

Novasys Consulting

Detroit and the Global Automobile Industry in 2017 and Beyond

Abstract

In this white paper, I am briefly reviewing the history of the automobile industry in a few industrial countries. I emphasize on the key determinants of the survival of domestic manufacturers in the selected countries. I then focus more on the United States (U.S.) market and the U.S. automobile industry. I analyze the U.S traditional domestic manufacturers in the global market and in their domestic market. I am not discussing Tesla in any detail as it is still pioneering the green automobile industry. I then review the factors that may determine the survival of FiatChrysler, Ford Motor Company, and General Motor Company in a future that will be marked by the global rise of Chinese manufacturers and the resilience of Asian and German manufacturers. I then propose solutions that may help the Detroit automobile industry in a medium to long term.

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1. A Brief Review of the History of the Automobile Industry and the Determinants of Success

1.1 A Brief History of the Chinese Automobile Industry

The Chinese government fostered the development of the automobile industry. With over ten automobile manufacturers working in joint ventures with the largest manufacturers of developed countries, the Chinese automobile industry grew high enough to become the highest automobile country market in the world. With import tariffs, very low labor costs, and skilful workers China developed an automobile supply base and other related industries such as consumer electronics and heavy manufacturing.

The Chinese government's use of planning for economical growth has been the key driver of Chinese development with many dozens of years of economical growth above 7% within the last 30 years. The planning has led to the progressive mastering of complex industries such as aircraft manufacturing, initially for the use of the Chinese military, and subsequently for civil use. One should notice that mastering technology implies mastering system thinking as applied which leads to positive outcomes in other industries such as for profit services (healthcare, banks, and education as examples) and governmental services.

The future for Chinese residents will be shinier because Chinese people have a tradition of saving a sizable proportion of their incomes and because as the economy gets better and technology gets diffused, the average income of Chinese citizens will increase and the gap between the wealthiest and the very poor will be reduced. Thus, China is developed in some areas but it is still developing.

1.2 A Brief History of the U.S. Automobile Industry

The United States (U.S.) automobile industry was born at the beginning of the twentieth century in Michigan and precisely with the incorporation of Oldsmobile by Ransom E. Olds on August 12, 1897. The Dodge brothers, Durand, Henry Ford, Olds, and Walter Chrysler were the pioneers. There was a worldwide automobile movement in the most advanced nations of Europe and the U.S.

Daimler and later Renault had introduced the salable automobile respectively in Germany and France. A few years later Henry Ford, having started his company a few times without success, incorporated the Ford Motor Company (Ford) in 1903 and a few years later he

introduced the assembly line with the mono-color (black only) Model T. In both Europe and the U.S. there had been a need for an individual mobility tool better than horses in term of speed, comfort, practicability, and overall cost of usage. The automobile marked the beginning of a new industrial era breaking away from horses and complementing the railroad for the benefit of individual customers and businesses.

When a new industry gets birth in a country or a region, it starts slowly with few pioneers then many companies enter the markets, get their market shares, adapt, transformed themselves for survival in times of distress, or exit the market; or died. The number of entrants into the market and the survival rate often depend on the size of the market, the country governmental policies with respect to tariff and free competition, the level of government support of the domestic business operating in the industry, and the competitiveness of the players in the industry.

1.3. A Brief History of the German Automobile Industry

In Germany, there was a dynamic similar to that of the U.S. with the earlier manufacturers such as Daimler, Volkswagen, Benz, and many others. However, because Germany lost World 1, and especially World War 2, the number of entrants in the markets could not be comparable to that of the U.S. Losing the World War 1 limited the ability of the German government to support the automobile industry because of World War 1 related financial liabilities.

More, after losing World War 2, for a few years a consortium of administrators from World War 2's Allied winner side (France, the U.S. and Great Britain) managed German automobile manufacturers such as Volkswagen, Daimler, and Benz. After Germany finally recovered the administration of its automobile manufacturers, the manufacturers became object of superior national interest which purposed was to help West Germany recover from the World War 2 and to progressively emerge as an industrial power. The fact is that fewer external or foreign automobile manufacturers entered the German market between 1914 and 1950 compared to the at least 68 manufacturers that entered the U.S. market (see Figure 8).

After World War 2 the German Automobile Industry grew with noticeable hurdles through distress but driven by exportations or Transplants in non German markets. The presence of German manufacturers in the U.S. market is an illustration of the strength of German manufacturers and more of the fact that an export driven strategy helps strengthen domestic

manufacturers. Unfortunately, for the last forty years, exporting vehicles from the U.S. to outside markets has not been a government strategy nor a Big Three (Chrysler, Ford Motor Company, and General Motor Company)'s strategy.

2. The Dynamic of Survival in the U.S. Automobile Industry

2.1 Free Market and the Survival Rate of U.S. Automobile Manufacturers

By the earlier 1900s, the successive U.S. governments were supportive of free market and progressively regulated the new automobile industry as the industry players learned from their various experiences in the development, manufacturing, marketing, and sales of new vehicles. For instance occupant safety was a concern and the government created regulations on speed limits on road, alcohol limit on drivers, and on occupant restraints such as seat belts, and a few dozen years later on airbags. I am briefly introducing regulation here because it is another barrier to entry in a market and a determinant for the survival of an automobile manufacturer in a market. If a manufacturer cannot pass country regulations on the automobiles, then it may not sell automobiles in that country. The second barrier to entry is the number and calibers of players already existing in the market.

A market that has a size of 10 millions of automobiles sold per year and 20 high caliber players will be more difficult to enter than a market of an annual size of 10 millions of vehicles and just 10 high caliber players. High caliber players are manufacturers that are established in the market with at least two percent of the market in either of the luxurious category or non luxurious category. As the industry grows, many manufacturers enter the market, overtime but only the fittest ones survive.

Survival depends on the competitiveness of the players in normal times and their resilience during economic downturns such as recession or competitiveness driven downturns. The automobile industry is cyclic because typically, recessions will always occurs overtimes, and other economic downturns will also occur driven by the transient factors of the economy.

In the U.S, many entrepreneurs and businessmen partnered to start automobile companies. From 1897 to present there have been about 110 defunct automobile manufacturers which lives were over four years (see Table 8). About 50 percent of the manufacturers had a life of four to 15 years. About 20 percent of the defunct manufacturers had a life that varied from 30

year to 107 years. The U.S. brands that have survived may not die easily unless forced by unfavorable market conditions. However, not as many Chinese automobile manufacturers die.

2.2 U.S. Automobile Manufacturers' Survival Rates versus Chinese Manufacturers' Survival Rates

China which is at the same stage where the U.S. market was in the first third of the 20th Century has automobile manufacturers which births were fundamentally different that of the U.S. manufacturers. In China, the government started most of the major automobile manufacturers and many of the ones that have been private had some state ownership on them or bought a business that was financed by the state. For that reason, none of the major players was under a risk of closure amid the recent 2007-2009 global recession. Only the weakest of the minor players have been forced to close usually because they did not meet Chinese requirements for automobile manufacturer certification (see Table 7).

Of the 13 major players identified on Table 7, none has shown sign of major sales declines. Instead, most have followed the Chinese automobile industry trend often structurally supported by the benefits of joint ventures with American, Asian, or European manufacturers. Lower Chinese labor costs have also been a factor that had enabled the companies to be profitable while assembling lower volumes of cars or trucks. Whether an automobile is American, Asian, Chinese, or European, they all use various strategies amid the 2007-2009 recession to grab an opportunity for growth.

2.3 Using Economic Downturns as Periods of Opportunities

Divesture as a strategy. When an economic downturn occurs, there are different opportunities for different players. Depending on the leadership of the manufacturers, some manufacturers may divest brands keeping only the strongest ones in what I call a strategy of focus on the strongest brands. It was the case of Ford Motor Company between 2008 and 2010 when it sold Land Rover and Jaguar to Tata Motor Company, sold Volvo to Geely Automobile Holding of China, sold out Aston Martin, and cancelled Mercury in 2010.

Seemingly, Chrysler eliminated the Eagle brand in 1998 and the Plymouth brand in 2001. General Motors eliminated the Oldsmobile brand in 2003, and amid the 2007-2008 recession the Pontiac, Saturn, Hummer brand, and later in 2010 the Saab brand. Other manufacturers use periods of economic downturns as time of great opportunity for revival.

Acquisition for growth capability. Even though the three U.S. former Big Three automobile manufacturers all benefited from either bankruptcy restructuring or Government's aids allowing them to clean their balance sheets or redefine better business models upon the 2007-2009 recession, they did not take any opportunity to acquire a distressed automobile manufacturer. Instead foreign manufacturers used economic downturns to acquire growth capability. It was the case of Tata Motors Limited that purchased Jaguar and Land Rover from Ford Motor Company in 2010 allowing it to speed up its competitiveness in the luxurious brand automobile market, which became an undeniable success six years later.

It was also the case of Geely Automobile of China when it acquired Volvo in 2009. Acquiring Volvo allowed Geely to also enter the global market of luxurious vehicles and to become a player in the U.S. market, the second market per size and revenues in the world. More recently in late 2016, Peugeot Citroen (or the PSA Group) acquired Opel and Vauxhall from General Motors amid competitive struggles of General Motors in the European market. The three examples that I just listed illustrate the possibility of automobile manufacturers under new management and a new vision to take automobile businesses from a lower status in the global market or in a regional market to a better status being more competitive and eventually profitable.

Alliance or joint ventures as a strategy. The third common strategy is that of alliances or joint ventures, which may often be the riskiest of the three strategies because of the difficulties to align two business cultures toward common goals. Some alliance or mergers have been successful when others have failed. The Renault Nisan alliance has been successful because of their Common CEO Carlos Ghosn's leadership transformational skills that let the Nissan employees and managers own the change process without changing the core of the Nissan's culture.

Volkswagen has been successful in acquiring different brands among which automobile Lamborghini S.P.A, Bentley Motors Limited, Bugatti Motors S.A.S, Porsche A.G., Skoda, Scania, and Ducati. However, the 1997 merger between Daimler and Chrysler failed because of top down behaviors of the larger of the two companies which was the Daimler. Ford's Acquisition of Volvo, Land Rover, Jaguar, and Aston Martin was also a failure since Ford had to sell the four brands by 2010. Finally General Motors s' acquisition of Saab was not successful as the company found the brand to be too costly amid the 2007-2009 recession. Other strategies

that automobile manufacturers commonly used are efficiency strategies, and quality superiority strategies.

Efficiency strategies are numerous including low cost through economy of scale, lean enterprise, downsizing, and mostly control of capacity utilization. Higher capacity utilization drives profitability, which is where most manufacturers that quickly divest brands or perform basic badge engineering fail. Quality is a major differentiator of brand value among automobile manufacturers. Quality metrics such as initial quality, long-term dependability, comfort, and customer overall satisfaction with the service experience at the dealership and the ownership experience should be among the major objectives of automobile manufacturer's businesses

3. Changes in the U.S. Automobile from 2007-2009 to 2017

3.1 The U.S. Market Has Recovered

Compared to the years 2007-2009, the U.S. automobile market has grown again in size and General Motors, Ford Motor Company, and to some extent FiatChrysler have grown their market shares at a level compared to their best competitors Toyota, Honda, and Nissan. The Big Three are now the Big Two and Half turning overtimes toward the Big Two. FiatChrysler is slowly becoming Fiat owning Chrysler, a repeat of a business structure similar to the DaimlerChrysler structure but with more inequalities in the merger of the unequal.

3.2 Chrysler is Now FiatChrysler

FiatChrysler is led by the Fiat side of the business which owns more shares. Sadly for those whose families have worked in the automobile industry and at Chrysler for two or more generations, they are witnessing the voluntarily weakening of the Chrysler brand with the cancellation of the Chrysler 200 and a reduction of the number of model to just three: The Chrysler 300, the Chrysler Pacifica, and the Chrysler Pacifica Hybrid. The Dodge brand is also struggling with the Dodge cancelled in September 2016 (see Table 5).

From 2011 to 2016, FiatChrysler's U.S. market share remained quite stable between 10% and 11%. Although the market share did not increase, it did not decrease drastically. However, 2016 sales volumes of the Chrysler brand decreased by 27 percent and the 2016 sales volumes of the Fiat brand decreased by 23.7 percent. Hence, there is more reliance on Dodge, Jeep, and Ram to sustain market shares above 10% (see Figure 1 to Figure 6; Table 3 to Table 5).

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FiatChrysler lags behind Tesla, General Motors, Ford, and Toyota in the development of electric vehicles and perhaps hybrid vehicles. Chrysler has a higher structural risk in the U.S. market since brands that were well known such as Chrysler, Dodge, and Jeep have few models respectively, two, four, and four. Ram is no longer a nameplate of the Dodge brand but a different brand reserved just for trucks and vans and is doing well in the U.S. market so is Jeep which unfortunately has fewer models.

The Abarth is now a somehow different brand from Fiat but both Fiat 500 and the Abarth will have to compete with Lancia (it has only two models) although the Abarth may arguably be considered luxurious among the three. The combined sales volumes of the Abarth and Fiat vehicles have been below mediocre for the last two years (see Table 3 and 4). Alpha Romeo looking luxurious has fewer models compared to other luxurious brands while the offering of Maserati should be competitive at a low volume. New brands take time to conquer a market. It took ten years for both Hyundai and Kia to be fully established.

Every time General Motors, Chrysler, or Ford cancelled a brand, Kia and Hyundai benefited from it because they entered the U.S. market offering low cost vehicles and were able to drastically improve their quality at unexpected speeds. For Abarth, Fiat, and Lancia cars there will be more competition in the years to come when compared to the years 1995-2000 while entering the U.S. market at retail prices that are relatively high for mass market vehicles of the same sizes. Dodge, Jeep, and Ram may help Fiat Chrysler be competitive in the U.S. market but there is a caution on the number of models which is very low for each of them and may ultimately lead to loss of market shares.

For the international market, Chrysler needs to speed up its export and make its presence in China meaningful. FiatChrysler needs to opt for an Export strategy from the U.S. and from its other manufacturing bases of Europe, and South America. Giving up former Chrysler LLC's dominance in minivans under the Dodge brand may hinder competitiveness in North America, thus the Dodge Caravan needs an update. Given up the manufacturing of sedans, coupe cars, and convertible cars under the Chrysler brands and the Dodge brands may also hinder competitiveness in North America. The Italian brands at the exception of Materasi have not gained any traction in the U.S. market and it will be quite difficult for Abarth, Fiat, and Lancer to replace Chrysler's cars and Dodge cars.

3.3 Ford is Competitive in the U.S. but under Pressure from Competitors

Ford remains competitive with new offering of full vans that are more fuel efficient while replacing the E-series. However, many more updates are needed for the Taurus and the Flex, and in general a few more models will be welcome and mostly if they are more fuel efficient with hybrid technology at an affordable manufacturer retail price. There should be a caution on competitive moves from Toyota and Nissan with new pick-ups.

The Lincoln Brand still needs more cars in order to be globally competitive (see Figure 6). Daimler, Lexus, Audi, and BMW have a wider coverage of the market demographic (see Figure 5). The MKC and the new Continental are examples of new products that are still needed for Lincoln to be competitive in the U.S. and abroad. In general, Ford Motor Company needs to continue growing in China, rest of Asia, Brazil, and Russia. To be competitive more competitive, Ford needs to opt for an Export strategy from the U.S. and from its other manufacturing bases of Asia, Europe, and South America. The main reason is that relying on U.S. sales volumes may not be enough to be very profitable in the U.S. and without selling more in most foreign markets, Ford will be under competitive pressure from Chinese manufacturers and Tata Motor Limited (Tata) when the Chinese manufacturers and Tata scale up their exports of mass market vehicles.

From 2011 to 2016, Ford's market share decreased from 15.2% in 2011, 15% in 2012, and 14.8% in 2016. Although the market share did not increase, it did not decrease drastically. Hence, there are possibilities for Ford Motor Company to increase its U.S. market share. Exporting more vehicles and increasing the number of models of Lincoln may be some of them.

3.4 General Motors Company Doing Well but Can it Sustain the Momentum?

General Motors has a good momentum with Buick, Chevrolet, Cadillac, and GMC in the U.S. market. U.S. market shares varied from 19.5% in 2011, 19% in 2012, and 17.5% in 2016. In 2016, Cadillac's market share decreased by 3 percent, Chevrolet's market share decreased by 1.2 percent, and GMC's market share decreased by 2.2 percent. GM will have to address the potential losses of market shares in the U.S.

GM's other problem is that it gave away the European market by selling Opel and Vauxhall to PSA. It will take dozens of years for the GM's brands to become players in many European markets. In General GM needs to continue growing in China, rest of Asia, Brazil, and

Russia. GM is doing well in China but needs to address the lack of global presence of its brands particular in developing countries.

There should be a caution on competitive moves from Toyota and Nissan with new pick-ups in the USA. Although Cadillac product lineup is wider than that of Alfa Romeo, Buick, Lincoln, and Maserati which are the Big Three's other luxurious brands, it still lags behind that of Audi, BMW, Lexus, and Mercedes-Benz.

4. Integration of High Tech in Automobiles

4.1 More Electrical Vehicles and Hybrid vehicles in the Market

There are now more electrical vehicles as well as hybrid vehicles, many at high prices and many in Europe at low prices ranging from 7000 Euros to 10000 Euros. Tesla leads the production and sales of electric vehicles priced 30000 U.S. dollars or more. Toyota leads the production of hybrid vehicles and the Toyota Prius is still the hybrid vehicle the most sold in the world.

Of the Big Three Manufacturers, Ford is the one that offers the largest number of hybrid electric vehicles and electric vehicles. GM offers only two models the Chevrolet Bolt and the Chevrolet Volt. FiatChrysler offers only one, the Chrysler Pacifica Hybrid. Ford has adopted a green power diversification strategy, while GM has focused on the Electric battery rechargeable with a small gasoline engine technology, and FiatChrysler is a late entrant in the green automobile industry (see Figure 5 and Figure 6).

4.2 Still no Best Solution Green Power Technologies

There is still no standard solution or preferred solution for automobile power technology. Different manufacturers have taken different strategies. Tesla is going fully electric so are new players such as Fisker Automobile in the U.S. and Bolloré in France. Ford uses a combination of battery hybrid, electric, and plug-hybrid electric vehicles. Toyota focuses on hybrid vehicles. Many other manufacturers that follow a strategy similar to that of Ford are Nissan, Renault, Honda, Mitsubishi, and Peugeot. General Motors has opted for its Electric battery and small gasoline engine that helps recharge the battery illustrated by the Chevrolet Volt and Chevrolet Bolt. In the future, hydrogen as a power, solar energy, and more efficient hybrids could be other solutions.

4.3 Self-driving and Self-parking Technologies

Automobile manufacturers are integrating high technologies in vehicles more than they did ten years ago. There is a passion for developing self-driving vehicles. Developing self-driving vehicles will help improve vehicle occupant safety. Self-parking technology is another example of high technology integrated in vehicles.

4.4 High-Tech and Transit Businesses

There are now companies such as Uber and Lift that use the internet and smart phones to have vehicles owners transport people for a fee. The companies compete with taxicabs, buses, and motorcycles. The companies are going global. However, it is still unclear whether or not such companies will have a positive impact on the future of the global automobile industry

5. Key Features of the Global Automobile Market

5.1 The Tata Nano and the Base of the Pyramid.

Tata is selling the Nano at prices as low as 3000-4000 U.S. dollars. The move by Tata with the Nano means low income countries are potential markets for low price vehicles. Thus, African countries and many other countries in Asia and the Middle East will become markets for new vehicles manufactured locally. The relative success of the Nano also means that other automotive manufacturers may design low cost vehicles for the base of the pyramid. The base of the pyramid consists of the people who have average incomes in developing countries but who may still be able to afford a low price vehicle at a manufacturer's suggested retail price comparable to that of the Tata Nano.

5.2. China, the Largest Automobile Market.

Chinese automobile manufacturers have not started exporting their vehicles sizably. However because they have grown through joint ventures with major automobiles manufacturers from Europe, America, and Asia, they have quickly acquired technologies including power technologies and occupant safety technologies. Because of its populations the Chinese market will keep attracting more manufacturers.

5.3. The U.S. Market, Still an Important Market

The U.S. market is still an attractive market for many non U.S. manufacturers that import vehicle in the U.S. or manufacture vehicle in US-based transplants. Meanwhile when compared to the

Japanese and the Germans manufacturers that export at least 30% of the vehicles that they manufacture in their home market, U.S. automobile manufacturers export very little (less than 10%) from the U.S. Such a trend creates an economic disadvantage in terms of jobs for U.S. residents and business revenues for U.S. based and owned automobile manufacturers. Except Tesla, the U.S. based and owned manufacturers (FiatChrysler just partially, Ford Motor Company, and General Motors) are far more squeezed by competition in their domestic market when compared to German manufacturers, Korean manufacturers, and Japanese manufacturers all having a significant portion of share of the U.S. automobile market (see Figure 1 to Figure 6 and Table 1 to Table 6)

6. Where does Detroit Go from Here?

To understand what will happen to Detroit, I have to consider what will inevitably happen in the next twenty years combined with scenarios based on realistic assumptions.

6.1 Realistic Assumptions

6.1.1 Growing Country markets and the Search for Green Power Technologies

What I believe will happen inevitably is that the automobile industry will still exist with China the largest market, the U.S. market, the Indian market, Brazil, the European country markets, and the rest of Asia markets will still be the major markets. Country markets in developing countries of Africa and Asia will become meaningful as the economies of the countries grow. The sales volumes of battery electric vehicles (BEV), battery hybrid vehicles (BHEV), and plug-hybrid-electric vehicles (PHEV) will keep growing . There will be more hydrogen power vehicles in Europe, and the industry will have a clearer idea on how to use solar energy and wind energy to power vehicles.

6.1.2 Growth in the Indian Market

Another realistic assumption is that since the Indian market will keep growing, Tata Motors Limited the largest Indian manufacturers will be selling more vehicles in its home market and abroad. One of the implications for the U.S. markets is that the two companies that Tata acquired from Ford will be more competitive, thus Land Rover and Jaguar will be major players in the global market of premium vehicles. The reason is that Tata's senior managers have claimed their vision to export vehicles out of India and Tata's exports have been progressively growing in

volumes. More sales volumes of Land Rover and Jaguar globally will mean more competition in the U.S. premium automobile market because the two brands Jaguar and Land Rovers have built brand equity in the U.S. for more than 20 years.

6.1.3 Manufacturers to Grab Opportunities amid Economic Downturns

Sales volumes of Geely Automobile Holding will increase in China including sales volumes of Volvo that Geely purchased from Ford. If sales volumes of Volvo increase, then Volvo will be a major player in the U.S. premium automobile market. Such increase in sales volumes will benefit the assembly plant that Volvo is opening in Berkeley, South Carolina, USA with more jobs and a positive value to the U.S. economy. Volvo, Jaguar, and Land Rover are good examples of consequences of choices made by leaders amid a recession or any other economic downturn. What is a burden for some becomes an unbelievable opportunity for others. Volvo represents more than half of Geely's revenues. By purchasing Jaguar and Land Rover, Tata became a major player in the global Luxurious automobile markets. Both Geely and Tata are offering customers what they want: Attractive luxurious vehicles with comfort, occupant safety, and dependability (see Figure 1 to Figure 6 and Table 1 to Table 6).

In the past, U.S. automobile manufacturers were not able to benefit from such opportunities usually because of the absence of manufacturing flexibility that allows high capacity utilization for various brands. Hence when Ford purchased Jaguar, Land Rover, and Volvo in the 1990s it did not consolidate the production of those products in the same assembly plants as the ones that assembled Ford, Mercury, and Lincoln vehicles.

6.1.4 When Investors Skip U.S. Distressed Brands, they Miss Opportunities

When DaimlerChrysler cancelled Eagle in 1998 and Plymouth in 2001, no U.S. investors grabbed the opportunity to purchase the brands and build them back up just as Geely and Tata are doing for Volvo, Jaguar, and Land Rover. The same kind of events happened when General Motors cancelled Oldsmobile, Hummer, Pontiac, and Saturn. The reason is that most potential U.S. investors primarily focused on the U.S. market and often concluded that the market was saturated without looking into three main opportunities.

1) The opportunities of selling or even manufacturing vehicles in foreign markets, not only in China but also in many developing countries.

2) The second opportunity is that keeping the brands alive helps protect the U.S. domestic manufacturers against foreign entrants - The brands that manufacturers cancelled had market shares that foreign manufacturers partially grabbed. Domestic manufacturers did the same. However, had the brands remained alive under new management or new corporations, the decline in market shares of domestic manufacturers may have been contained.

3) The third opportunity is that of taking advantage of a very qualified workforce of engineers, managers, specialists, and technicians who have received what is arguably the best education for what matters in the automobile industry.

6.2. FiatChrysler May Be Profitable but the Chrysler and Dodge Brands are at Risk.

Among the Big Three manufacturers, Chrysler remains the most vulnerable for the following reasons:

It has reduced its number of models for traditional U.S. brands Dodge, Chrysler, and Jeep; reducing Chrysler to two vehicles only, Dodge to four vehicles, and Jeep, to four brands only. Only Ram has enough vehicles to sustain competitiveness in the U.S. Market. As FiatChrysler progressively cancels vehicles for Chrysler, Dodge, and Jeep for the past half-dozen of years, it has progressively lost market share more than the competition (see Figure 1 to Figure 6 and Table 1 to Table 6).

The reason is that U.S. customers have not rushed to purchase neither Fiat vehicles, Lancia vehicles, nor Alpha Romeo vehicles. The only vehicle new to the market that has received positive response has been the Maserati. Fiat has less than 0.3 percent of the U.S. market. In 2016, Chrysler has been reduced to 1.3 percent of the U.S. market, while Dodge had 2.9 percent of the market in 2016. All the three brands had negative trends in December 2016 (Figure 5 and Figure 6; Table 3, and Table 4). All this is happening when the Chinese manufacturers are not yet exporting many vehicles out China nor even exporting vehicles in the U.S.

6.3. The U.S. Automobile Industry, still Attractive but more Competitive

The U.S. automobile industry will remain competitive and there will be little opportunities for major market share increases for incumbent automobile manufacturers. One reason is that there are many major players: General Motors, Ford Motor Company, Toyota, Fiat

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Chrysler, Honda, Nissan, Hyundai, Kia, Volkswagen, and Subaru for mass market brands. For the luxurious brands the major players are Mercedes Benz, Lexus, BMW, Buick, Cadillac, Acura, Infiniti, Lincoln, and Volvo.

Another reason especially for Ford Motor Company, FiatChrysler, and General Motors Company is that although they have grown as the whole industry after the 2007-2009 recession, their market shares steadily decrease slightly more than the best in class except for some of the General Motors' brands, which is an evidence of customers preferring foreign incumbents to the market. Unfortunately, Chinese manufacturers may enter the market.

Unless there are specific agreements between China and the U.S, Chinese manufacturers may enter the U.S. market. Stiffer regulations may protect such entry. If Chinese manufacturers face higher tariffs, they may decide to build transplants in the US. That many U.S. manufacturers have joint ventures with Chinese manufacturers give U.S. manufacturers the necessary leverage to keep their allied from building transplants in the U.S.. However Chinese manufacturers that are not joined with U.S. manufacturers may not have any restraint from entering the U.S. market.

There are about 13 major automobile manufacturers in China, and 20 minor automobile manufacturers. There are also new manufacturers of green vehicles that are continuously applying for and obtaining license in China. Since Chinese major manufacturers have a very low defunct rate, it is realistic to conclude that for the next twenty years at least twenty Chinese manufacturers will survive and at least six of them will be major global players.

For Detroit manufacturers and Tesla, the competitions in foreign markets will be fierce with sale levels cut at least by half. In case Chinese manufacturers receive authorization to export vehicle toward the U.S., the trend of declining market shares will be stiffer and companies such as General Motors may reach market shares below 10 percent and it will be worse for FiatChrysler and Ford. The problem as described here is the worst realistic problem that Detroit automobile manufacturers face. Such threat will happen and it is just a question of times. Here are some few solutions for Detroit automakers

6.4. Some Potential Solutions

S1) U.S. manufacturers that have alliances or Joint ventures with Chinese manufacturers may sign agreements that limit export of vehicle to the U.S.

S2) The Big Two Manufacturers (Ford and GM) may adopt an export strategy out of the U.S. market and out all their other manufacturing hubs which are: Brazil, China, Germany, India, Russia, and South Africa.

S3) The U.S. government and the regional government of Michigan may work with the automobile manufacturers, leader of the automobile industry, entrepreneurs, investors, and university to define a strategic for the competitiveness of Detroit's Automobile manufacturers considering the inevitable future rise of Chinese automobile manufacturers in the global automobile market

S4) Because China will probably have at least six major automobile manufacturers and dozens of minor automobile manufacturers, the Detroit region needs more automobile start-ups to compete against Chinese manufacturers and other foreign manufacturers in the U.S. domestic market and in foreign markets

S5) In order to generate more automobile start-ups entrepreneurs can have alliances with companies such as FiatChrysler, Ford, and GM from which they may purchase the design of defunct brands: Plymouth or Eagle for Chrysler, Mercury for Ford, and Oldsmobile, Saturn, and Pontiac for GM. The start-ups should foster green power technologies by working with centers of automobile research at Clemson University, Ohio State University, the University of Michigan, and Stanford University as well as with the Argonne National Laboratory located in Argonne, Illinois.

S6) The U.S. Government needs to help save the traditional Chrysler's brands: Chrysler and Dodge which are at risk of being deceased. If FiatChrysler leadership decides to get rid of the brands, then the government may work with local governments in Michigan and investors to create a new Chrysler Dodge Company

S7) As a lesson learned following the 2007-2009 recession, the notion of automobile manufacturer's citizenship needs to be considered when divesting automobile manufacturers or organizing them in joint ventures. Regardless of the imperative of free market, U.S. automobile manufacturers should not be the only ones to not consider automobile brands as

strategic assets for their home country economy. Thus mergers such as the Daimler Chrysler merger and the Fiat Chrysler merger need to be avoided because upon such mergers, there is a transfer of important intellectual property to companies of foreign national citizenships. Seemingly, the sales similar to that of Hummer to Chinese investors, that of Land Rover and Jaguar to Tata, and that of Volvo to Geely should be done differently. The company should rather be sold to corporations or investors of U.S. citizenship. The automobile industry will become very fragmented as China now has about 33 automobile manufacturers and many other small automobile manufacturers start up in various countries of Europe.

S8) In order to diversify in the segment of green automobile, the government should help companies such as Fisker Automobile or Elio Motors because they already have products. There should be an emphasis on making not just luxurious vehicles but also vehicles that the average U.S. customer can purchase.

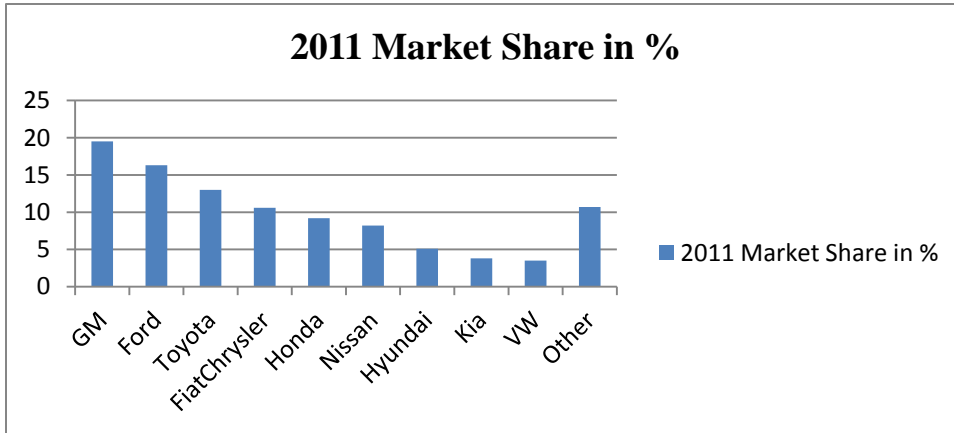


Figure 1. 2011 Market Shares of the Main Manufacturers in the U.S. Market

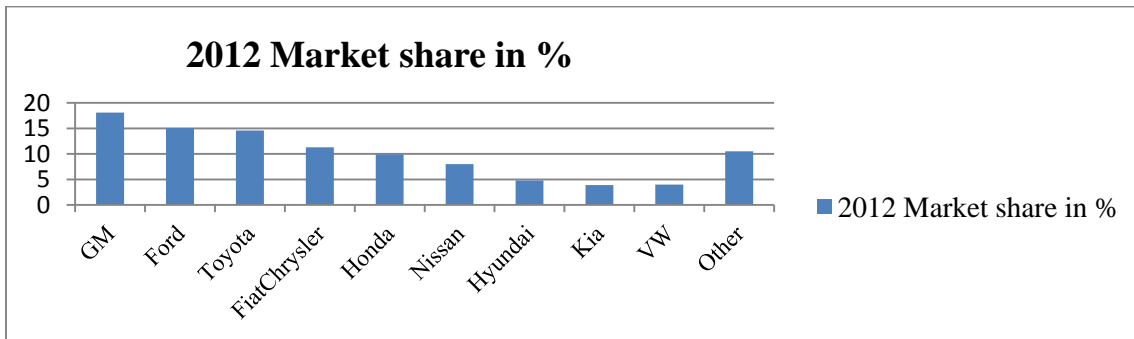


Figure 2. 2012 Market Shares of the Main Manufacturers in the U.S. Market

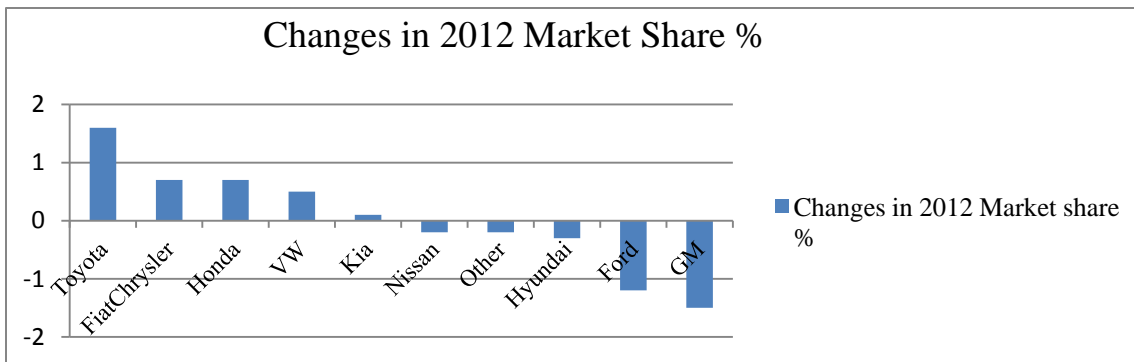


Figure 3. Changes in 2012 Market Shares in the U.S. Market

Detroit and the Global Automobile Industry in 2017 and Beyond

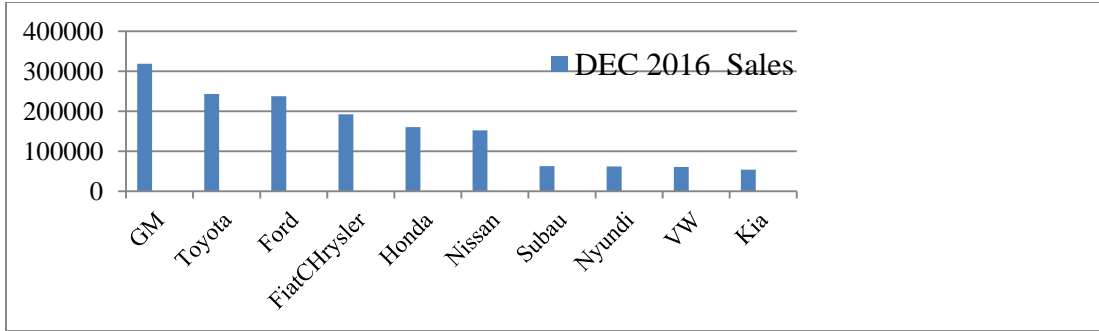


Figure 4. December 2016 Sales Volumes

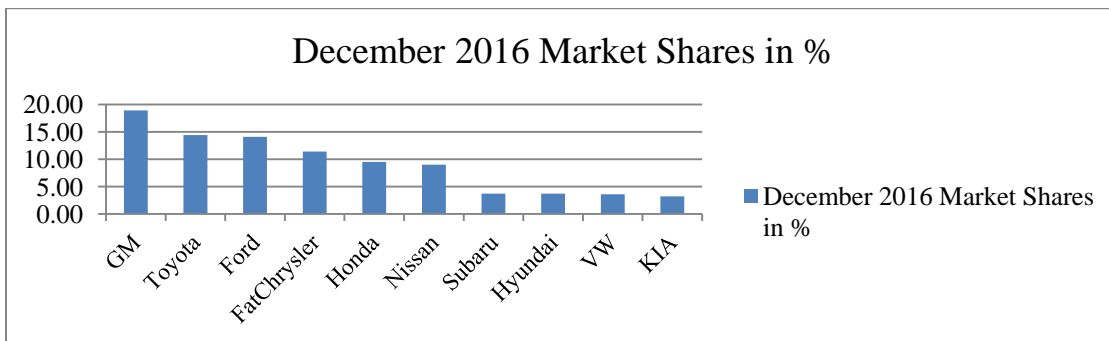


Figure 5. Market Shares as of December 2016

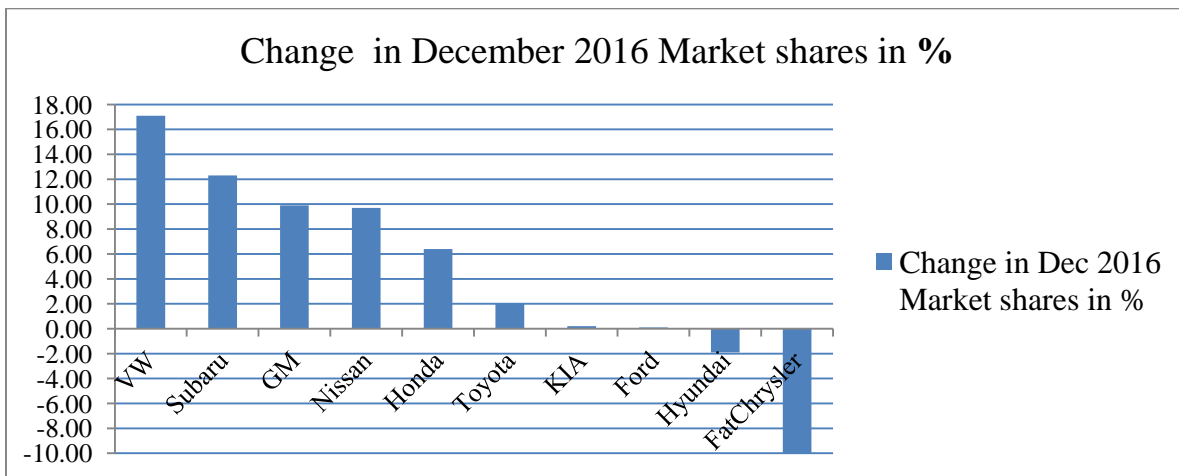


Figure 6. Changes in December 2016 Market Shares in the U.S. Market

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Table 1

Luxurious Brand Sales Volumes in the U.S. for the Year 2016 Ranked by 2016 Sales Volume

Brand	Dec 2016 Sales Volumes	Change Dec 2016 (%)	2016 Sales Volumes	Change 2016 (%)	Dec 2016 market shares	2016 Market shares
Mercedes Benz	35,871	-6.20%	374,541	0.40%	2.10%	2.10%
Lexus	41,182	-0.50%	331,228	-3.90%	2.40%	1.90%
BMW	32,835	-5.20%	313,174	-9.50%	1.90%	1.80%
Buick	21,288	2.80%	229,631	2.90%	1.30%	1.30%
Audi	23,195	13.70%	210,213	4.00%	1.40%	1.20%
Cadillac	21,446	3.20%	170,006	-3.00%	1.30%	1.00%
Acura	17,148	1.90%	161,360	-8.90%	1.00%	0.90%
Infiniti	18,198	20.60%	138,293	3.60%	1.10%	0.80%
Lincoln	12,791	17.80%	111,724	10.40%	0.80%	0.60%
Volvo	10,129	8.40%	82,724	18.10%	0.60%	0.50%
Land Rover	8279	-1.90%	73,861	4.60%	0.50%	0.40%
Porsche	4015	2.00%	54,280	4.90%	0.20%	0.30%
Jaguar	4294	259%	31,243	116%	0.30%	0.20%
Maserati	1694	58.50%	12,534	7.20%	0.10%	0.10%
Bentley	407	-29.90%	2581	-3.90%	0.00%	0.00%
Alpha Romeo	52	-7.10%	516	-21.70%	0.00%	0.00%
Genesis	1733	0.00%	0	0.00%	0.10%	0.00%

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Table 2

Luxurious Brand Sales Volumes in the U.S. for the Year 2016 Ranked by Change in 2016 Sales Volumes in %

Brands	Dec 2016 sales volumes	Change Dec 2016 (%)	2016 Sales Volumes	Change 2016 (%)	Dec 2016 market shares	2016 Market shares
Jaguar	4294	259%	31,243	116%	0.30%	0.20%
Volvo	10,129	8.40%	82,724	18.10%	0.60%	0.50%
Lincoln	12,791	17.80%	111,724	10.40%	0.80%	0.60%
Maserati	1694	58.50%	12,534	7.20%	0.10%	0.10%
Porsche	4015	2.00%	54,280	4.90%	0.20%	0.30%
Land Rover	8279	-1.90%	73,861	4.60%	0.50%	0.40%
Audi	23,195	13.70%	210,213	4.00%	1.40%	1.20%
Infiniti	18,198	20.60%	138,293	3.60%	1.10%	0.80%
Buick	21,288	2.80%	229,631	2.90%	1.30%	1.30%
Mercedes B	35,871	-6.20%	374,541	0.40%	2.10%	2.10%
Genesis	1733	0.00%	0	0.00%	0.10%	0.00%
Cadillac	21,446	3.20%	170,006	-3.00%	1.30%	1.00%
Lexus	41,182	-0.50%	331,228	-3.90%	2.40%	1.90%
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Table 3

Mass Market Brand Sales Volumes in the U.S. for the Year 2016 Ranked by 2016 Sales Volume

Brand	Dec 2016 Sales Volumes	Dec 2016 Change (%)	2016 Sales Volumes	2016 Change (%)	Dec 2016 Market Share	2016 Market Share
<u>Ford</u>	224994	-0.01	2487487	-0.60%	13.30%	14.20%
<u>Toyota °</u>	201945	0.04	2106374	-0.70%	12.00%	12.00%
<u>Chevrolet</u>	212959	0.13	2096510	-1.40%	12.60%	12.00%
<u>Honda</u>	143329	0.07	1476582	4.80%	8.50%	8.40%
<u>Nissan</u>	134545	0.08	1426130	5.50%	8.00%	8.10%
<u>Jeep</u>	83159	-0.06	926376	6.10%	4.90%	5.30%
<u>Hyundai</u>	60572	-0.05	768057	0.80%	3.60%	4.40%
<u>Kia</u>	54353	0.00	647598	3.50%	3.20%	3.70%
<u>Subaru</u>	63177	0.12	615132	5.60%	3.70%	3.50%
<u>GMC</u>	63415	0.06	546628	-2.20%	3.80%	3.10%
<u>Ram</u>	53597	0.10	545851	11.10%	3.20%	3.10%
<u>Dodge</u>	36329	-0.21	506858	-3.90%	2.20%	2.90%
<u>Volkswagen</u>	37229	0.20	322948	-7.60%	2.20%	1.80%
<u>Mazda</u>	28754	-0.02	297773	-6.70%	1.70%	1.70%
<u>Chrysler</u>	16776	-0.32	231972	-27.00%	1.00%	1.30%
<u>Mitsubishi</u>	7383	-0.06	96267	1.00%	0.40%	0.50%
<u>Mini</u>	4658	-0.07	52030	-11.10%	0.30%	0.30%
<u>Fiat</u>	2606	-0.54	32742	-23.70%	0.20%	0.20%
<u>Scion °</u>	102	-0.95	12028	-63.50%	0.00%	0.10%
<u>Smart</u>	1186	0.77	6211	-17.00%	0.10%	0.00%

Table 4

Detroit and the Global Automobile Industry in 2017 and Beyond

Mass Market Brand Sales Volumes in the U.S. for the Year 2016 Ranked by Change in 2016 Sales Volumes in %

Brands	Dec 2016 Sales Volumes	Dec 2016 Change (%)	2016 Sales Volumes	2016 Change (%)	Dec 2016 Market Share	2016 Market Share
<u>Ram</u>	53597	0.10	545851	11.10%	3.20%	3.10%
<u>Jeep</u>	83159	-0.06	926376	6.10%	4.90%	5.30%
<u>Subaru</u>	63177	0.12	615132	5.60%	3.70%	3.50%
<u>Nissan</u>	134545	0.08	1426130	5.50%	8.00%	8.10%
<u>Honda</u>	143329	0.07	1476582	4.80%	8.50%	8.40%
<u>Kia</u>	54353	0.00	647598	3.50%	3.20%	3.70%
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<u>Chevrolet</u>	212959	0.13	2096510	-1.40%	12.60%	12.00%
<u>GMC</u>	63415	0.06	546628	-2.20%	3.80%	3.10%
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<u>Scion °</u>	102	-0.95	12028	-63.50%	0.00%	0.10%

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Table 5

Number of Models per Mass Market Automobile Brands in the U.S. as of July 2017

Makes	Number of Cars and Wagons	Number of CUV, SUV, & Minivans	Numbers of HEV, PHEV and EV
Jeep	0	4	0
Chrysler	1	1	1
Dodge	3	3	0
Fiat	4	2	0
Ford	6	6	12
Chevrolet	5	5	2
GMC	0	4	0
Toyota	7	7	6
Volkswagen	7	3	0
Honda	9	4	2
Hyundai	6	3	4
Nissan	8	5	1
Average for the all Makes of the Sample	4.7	3.9	2.3
Average for non U.S. Manufacturers	7.4	4.4	2.6
Average for U.S. Manufacturers	2.7	3.6	2.1
Fiat Chrysler Average-Non Jeep	2.7	2.0	0.3
Ford GM Average Non GMC	5.5	5.5	7

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Table 6

Number of Models per Luxurious Automobile Brands in the USA as of July 2017

Makes	Number of Cars and Wagons	Number of CUV, SUV, & Minivans	Numbers of HEV, PHEV and EV
Alpha Romeo	3	1	0
Buick	4	3	0
Cadillac	8	2	1
Lincoln	2	4	0
Maserati	4	1	0
Acura	4	2	3
Audi	24	5	0
BMW	20	8	2
Lexus	11	4	6
Mercedes-Benz	17	6	3
Infiniti	4	5	0
Average for the all Makes of the Sample	9.2	3.7	1.4
Average for Non U.S. brands Alpha Romeo and Maserati Excluded	13.3	5.0	2.3
Buick, Cadillac, and Ford Average	4.7	3.0	0.3
Maserati and Alpha Romeo Average	3.5	1.0	0.0

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Table 7

Current Chinese Automobile Manufacturers as of July 2017

Chinese automakers	small player	Major player	Cars	SUVs and CUV	Buses vans trucks	Birth
<u>BAIC Group</u>		y	Y	y	y	1988
<u>BYD (2003–present) (17)</u>		y	Y	y	y	2003
<u>Changan Motors</u>		y	Y	y	y	1990
Chery Automotive		y	Y	y		1997
<u>Dongfeng (15)</u>		y	Y	y	y	1969
First Automobile Works Grp Corp (FAW) (14)		y	Y	y	y	1953
<u>Geely (Jili) (11)</u>		y	Y	y	y	1998
<u>Great Wall Motors</u>		y	Y	y	y	1984
<u>Guangzhou Automobile Industry Group (GAIG)</u>		y	Y	y		2000
HuaChen Group Auto Holding Co., Ltd (Brilliance Automobile Group) (9)		y	Y	y		1991
<u>Jianghuai (JAC) (8)</u>		y	Y	y	y	1964
<u>Jiangling (JMC) (7)</u>		y	Y	y	y	1968
<u>Qoros (2)</u>		y	Y	y		2013
<u>SAIC Motor (1)</u>		y	Y	y	y	2011
Shuanghuan	y	Total major players: 13	Y	y		1998
<u>Dadi (16)</u>	y				y	1988
<u>Foton (12)</u>	y					
Gonow	y			y	y	2003
<u>Green Field Motor (10)</u>	y			y		2010
<u>Guangqi Honda Automobile (3)</u>	y		Y			2014
<u>Hawtai Motor (Huatai)</u>	y		Y	y		2000
<u>Jonway (5)</u>	y			y		2003
Kingstar Vehicle Company Limited (6)	y		Y	y	y	2004
Liaoning Shuguang Automotive Group, Ltd (SG)	y				y	1984
<u>Lifan (4)</u>	y		Y	y		2005
Shaanxi Automobile Group	y				y	1968
<u>Sichuan Tengzhong</u>	y				y	2005

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<u>Xinkai</u>	y			y	1984
<u>Yema Auto</u>	y		Y	y	1994
<u>Youngman</u>	y			y	2001
<u>Yutong Group</u>	y			y	1963
<u>Zhangjigang Jiangnan</u>					
<u>Automobile</u>					
<u>Manufacture Co., Ltd.</u>	y			y	1980
<u>Zhongxing (Zxauto)</u>	y			y	1999
<u>Zotye</u>	y		Y	y	2005
	Total Minor Players: 20				



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Table 8

Defunct Automobile Brands in the U.S. between 1897 and 2015

	Company or Brand	Birth	Death	Age
1	<u>Oldsmobile</u>	1897	2004	107
2	<u>Sterling Trucks</u>	1907	2009	102
3	<u>Pontiac</u>	1907	2008	101
4	<u>Mack</u>	1900	2000	100
5	<u>Plymouth</u>	1928	2001	73
6	<u>Mercury</u>	1939	2010	71
7	<u>REO</u>	1905	1975	70
8	<u>Studebaker</u>	1902	1963	61
9	<u>Packard</u>	1899	1958	59
10	<u>Hudson</u>	1909	1957	48
11	<u>Nash</u>	1916	1954	38
12	<u>Pierce-Arrow</u>	1900	1938	38
13	<u>Auburn</u>	1900	1937	37
14	<u>AMC</u>	1954	1988	34
15	<u>DeSoto</u>	1928	1961	33
16	<u>Peerless</u>	1900	1933	33
17	<u>Detroit electric</u>	1907	1939	32
18	<u>Hupmobile</u>	1909	1940	31
19	<u>Marmon</u>	1902	1933	31
20	<u>Stearns-Knight</u>	1898	1929	31
21	<u>Doble</u>	1909	1939	30
22	<u>Excalibur</u>	1965	1995	30
23	<u>Locomobile</u>	1899	1929	30
24	<u>Continental</u>	1905	1934	29
25	<u>Mosler</u>	1985	2013	28
26	<u>Rauch and Lang</u>	1905	1932	27
27	<u>Stevens-Duryea</u>	1901	1927	26
28	<u>Kissel</u>	1906	1930	24
29	<u>National</u>	1900	1924	24
30	<u>Oakland</u>	1907	1931	24
31	<u>Overland</u>	1903	1926	23
32	<u>Crawford</u>	1905	1927	22
33	<u>LaFayette</u>	1919	1941	22
34	<u>Apperson</u>	1904	1926	22
35	<u>Davis</u>	1908	1929	21
36	<u>Haynes</u>	1904	1925	21
37	<u>Maxwell</u>	1904	1925	21
38	<u>Dorris</u>	1906	1926	20
39	<u>Imperial</u>	1955	1975	20

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40	<u>Jackson</u>	1903	1923	20
41	<u>Saturn</u>	1990	2010	20
42	<u>TH!NK</u>	1991	2011	20
43	<u>McFarlan</u>	1909	1928	19
44	<u>Stutz</u>	1968	1987	19
45	<u>Thomas Motor Co.</u>	1900	1919	19
46	<u>Hummer</u>	1992	2010	18
47	<u>Laforza</u>	1985	2003	18
48	<u>Lexington</u>	1909	1927	18
49	<u>Lozier</u>	1900	1918	18
50	<u>Chalmers</u>	1908	1925	17
51	<u>Duesenberg</u>	1920	1937	17
52	<u>Chandler</u>	1913	1929	16
53	<u>Cole</u>	1909	1925	16
54	<u>Baker Electric</u>	1899	1914	15
55	<u>Jeffery</u>	1902	1917	15
56	<u>Pilot</u>	1909	1924	15
57	<u>Knox</u>	1900	1914	14
58	<u>Crosley</u>	1939	1952	13
59	<u>Essex</u>	1919	1932	13
60	<u>Graham-Paige</u>	1928	1941	13
61	<u>Kline Kar</u>	1910	1923	13
62	<u>LaSalle</u>	1927	1940	13
63	<u>Premier</u>	1903	1916	13
64	<u>King</u>	1911	1923	12
65	<u>Clénet</u>	1975	1986	11
66	<u>Columbia</u>	1899	1910	11
67	<u>Lambert</u>	1905	1916	11
68	<u>Rambler</u>	1958	1969	11
69	<u>Apollo</u>	1904	1914	10
70	<u>Cartercar</u>	1905	1915	10
71	<u>Durant</u>	1921	1931	10
72	<u>Inter-State</u>	1909	1919	10
73	<u>Regal</u>	1908	1918	10
74	<u>Scripps-Booth</u>	1913	1923	10
75	<u>Simplex</u>	1907	1917	10
76	<u>Eagle</u>	1988	1998	10
77	<u>Amplex</u>	1906	1915	9
78	<u>Dort</u>	1915	1924	9
79	<u>Monroe</u>	1914	1923	9
80	<u>Stoddard-Dayton</u>	1904	1913	9
81	<u>Alco</u>	1905	1913	8
82	<u>Daniels</u>	1916	1924	8

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83	<u>Elgin</u>	1916	1924	8
84	<u>Geo</u>	1989	1997	8
85	<u>Hupp-Yeats</u>	1911	1919	8
86	<u>Kaiser</u>	1947	1955	8
87	<u>Cord</u>	1929	1937	8
88	<u>Adams-Farwell</u>	1905	1912	7
89	<u>ArBenz</u>	1911	1918	7
90	<u>DeLorean</u>	1975	1982	7
91	<u>Fisker</u>	2007	2014	7
92	<u>Speedwell</u>	1907	1914	7
93	<u>Aptera</u>	2005	2011	6
94	<u>Brush</u>	1907	1913	6
95	<u>Pungs Finch</u>	1904	1910	6
96	<u>Star</u>	1922	1928	6
97	<u>Sterling</u>	1920	1926	6
98	<u>Frazer</u>	1946	1951	5
99	<u>Checker</u>	1954	1958	4
100	<u>Flint</u>	1923	1927	4
101	<u>Frontenac</u>	1921	1925	4
102	<u>Pope-Toledo</u>	1903	1907	4
103	<u>Pope-Tribune</u>	1904	1908	4
104	<u>Stanley</u>	1907	1911	4
105	<u>Monarch</u>	1913	1916	3
106	<u>Cutting</u>	1909	1912	3
107	<u>Bates</u>	1903	1905	2
108	<u>Edsel</u>	1958	1960	2
109	<u>Lyons-Knight</u>	1913	1915	2
110	<u>Nyberg</u>	1911	1913	2