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Automotive sector and situation in Turkey

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To my beloved family...

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1. INTRODUCTION

1.1 Overview

The automotive sector is mainly defined as an industrial branch that produces road vehicles (passenger cars, buses, minibuses, trucks, tractors, etc.) and the parts used in the production of these vehicles.

This sector in the world is seen as one of the most important branches of industry in terms of both its size and its impact area. In this respect, the automotive industry is taking on a key path in many technological and social developments beyond producing products that meet people's transportation needs. As the automobile culture has spread throughout the world in the last century, the sector has led to significant changes in where and how people live, as well as leading the world economy.

According to the findings of the *International Organization of Motor Vehicle Manufacturers (OICA)*, if the world automotive sector were a country then it would be the world's sixth largest economy according to 2017 on gross value added generated within a year. In 2017, the sector generated $1.9 trillion in gross value added and invested $84.8 billion in R&D. In this way, over $400 billion of tax revenue is provided to the public over the automotive sector in a year. However, many of the millions of people are employed in the sector, which provides 5% of total manufacturing industry employment.

After the economic fluctuations in 2009, production and sales of the sector continued to grow steadily between 2010 and 2017. This improvement was driven by the relatively stable growth trend in global economic activity despite high geopolitical uncertainties and volatility in financial markets. In 2017, total automotive sales in the world increased by 3.1% to 96.8 million units, while production grew by 2.4% to 97.3 million units. According to *LMC Automotive data*, total production and sales declined by 2.7% to 94.7 million units in 2018. In 2019, the production of the sector is expected to shrink by 3.7 percent to 91.2 million.

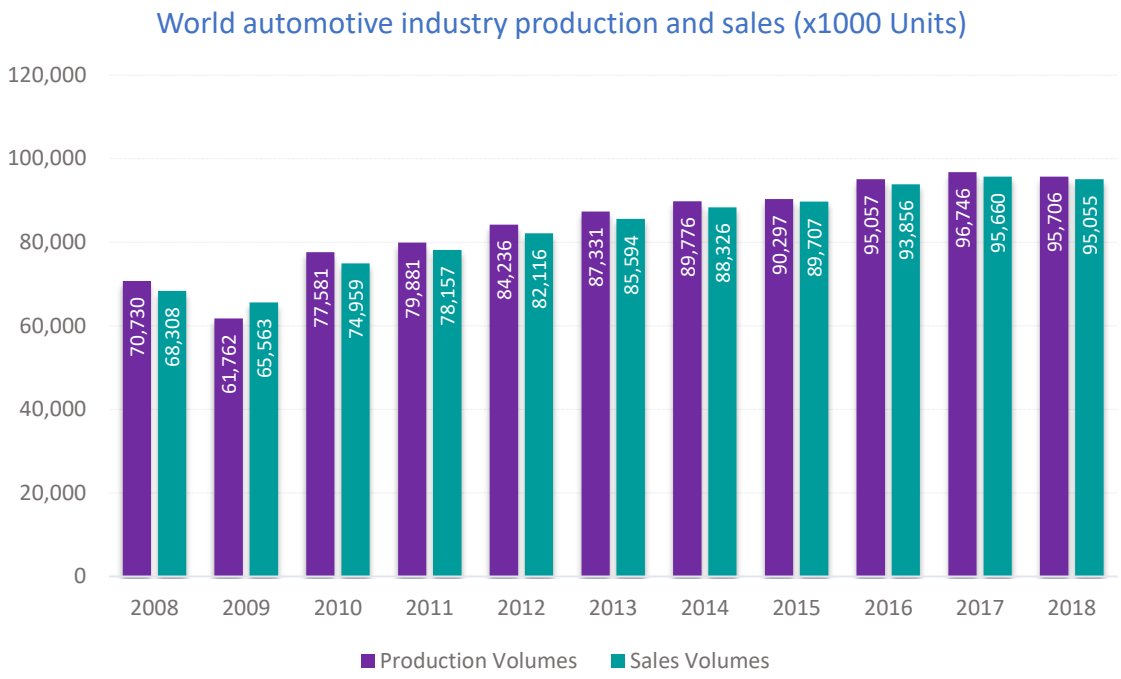


Figure 1.1 World automotive industry production and sales volumes – OICA 2019

Production in the world automotive industry has shifted from Europe and the US to Asia in the last 10 years, and it is seen that there is a tendency from developed economies to developing economies within the regions. Before the global crisis in the world automotive production in America and Europe, respectively, 24% and 31% share, while in 2018, the share of automotive production in these economies decreased to 21.2% and 22.8% respectively. However, the share of Asian economies in global automotive production rose from 44% to 55% in this 10-year period.

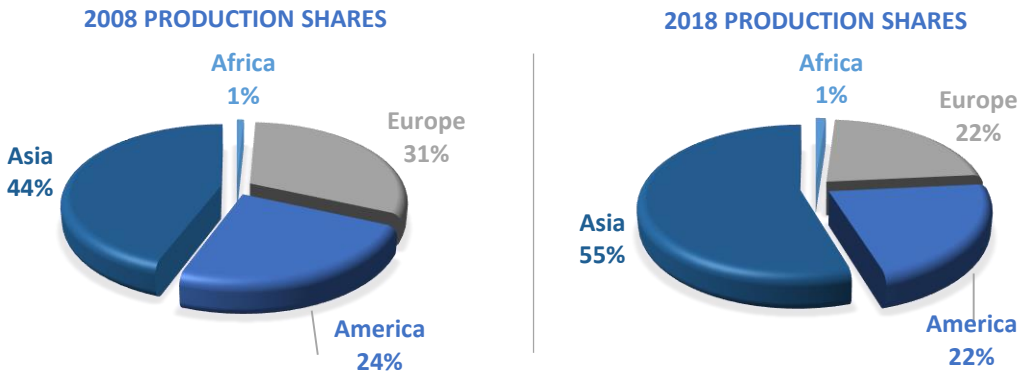


Figure 1.2 Production Shares between 2008 and 2018 by Markets – OICA 2019

Before and after the global crisis, the top 10 manufacturers in the world automotive production remain the same, while Asian companies appear more prominent in the ranking. These 10 major manufacturers, as in the past today, approximately 68 percent of the world's total automotive production is realized.

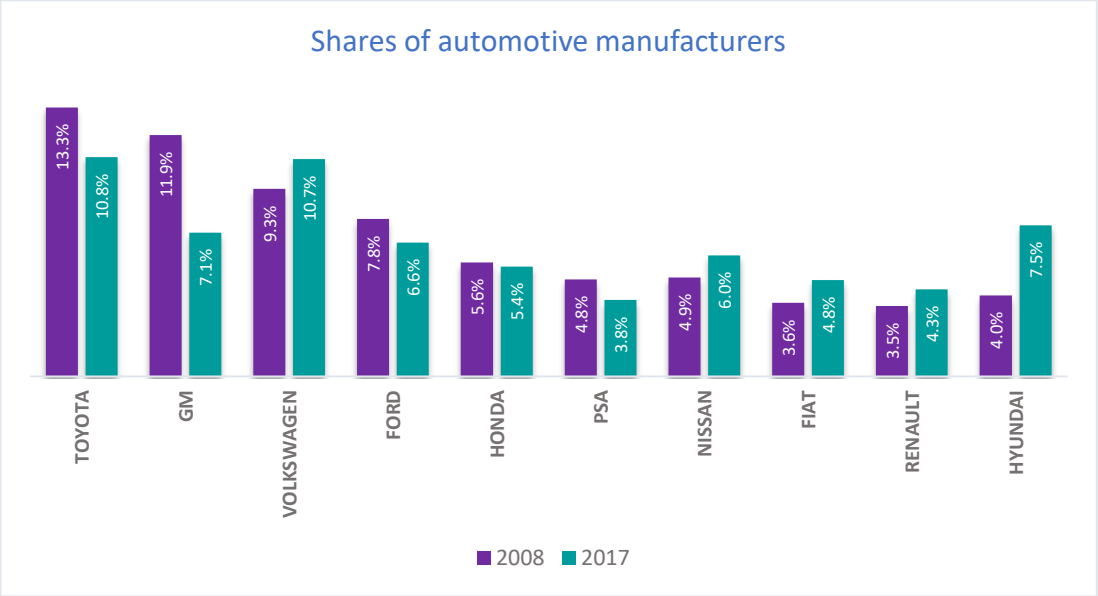


Figure 1.3 Shares of automotive manufacturers by Brands – OICA 2019

More preference for low-emission, environmentally friendly hybrid and electric vehicles forces traditional manufacturers around the world to make new investments. It also puts pressure on production in case the companies cannot bring rapid changes in the existing production structure. Therefore, in the last quarter of 2018, the production of the automotive sector in major economies of the world struggled with serious problems. During this period, the UK's process of leaving the EU (Brexit) forced European automotive manufacturers to designate new production centers for themselves, while the protectionist trends in global trade increased the threat on the global automotive sector as in other manufacturing companies.

For the recent course of the world automotive sector, the use of technologies that regulate competition and protect consumer rights, as well as the use of technologies that reduce fuel consumption, increase safety and efficiency, and tighten environmental regulations are of paramount importance. Even though the sector maintains its profitability thanks to the power of sales and process improvements that ensure productivity increase in production, high R & D expenditures and penalties and compensations that the sector representatives have to pay in order to adapt to the new conditions will have difficulties in the coming years. Therefore, companies are trying to overcome these difficulties by going to more cooperation in recent years.

1.2 General Features of Automotive Industry

The automotive industry is considered the locomotive sector for all industrialized economies due to its close relationship with other industries of the economy. It makes important contributions with the added value it creates for the country's economies, its contribution to the sub-industry, employment level, creating demand in different sectors and directly affecting other industries for the development of new production techniques.

The beginning of the automotive industry goes back to the late 19th century. Production, which was limited to automobiles in the first years of production, also included commercial vehicle production in the early 1900s. However, despite this, the main share in total production was automobile production and the sector has made progress and progress in this aspect.

When we look at the history of the car in the world, the first car was produced with the presence of steam power. Various sources state that this car was produced in three wheels by French Captain Nicholas Joseph Cugnot in 1769. However, due to the insufficient use of this tool, mass production has not been initiated. This produced car was developed from the work of British Richard Trevithick in 1801 and the American Oliver Evans in 1805. The first internal combustion engine was discovered by Etienne Lenoir in 1860. Thus, the production of internal combustion engines started at the Gasmotorenfabrik Deutz factory in 1864 in Germany. Otto, one of the initiators of this production, succeeded in producing a four-cylinder internal combustion gasoline engine in 1876.

In today's sense, a car was first produced in 1886 by Karl Benz and Gottlieh Daimler. After this production, mass production automobile use in Europe has increased in a short time. Modern production of cars started in the United States in 1893. The number of automobile brands all over the world during this period increased, it increased from 8 in 1880 to 50 in 1885 and 500 in 1890 (BEDİR, A, 2002, P.2). However, this production was carried out in small workshops far behind today's factory production. Since the automation process has not started yet, production was mostly based on workforce.

The automotive industry in the world was established in the early 1900s. With the "Mass Production" method developed by entrepreneur Henry Ford in the United States, it has become a major industry first in the USA and then in other parts of the world. However, the increase in the production of the automobile, the production of more started with the production of Ford's “Model T” car. Thus, standard and mass production affecting many other branches of industry started in this way. Thus,

automobile production reached a high level in the United States in a short time. The production of automobiles, which developed in the European continent in the 1940s, halted its development with the need for steel due to the transition to the war economy with the Second World War. After the end of the Second World War, the automotive industry has made a big leap in many Western European countries, especially in Germany, and many factories have been established. With this development that emerged in Europe, the companies of the United States started to make investments in this continent since the 1960s, and on the one hand, they shifted their production to Europe with the partnerships they established with the European companies. In this way, the US companies entered the European market and started production. As a result of the rapidly growing economy in Europe after World War II, per capita national income increased in many countries, especially in Germany, and the automotive industry grew rapidly, especially with the development of roads. Thus, automobile production in Europe approached 6.2 million in 1960 and the USA, which was 7.0 million, reached a level close to automobile production. In these years, automotive production is only 165 thousand units in the newly developing Japan. In the 1970s, Japan made a major leap in the automotive industry and started to enter the US and European markets gradually with its quality and low cost production method. Especially in Japan where de Mexico, Turkey has an important place in the container market in countries such as Brazil and Argentina.

The development of the European Economic Community, especially in the 1980s, and the fact that Europe went to a single common market led to the further development of the automotive industry and its spread to the European continent. He joined the growing car industry in Europe, in Spain, which has made significant investments due to special incentives. Spanish cars thus took their place in the market. Japanese companies, which have made a significant breakthrough in the automotive industry, have also established factories in the United States and the European Union and moved their production to their markets there. After the Japanese automotive industry largely took over the market with these new investments in Western industrialized countries, Japanese companies took over a large part of the market in these regions, especially in the second half of the 1980s.

By 1999, the share of European countries was 38 percent with 14.8 million production, the share of North American countries consisting of the United States, Canada and Mexico was 21 percent with 8.3 million production, Japan 8.1 21 percent with million production and South Korea is 6 percent with 2.4 million production. The share of other countries is 14 percent (KILIÇ, M, 2008, P.135). After recent developments in the world economy, automobile production has shifted from industrialized countries to other countries. The main reason for this is that the domestic market has reached the

saturation point in industrialized countries. When we look at the global scale since 2000, it is observed that the production of motor vehicles has grown by an average of 3 percent annually. Due to the economic crises in 2001, 2008 and 2009, this growth rate has not been observed. It is observed that the export share of the automotive sector in total exports decreased by 6 percent in 2015 compared to the previous year and reached the level of 1.3 trillion dollars.

1.3 Importance of Automotive Industry in Economy

The automotive industry is one of the leading sectors in the world, which ensures the steady growth of developed and developing countries' economies, accelerates technological developments and helps many other sectors to grow. The sector, which makes up 5% of the world economy with a total size of approximately 4 trillion dollars, corresponds to the fourth largest economy in the world. In addition, the automotive sector employs 80 million people directly and indirectly in the world.

The automotive sector has a high multiplier effect and benefit on economic growth with strong forward and backward links with other sectors. Although the automotive sector is the buyer of products produced by sectors such as iron-steel, petro-chemistry, plastics, glass, textile and electronics, it also supplies motor vehicles needed by sectors such as agriculture, tourism, construction, infrastructure, transportation and defense. The automotive sector is also closely linked with the marketing, dealer, after-sales service, fuel, finance and insurance sectors, which provide raw materials and sub-industry and finished goods to the consumer. The automotive sector, which has a high level of connection with a large number of sectors, is of strategic importance as a problem occurring in the sector can be quickly reflected to other sectors. When both the direct and indirect effects of the automotive sector in total economic activity in G7 countries are considered together, it is calculated that the increase in the value added of 1 dollar in the sector provides an increase in the value added of 3 dollars to the total economy. In addition, one-person increase in employment capacity in the automotive sector leads to five-person increase in other sectors. Therefore, besides being a capital-intensive sector, the automotive sector is among the sectors that create a high amount of employment. The automotive sector, which is in the position of being the buyer of the products produced by sectors such as iron-steel, petro-chemistry, plastic, glass, textile and electronics, supplies the motor vehicles needed in fields such as agriculture, tourism, construction, infrastructure, transportation and defense. Since these sectors are products buyers and suppliers, all kinds of technological developments in the automotive sector contribute to the advancement of these industries.

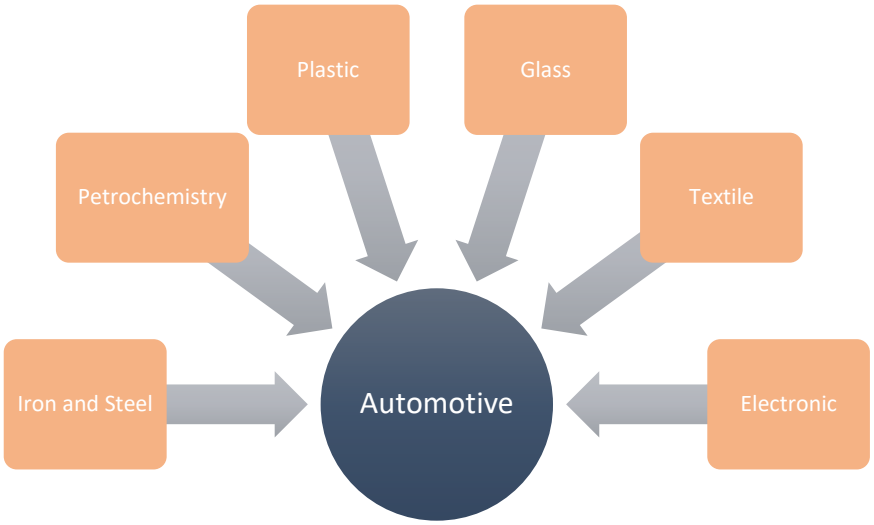


Figure 1.4 Sectors in which the automotive sector is the buyer - ODD

It is seen that marketing, dealer and after-sales service services, which enable the raw materials, sub-industry and end products to reach the consumer, are important in the automotive sector. At the same time, the automotive industry is one of the main reasons why energy is one of the leading industries in the world. In addition, distributors make important contributions to the development of a large number of service sectors, particularly insurance activities, along with retail sales, maintenance and repair services. In addition to the economy, its social contribution should not be forgotten. For example, owning a car has advantages such as freedom of movement, time savings, culture and entertainment. As a result, when all of the things mentioned here come together, social welfare emerges and additional power is created in development.

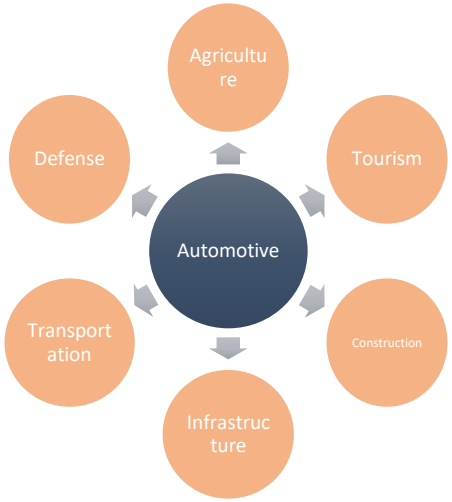


Figure 1.5 Automotive industry supplied sectors – ODD

1.3.1 R&D Expenditures in Automotive Sector

In automotive production, the need for manufacturers to reduce costs to minimum, consumers demanding more innovative products that work more efficiently, the development of additional equipment requested, increasing competition and the search for solutions to many problems faced by the sector require increased R&D expenditures in the sector. When the leading countries in automotive production are considered, it is seen that the automotive sector, which has an important place in innovation, has a higher share in total R&D expenditures compared to other sectors. For example, both Germany, Japan, Italy, South Korea as well as in developed countries, the share of total R&D spending in the automotive sector in developing countries such as Turkey, Romania and Mexico is over 10%. Automotive R&D centers in the world are moving towards regions where the market and production are growing rapidly and R&D activities are carried out at lower costs. In this respect, the number of R&D centers established in Asia exceeds North America and Europe. It was determined that the automotive manufacturers that established a wider innovative network on a global scale had better financial results than other automotive manufacturers. The share of R&D costs in total revenue remained constant as a result of the increase in the revenue of firms that increased their R&D expenditures. In other words, innovative development did not put pressure on firms in terms of cost, and helped increase revenues and market share. According to the sectoral distribution of R&D expenditures worldwide, the automotive sector ranks third after the information technology and health sectors. In 2015, 5 of the 20 companies with the highest R&D spending in the world are in the automotive sector (Volkswagen, Toyota, Daimler, General Motors and Ford). Among the 1000 companies that make the highest R&D expenditure in the world, the share of companies belonging to the automotive sector is 16.1%.

The contribution of R&D investments in the automotive industry to technological progress cannot be ignored. The automotive industry collects the fruits of high investments in R&D as patents. In the automotive sector, where approximately 8 thousand patent applications are made every year, more than 55 percent of this is made by Germany and Japan. It is understood that countries allocating more resources for R&D expenditures have applied for more patents. On the other hand, in China, where more than 30 percent of the cars are produced, the patent application rate is 1.6 percent. It is stated that one of the most important reasons of this situation is caused by the problems related to the protection of intellectual property rights in China.

Figure 1.6 Share of Automotive Sector in Total R&D Expenditures by Selected Countries - The 2019 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

Technical and environmental legislation, which is constantly being renewed in the automotive sector, is leading the development of new production technologies that are closely related to other industrial sectors providing input to the sector. Therefore, it is generally accepted that the long-term shrinkage in the automotive sector will lead to a contraction in the innovation capacity of the countries and consequently create a risk for long-term economic growth.

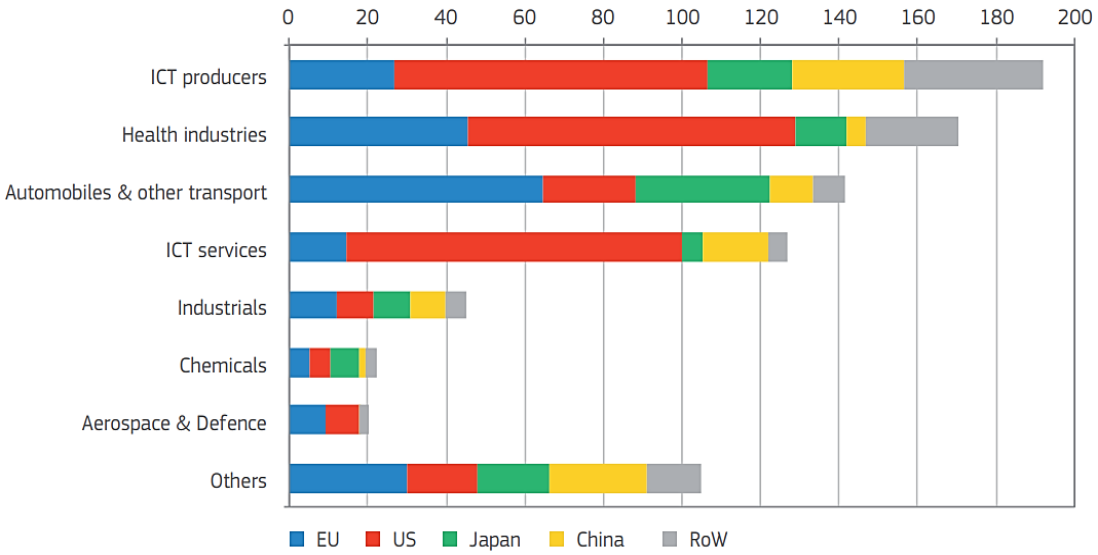


Figure 1.7 R&D investment by the 2500 companies by industry and main country/region (€BN) - The 2019 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

There are five automotive companies in the list of top twenty companies that make the highest R&D spending worldwide (Table 1.1). In the table where three sectors, namely automotive, advanced information technologies and pharmaceuticals, come to the forefront, it is seen that automotive manufacturers with a high R&D investment have an important position in the international market.

Place	Company	Country	Industry	Amount Spent (Billion $)
1	Volkswagen	Germany	Automotive	13,2
2	Samsung	South Korea	Informatics & Electronics	12,7
3	Amazon	USA	Software & Internet	12,5
4	Alphabet	USA	Software & Internet	12,3
5	Intel	USA	Informatics & Electronics	12,1
6	Microsoft	USA	Software & Internet	12
7	Roche	Switzerland	Medical	10
8	Novartis	Switzerland	Medical	9,5
9	Johnson & Johnson	USA	Medical	9
10	Toyota	Japan	Automotive	8,8
11	Apple	USA	Informatics & Electronics	8,1
12	Pfizer	USA	Medical	7,7
13	General Motors	USA	Automotive	7,5
14	Merck	USA	Medical	6,7
15	Ford	USA	Automotive	6,7
16	Daimler	Germany	Automotive	6,6
17	Cisco	USA	Informatics & Electronics	6,2
18	AstraZeneca	Britain	Medical	6
19	Bristol-Myers Squibb	USA	Medical	5,9
20	Oracle	USA	Software & Internet	5,8

Table 1.1 the highest R&D spending by top 20 companies worldwide - *"The 2017 Strategy and Digital Auto Report", PWC.*

1.3.2 Foreign Direct Investments in the Sector

Especially in developing countries, there is a high and positive relationship between automotive production and foreign direct investments. For example, in China, which has achieved rapid production growth in the last 30 years, this relationship is over 90%. The rapid increase in per capita income of rapidly developing countries around the world also changes the demand centers. Major automotive manufacturers, who want to increase their market share in new markets and to increase their price competitiveness by reducing their costs in the direct or near-market production strategy, make large-scale investments in different countries.

Foreign direct investments in the automotive sector contribute to the growth and development of many sectors with the effect of spreading to other sectors where it is linked. Foreign direct investments in the South Korean automotive sector have been decisive for the exit from the economic crisis and long-term competition. In 2000, 40% of the total foreign direct investments in South Korea were made in the automotive sector, and the Asia Crisis was rapidly recovered due to the high expansion effect of the automotive sector to other sectors. In the period in which foreign investments in the automotive sector accelerated in the last 15 years, South Korea rose to the 5th place in global automotive production and achieved significant production and employment growth in other sectors.

The automotive sector offers high amounts of income to governments through many channels such as value added tax, special consumption tax, customs tax, usage tax, income tax and corporate tax collected from the production and sales of zero vehicles. In Japan, for example, taxes on the automotive sector account for about 10% of total tax revenues. In the United States, the US $ 135 billion annual tax collected from the automotive sector accounts for 13% of total state taxes. In India, taxes collected from the sale of motor vehicles and indirect taxes on fuel used by the sector constitute 8% of the central tax collection.

1.4 Change in Automotive sector and its Value Chain

Real wages and raw material prices, which increased in the developed countries in the 1960s and 1970s, caused the costs to increase exponentially in the automotive industry. Profitability ratios of certain stages of the international automobile manufacturing companies do not want to fall in China, India, Turkey and Brazil as the costs shifted to developing countries is lower than that. Institutional steps taken to facilitate free movement in world trade have also led to an increase in international investments made by automotive manufacturers in the countries where they have production advantages. At this point, with Turkey attracted international investment that annually produces over 1.5 million vehicles.

After 1990s, power changes occurred from automotive manufacturers to their suppliers. Due to the fact that it plays an active role in the fields of design, production and foreign investment, international suppliers have been significantly influential, and at the same time, the increase in the activities of the outsourcing and value chain has brought much more growth of the suppliers. This situation has caused the supplier companies to come to the forefront in forming the value chain. With global integration, automotive manufacturers have started to integrate themselves regionally due to the

fact that final assembly facilities are located in other countries. The increase in technical dependence on suppliers has also changed the functioning of the supply chain in the sector. Unlike the supply chain, suppliers now integrate vertically to process complex subsystems. In this regard, automotive companies try to gain an economic advantage by installing their production and assembly facilities close to the point of sale and low labor force.

Although a significant part of the production in the automotive sector has shifted to developing countries, high-tech inputs are provided mainly from developed countries. In this case, in developing countries such as Turkey, which leads to higher input and dependence on foreign imports in the automotive sector. Some of the developing countries are increasing their support to increase the localization rate in inputs and / or to reveal their own automotive brands in order to reverse this situation that puts pressure on the current balance.

Automotive production, which experienced deep breaks in production methods in time such as mass production techniques in the 1920s, lean production and just in time methods in the 1980s, has become one of the sectors where the competition has increased and marketing has become more prominent. There is a process in which automobile production patterns become more capital intensive due to economic conditions and developed countries follow strategies to attract automobile factories back to their countries. In addition, it is predicted that the transfer of large factories in the automotive industry has been closed and small production facilities that work more flexibly will be more popular. As a result, even the international companies shifting their production from the developing countries to their own countries may come to the agenda in the near future, as a result of both economic reasons and political pressures.

Extra equipment and software related services for autonomous vehicles are thought to increase vehicle sales prices. For example, it is stated that many features such as active lane support, cruise control and top view camera will increase the car sales price by $ 5,000. It is stated that there will be an annual cost of 200-600 dollars for navigation and security services. It is expected that strong, redundant and misuse protection, which is structured similar to aviation service standards by experts, will further increase the costs of autonomous driving systems, as faults can cause fatal accidents. It is understood that cars' software features will come to the forefront rather than hardware in the future, and this development will depend on the condition that a good brand has a strong software. In this case, it is concluded that the most important issue in the value chain will become software.

Less fuel and zero accident risk in the automotive industry brings an increase in R&D studies. So much so that every automobile manufacturer has to act like a technology

company and evolve traditional production into new technological models. The development of connectivity and digitalization turns tools into data centers. It is seen that the automotive industry has rapidly adopted and implemented the Fourth Industrial Revolution processes. With 3D technology used in the production of internet of things, robotics and spare parts, it is foreseen that production costs will decrease by 50 percent, and this situation will also be reflected in labor costs, and therefore the costs of labor will decrease in total cost. It is understood that both technological production techniques and good software will come to the fore in the value chain.

The automotive industry is on the verge of a significant change not only in terms of manufacturers but also in the value chain throughout the industry. The new models, which will be created by mobility, connection services, especially updating of the versions and upgrading of their features, are expected to expand the automotive market by 30 percent, that is, approximately 1.5 trillion dollars. In a research that stated that the behavior of consumers about the journey will change, it is stated that one of every ten vehicles will be shared in 2030. According to the nature of the work to be done, it is thought that the variety of vehicles will come to the fore and that different vehicle preferences for vacation, business or shopping will show up not with a single vehicle like now. It is estimated that the vehicle sharing rate will increase to 28 percent in 2050. In the event that technological and legal regulations allow, the ratio of autonomous vehicles is expected to be 15 percent in 2030. In the light of these estimates, it is understood that the automotive industry will undergo a structural transformation in the near future and therefore the value chain will become more important.

The introduction of new business models will bring structural changes in the automotive industry, as highly connected cars offer solutions for integrity, safety, road safety and obligations. It is estimated that advances in technology will reduce fatal accidents involving cars by 80 percent over the next fifty years. At the same time, it is thought that the companies that provide independent vehicle repair services will be adversely affected by the connection of the connected cars directly with the manufacturer or the dealer in case of malfunction or maintenance. In addition, it is thought that people will not want their own cars as much as they do today with the requests of the customers. In addition to this, connected vehicles that will use internet facilities will be preferred by customers rather than traveling by reading books. This expected change in the automobile industry can lead to new relationships between car manufacturers, fleet owners and consumers. In this case, manufacturers will begin to see car fleet owners as target customers and fleet owners will attempt to impress consumers with extra services.

Internet of things has an important influence on the structural change of cars. It is understood that communication technologies such as car-2-car, car-2-infrastructure or car-2-home will provide significant benefits to customers. However, these factors, collectively known as "the Internet of Things", represent only one commodity. Automakers will benefit automakers to understand what orients customers' thoughts, behaviors, and purchasing practices to achieve the true value of connectivity, and to apply their business models to smaller target audiences of similar-minded people. Connected car technologies will not only guide traffic when they are connected to a location, but can also be an important media tool that provides local shopping or relaxation options, personalized news and entertainment and other services.

All this will bring a high income flow as it will create a suitable environment for applications such as advertising, e-marketing, and social media. Ultimately, it will be possible to predict the products and services that the customer will want most. In order to reach the “Internet of Behaviors” point and take advantage of the absolute potential of the data, it is necessary to consider their lives as a whole, instead of seeing customers as “drivers” only. Thus, a relationship that will increase loyalty with drivers will be established. As a result, it is seen that the perspective of the value chain should be made by evaluating the life of the person as a whole in order to construct the value chain well.

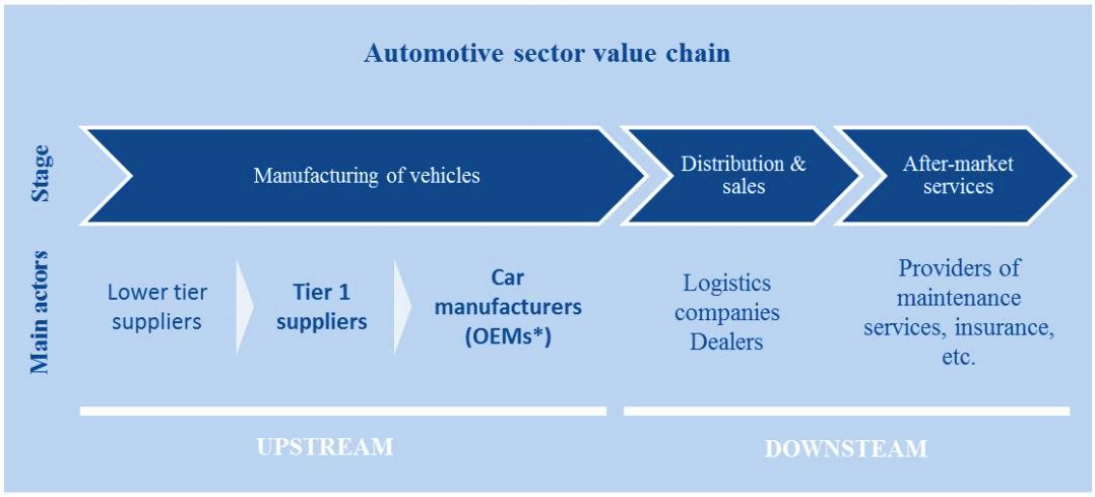


Figure 1.8 Automotive value chain: stages and main actors - (relating to the activities of the ISIC Rev.4 classification under Section A, Division 01, except for Group 017)

2. AUTOMOTIVE SECTOR IN TURKEY

2.1 Historical Development of Turkish Automotive Industry

The first meeting of the people in Turkey with the car was in the early twentieth century. After the First World War, the Ford and Chevrolet cars and trucks of the USA by the company "American Foreign Trade" during the occupation of Istanbul; Italian Fiat brand cars entered the market with the help of a private office operating in Istanbul under the Turin. In 1929, Ford Motor Company started production trial in Istanbul. It is envisaged that some of the production made at the factory established to produce cars, tractors and trucks will be exported to the Soviet Union. The factory employing 450 workers had technological possibilities that could be considered modern. In the facility, the capacity of 48 trucks and automobiles per day has been reached; however, due to the negative effects of the depression experienced in the 1930s, the targeted export could not be realized. As a matter of fact, production was stopped at the factory in 1934 and the first production attempt was thus unsuccessful. After this first trial, which failed, our country's automotive sector started production again in the 1950s. Foundations were laid for the development of the automotive industry in Turkey founded in the early 1950s to the late 1960s and 1970s, it was formed with the specific capacity and reach nativism share of the factory.

After the 1950s, the reasons such as the development of the highway infrastructure and the establishment of a highway-oriented transportation and transportation scheme, the increase in urbanization, and the increase in the income level caused an increase in the demand for automotive products and this demand was met mainly in the first years. In 1950, total car park in Turkey is 13,400 units, 30,000 units in 1955 rose to an annual average growth of 17%. However, vehicle ownership in these years is very low. For example, the 1954 population per car (person) The number of US 3, 16 in France, 64 in Italy, 105 in Mexico, 141 in Brazil, 804 in Turkey.

The first production line was established in 1954 with the aim of producing Turkish jeeps and pickup trucks for the Turkish armies by Türk Willys Overland Ltd. And continued with the production of trucks in 1955 and buses in 1963. In the following years, factories producing passenger cars (Tofaş-Fiat, Oyak-Renault, Otosan-Ford) started production. The first attempt in automobile production after the end of World War II, has been launched by "KOÇ Ticaret şirketi" as a general representative of the Ford Motor Company. In the early 1950s, KOÇ Ticaret şirketi is contacted about

undertaking joint production with Ford Motor Company in Turkey. After the Ford Motor Company owner, Henry Ford II, was timid on the subject, Adnan Menderes, the prime minister of the era Turkey, wrote a letter to Henry Ford II and encouraged him to cooperate with the KOÇ Ticaret şirketi. Following this, Koç Ticaret A.Ş. has been granted as “Dealer Assembler” status. The factory, which was established as a result of this privilege, started its activities with a production capacity of 8 trucks and 4 cars per day.

The first Turkish car was produced in Eskişehir State Railways factory in 1961. The car called “Devrim” in Turkish and “Revolution” in English was limited to the production of four model models. Based on the fact that the demand remained below 5,000 in those years, the production could not be maintained on the grounds that a production far below the economic scale could not be realized due to insufficient demand.

In 1966, the automotive industry started its production by developing its own models and “ANADOL” domestic automobile was produced by Otosan with a fiberglass filling. 87 thousand “ANADOL” brand cars were produced in the 18 years. Between 1966 and 1984 . Tofaş and Oyak-Renault, two major automobile companies, continued this process with Italian and French licenses in 1971, by setting up production lines to produce cars.

First Turkish domestic automobiles “Devrim” – 1961 Eskişehir

2.2 Development of the Main Industry

Automotive industry in Turkey include a 1959 Ford-KOÇ partnership began with the establishment of Otosan. Of course, there were "Revolution Cars" in between, and in fact, the full establishment of the automotive industry was possible in the 1960s, when the automotive industry was part of a larger scale import substitution program. Features of import substitution include not only high tariffs, but a multidimensional protection mechanism provided through preferential exchange rates used in technology imports, tax exemptions and import license documents that limit imports. The emerging automotive industry, like the protection in Japan, was under serious protection. Unlike Japan, even if domestic production is not encouraged, the fact that 85% domestic parts have been introduced in the 5th year of the automotive industry to be established and started production suggests that the automotive industry has completed its import substitution and that it has been planned to start domestic production after a while.

In 1966, fiberglass Anadol model, produced by Otosan by agreement with the British Reliant company, came into play. After this model, which was produced in the first series, Oyak-Renault was established in 1969 and started production with an agreement with French Renault Company in 1968 and Tofaş with Italian Fiat company, another Koç Holding partnership. Toyota joined this group in 1990. While these factories producing in a fundamentally protected market until 2000 were working towards the domestic market, the effects of the Customs Union agreement of January 1, 1996 began to be felt.

According to James Darby, another "protectionist" was also Australia and the automotive sector between 1960-1980 car market in Australia and Turkey were similar. In the meantime, there was a difference: the large conglomerates in Turkey had continued to form partnerships with foreign firms to enter the automotive business unwillingly alone. Protectionism necessarily coming to an end cars produced in Turkey was still foreign partners and Fiat, Renault, Toyota brand was carrying. This situation will provide great advantage in turning to export in 2000s.

Having strong domestic carriers that provide political links with local market entry, staff, distribution, supply industry input and lobbying activities in a market with low car ownership penetration and per capita income for about 30 years from the late 1960s to the late 1990s. it was an advantage. Thus, this period was passed with a production design of foreign brands that are not global but that are progressing through bilateral / joint ventures, with a production design that is “open to foreign but far from global supply chains”. However, one should not think that the opening in the 2000s was a straightforward process, just like the natural result of old partnerships. While moving

towards being a part of the global strategy, existing foreign partners focused on export opportunities to regional markets, not to the domestic market, due to factors such as more control, closer surveillance and quality control, and lack of old technology / old models, even in the domestic market brought by competition with imported vehicles. In fact, although it is considered as an import substitution period between 1960-1980, protectionism for the automotive sector has taken much longer. By 1989, tariffs on passenger car imports ranged between 72-150%.

The customs tax was reduced to 39% in 1993. Practically, even though it was claimed that a transition to an export-oriented open economy was made, and even in 1989, the balance of payments / capital account was opened out with Decree 32, customs walls still existed for the automobile. In the sector, which entered the 1990s with low capacity utilization rates, it is clearly stated that domestic players tend to continue import substitution and protectionism with the intention of continuing for a while with old technology and high returns rates that do not require new investments, but this is no longer possible in the face of the globalization of the automobile industry worldwide. and developments have followed in this direction.

2.3 Main Milestones in Turkey's Automotive Industry

The basic characteristics of the automotive industry sector are described in the Report of the “Tenth Development Plan Automotive Industry Working Group of the Ministry of Development” as follows.

The automotive industry is a sector that maintains its strategic importance for the European Union economy and industry and provides employment to millions of people.

- The automotive sector plays an active role in introducing products that meet consumer needs in the center of many economic activities, in the competitive market and in after-sales services.
- The automotive industry works closely with the fuel supply companies as a leading sector that closely follows technological developments (clean, fuel efficiency, safety, etc.).
- The automotive industry forms a solid network with a flexible and integrated supply network and distribution system.
- The automotive industry exports products that require advanced technology to third countries.
- The labor force in the automotive industry production, R & D and after-sales departments is well trained to work with advanced technology.

In the Tenth Development Plan, the development processes of the automotive industry are shown and explained in six basic sections as follows (Anonym, 2014/b):

1. *1941-1950 Government investments priority development*

   Due to the weak private sector and the lack of entrepreneurs large enough to invest, the government had to invest in the automotive sector at its own expense during this period.

2. *1951-1960 Beginning of private investments*

   The 1950s is a milestone in Turkish politics. The change in the political sphere has also been seen in the economic sphere.

3. *1961-1980 Industrialization through import substitution policies*

   In this period, a national automotive main and subsidiary industry was tried to be established. Thanks to the import substitution policy, the closed economy protected the domestic main and sub-industry from competition. The reason for supplying parts from a single source in this period is that there is no alternative supplier industry.

4. *1981-1995 Export priority and full competition preparation*

   In this period, with the abolition of the import substitution approach, a competition has started between both domestic and foreign companies. This competition was an opportunity for domestic companies that increased after the 1970s. In this period, investment in advanced production technologies has started for both main and sub-industrialists. In parts purchases, quality as well as price has been taken into consideration and relations have become medium-long, communication has been formal but sparse. In short, the foundations of the major leaps in the automotive industry in the future were laid.

5. *1996-2005 Full competition within the scope of Customs Union and World Trade Organization membership*

   This phase is the period in which the sub-industrialists are expected to deliver the demand in high quality, on time and at the best price, while the main industry is focused on Full-Time-Production and Total Quality Management in order to reduce transaction costs and ensure the effectiveness of communication. In order to reduce costs, joint studies between main and sub-industries have increased and formal and informal communication has been improved. During this period,

companies understood the importance of transparent and long-term relationships based on trust and mutual support.

6. *2006-Today Sustainable global competition with technology management and innovative approach*

   Although the Turkish automotive industry has experienced significant declines and increases between 2005 and 2010, it has maintained its production of around 800 thousands lines for the last 5 years. The share of European countries in need as well as production and sales are increasing with each passing day Turkey from 2010 until today. As of today the Far East, the most established companies in the fields of investment from all regions of the world, especially Europe and America, Turkey has become a country. The sector, which considers the production of 100 thousands units before the year 2000 impossible, today realizes more than 1000 thousand production with these investments.

2.4 Current Situation of Automotive Industry

Automotive industry is among between the largest export and investment sectors of the Turkey's economy. Besides provides economic size of Turkey's economy and employment business has also a crucial role in terms of strategic importance in the technological development with R&D projects. Recent global and local trends in the Turkish automotive industry increase the downside risks. While domestic demand contracted due to the decline in purchasing power and weak consumer confidence due to the economic turmoil in the domestic financial markets in 2018, the deceleration in the global economy puts the export performance of the sector under pressure. In addition to the radical changes in the world automotive sector, it is worried that protectionist policies in the world trade and Brexit process may be the factors that will force the Turkish automotive sector in the coming period.

2.4.1 Production

The automotive industry related to the manufacture of motor vehicles is a global industry with a high density. Around 20 companies from six countries in the world dominate more than 90% of industry and trade. Therefore, the production methods and technology in this industry are global. Turkey is also flourishing around the investments of global investors is not its own brand in the automotive industry. After

the 90 began to invest in Turkey's exports with investment from outside. In fact, it has received its fruit over time (Anonymous, 2007).

When looking at the last 50 years in Turkey; In the 1960s, the automotive industry, which produced around 10 thousand rickety production, exceeded the 100 thousand limit in the 1970s. Production in the 1980s, which was based on the 200 thousand limit, rose to over 400 thousand in 1993. In 2000 Turkey, passed 500 thousands limit and from 2005 so far it has become one of the most important manufacturers in Europe with over 1 million production. Given the recent data in recent years, it is seen that the automotive industry is one of the most important parts of the country's economy in many areas from production to employment, import and export.

When the production of the automotive sector in Turkey for the last 20 years, it seems that more influenced by global trends of domestic development. Following the 2008-2009 global financial crisis, the European Debt Crisis in 2012 and the slowdown in the global economy in 2018 led to a contraction in the Turkish automotive industry.

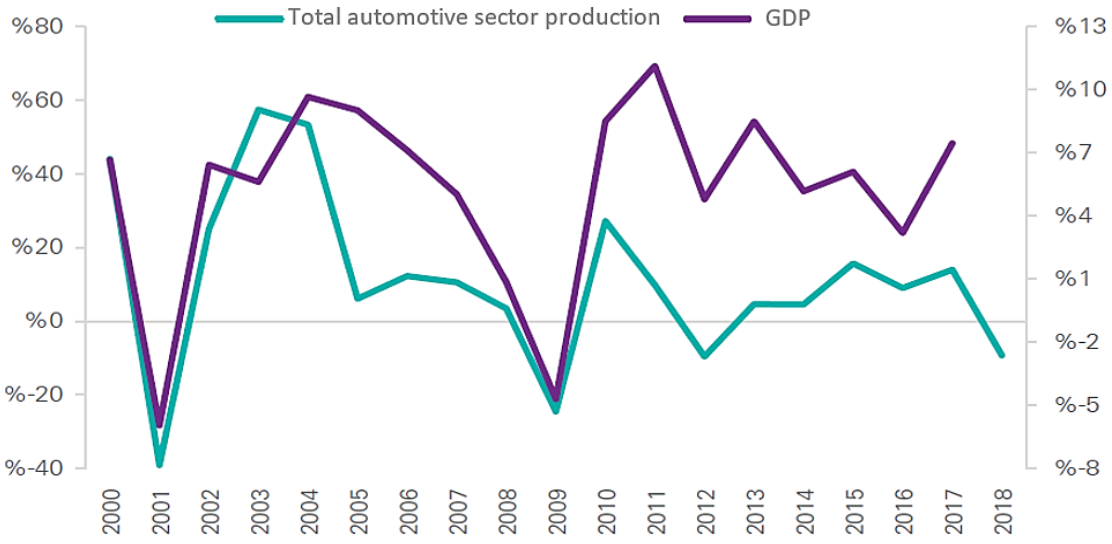


Figure 2.1 Annual growth rates and total production – OSD, TÜİK

In light of these dynamics, automotive sector production, which grew one and a half times faster than the national economy in the 2013-2017 period, contracted by 9.2 percent in 2018 due to the slowdown in global demand and contraction in domestic demand. This was observed more clearly in automobile production and the contraction in 2018 was reached 10.2 percent. In 2018, production in the light commercial vehicle group contracted by 6 percent, while production in the heavy commercial vehicle

group increased by 6 percent. Despite this, there was a 5.3 percent contraction in production throughout the commercial vehicle group.

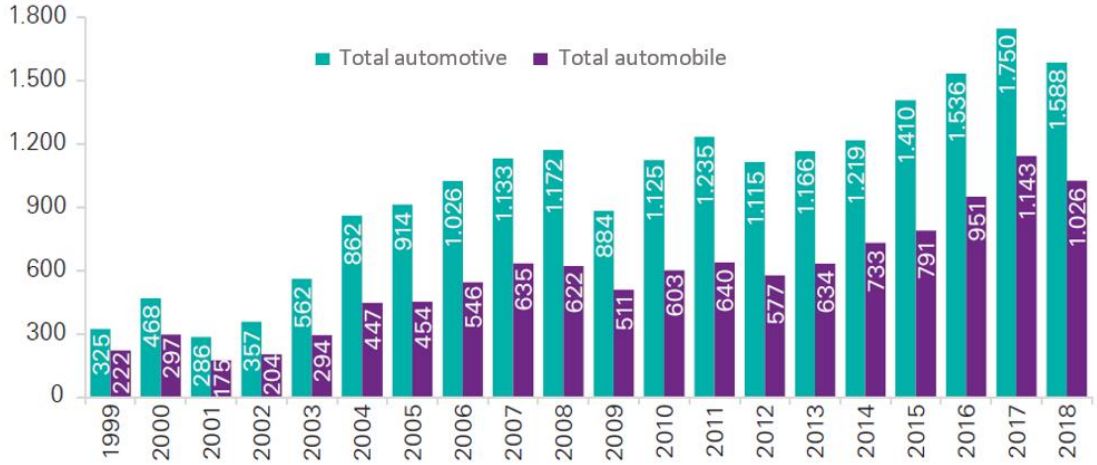


Figure 2.2 Annual production (x1000 units) – OSD

2.4.2 Export

The Turkish automotive industry, which has a net foreign trade surplus, exports about three quarters of production. In 2018, due to the sharp contraction in the domestic market, the ratio of exports to total production was 84 percent, the highest level of recent years. According to OSD data, in 2018, automotive exports decreased by 0.8 percent compared to the previous year and amounted to 1 million 334 thousand units. Despite an increase of 7.8 percent in the export of commercial vehicles, there was a 5 percent contraction in automobile exports throughout the year.

On the other hand, according to the Automotive Distributors Association (ODD) data, it is calculated that there is a 1 percent contraction in the exports of the Turkish automotive sector in 2018, while imports decreased by 36.4 percent.

Figure 2.3 Automotive production and export (x1000 units) – OSD

Figure 2.4 Automotive Trade (x1000 units) – Automotive Distributors Association ODD

Based on the manufacturer firm, although the first five companies have not changed at all in the last three years, the most exporting company is constantly changing. As of the end of 2018, Ford Otosan was the most exporting company by exporting 329 thousand automobiles. Oyak Renault and Tofaş followed this. In 2018, the top five companies accounted for 96 percent of total automotive exports.

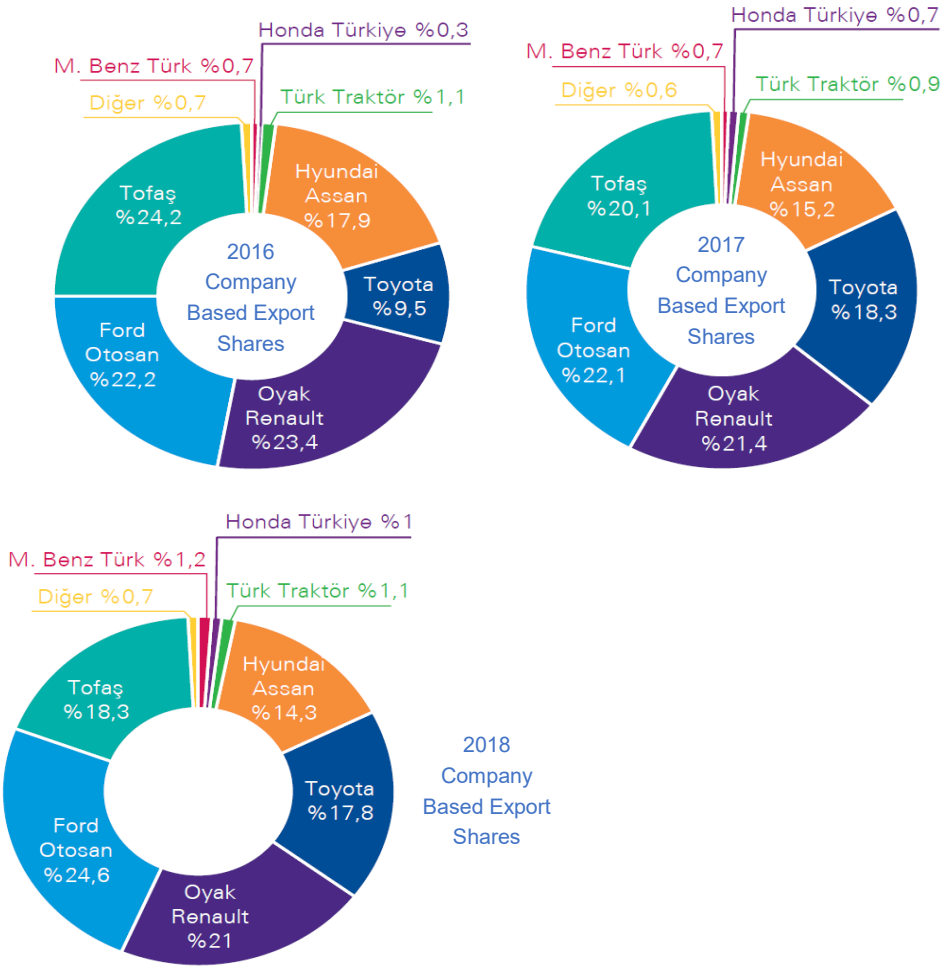


Figure 2.5 Automotive Company based export shares - ODD

Passenger vehicle exports, which amounted to approximately 921 thousand units in 2017, remained at 875 thousand levels in 2018 and decreased by 5%. The main industry passenger car manufacturers were affected by this decline closely. Honda, which put the diesel version of the Civic model into production, recorded a 45% increase in exports due to the effect of this model and increasing production volumes.

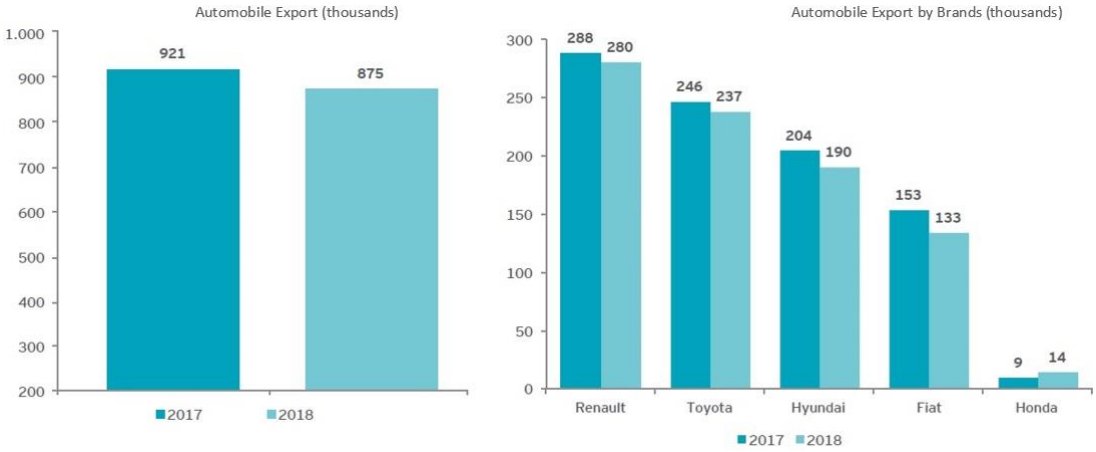


Figure 2.6 Company based exports – OSD 2019

The sector, which exports more than $ 12.4 billion in passenger cars in 2018, has significantly increased sales in France, Spain, the UK and Belgium. Some pieces in their markets shrinking passenger car exports from Italy to Turkey remained at the same level, in the United Kingdom market instruments has strengthened the position of Turkish origin.

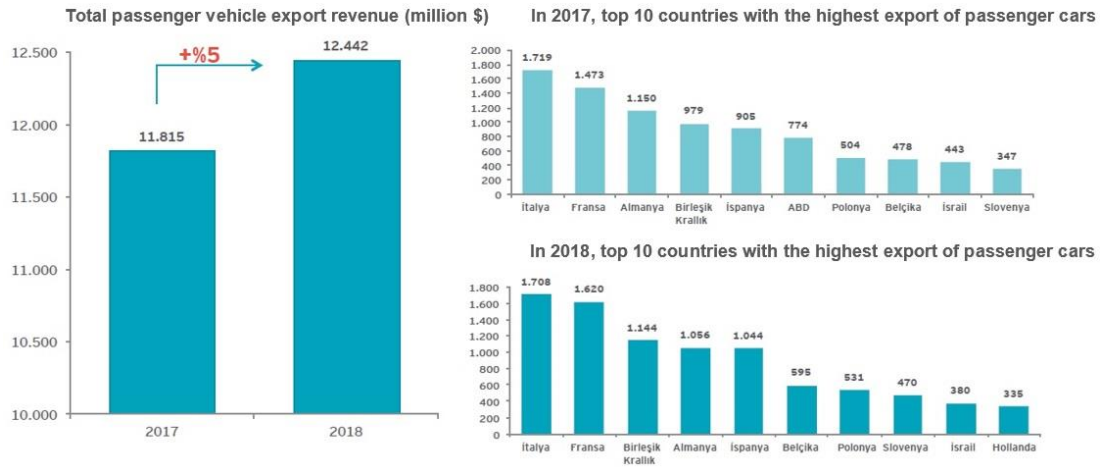


Figure 2.7 Revenue based on exports – Turkish Statistic institution

2.4.3 Employment in the Automotive Industry

The automotive industry creates a large employment area for Turkey. This developing industry branch has also increased the number of people employed since 1995. Considering the blue and white collar workers employed in the largest industrial establishment, the sector, which was employed by 20 thousand people in 1995, has become a sector where more than 50 thousand people work today. Considering the number of employees in the automotive supplier industry operating Turkey, this figure reaches approximately 200 thousand.

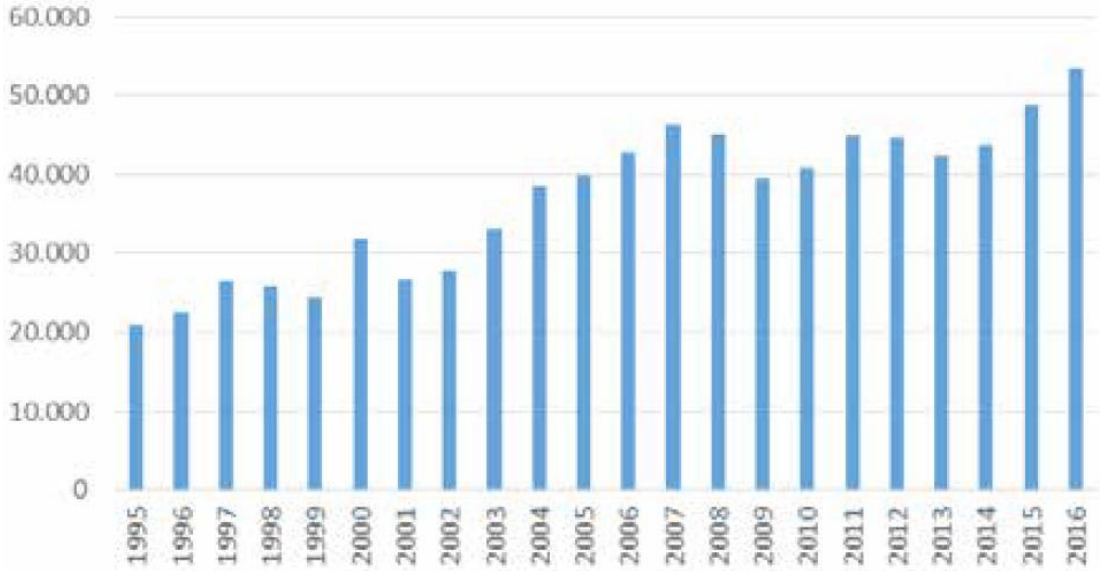


Figure 2.8 Employment in automotive industry - OSD

The automotive industry employment, which fell to 5 percent due to the effects of the 1999 and 2001 crises, indicates that the sector has contracted employment. In the global financial crisis of 2009, the automotive industry employment was 39.584 with a decrease of 12.33 percent. We observe that there are declines in 2012 and 2013 except for the crisis periods. It may be possible to say that the negative effects of developing technology have been seen for this period. With the development of technology, we can say that man-power is less needed and production becomes mechanized.

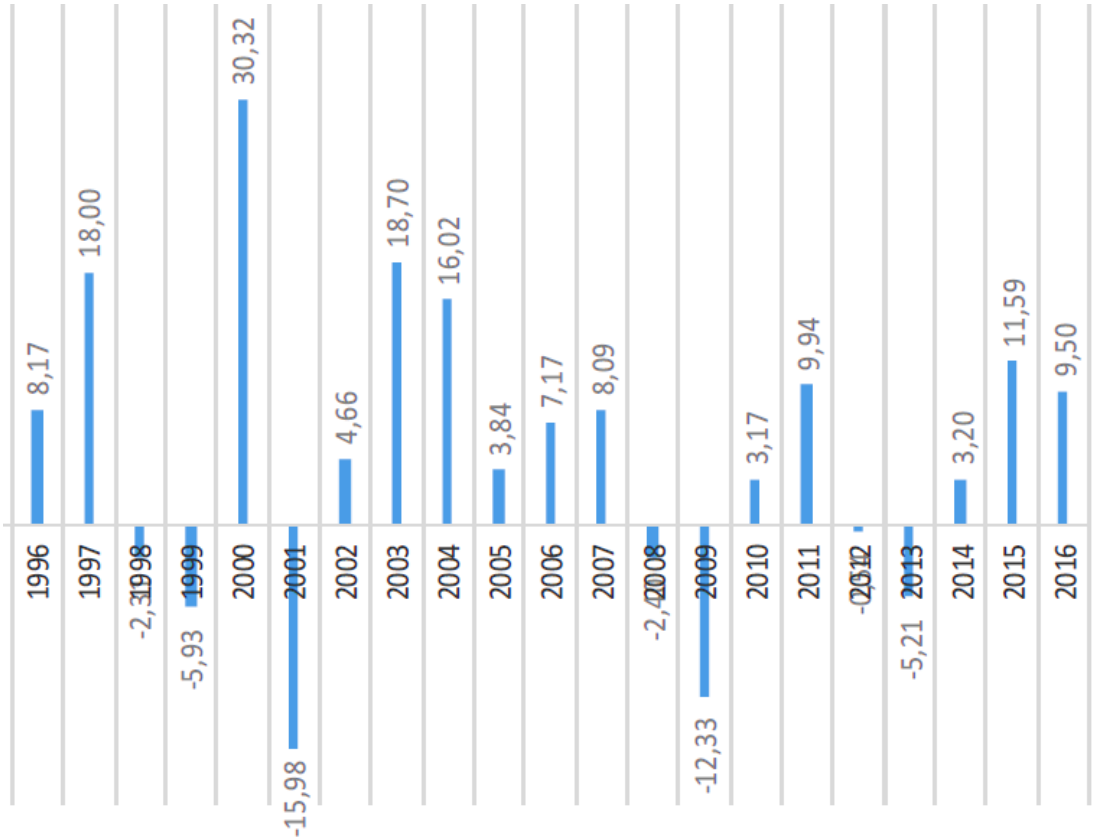


Figure 2.9 Change employment in automotive Industry (percentage) - OSD

2.4.4 Suppliers and Related Industries

From the beginning of the world automotive industry to the 1970s, based on the principle of "economics of scale", inflexible "mass production" technology has brought significant drawbacks such as long model change time and lack of responsibility awareness to employees. Lean manufacturing, which was initiated by Japan in the 1970s, has been an important revolution in the automotive industry. Lean manufacturing concept combines the concept of "economy" with the flexibility concept of "workshop type" production. Applications such as continuous improvement and just-in-time production brought with this approach have increased creativity and loyalty of the employees to the enterprise on the one hand, and on the other hand have enabled the savings in production costs.

Turkey also launched the competitive nature of an industrial export with intensive integration process towards the realization of the cooperation between the global companies and their partners in Turkey and developed for production. Therefore, the production methods and technologies applied in the automotive industry are equivalent to the methods and technologies used by the main companies at the international level. It is also developing automotive industry in Turkey, with R&D facilities and capacity

in recent years, production methods and increase their efforts to improve product technology.

The automotive sector is regarded as the engine of the economy in all industrialized countries. The reason for this is that it is closely related to other industries and other sectors of the economy. Changes in this sector have a significant impact on the economy. In the automotive industry, there is a mutual interdependence between manufacturers of motor vehicles, which are referred to as the main industry, and manufacturers of components, parts and systems, which are referred to as sub-industries. This dependence, which forms the basis of long-term, transparent and mutual trust relations, has to be developed not only in production but also in design. This issue becomes even more important in the upcoming period, in which new strategic targets will be set in order to improve the overall competitiveness of the industry and to create higher added value.

The product range of automotive supply industry companies, which includes all parts except some products, is wide enough to allow 85-90 percent of the vehicles manufactured in Turkey to be manufactured locally. It is possible to classify the main product groups manufactured by the company's manufacturing for the vehicle manufacturing industry as follows:

- Complete engine and engine parts
- Powertrain
- Brake systems and components
- Hydraulic and pneumatic components
- Suspension parts
- Safety components
- Rubber and rubber parts
- Chassis components and parts
- Forging and casting parts
- Electrical equipment and lighting systems
- Battery
- Auto glass
- Seats

The automotive supply industry in Turkey has established itself in the domestic market both in terms of production quantity and quality, and has reached a competitive power in international markets. The sector has developed itself technologically and has made a great progress in terms of production capacity and efficiency. Most of the companies in the sector have obtained ISO quality certificates and increased their production for foreign markets.

In the automotive supply industry, original and equivalent products, semi-finished products and systems are produced in accordance with the technical documents determined directly or indirectly by the main industry both for the companies operating

in Turkey and abroad and for the renovation market. However, for a higher domestic contribution, the power unit consisting of “engine-gearbox and differential box” and “electrical / electronic control systems are required to be mass-produced.

2.4.5 Vehicle Park

According to Turkish Statistic Commission data, vehicles registered in traffic as of the end of November 2019, 54% for automobile, 16.4% Van, 14.4% motorcycle, 8.2% tractor, 3.6% truck, 2.1% minibus and 0.9% is bus.

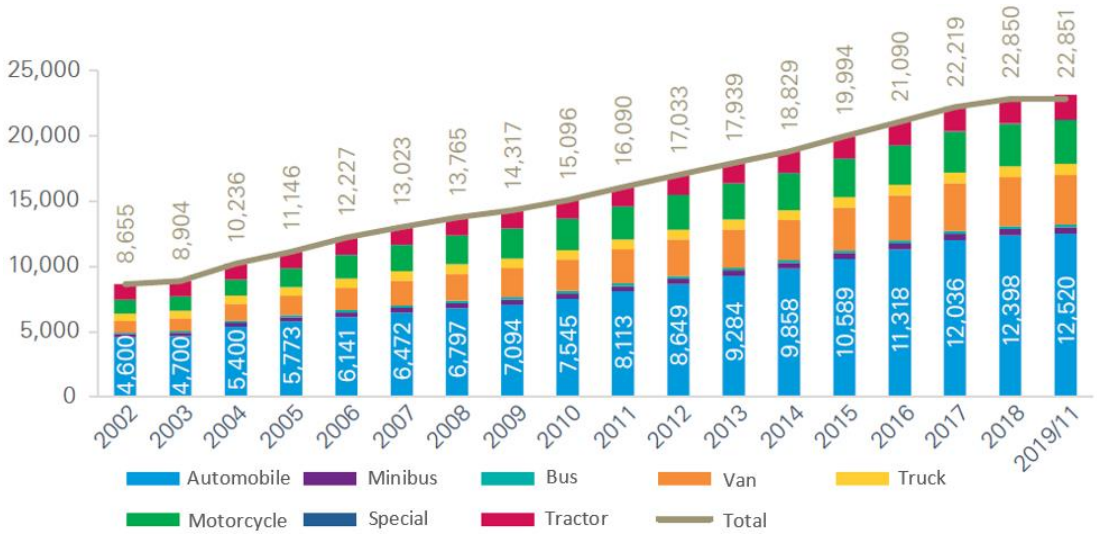


Figure 2.10 Turkey's car park (in thousands) – Turkish statistic commission

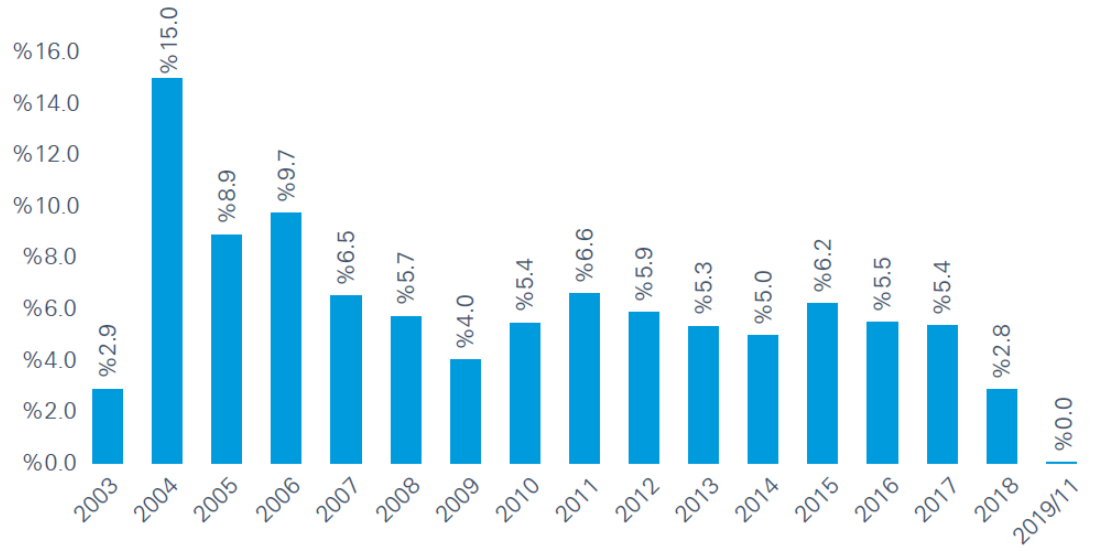


Figure 2.11 Vehicle park growth – Turkish statistic commission

2.5 Automotive Manufacturers in Turkey

AVL - established by Hans List in 1948 in Austria, the company employs more than 9000 engineers in its over 40 affiliates. It`s the world`s largest independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems. AVL has an office in Istanbul with 250+ engineers. It claims it aims to become a global engineering hub. One of the two exporting affiliates of AVL started to work on Hybrid and autonomous car technologies. The company is also supported by Tubitak for its works on electric and autonomous car projects.

FEV - established in 1978 in Aachen, Germany, FEV employs 4000 researchers and developers. Focusing on powertrain components engineering (mainly engine turbo charger and transmission), the company expanded into Turkey in 2011 with 10 engineers working in the local office. The main focus of the company`s business is design and R&D consulting of powertrain and ICE for the automotive sector. FEV also works on design, simulation, software development, and engine/vehicle calibration. The unit dedicated to this job consists of more than 50 engineers.

Idiada - the company was established in 1973 with headquarters in Santa Oliva, Spain. It currently employs more than 2100 workers. Idiada is present in 25 countries, focusing on design, testing, engineering, and certification services in the automotive sector.
The enterprise expanded into Turkey in 2000 with an engineering office. The focus of the company is on testing of R&D consulting for the automotive industry.

Ricardo - this company was founded in 1927 with headquarters in Shoreham by Sea, England. It now employs approximately 3000 engineers. Ricardo is operating in 15 countries with focus on engines, transmissions, and intelligent transportation systems. It works in collaboration with the Turkish engineering house Anova in the field of powertrain development and R&D consulting in Turkey.

Ford - the foundation of Ford`s first factory was laid in 1959. The company has total capacity of production of 415 000 cars per year. The Turkish affiliate is considered the commercial vehicle manufacturing hub of Ford Europe. The company also owns Turkey`s largest R&D center located in a single campus in Istanbul. It exports worth USD 4,8 billion in 2017 to 83 countries. It is also one of the 3 largest R&D centers of Ford Global.

Renault - the Turkish unit is one of the biggest factories of Renault with annual production capacity of 375 000 cars and 750 000 engines. Its total exports in the last

15 years exceed USD 30 billion. It has been a flagship company in passenger car production for years with over 6300 employees, almost 1500 of which are white-collar.

Fiat - the facility was established in 1968 and has the capacity of 450 000 vehicles per year. It currently employs more than 9000 workers. It`s the only factory in Turkey that manufactures both passenger and light commercial vehicles. The R&D center in Bursa is the only center of Fiat outside Italy serving the European market.

Hyundai - the company stepped into the Turkish market in 1990. It started to manufacture in 1997 in its Izmit factory. Hyundai Turkey has a total production capacity of 245 000 vehicles annually. It employs more than 3000 workers. The company is positioned as the global brand`s manufacturing hub for European markets.

Toyota - it has invested almost USD 2 billion since entering Turkey. It currently has over 3500 employees, and a 280 000 cars annual production capacity. Almost 85% of the production is being exported to more than 50 countries. The local affiliate started the production of first two hybrid vehicles in Turkey, C-HR and Corolla Hybrid, with an investment that exceeded EUR 500 million in total.

Mercedes - the global company is operational in Turkey since 1967. The production started in 1968 and the first export was in 1970. Mercedes has now two facilities in the country – a bus factory in Istanbul and a truck factory in Aksaray. The total investment of the company in Turkey amounts to EUR 1 billion and the staff numbers over 6000 employees.

Honda is operational in Turkey since 1992. The production of the company`s Civic model started in 1997. In its Izmit factory it has an annual production capacity of 50 000 cars with over 1500 employees. The global car manufacturer has invested almost USD 500 million since the establishment of its Turkish operations. It now exports the Civic series to 46 countries throughout the world.

MAN - the German giant began operations in Turkey in 1966. There was founded its first factory outside Germany. It is the largest integrated bus company of MAN Global with 2000 units annual bus production capacity and over 2000 employees. The Turkish subsidiary is the production base of the company`s premium Neoplan bus brand. It also exports to 41 countries including European ones.

Big automobile manufacturers such as Hyundai Motor, Fiat Chrysler Automobiles (FCA) and Toyota Motor continue to invest in Turkey with increased production capacities according to the 5-year forecast period until 2027, the Turkish Investment Agency notes. “These investments will make a 0,9% contribution to the average annual growth in the passenger car production in Turkey between 2018 and 2027. Renault

Motor is also planning to carry out more of the Clio subcompact vehicle manufacturing operations in Turkey", the Agency`s report says. According to this new production plan, 94% of the global production of the Clio model of the French automaker will be carried out at the facilities in Turkey and Slovenia. In addition, Toyota Otomotiv, the Turkish affiliate of Toyota Motor, notably increased the production volume of its Turkish manufacturing operations with the release of a new SUV model in 2017. The company invested a total of 350 million EUR (396 million USD) in its Sakarya manufacturing facility as part of a larger investment program valued as much as 470 million USD. The program aims to foster Toyota`s annual production capacity from 150 000 vehicles to 280 000 vehicles per year. The above mentioned SUV model is the first hybrid car which will be mass-produced in Turkey. "Earlier, in November 2014, Turkish automotive manufacturer, Tofas, owned by Koc Holding and FCA in Turkey made an additional investment amounting to 480 million USD on top of an investment of 520 million USD as announced earlier, in the manufacturing of new passenger cars until 2023. The ultimate purpose of the investment is to boost Tofas`s production up to 700 000 units per year in the new hatchback and station wagon models", the cited earlier report adds.

Figure 2.12 Big OEMs in Turkey – Automotive meetings

Firms	The Production Place	Starting Year Of Production	License	Capital (1000 TL)	Foreign Cap. (%)	Covered Area (1.000 M2)	Total Area (1.000 M2)
A.I.O.S.	**KOCAELİ**	1966	**ISUZU**	84.000	29,73	99	299
FORD OTOSAN	**ESKİŞEHİR** **GÖLCÜK/KOCAELİ**	1983 2001	**FORD**	350.910	41,04	117 414	1.125 712
	YENİKÖY/KOCAELİ	2014				127	639
HATTAT TRAKTÖR	**TEKİRDAĞ**	2002	**VALTRA, HATTAT**	40.000	0	51	195
HONDA TÜRKİYE	**KOCAELİ**	1997	**HONDA MOTOR EUROPE. LTD.**	180.000	100	80	292
HYUNDAI ASSAN	**KOCAELİ**	1997	**HYUNDAI MOTOR COMP.**	627.235	70	123	687
KARSAN	**BURSA**	1966	**HYUNDAI MOTOR COMPANY**	600.000	0	104	237
			MENARINI BUS				
M.A.N. TÜRKİYE	**ANKARA**	1966	**MAN TRUCK & BUS AG**	65.000	99,9	111	317
M.BENZ TÜRK	**İSTANBUL** **AKSARAY**	1968 1985	**MERCEDES BENZ**	275.000	84,99	267 143	515 687
OTOKAR	**SAKARYA**	1963	**FRUEHAUF**	24.000	0	144	560
O.RENAULT	**BURSA**	1971	**RENAULT**	323.381	51	356	630
TEMSA	**ADANA**	1987	**TEMSA**	210.000	0	115	510
TOFAŞ	**BURSA**	1971	**FIAT**	500.000	37,8	410	978
TOYOTA	**SAKARYA**	1994	**TOYOTA**	150.165	100	256	917
T.TRAKTÖR	**ANKARA** **SAKARYA**	1954 2014	**NEW HOLLAND / CASE IH**	53.369	37,5	82 69	257 402
			TOTAL	**3.483.060**		**3.068**	**9.959**

Table 2.1 General information on the automotive manufactures – *OSD 2019*

Firms	Passenger Car	Truck	Pick Up	Bus	Mini-Bus	Midi-Bus	F. Tractor	TOTAL
A. ISUZU	0	8.000	7.300	1.152	0	2.560	0	19.012
FORD OTOSAN	30.000	15.000	366.000	0	44.000	0	0	455.000
HATTAT TRAKTÖR	0	0	0	0	0	0	25.000	25.000
HONDA TÜRKİYE	50.000	0	0	0	0	0	0	50.000
HYUNDAI ASSAN	245.000	0	0	0	0	0	0	245.000
KARSAN	0	0	40.500	2.025	7.000	2.700	0	52.225
M.A.N. TÜRKİYE	0	0	0	2.400	0	0	0	2.400
M. BENZ TÜRK	0	17.140	0	2.310	0	0	0	19.450
OTOKAR	0	0	5.300	1.000	1.500	2.500	0	10.300
O. RENAULT	375.000	0	0	0	0	0	0	375.000
TEMSA	0	6.000	0	2.500	0	2.000	0	10.500
TOFAŞ	290.000	0	210.000	0	0	0	0	500.000
TOYOTA	280.000	0	0	0	0	0	0	280.000
T. TRAKTÖR	0	0	0	0	0	0	50.000	50.000
TOTAL	**1.270.000**	**46.140**	**629.100**	**11.387**	**52.500**	**9.760**	**75.000**	**2.093.887**

Table 2.2 Production Capacities – *OSD 2019*

FIRMS/TYPES	2014	2015	2016	2017	2018
A.I.O.S.					
Pick Up	2.692	4.012	2.239	2.542	1.451
Truck	3.073	4.663	1.648	2.569	1.517
Bus	151	462	236	353	414
Midibus	1.764	2.025	1.117	902	1.079
TOTAL	**7.680**	**11.162**	**5.240**	**6.366**	**4.461**
FORD OTOSAN					
P.Car	9.790	21.083	24.514	25.844	22.916
Truck	7.955	10.956	4.862	6.000	5.695
Minibus	33.864	45.453	43.273	287.355	55.892
Pick Up	193.073	257.130	261.100	53.806	289.199
TOTAL	**244.682**	**334.622**	**333.749**	**373.005**	**373.702**
HATTAT TRAKTÖR					
F. Tractor	2.580	3.702	4.715	5.539	3.572
TOTAL	**2.580**	**3.702**	**4.715**	**5.539**	**3.572**
HONDA TÜRKİYE					
P. Car	11.633	12.667	15.163	28.742	38.319
TOTAL	**11.633**	**12.667**	**15.163**	**28.742**	**38.319**
HYUNDAI ASSAN					
P. Car	203.157	226.500	230.010	226.979	203.000
TOTAL	**203.157**	**226.500**	**230.010**	**226.979**	**203.000**
KARSAN					
Truck	3	0	0	0	0
Minibus	1.544	1.625	1.142	1.230	1.042
Midibus	99	602	152	327	213
Bus	43	384	91	180	339
Pick Up	25	4.628	4.262	4.290	5.130
TOTAL	**11.633**	**12.667**	**15.163**	**28.742**	**38.319**
MAN TÜRKİYE					
Bus	1.051	1.743	1.826	2.145	2.558
TOTAL	**1.051**	**1.743**	**1.826**	**2.145**	**2.558**

FIRMS/TYPES	2014	2015	2016	2017	2018
MERCEDES BENZ					
Bus	3.686	4.253	4.231	3.792	3.708
Truck	18.519	19.688	9.885	13.351	17.148
TOTAL	**22.205**	**23.941**	**14.116**	**17.143**	**20.856**
OTOKAR					
Midibus	2.066	2.815	990	1.319	1.123
Minibus	12	0	0	0	0
Truck	359	531	0	430	457
Pick Up	423	553	706	465	195
Bus	406	714	665	493	594
TOTAL	**3.266**	**4.613**	**2.361**	**2.707**	**2.369**
OYAK-RENAULT					
P. Car	318.246	339.240	340.000	365.002	336.778
TOTAL	**318.246**	**339.240**	**340.000**	**365.002**	**336.778**
TEMSA					
Bus	1.105	1.233	1.034	1.203	928
Truck	0	0	979	1.152	720
Midibus	1.395	1.689	1.071	1.184	901
TOTAL	**2.500**	**2.922**	**3.084**	**3.539**	**2.549**
TOFAŞ					
P. Car	59.109	75.644	193.530	216.437	168.364
Pick Up	163.698	202.610	189.965	167.737	133.386
TOTAL	**222.807**	**278.254**	**383.495**	**384.174**	**301.750**
TOYOTA					
P. Car	131.504	115.893	151.236	279.902	257.084
TOTAL	**131.504**	**115.893**	**151.236**	**279.902**	**257.084**
TÜRK TRAKTÖR					
F. Tractor	45.823	47.536	46.031	48.302	34.114
TOTAL	**45.823**	**47.536**	**46.031**	**48.302**	**34.114**
GRAND TOTAL	**1.218.848**	**1.410.034**	**1.536.673**	**1.749.572**	**1.587.836**

Table 2.3 the Production Units of the Manufacturers – *OSD 2019*

Production Capacity Distribution 2018

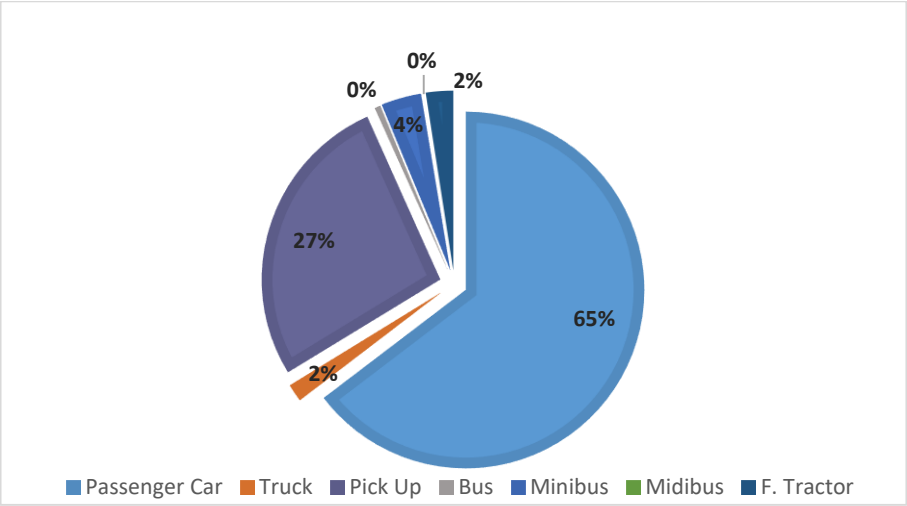


Figure 2.13 Turkey Production Capacity Distribution – OSD 2019

Production vs Capacity

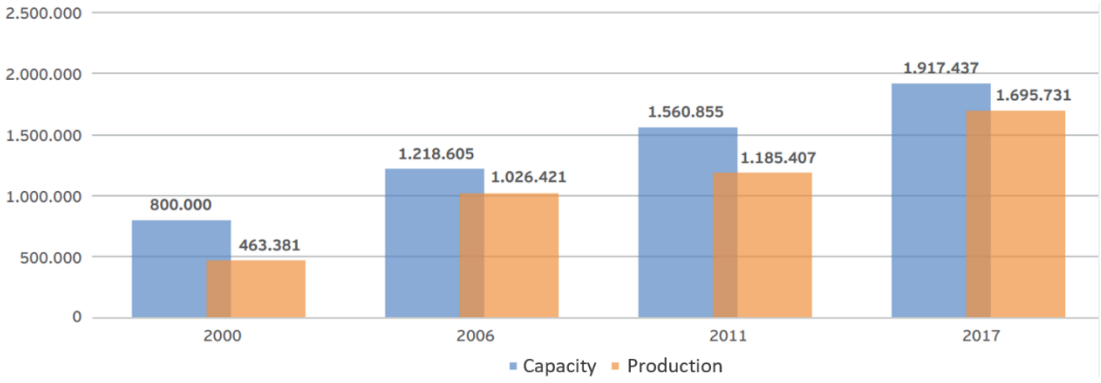


Figure 2.14 Turkey Production Capacity vs Production – OSD 2019

The production capacity of vehicles in 2018 in the automotive industry in TURKEY is capable of producing 2 million vehicles. However, total production in 2018 was roughly 1.6M vehicles. When the capacity level and production ratio are analyzed, it seems that there is an excess capacity. Figure 2.6 shows the total production capacity as a percentage of passenger cars and commercial vehicles. In 2018, 65% of the production was automobile. Commercial vehicle production consists of trucks, vans, buses, minibuses, midbuses and tractors, accounting for 35% of total production.

Renault world production network

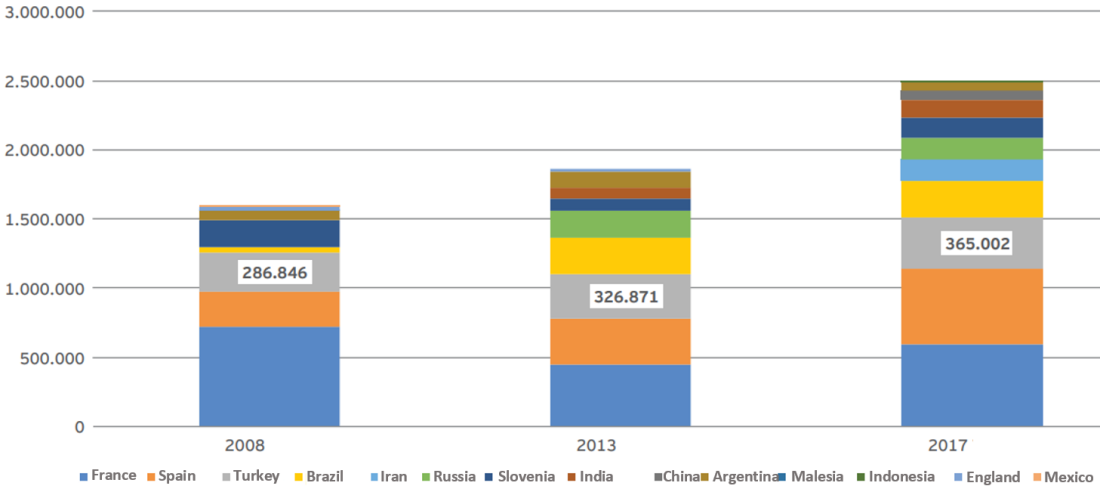


Figure 2.15 Renault word production network – Marklines

Toyota world production network top 10

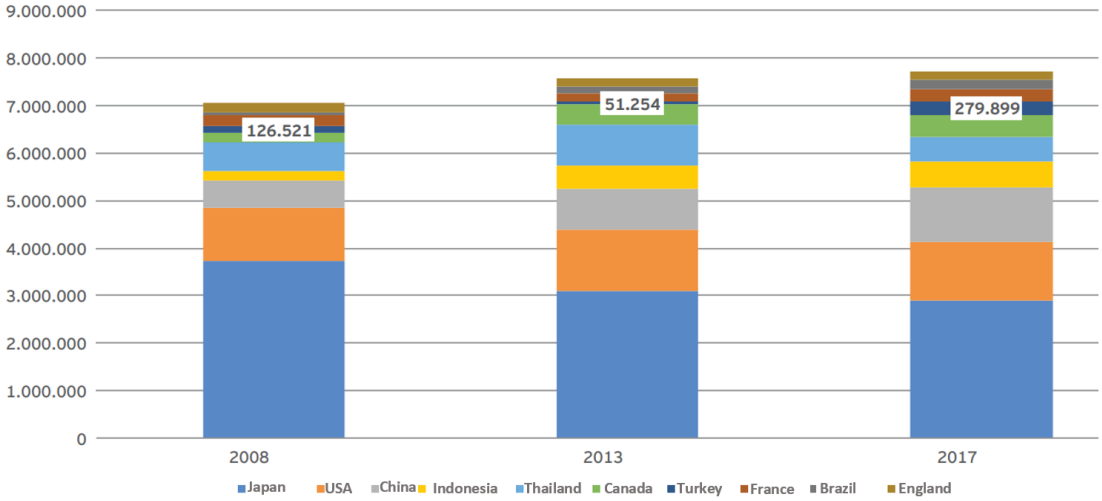


Figure 2.16 Toyota word production network top 10 – Marklines

Ford world production network top 10

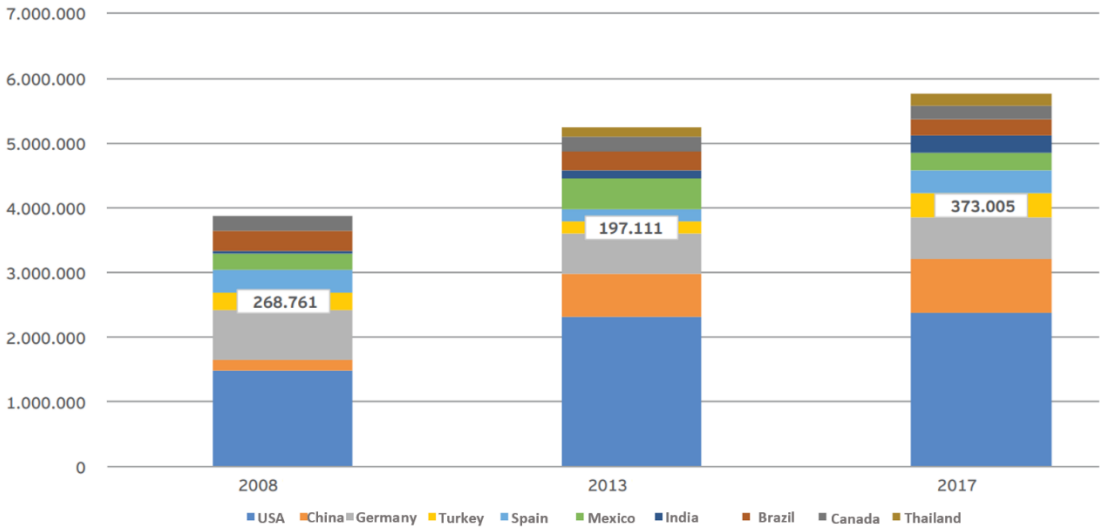


Figure 2.17 Ford word production network top 10 – Marklines

FCA world production network top 10

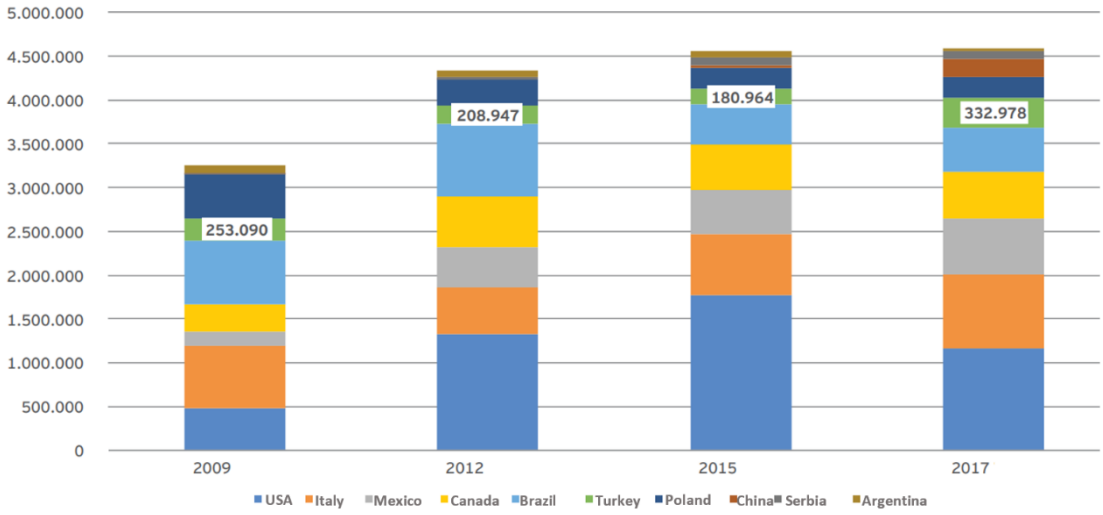


Figure 2.18 FCA word production network top 10 – Marklines

2.6 Turkish Automotive Industry's Performance in Recent Years

According to Turkish Statistic institution, following OEMs' new capacity upgrades and subsidiary industry investments triggered by these new capacities, the total revenue of the automotive sector in Turkey rose to 37.7 billion euros from 17.6 billion euros between 2017 and 2009.

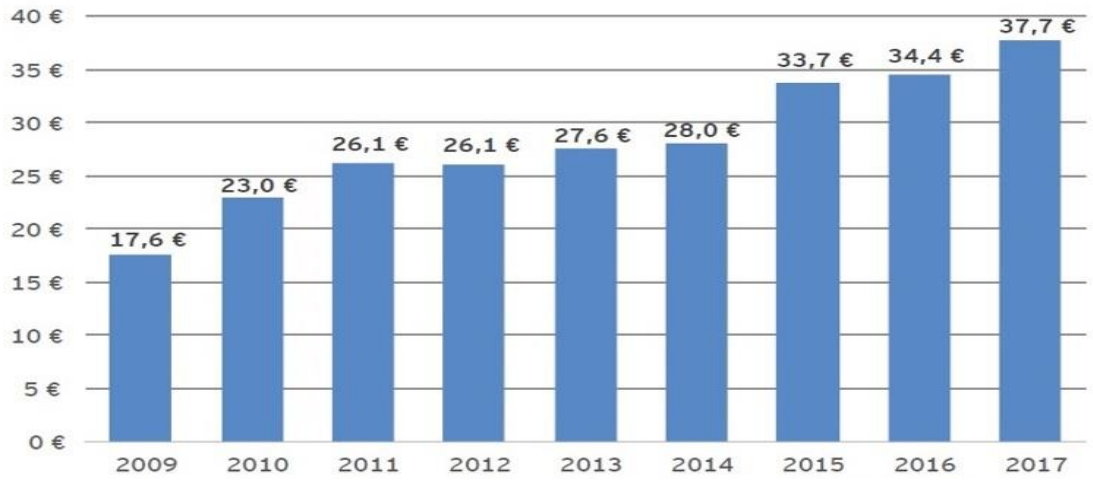


Figure 2.19 Turkey's total revenue for the automotive industry (billion €) – Turkish Statistic Institution

Revenue grew by 10% in Turkey in terms of average annual growth rate between 2009 and 2017 the automotive industry.

The increase in production volumes has led to increased employment in both vehicle and parts manufacturing companies. In return, the total staff cost burden of the industry increased.

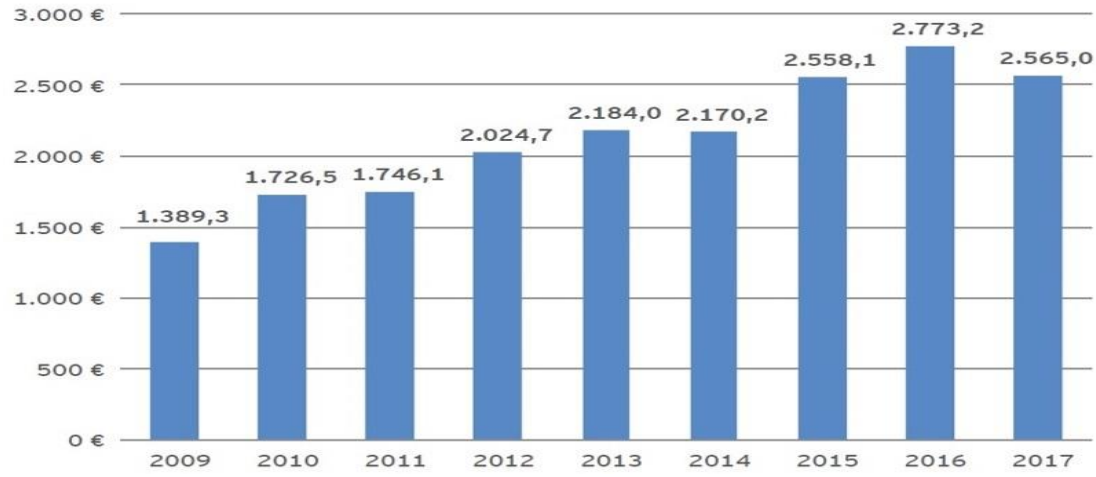


Figure 2.20 Turkey's total personnel costs of the automotive industry (million €) – Turkish Statistic Institution

Between 2009 and 2017, personnel costs increased from 1.3 billion Euros to 2.6 billion Euros. The average annual growth rate in the said period was 8% shown on Figure 2.20

Despite the increase in personnel costs, a strong growth in the field of income has enabled the industry to maintain its competitiveness in recent years.

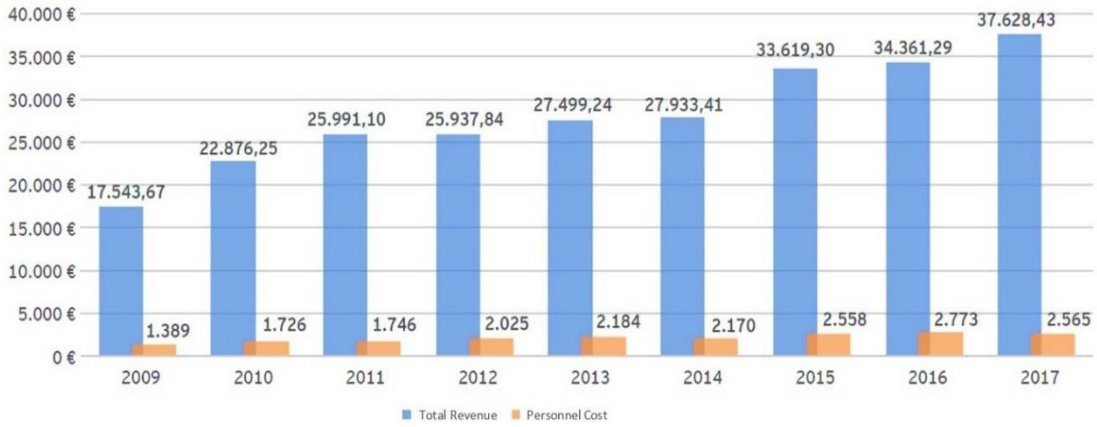


Figure 2.21 Turkey's total revenue and personnel cost comparison for the automotive industry (million €) – Turkish Statistic Institution

Vehicle manufacturers' revenue grew nearly twice between 2009 and 2017, from 12.5 billion euros to 20.05 billion euros. In the same period, personnel costs increased from 703 million Euros to 1.03 billion Euros.

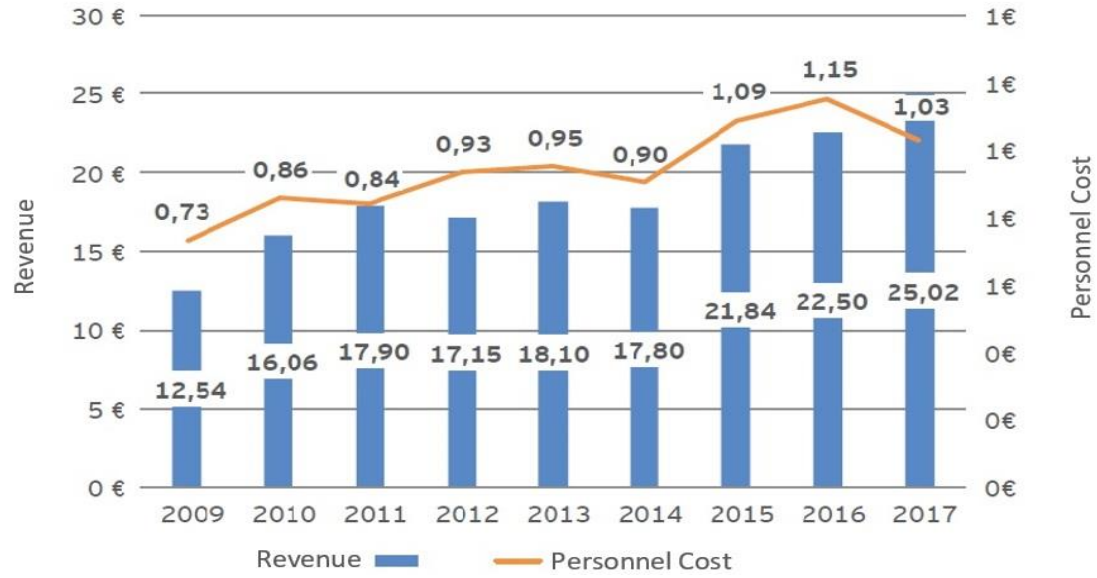


Figure 2.22 Vehicle manufacturers' total income and personnel cost comparison (billion €) – Turkish Statistic Institution

- The manufacturers' income has a growth rate of about 10% (annual average).
- In the same period, personnel costs grew at an average annual growth rate of 4.5% in Euros.
- The industry was able to increase its competitiveness in general with this performance.

Sub-industry has managed to increase its total income from 3.78 billion Euros to 10.09 billion Euros. On the other hand, the personnel cost of the sector increased from 555 million in 2009 to 1.23 billion Euros in 2017.

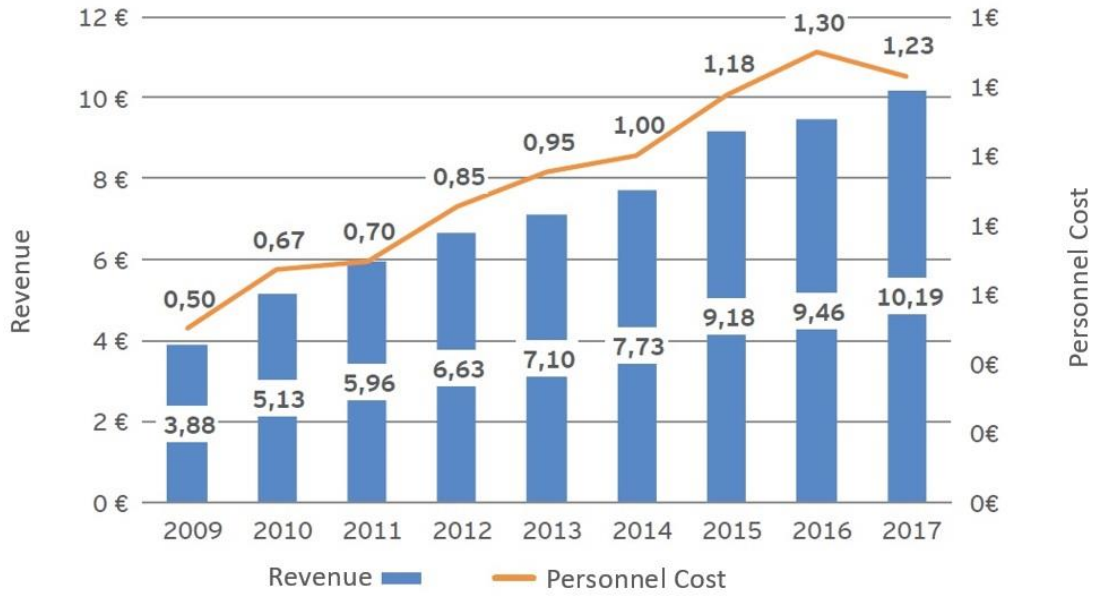


Figure 2.23 Total income and personnel cost comparison for parts manufacturers (billion €) – Turkish Statistic Institution

- The growth rate of the supplier industry in terms of income (Annual Average Growth Rate) was 13% between 2009 and 2017.
- On the other hand, staff cost grew by 12% Annual Average Growth Rate in Euros.
- With these results, the industry was successful in maintaining its competitiveness.

2.7 Attractiveness of Automotive sector in Turkey

The automotive industry is based on the foundations of Turkey beginning of the 1960s. Passing through a period of rapid industrialization and progress, this important sector has transformed from assembly-intensive partnerships into a full-fledged industry with design capability and large production capacity. Original equipment manufacturers (OEM), operating in Turkey since 2000 and has invested over 15 billion US dollars. These investments, said increasing the production capacity of the company has provided substantial acquisition of Turkey's most important place in the global value chains of international OEMs. meet international quality and safety standards, even in today's Turkey last beyond these standards in the automotive industry, thanks to the understanding of value-added production is located in a highly efficient and competitive position. The 15th biggest automotive producer in the world and the 5th in Europe in 2019. The country accounts for 25% of the automotive production occurring in Central and Eastern Europe. The automotive industry is one of the main drivers of the manufacturing sector in Turkey and employs more than 400,000 people. Turkish automotive industry is an export champion with its 16% share in total export. 75% of production in Turkey is destined for foreign markets. *(OICA 2019)*

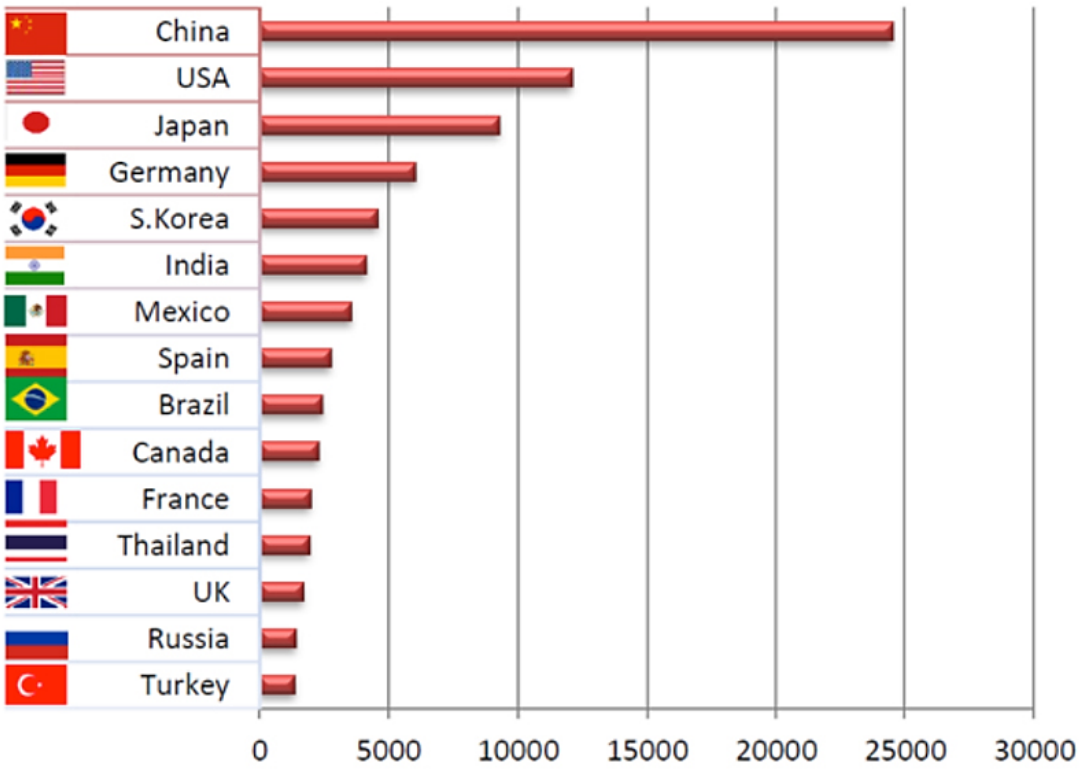
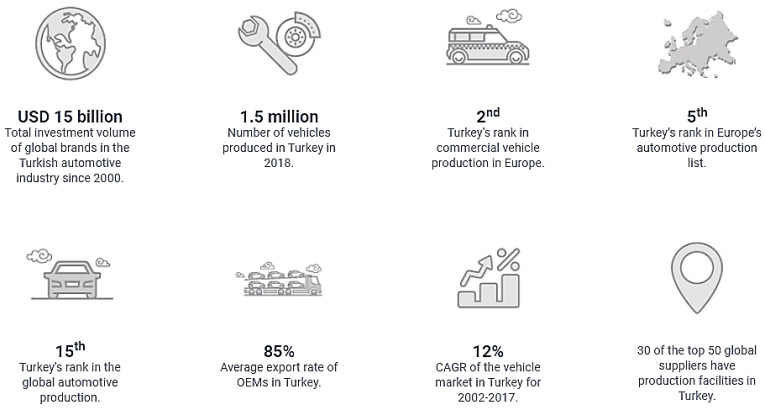


Figure 2.24 World motor vehicle production by country 1000x units/year – OICA 2019

According to *https://www.invest.gov.tr/* sources, there are main milestones to invest turkey in automotive sector, which are:

- Competitive and qualified workforce, and advantageous geographical position thanks to dynamic domestic market in 2002, while production of 9 global OEMs in Turkey's 300,000 vehicles, surpassing the 1.5 million in 2018 increased by almost five times. This increase shows that an annual compound growth rate of approximately 10% has been realized in the said period. In the last five years alone, MAN has increased its production by 143%, Toyota 95%, Ford 52% and Fiat 35%.
- This significant growth recorded by the automotive sector in Turkey by the end of 2018, the world's 15th largest, has enabled Europe to rise to the 5th largest automotive manufacturer.
- Turkey, especially in the commercial vehicle production, has become a center of excellence. By the end of 2018, Turkey was Europe's second largest commercial vehicle manufacturer.
- Proving itself as a unique automotive industry production center of Turkey, it is now R & D, design and branding aims to develop capacities. As of 2019, the automotive manufacturers in Turkey / suppliers shows 184 design and R & D center of their activities.
- Ford, Fiat, Daimler and AVL product development in Turkey, who are outstanding in their design and engineering activities, stand out as examples of global brands. While Ford Otosan's R&D center is one of Ford's three largest R&D centers globally, Fiat's R&D center in Bursa is the only Italian company serving the European market outside of its own country. On the other hand, Daimler's R & D center in Istanbul, plays an integral role in the German company's truck and bus production activities in Turkey. The second R & D center opened in Turkey while Turkey AVL, driverless technologies and hybrid vehicles began to develop.
- Turkey offers a supportive environment in the supply chain side. There are approximately 1,100 parts suppliers in the country that support production in OEMs. The parts directly enter the manufacturing lines of vehicle manufacturers and the localization rate in OEMs ranges from 50% to 70%.
- Turkey is home to a large number of global suppliers. Turkey has more than 250 global suppliers and their use as a production base is located in 30 of the 50 largest global supplier.
- Automotive manufacturers, as a production base for exports are increasingly more likely to prefer Turkey. estimated to be about 85% of the market for foreign vehicle production in Turkey in 2018 is an indication of this condition.

In the same period, foreign markets have been exported from Turkey to more than 1.3 million vehicles. At the same time last year, it has more than 1.1 million vehicles in the European car-exporting countries to Turkey.



(invest.gov.tr)

2.7.1 Economic Factors

Ranking of Economies by GDP at PPP (Purchasing Power Parity), The Turkish economy, from 2003 to 2018, has posted record growth and climbed from 18th place to 13th globally.

2003		2018		2023	
1	USA	1	CHINA	1	CHINA
2	CHINA	2	USA	2	USA
3	JAPAN	3	INDIA	3	INDIA
4	GERMANY	4	JAPAN	4	JAPAN
5	INDIA	5	GERMANY	5	GERMANY
6	RUSSIA	6	RUSSIA	6	RUSSIA
7	FRANCE	7	INDONESIA	7	INDONESIA
8	UK	8	BRAZIL	8	BRAZIL
9	BRAZIL	9	UK	9	UK
10	ITALY	10	FRANCE	10	FRANCE
11	MEXICO	11	MEXICO	11	MEXICO
12	INDONESIA	12	ITALY	12	TURKEY
13	SPAIN	13	TURKEY	13	ITALY
14	CANADA	14	S.KOREA	14	S.KOREA
15	S.KOREA	15	SPAIN	15	S.ARABIA
16	IRAN	16	S.ARABIA	16	SPAIN
17	S.ARABIA	17	CANADA	17	CANADA
18	TURKEY	18	IRAN	18	EGYPT

Table 2.4 Ranking of Economies by GDP at PPP – *International Monetary Fund World Economic Outlook, April 2019 (IMF WEO*)

Average Annual GDP Growth (percentage) – 2003-2018, Turkey has outpaced its peer economies, and the growth momentum is set to continue in the coming years.

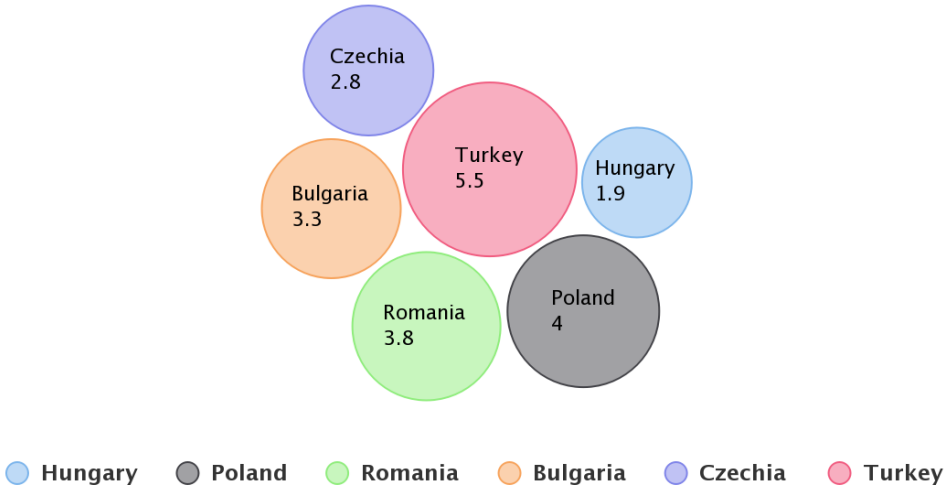


Figure 2.25 Average Annual GDP Growth (%) – 2003-2018– IMF WEO

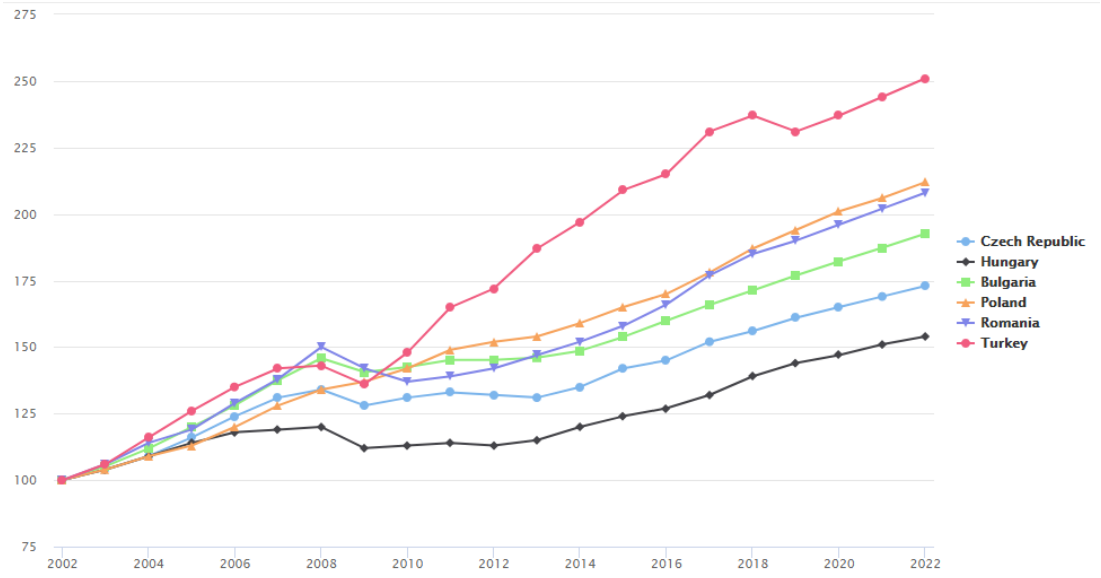


Figure 2.26 Real GDP Growth (Index: 2002=100) – IMF WEO (2020, 2022 estimated)

2.7.2 Domestic and Regional Markets Factors

Income per capita (GDP per capita, current prices), Turkey's performance in economic development saw its income per capita increase from USD 3,581 in 2002 to USD 9,632 in 2018.

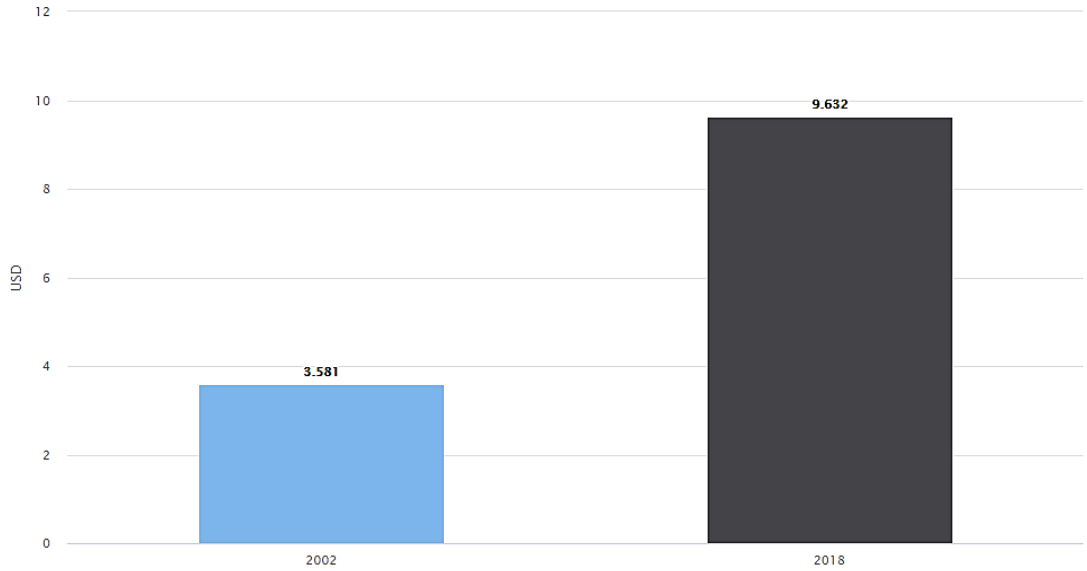


Figure 2.27 Income per capita (GDP per capita, current prices), – TurkStat

GDP per capita in Countries with Population over 50 Million – 2018, Turkey is the 11th largest economy in terms of GDP per capita among countries with population over 50 million.

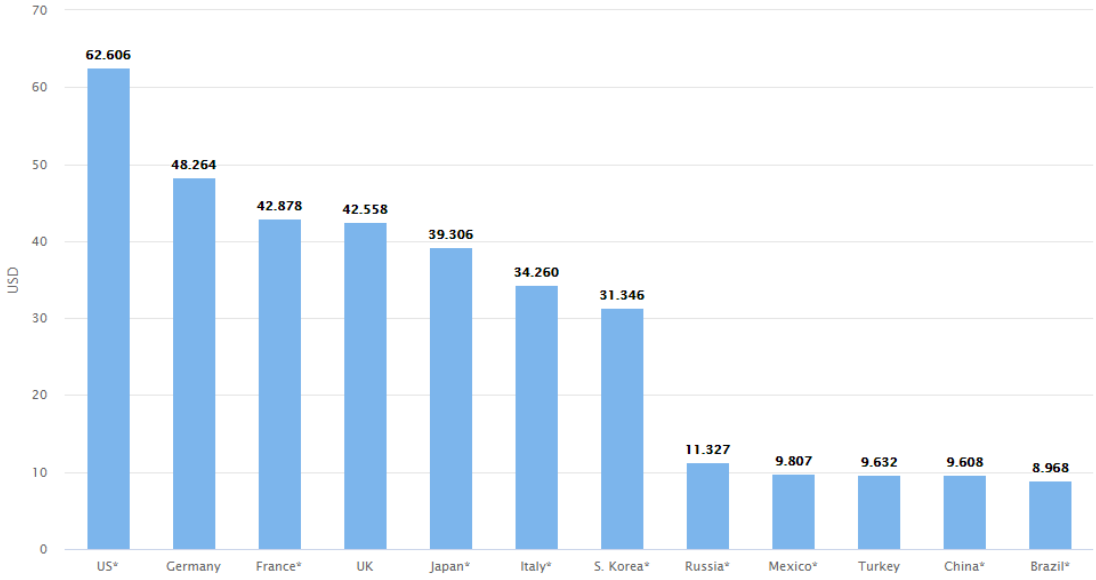


Figure 2.28 GDP per capita in Countries with Population over 50 Million, - IMF WEO, *Estimated figures

Stock of Automobiles (millions of passenger cars), Turkey's economic growth has paved the way for emergence of a sizeable middle-class with an increasing purchasing power.

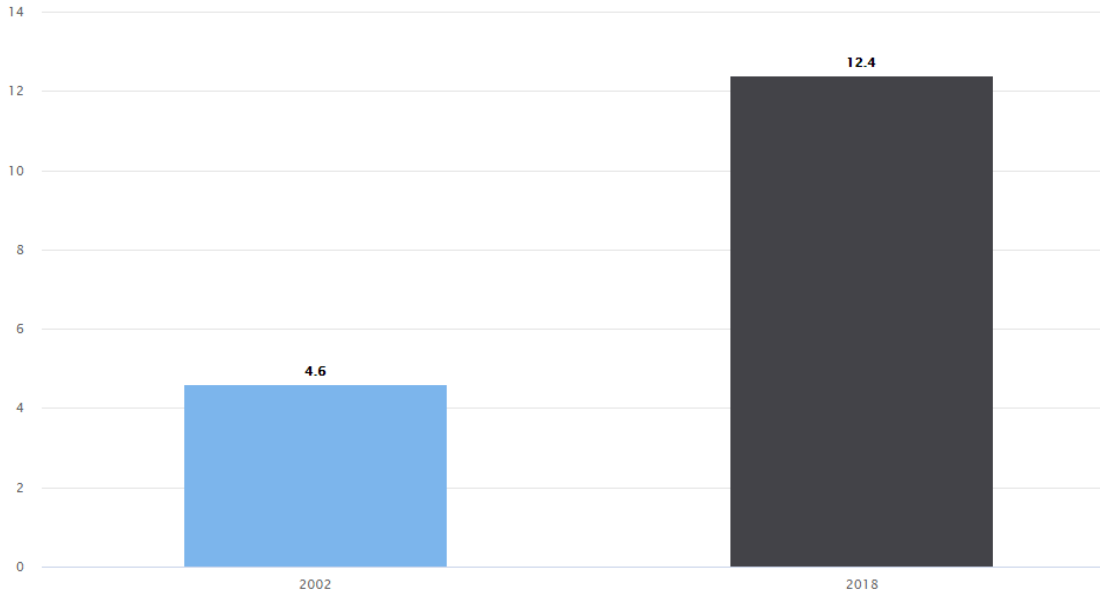


Figure 2.29 Stock of Automobiles (millions of passenger cars), - TurkStat

Urbanization, More than 23 urban centers, each with populations of over 1 million, support Turkey's thriving domestic market through their production of goods and services. In terms of population, Istanbul is the largest city in Europe.

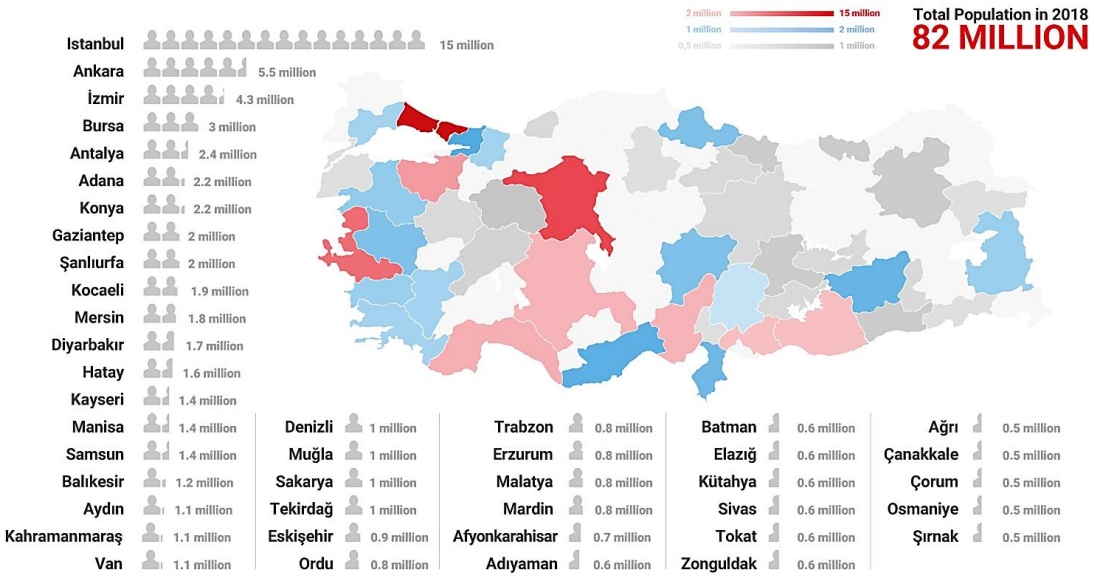


Figure 2.30 Urbanization – TurkStat

Figure 2.31 Access to Markets – Eurostat, population as of 2017, Ministry of Trade

- 72 million broadband internet subscribers in 2018, up from 0.1 million in 2002 *(ICTA, TurkStat)*
- 80.6 million mobile phone subscribers in 2018, up from 23 million in 2002 *(TurkStat)*
- 66.3 million credit card users in 2018, up from 16 million in 2002 *(Interbank Card Center)*
- 211 million airline passengers in 2018, up from 33 million in 2002 *(General Directorate of State Airports Authority)*
- 45.6 million international tourist arrivals in 2018, up from 13 million in 2002 *(TurkStat)*

2.7.3 Strategic Location Importance

Turkey is a natural bridge between both the East-West and the North-South axes, thus creating an efficient and cost-effective hub to major markets.

- *Close proximity to major markets*, Turkey offers easy access to 1.5 billion people and a combined market worth of USD 24 trillion GDP in Europe, MENA, and Central Asia within a 4-hour flight radius. *(invest.gov.tr)*
- *Same day reachability of key markets*, Turkey's strategic location enables easy reach to markets across 16 different time zones, from Tokyo to New York.
- *Global connectivity*, Turkish Airlines connects 255 destinations in 122 countries.*(Turkish Airlines)*
- *Hub for multinationals*, Multinationals are increasingly choosing Turkey as a preferred hub for manufacturing, exports, as well as management.

2.7.4 Demographic Factors

Investors are faced with significant challenges, such as aging and declining population in Europe, Turkey's young and good consider its educated population as an important advantage. Turkey, with strong labor market and young form the basis of the strong domestic market, offers unique opportunities with a dynamic and growing population.

According to Turkey Statistical Institute (TUIK) Turkey's population that is 82 million in 2018, is expected to reach 86.9 million in 2023, and 100.3 million in 2040. It is predicted that the population will maintain its growth momentum and reach 107.6 million, the peak point in 2069.

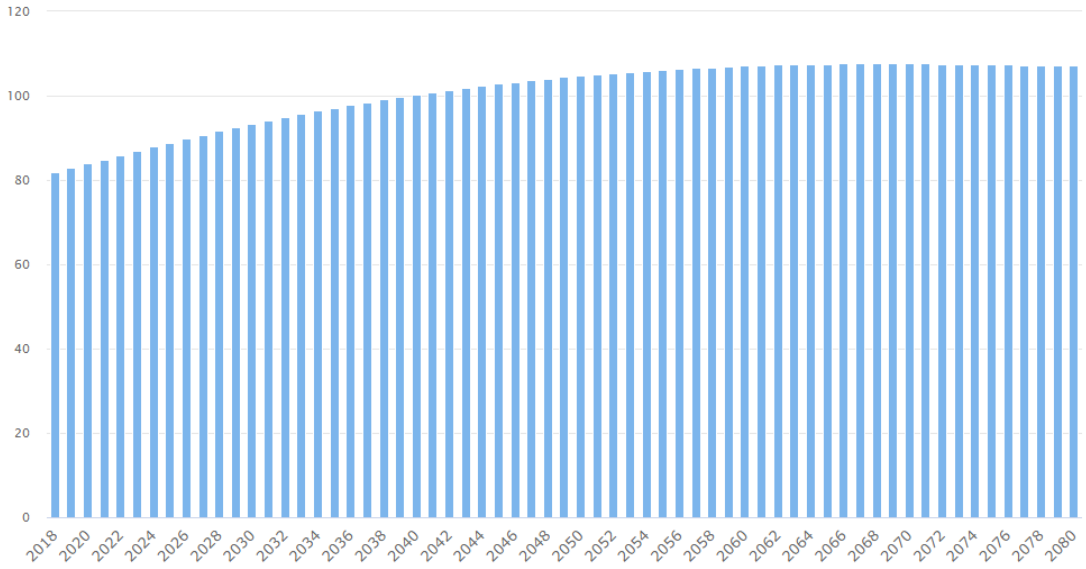


Figure 2.32 Population Forecasts - 2018-2080 (million) – TÜİK (*Turkey Statistical Institute)*

Half of the population is under the age of 32 in 2018; Turkey has the youngest population in comparison with EU member states.

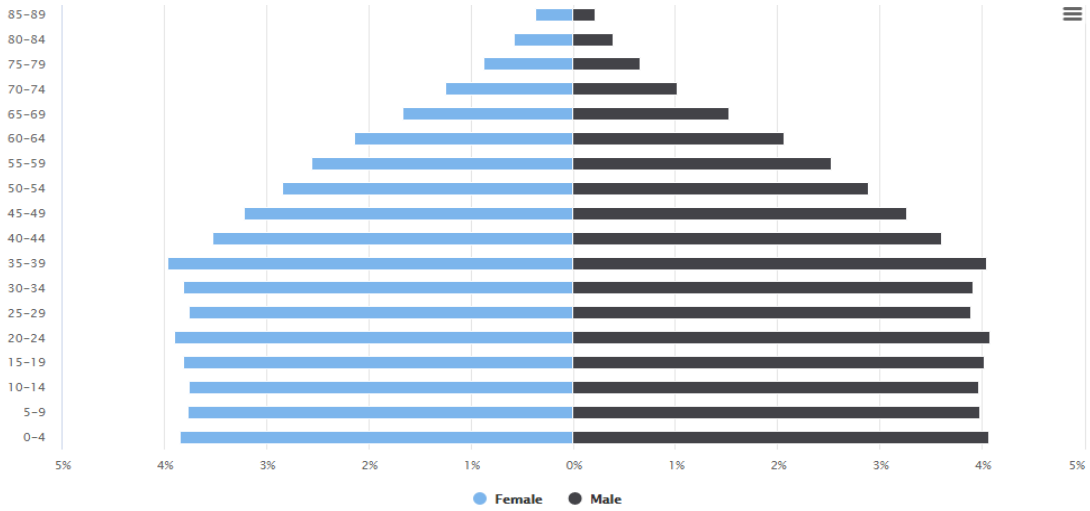


Figure 2.33 Population-Age Group Pyramid – 2018 – Turkstat

2.7.5 Skilled and Cost-Competitive Labor Force

Turkey's overall labor force is around 32.7 million people, which makes the country the 3rd largest labor force in Europe. Turkey's young population is an important contributor to labor force growth and has boosted the country's rank over peer countries. Turkey has posted the largest labor force growth among the EU countries.

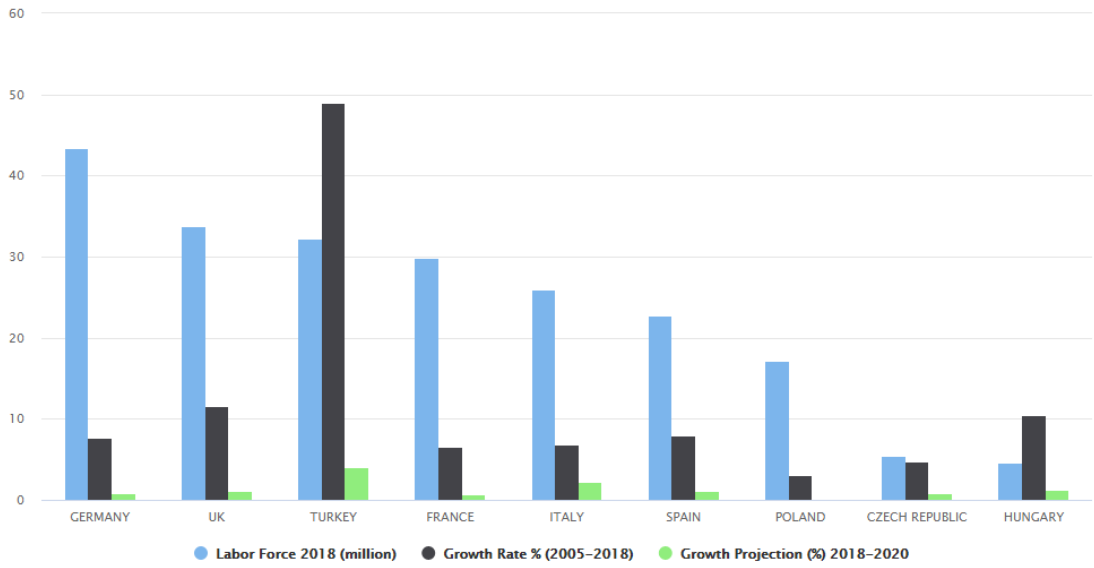


Figure 2.34 Labor Force – 2018 – OECD, World Bank, TurkStat

A rapid expansion in the number of universities has allowed Turkey to have more university graduates, enabling Turkey to transform its young population and large labor force into a skilled workforce.

- More than 6.7 million students are enrolled in higher education currently
- World-class engineering education
- Over 800,000 university graduates annually

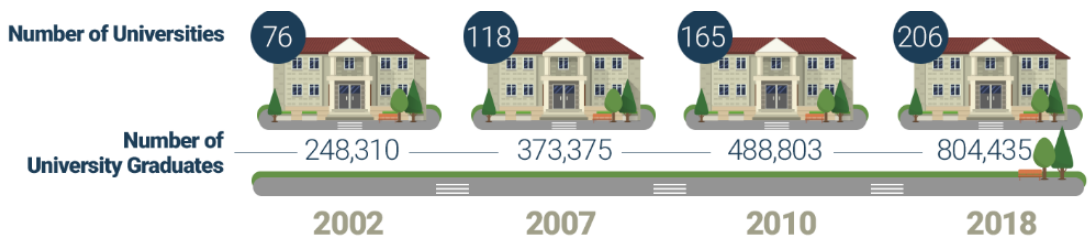


Figure 2.35 Number of Universities and University Graduates - CoHE

2.7.6 R&D Ecosystem Factors

The Turkish government has set the target of increasing the share of R&D investments within the overall public budget to 2%. As of 2018, this figure has already increased above 1 percent – with the expectation to reach 2 percent over the next several years.

Extensive R&D incentives in Turkey are further supported by well-educated and highly qualified labor force, competitive cost advantages, and several global companies that are active in the market. All together these form a dynamic ecosystem in Turkey.

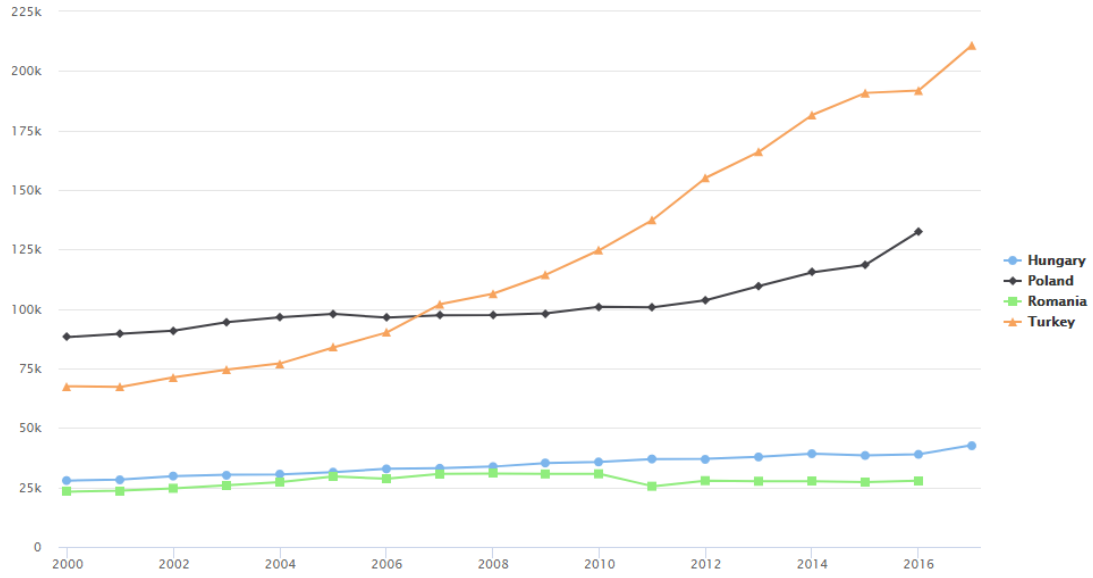


Figure 2.36 Number of Researchers (thousands) - OECD, Eurostat, TurkStat

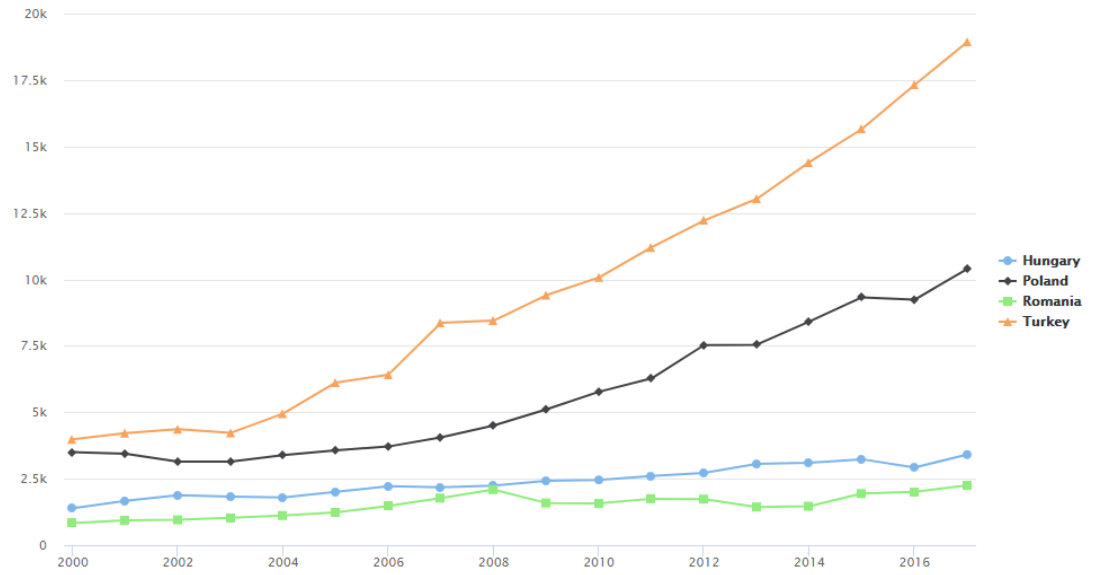


Figure 2.37 Gross Domestic Spending on R&D (USD, thousands) - OECD, Eurostat, TurkStat

2.7.7 Sectoral Opportunities

Turkey offers abundant opportunities in a wide variety of sectors where it has a competitive edge.

Figure 2.38 TurkStat, Ministry of Industry and Technology, SASAD, OSD, SBB; export values as of 2018, market values as of 2017; defense industry value as of 2018

2.7.8 Volkswagen's Decision for investment

One of the most important developments of the last 2 years in the automotive industry was Volkswagen's desire to configure its factories in Germany for the production of electrical models. Therefore, the German group preferred the Passat and Skoda began seeking a place for the production of Superb models in Turkey. Because looking for a place brand new facility in Eastern Europe to Turkey was ranked first among the alternatives.

Electrification in the automotive industry has already started to affect brands' production patterns fundamentally. Electric cars, which are easier and different to manufacture than conventional, internal combustion engine cars, are very popular with each brand's step in this transformation. The emission limitations applied in Europe in recent years have led to the acceleration of the production of electric cars and to meet tens of vehicles with either fully electric or hybrid engines within a year. Especially

the change in the emission limitation in the next 2-3 years and the big penalties per vehicle to be paid by the brands that do not comply with this limitation have also cornered the manufacturers.

VW announced that since mid-2018, some models of the Skoda and Seat brands were looking for a new facility as it could not catch up in terms of production. East Europe for this facility is planned among Turkey, Serbia, Romania and Bulgaria. Turkey was actually the most powerful among those alternatives. The strengths of the country were the logistics infrastructure, the three sides surrounded by the sea, a bridge between the Middle East and West Asia and Europe. In October 2019, Turkey realized the bride German automotive company setup. According to the information in the Official Newspaper, the name of the company was "Volkswagen Turkey Otomotiv Sanayi ve Ticaret AŞ." The company was founded in Manisa. The head office of the company was "Keçiliköy OSB Mahallesi Cumhuriyet Bulvarı No: 14/118 Yunusemre / Manisa". Company; It was established to carry out all other activities related to the design, manufacture and assembly of cars, trucks and all kinds of motor vehicles and transport vehicles, the design, manufacture and assembly of their parts and components, and the sales, import and export of all these products. The company's capital is 943.5 million TL.

German automotive Volkswagen established a company in Manisa for its new factory. So why VW chose Turkey? Professor from Konstanz University. Dr. Erdal Yalçın answered the questions of Deutsche Welle Turkish.

Turkish DW: Volkswagen why I chose Turkey for a new production facility?

Erdal Yalçın:at first glance, the decision to invest here in a period of political unrest in Turkey does not seem reasonable. However, from a long-term perspective, this decision is understandable and logical. Turkey has become an important production site, especially in the automotive industry for the past 15 years. Especially thanks to suppliers settled in Turkey. The network of supplier companies, including Robert Bosch, which has a factory near Bursa, has grown enormously. This is of course very useful for a company like VW. These conditions do not exist in Bulgaria.

Turkish DW: The conditions of the employment market in Turkey how it looks in terms of VW?

Erdal Yalçın: labor costs in Turkey are very low. The minimum wage is around 420 euro. This is an important difference compared to Bulgaria. In addition, a huge market and the future of Turkey's population is expected to exceed 100 million. The company

can hire young employees who will make a positive contribution to Volkswagen in the long term. The potential workforce is well educated. From 2005, that was progress since the start of accession talks with Turkey. Also political problems in recent years, many talented people in Turkey to abandon, so also lead to brain drain.

Turkish DW: Unemployment, borrowing, inflation… The Turkish economy is currently having trouble on these issues. Will the investment of a big company like Volkswagen boost the economy?

Erdal Yalçın: Exactly! This is an important investment for the economy. This is a message like this: "Look, the world's largest automotive company investing in Turkey." This decision may motivate other foreign investors.

Turkish DW: Criticism of violating the rule of law in Turkey in recent years directed. Is VW's investment decision wise considering these criticisms?

Erdal Yalçın: Especially if we strive for improvement in the long term, no investment is not a solution. Investments from Germany to Russia have recently been partially prevented or banned. However, economic isolation has been of no use. Likewise, it was not effective in Iran. As a result, stopping investments further weakened democratic forces. I see investment as an opportunity in countries with a difficult political environment. A positive addiction can occur. Past experiences show us that maintaining economic relations is a better tool than isolation in the long run. Investments in Turkey may also provide political relations will positively affect the formation conditions.

"© Deutsche Welle Turkish"

2.8 First Turkish Electric Vehicle Born,TOGG

Türkiye'nin Otomobili Girişim Grubu (TOGG), realized to make Turkey's 60-year dream come true and become Turkey's first global mobility brand by leading the transformation of Turkey's automotive industry. TOGG presented its early stage prototype C-SUV and a concept Sedan at a public event held at IT Valley in Gebze, Turkey. The C-SUV launch in 2022 will be positioned TOGG as Europe's first non-conventional battery electric SUV manufacturer. In addition to being a born-electric BEV with zero emission, the C-SUV is going to be a smart car with best-in-class features such as the longest wheelbase, the most spacious interior, the best acceleration performance and the lowest total cost of ownership.

Turkey’s automobile is developed on a genuine, born-electric platform built by TOGG engineers and designers, with intellectual property rights 100% owned by Turkey. As part of the design process, a total of 18 design places from Turkey and abroad were assessed objectively in line with 6 different criteria set by TOGG. TOGG Design Team, including experienced Turkish designer Murat Günak, shortlisted 3 design houses with the highest scores. The short-listed design houses, which were briefed with insights from a comprehensive Turkish consumer survey, provided 2D design alternatives for the contest.

During this period, over 100 different themes were evaluated and further consumer insights were provided to the design houses as feedback. One exterior and one interior design from each shortlisted house were checked and tested with potential car buyers in Turkey. The results were evaluated by the TOGG Design Team on engineering compatibility. After these stages, Italian design house Pininfarina, among the best in the world, was selected as a strategic partner and the 3D design phase kicked-off.

Driven by the Turkish consumer insights, joint work of the TOGG Design Team and Pininfarina converged into an authentic design language appealing to both Turkish and universal taste.

The distinctive and sharp lines illustrating the C-SUV and concept Sedan models express the robust and powerful character of the automobiles, while forming the design DNA of the product range that is to expand in the coming years. The distinctive character lines of the SUV; express a fluent continuity which gives Turkey's automobile an authentic and modern look. The design and positioning of the headlights impute the vehicle its penetrating looks, while the chrome details that shape the front grille underlines the prestigious appearance with its continuity along the side and rear design.

In addition to be shaped by Turkish consumers’ insights, the design is inspired by Turkish culture. The tulip, which has strong roots in Anatolian culture, has become an inspiration figure. A stylish interpretation of tulip design is imprinted on the front grille and wheel rims, to give the car its signature sight, while underlining the deep connection with Turkey’s rich cultural heritage.

The interior is welcoming with carefully selected stylish and high-quality materials and state-of-the-art technology. The wide digital infotainment display emphasizes the advanced technology the car. The user-centric display supports the conversion of the car into a smart living space by embracing all passengers as well as the driver. The unique centre console stands out as one of the most important styling and functional feature of the interior. The form, which reminds an aircraft cockpit, also helps control the touch screen via ergonomics of the console, which houses gear and electronic

parking brake functions. The user-centric design of the interface on the touch screen supports simplistic and minimalist design of the interior, reducing as much of the physical control switches as possible with the help of voice-command technology. Turkey's automobile simply proves that high technology can be presented without complexity.

Turkey's automobile transforms into a new living space that will comfortably host a family of 5 thanks to its best-in-class wheelbase. With its high headroom in the cabin and the longest rear leg-room in its class, the spacious interior provides superior class comfort for the whole family during long journeys. Three main pillars defining the all new, native electric modular platform that will provide the infrastructure for all models of the TOGG range are as follows:

- *Genuine*, An all new, state-of-the-art, native electric and connected platform, completely developed by TOGG engineers, with intellectual property rights 100% owned by TOGG.
- *Modular*, Modular in length and width to support all vehicle variants with max efficiency, comfort, durability and safety.
- *Superior*, The infrastructure that maximizes the width, spaciousness and comfort of the living space in the car by offering the longest wheelbase in its class.

Electric driving experience, Low total cost of ownership, quiet, pleasant and a clean ride with zero emissions: these are the main advantages of a battery electric car over internal combustion engine cars. Turkey's automobile will be charged at homes, offices and charging stations en route thanks to the widespread charging infrastructure that will be ready by 2022. As driving a connected and smart car, users would plan and manage the charging with ease via connected services.

Range over 500 kilometers, Users will be able to choose from 2 different range alternatives offered by the high-energy Li-ion battery technology. Turkey's automobile will offer two battery packs that provide 300+ km or 500+ km ranges and will allow the users to configure their cars by choosing the most suitable range based on their needs.

Rapid charge under 30 minutes, Turkey's automobile will reach 80% state of charge in a short time period of less than 30 minutes. Thus, the car would be charged enough for the rest of the journey during a short coffee break on long routes.

8-Year Battery warranty, Long lasting battery pack with state-of-the-art battery management and liquid thermal management systems offers 8 year warranty.

Economy and Environmental Awareness, Battery electric and connected cars having leaner systems compared to the internal combustion engine cars, will minimize the need for technical service/maintenance with the help of features such as over the air updates and preventive maintenance warning for drivers. In addition, the fuel cost per kilometer will be much lower compared to an internal combustion engine car, due to the lower energy requirement for the same distance. Turkey's automobile will have an important advantage in total cost of ownership considering the combination of these basic elements. At the same time, it will take its place among the most environmentally conscious cars with zero emission.

Unique Driving Dynamics, The electric motor (e-motor) technology will redefine driving standards with an experience beyond expectations. Two drive options are available, a rear-wheel drive (RWD) with a single e-motor offering 200 HP, or an all-wheel drive (AWD) system with the 2nd e-motor positioned on the front, offering a combined power of 400 HP. The all-wheel drive (AWD) system with two e-motors of high- fficiency on the front and rear axles will provide better road handling and performance in harsh weather and road conditions. Independent MacPherson strut located on the front axle optimise comfort and performance; while the rear integral link independent suspension system offers sport feeling and responsive ride with precise handling.

Seconds Thrilling acceleration experience with both drive systems. The automobile will complete 0-100km/h acceleration in 7.6 seconds with its 200 HP RWD option and only in 4.8 seconds with 400 HP AWD option, delivering unmatched acceleration with zero emission and in silence. Utmost safety thanks to the novel crash structure with battery pack bolted to body platform that improves the torsional rigidity by more than 30% and comprehensive passive and active safety measures including 7 standard air-bags and best-in-class braking with powerful front and rear ventilated disc brakes. With all those safety elements and optimized structural design, Turkey’s automobile will be compatible with EuroNCAP 5-Star when it will be launched in 2022.

More than a car: New smart living space, With smart technologies offered, Turkey’s automobile will become the third living space following homes and offices. Thanks to its connected architecture, Turkey’s automobile will permanently be connected to internet without any external device support. The automobile will be in communication with all smart devices, homes, buildings, infrastructure including the electricity grid and the completely smart city. The connected automobile will become an essential component of the mobility ecosystem. Following the advancement in 5G technology, new services that will add value to user’s life will arise within the ecosystem.

A unique experience with disruptive technology, Turkey's automobile will improve the user experience not only by being electric, connected and smart but also by demonstrating innovative and disruptive technologies. A pioneer example of this disruptive approach is the “Holographic Assistant”. This innovative assistant will benefit from advanced eye tracking algorithms and holographic three-dimensional imaging technologies to provide a user experience far beyond the ordinary virtual display panel. “Holographic Assistant” technology will transform the in-car experience completely by replacing the 2-dimensional display technologies currently used in the cars with 3D imaging and augmented reality technologies. Thanks to this technology, the driver will not only see the information on the vehicle's display screen without taking his/her eye off the road, but also have access to all other information about the road and environment. With augmented reality and a 3D enhanced image, the driver will be able to use navigation and other driver assistance systems more easily and have a safer, more comfortable and interactive driving experience. TOGG aims to be the first company in the automotive industry to offer this unique driving experience to its users via this disruptive technology.




(TOGG - TÜRKİYE’NİN OTOMOBİLİ GİRİŞİM GRUBU – PRODUCT PRESS RELEASE, 27 December 2019)

3. EXPECTATIONS & TRENDS FOR THE FUTURE

3.1 Innovation Based View in Automotive Industry

Technology continues to advance rapidly in the automotive industry as in every field. While car manufacturers are constantly improving themselves, they present unusual and innovative models. Although vehicle manufacturers are at the design stage, vehicle manufacturers can increase their product capacities and related market shares. In our age where global competition and awareness is increasing day by day, it is an inevitable necessity to focus on the perspective of innovation and innovation. The word innovation stands for progress, development and creativity. In the business world where demands are versatile and complex, managers are pressured to do faster, cheaper and better. Innovation in this challenging and printed environment is an important phenomenon that can enable businesses to gain market leadership.

All sectors are affected by the advancement and development of technology. The automotive industry is one of the sectors that are affected by technology and must adapt to technology. It has characteristic features based on mass production and dense capital. This situation has its advantages and disadvantages. Factors such as adopting the technology, investing in R&D, and thinking innovative are important.

According to *Atalay (2012),* the findings of the study, which mainly examines the relationship between intellectual capital, innovation and business performance, are summarized below:

- When the effect of business demographic features on innovation factors and innovation performance was analyzed, it was found that operating age had a significant effect on innovation performance. According to the research, the innovation performance of the old enterprises is higher than the young ones.
- Business legal status has a significant impact on process innovation. It has been observed that the process innovation level of capital companies is higher than that of private enterprises.
- Export has a significant effect on product and organizational innovation. Accordingly, the product and organizational innovation levels of exporting companies were determined to be higher than those that did not export.
- It is an expected situation that having an R&D department has a significant effect on innovation. The product, process, organization, general innovation

and innovation performance levels of the enterprises that have an R&D department within the organizational structure are higher than those that do not have an R&D department within the organizational structure. In the study, it is seen that the products, organizational and general innovation levels of the enterprises that supply R&D requirement from external sources are higher than those that do not meet the R&D requirement from external sources. In addition, it has been found that the degree of product, organizational, marketing, general innovation and innovation performances of enterprises that carry out joint R&D activities with customer enterprises are higher than those that do not carry out joint R&D activities with customer enterprises.

- The capitals with the highest average among the intellectual capital factors were found to be human capital, relational capital and structural capital respectively. The fact that high skilled human resources and long-term customer relations are of critical importance for the sector is an explanation of this finding.

3.2 Electrification

In the face of the critical level of global warming and increasing environmental, social and economic costs, the automotive sector has entered into an irreversible transformation, like many other sectors. Because road transport constitutes about 16% of the CO2 emission of human origin. With the Paris Climate Change Agreement, announced in 2015 and signed by 175 countries in April 2016, the goal was to limit the global average temperature increase between 2 and 1.5 degrees in 2100 compared to the pre-industrial period. According to the International Energy Agency (IEA), 600 million electric vehicles must be used in 2040 to achieve the goal set in the Paris Climate Change Agreement. In 2016, battery and hybrid vehicle sales surpassed previous years and amounted to 753 thousand units. With this sales figure, the global electric vehicle park has exceeded 2 million units and the market share of these vehicles reached 1.1%.

With a calculation based on energy efficiency, air quality and decarbonization projects implemented or reviewed on a global scale, IEA predicts that 56 million electric vehicles will be in circulation around the world by 2030. However, the decisions recently announced by governments give a clue that this transformation will be more rapid.

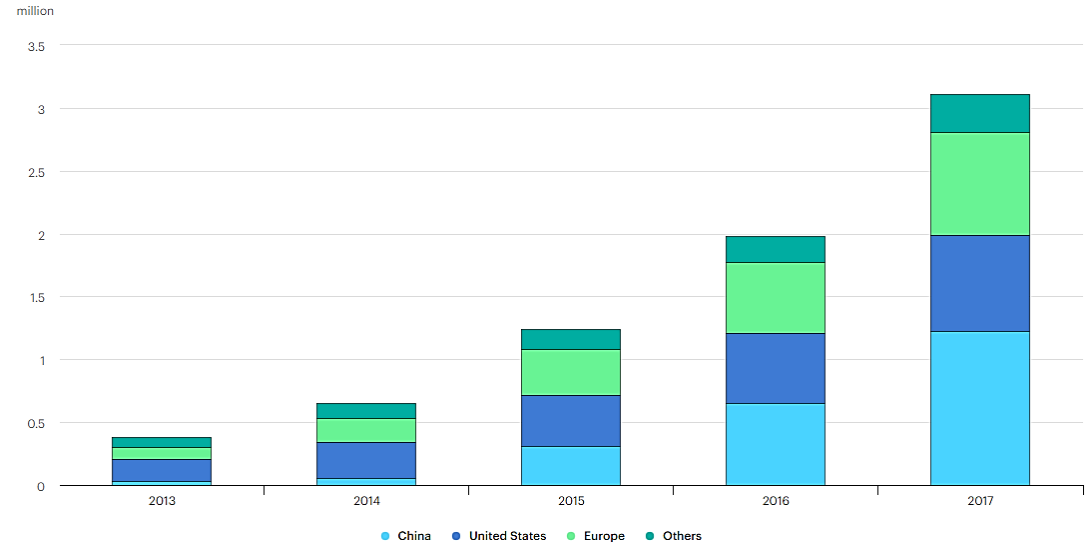


Figure 3.1 Global EV Outlook – IEA

Having become the leader in the world motor vehicle production with a share of 30% and became the most important electric vehicle market with a sales figure of 352 thousand in 2016, China has been the most productive company since October 2019 for all automotive manufacturers that produced over 30 thousand units annually in the country. it obliged to allocate less than 10% to electric vehicles. It is estimated that this new regulation brought by China will force the big players of the sector to take a more aggressive position in the electric vehicle segment. Turkey's main export market is in Europe which Britain and France in 2040, the Netherlands has already approved a ban on the sale of all petrol and diesel vehicles as of 2025. In addition, many countries such as Austria, Denmark, Ireland and Portugal have set various intermediate targets for electric vehicles. In these countries, besides strict emission controls and restrictions on access to city centers, differentiated tax and duty policies for electric vehicles have been implemented.

Different types of EVs – resized;

- Battery electric vehicles (BEV) use electric motors powered by a battery that needs to be plugged in to a charger
- Hybrid electric vehicles (HEV) use an internal combustion engine supported by electric motors and a battery, but don't need to be charged
- Plug-in hybrid electric vehicles (PHEV) are similar to HEVs, but the battery can be charged when the vehicle isn't in use
- Fuel-cell electric vehicles (FCEV) use a fuel, such as compressed hydrogen, to generate electricity that then powers the motors

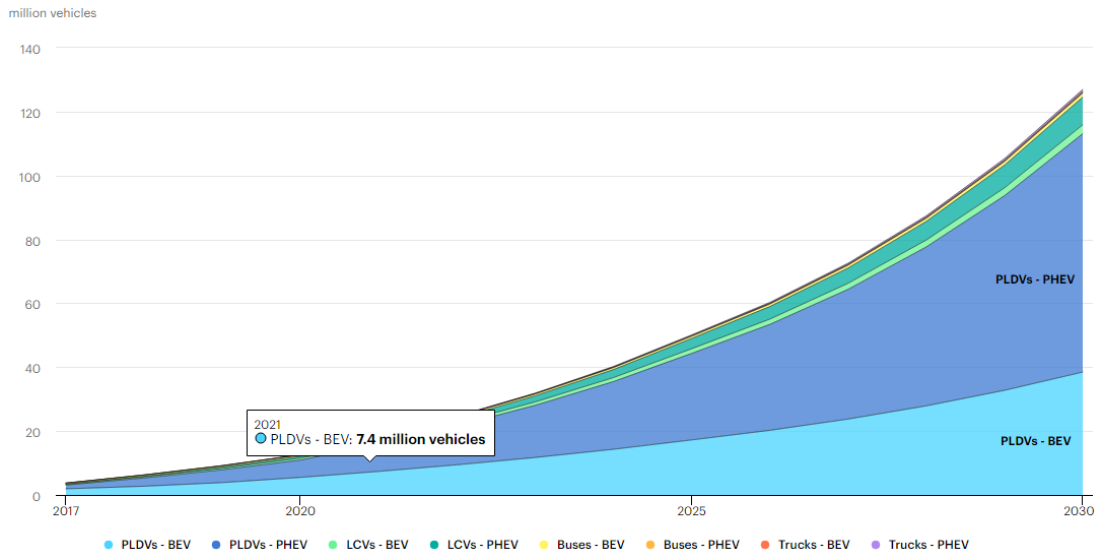


Figure 3.2 Global EV deployment in the New Policies Scenario, 2017-2030 - IEA

Today, vehicle use has started in all segments, especially commercial and passenger cars, and continues at an accelerated rate. In particular, the Tesla brand has pioneered rechargeable vehicle innovation and has managed to attract the attention of other automotive manufacturers. With the development of battery technology, vehicles with a range of up to 500 kilometers with full charge are produced today. Electric vehicles have many advantages besides driving comfort, safety and environment. These advantages are:

- There is no carbon emission since it uses a renewable energy source. There is no polluting effect on vehicle use.
- Since they do not have mechanical equipment such as gearbox and transmission elements, they work very quietly.
- Since braking can also be done through the electric motor, equipment such as brake disc and drum wear less and the cost resulting from braking decreases.
- Operation and maintenance costs are lower compared to vehicles working with petroleum-derived fuels.
- Since many countries import petroleum sources, it has the effect of reducing foreign dependency due to the nature. Electrical energy is obtained from many natural and renewable sources such as coal, wind and stream.
- Charging stations that take up a lot of space, such as fuel stations, are not needed. It can be charged if necessary facilities are provided in environments such as home and workplace. In addition, leading vehicle manufacturers are doing serious research on fast charging, and charging times have been reduced to as little as 30 minutes for some brands and models.
- They are safer than petrol-derived fuel vehicles. There is no risk of fuel explosion and fire.

Disadvantages of electric vehicles:

- Since the batteries have not yet reached the desired storage capacities, they need to be charged at regular intervals.
- Fast charging feature affects the batteries negatively and battery life is shortened.
- There are sufficient charging station and fast charging station infrastructure.
- With the increase in the use of electric vehicles, the supply and demand balance in electricity production will deteriorate, so there is a possibility that electricity production may be insufficient.
- The spread of electric vehicles in Turkey necessitates the electric vehicle charging facilities and infrastructure strengthening.

3.3 Autonomous Driving

The Global Health Safety 2015 report of the World Health Organization reveals that every year, 1 million 250 thousand people in the world die in a traffic accident. Low and middle income countries, which host 54% of registered vehicles in the world, witness 90% of deaths due to traffic accidents. The cost of accidents corresponds to 5% of the gross domestic product of these countries. Nowadays, automotive manufacturers have started to use advanced driver support systems such as 'automatic emergency braking system' by using the increased information gathering and analysis capabilities of vehicles, and that such specifications have become the standard equipment in many countries, which can be regarded as a precursor to the transition of vehicle control from driver to computer systems. Topics such as harmonization of current traffic infrastructure with this technology and ensuring cyber security create uncertainty in terms of predicting when driverless vehicles will become massively different from electric vehicles. However, driverless vehicle technology is seen as the biggest contributor to the development of the sharing economy in the transportation sector.

Companies that can establish structures that can adapt to the transformation process in the automotive main industry in the coming period will have the chance to survive as long as they reach their customers with the right and innovative products, effective production methods and the right price. Supply companies will have to have the capacity to provide solutions required by the transformation to the main market by acquiring new specialties such as software development and mechatronics. Consequently, given the rapidly changing consumer preferences in parallel with the

technology, it is clear that the right and innovative strategies for the automotive industry players will come to the fore as much as operational excellence in the coming period.

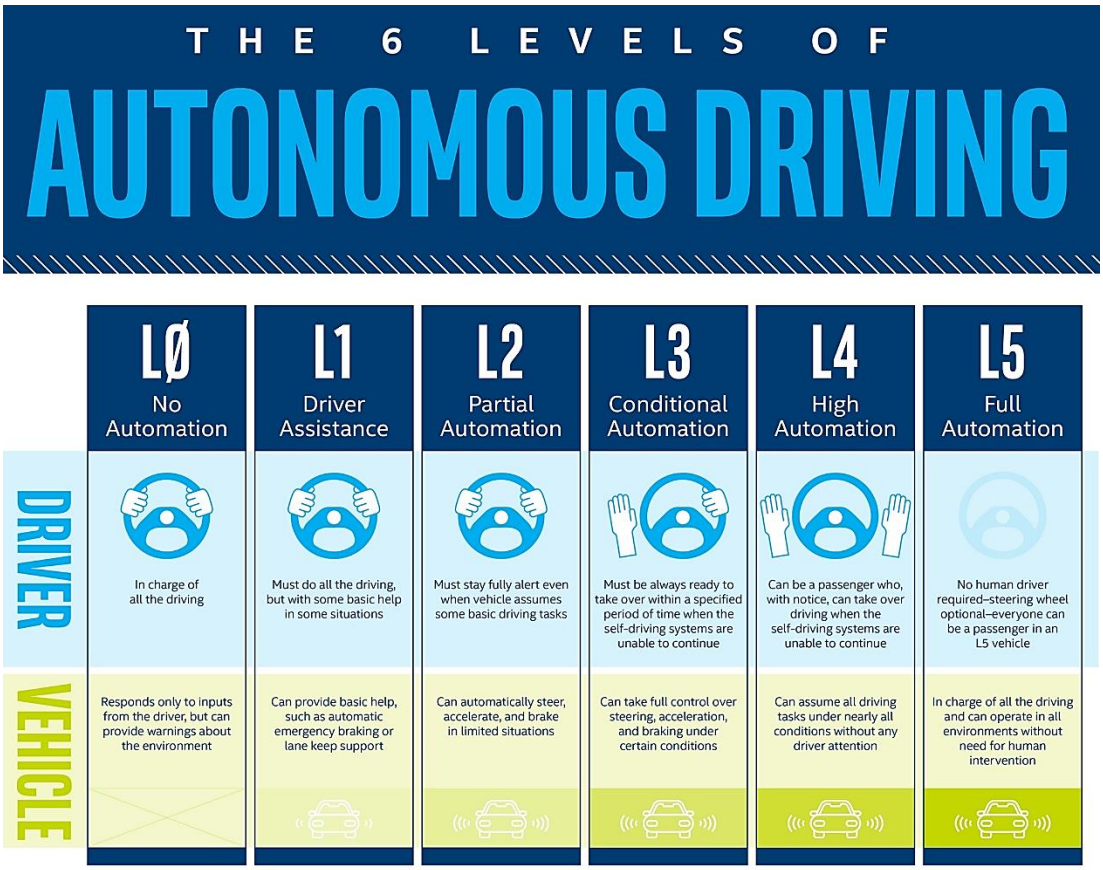


Figure 3.3 The 6 levels of autonomous driving – Society of Automotive Engineers (SAE); National Highway and Traffic Safety Administration (NHTSA) – INTEL

In autonomous vehicles, systems such as sensor data, extensive data analysis, machine learning and the M2M inter-machine communication system are essential for the successful implementation of the Internet of Things philosophy. Autonomous vehicle projects available in the market now provide sensor movements by evaluating sensor data, analysis and machine learning. Currently, there are not enough autonomous vehicles in today's traffic to design a vehicle suitable for the M2M inter-machine communication system. However, when a certain threshold point is reached in this issue, the control systems of autonomous vehicles can also enable interesting developments such as autonomous traffic control. Such a system will have a tremendous impact on industry and society as a whole. Items such as the decrease in the number of accidents, increase in the use of passenger cars that come with ease and decrease in crowds in public transportation centers, can be listed. However, with the

increase in vehicle use, the increase in fuel consumption seems to cause a new movement in the country's economies due to the increase in oil trade.

In the next eight years, South Korea plans to produce autonomous vehicles that it will fully develop with its own technology. Currently in the monopoly of American and European based companies, this sector is expected to expand further to Asia in the future. The Korean Government has allocated a budget of approximately $ 2 billion until 2019 to produce the eight major complementary parts required for driverless vehicles, including visual sensors and radars. In addition, autonomous vehicles, 100% of which are made in Korea, are planned to hit the roads in 2024. It is obvious that autonomous vehicles have a very bright future worldwide. Technology giants like Korean automakers and Samsung have already embarked on developments in the autonomous vehicle industry. According to Global Health Safety, 90% of traffic accidents are caused by human errors, but the autonomous vehicles that are designed and developed today will be offered programmed not to crash any time soon. In order to be sure of this technology, researches are being carried out to solve some of the ongoing technology problems. In addition, it will be a very difficult situation to coordinate a traffic of confused vehicles with and without drivers. In this transition period, the biggest problem that can occur in traffic consisting of autonomous and non-autonomous vehicles is that both vehicles will try to dominate the road, while both vehicles will perform the sharing process. For this reason, it seems that it will be more appropriate to start using the driverless vehicles on lane roads and private roads. As time goes by, this technology is not starting to appear in science fiction movies and is getting into our lives.

3.4 Developments that left a mark in 2019 in Turkey

Domestic car came on stage; Turkey's agenda for many years engaged in domestic automobile that is the most important step was taken in the final days of 2019. The foundation of the factory, which will be established on an area of 1 million square meters in Bursa Gölcük in 2020, will be laid after the concepts of domestic cars that create great excitement in the society. The date given for the facility, which is planned to be completed by 2022, for its transition to first production, was recorded as the last quarter of 2022.

It became clear that the domestic car will be a completely electric and new generation car. Beyond the classic car definition, we come across a smart vehicle with connectivity features such as 5G that will be at the internet level of things. In the

domestic car, there will be technologies such as three-dimensional hologram technology and software that will allow the vehicles to exchange wireless electricity. It is stated that the price will remain within the limits that can be purchased.

The government also announced its incentives for the domestic car. At the end of the investment, which will reach 22 billion TL in 15 years, a new automobile factory will emerge, producing 175 thousand vehicles per year.

BREXIT uncertainty over, process uncertainty started.

An important development for automotive exports occurred in the UK. As it became clear at the end of 2019, the UK will definitely leave the EU. In this separation, if there will not be any free trade agreement between UK and Turkey then an additional 10 percent customs tax may be raised due to UK won't be the part of EU. The UK-EU agreement to be signed by 31 December 2020 will be decisive. If there is no agreement, 10 percent additional taxes will apply.

Volkswagen Turkey investment; Another exciting greenfield investment in 2019 was the Volkswagen Manisa factory. An official meeting was expected in the autumn for the official announcement. In August, VW is now starting to look at elements in Turkey, in September, "Volkswagen Turkey Sanayi ve Tic. A.Ş." the name of the company he founded. The founding announcement of the company was published in the Trade Registry Gazette. Volkswagen Passat and Skoda in Turkey would invest 1.4 billion euros for factories to produce super models. In October 2019 due to entering Turkish Military in Syria Volkswagen, stop its decision. Dies, VW Group CEO announced that they had frozen the investment. Due to political developments the decision, will become clearer in 2020 summer.

3.5 The Future of the Automotive Industry in Turkey

Turkey, thanks to its young population and qualified labor is to have a dynamic position in the automotive industry sector. Since the growth of the sector depends on factors such as political, foreign trade and economy, it may vary. Turkey's automotive industry, protecting the power to compete on a global basis and to determine which strategies need to intensify efforts to increase the competitiveness.

It does not seem possible to achieve beneficial growth without adapting to innovative developments in science and technology and applying the developments to production processes. Customers are one of the important factors that determine the future of the sector. Customers follow the technology closely and force the sector based on

demands. Strengthening the ties with the fields of informatics, software and mechatronics will contribute to beneficial and effective growth by carefully following and considering the technology in every field.

Turkey continues to work on the car without interrupting the production of native speed. As a result of R&D studies, it has started to become clear mainly in the production of electric vehicles. Science, Industry and Technology, Ministry of Industry Directorate-General director of "Turkey Automobile Sector Strategy Document and Action Plan (2016- 2019)" was prepared. Strategies were determined according to the action plan and these strategies were turned into targets. Topics in the action plan; investment incentives consist of technical legislation harmonization with the EU, R&D studies, targets and actions. It is stated that the determined targets will be carried out under the responsibilities of public and non-governmental organizations (NGOs). Responsible and relevant organizations determined for each target have been identified. The vision of the action plan is “Having a voice in the world automotive market with its domestic brands,” and “generalizing the use of advanced technology with its strong and competitive supplier industry and its own domestic brands and increasing the value added”, and turned into targets within this scope.

There are three targets determined in line with the general purpose. These:

- Creating the Infrastructure Required for Domestic Brand Vehicle Production.
- Increasing the Branding Capability and Global Competitiveness of the Sector.
- Developing Legal and Administrative Arrangements for Strengthening the Automotive Sector.

In order to realize these targets, action names have been created and each action plan has been shared with the supervision and responsibilities of the responsible institutions and related institutions. Action plans of the targets:

- The category of electric domestic brand vehicles with extended range that can be competitive at the global level will be determined and the necessary support mechanisms for the production of the vehicle in question will be developed and implemented.
- It will be ensured that the domestic brand vehicles to be produced are preferred primarily in public procurements.
- Center of excellence will be established in order to encourage the production of internal combustion engines.
- Automotive Test Center will be established to perform type approval, design verification, strength, and road and vehicle tests.

- The production of great importance components and systems will be determined in Turkey, and the production of these parts will be supported under the name of the National Focus project.
- Productivity report for the automotive supplier industry will be prepared and as a result, suggestions to increase efficiency will be developed.
- Promotional activities will be carried out in order to enable companies in the automotive supply chain to benefit from the "Cluster Support Program" and cluster cooperation will be supported in this context.
- By creating a structure that takes into account the differences in the level of emissions in the taxation system, the use of vehicles with lower CO2 emissions will be encouraged.
- Necessary legislative and physical infrastructure works will be carried out to promote the use of environmentally friendly electric, hybrid, hydrogen and CNG vehicles.
- Applied research centers for the needs of the automotive industry will be established.

In the items in the action plan, it envisages the investigation of alternative fuels for the environment and the dissemination of alternative fuel vehicles such as CNG, with the strengthening of the sector against global competition. On environmental sensitivity issues in the action plan; It is envisaged to encourage vehicles that are lower in terms of CO2 emissions through taxation and to expand the use of alternative and renewable energy sources such as hybrid, rechargeable vehicles.

The driver safety systems, vehicle control mechanism, electronic card and devices that are among the automotive components are provided from developed countries. Turkey domestic automobile production conditions as abroad without provision of these crucial components in proportion to the production facilities and is of great importance. In the action plan, incentive practices are included to produce these components within the local possibilities. Thanks to the incentive practices, the production of high-tech automotive products will also reduce foreign dependency.

Production of a domestic electric car will not be enough alone. In addition to selling the manufactured product in the domestic market, it is also important to meet the consumer in the markets in developed countries. Factors such as the range of the electric vehicle produced, driving comfort, driver and passenger safety, and quality should also be taken into consideration. In the action plan, issues related to increasing the sales rates of the domestic vehicle to be produced in the domestic market are discussed. In particular, priority was given to the selection of vehicle use of the public sector from domestic brand vehicles. Turkey work jointly on issues of domestic car

production and development of public and should give attention to issues given priority in the action plans of all organizations in the private sector.

By the end of 2016, it is among the strategic importance attributed to the sector's identified as a priority transformation program within the framework of Turkey's annual automotive sector with a 7% share in providing 4% and industrial production of the national income of Turkey's 10th Development Plan. The automotive sector, which broke the record of all time with an export of 29 billion USD in 2017, continues to be the highest exporting industry of the country. In this case, Turkey's have become an important production base of global players, to be developed to support the structure of the production's success and the industry in production, they record in finding export markets for domestic firms, it is the result of the flexibility they show, in the face of changing geopolitical and economic conditions.

The adaptation of the domestic players to this rapidly developing transformation is critical for the domestic automotive industry to maintain its competitiveness in this period, when the automotive industry, which has such an important place for the country's economy in the long term, has experienced a global transformation with "Industry 4.0" and digitalization. On the one hand, the object in 2020 will be on the road with the Internet is estimated to reach 250 million, the number of cars, (*Gartner Research and Advisory Company, Predicts 2015: The Internet of Things)* on the other hand Brexit process, spread all over the world government protectionist policies, especially the right to secede from the United States trade agreement Turkey will cause also affected the automotive sector trade structure.

In the light of all these developments, it should be one of the strategic priorities of the Turkish automotive industry to direct its R&D investments on new generation vehicle production that requires electric, autonomous systems and smart transportation systems in accordance with the technological developments. In addition, the acquisition of skills to adapt to the digital transformation in human capital is another aspect that will play an important role in ensuring that domestic producers do not lose their competitiveness in global markets. As an example, most of the domestic supplier industry manufacturers currently produce products that require low and medium-low level technology. However, it is anticipated that many of these products produced by the domestic supplier industry will be less needed in new generation vehicles. According to data from 2016, the world's largest 14. Challenges to maintain its global market share in automotive manufacturer to be used in a new generation of tools of communication and the limited number of companies working on technologies such as sensors in Turkey in the near term domestic automotive industry emerges. Leading companies of the sector state that the number of qualified personnel developing technology is low. They underline that the skilled employees they currently employ

are in high demand by foreign companies and it is difficult to provide competitive conditions according to these companies. The same can be said for the supplier industry entrepreneurs who cannot find financial support. For these reasons, in particular to accelerate the technological transformation of the automotive industry manufacturers, software development and support of new initiatives offering engineering solutions for the life lost in Turkey's foreign markets and on behalf of exchange opportunities to translate to live in the near future will be of great importance. Accordingly, the government's working in partnership with the private sector, creating feasible support mechanisms according to the dynamics of the sector, and implementing these mechanisms quickly will enable the transformation process to be managed more effectively. In addition, the preparation of separate programs supporting the commercialization and branding of manufactured goods will contribute to the development of the capacity of the domestic sector.

On the other hand, continuing technology transfers and foreign investments to the country is one of the most important issues in terms of managing the transformation process of domestic companies effectively. It is known that one of the important criteria in foreign investors' decision to continue their existing investments and to make new investments is the size of the domestic market. However, high and variable tax burdens are an obstacle to the growth of the domestic market compared to other countries applied in vehicle sales. It is important to realize the action plans developed in order to improve the investment environment without losing time, especially considering the foreign investments that provide technology transfer to the Eastern European countries in the automotive industry recently.

The Turkish automotive industry, which has an increasing sector experience with the Customs Union, a geographical location close to major markets, and a young and flexible workforce highlighted by foreign investors, tries to turn this comprehensive transformation in the automotive industry into an opportunity. It is possible to achieve this goal with the right policies and collaborations to be developed for the purpose of developing the digital production infrastructure that can respond to the demands of the future quickly and effectively, increasing the activities accelerating commercialization and branding, supporting R&D investments and expanding the domestic market. Indigenous-owned automotive industry if it continues on its current technological structure, Turkey will be faced with the risk of failing to protect the near future international market share in the automotive sector players.

3.6 PEST & SWOT Analysis

Political Factors

- Tense political relations with neighboring countries prevent the opening of new export markets and new investments
- USA - Iran tension
- USA - China trade wars

Economic Factors

- Consumption-weighted growth trend
- Medium / long-term expectations that directly affect consumer behavior
- Development of logistics infrastructures

Cultural Factors

- High potential in the domestic market
- Young population
- Consumers are confused about which automobile technology they will turn to
- High unemployment level

Technological Factors

- The costs of turning to smart technologies in cars
- Competition of new technology companies that will meet historical players
- The need for a charging station network that slows down the transition to electric vehicles
- Electric vehicle batteries are still very expensive
- Failure to develop new battery technologies
- Protection of competitiveness
- The threat of disruptive technologies

Legal Factors

- Temporary solutions in legal incentives for automobile consumers
- Reduction of high taxes on cars, simplification of automotive taxes
- Strategic preparation of incentives for new investors
- Preparation of legal infrastructures of new systems such as E-Call technology
- Preparation of legal infrastructures for autonomous vehicles

Environmental Factors

- Supply of vehicles compatible with the new emission laws
- 30 percent emission reduction target for 10 years and new legal regulations for heavy commercial vehicles
- New additional restrictions to come with EU's "European Green Agreement" study

Strengths

- Strong capital and corporate structures of companies in the sector
- Proximity to the European market and strong cooperation based on a long history
- Ability to provide market diversity in exports
- Foreign partnerships of strong groups and advanced supply industry
- Advantage in relative labor costs
- Willing domestic market due to its demographic features
- Advanced supply industry

Opportunities

- In addition to the priority given to the domestic automobile project, public support for R&D and investment expenditures
- Historic transformation experienced by the sector in the global arena, revealing the allegations by Turkey's domestic automobile raises the chance for a new generation of vehicles

- A serious investment climate for new generation vehicles is becoming more and more evident day by day.
- Domestic demand may be persistent due to the high age of the vehicle park especially in commercial vehicles
- The number of vehicles per capita is below the developed country standards
- Geopolitical location and potential of the logistics industry

Weaknesses

- Imports based production structure of the sector
- Domestic producers are not sufficiently prepared in the face of environmental regulations on a global scale
- Ensuring a qualified relatively low cost workforce is not sustainable
- Lack of domestic alternatives and foreign dependency in high value-added inputs
- High tax burden on vehicle prices in domestic markets and uncertainties regarding the decisions of the regulatory public authority
- While tightness in domestic financial conditions and weak consumer confidence suppress demand, increases in firms' financing costs make production difficult.

Threats

- Volatility in exchange rates and inflation
- Transformation pressure that technological developments will create in automotive main and supplier industry
- Disruptions in the production processes of the sector and cost pressure due to protective tendencies in Brexit and global trade
- Fragility in global demand
- Additional and high amount of investment demand caused by transition to innovative and environmentally friendly vehicle technologies and change in consumer preferences

3.7 2020 Projection

According to OSD *(Automotive Manufactures Association)* members, 2020 market forecasts are in the direction of 580 thousand units. This means an increase of 18 percent compared to 2019. If new regulations such as scrap discounts and SCT incentives come, the market figure may change. However due to Corona virus pandemic many automotive manufactures are in trouble in order to achieve their annual production estimates.

OSD announced on 1 million 475 thousand automotive production forecasts in Turkey in 2020.Again, according to OSD projections, 1 million 256 thousand units were announced for export. SCT reduction is not expected. The scrap sale has ended. The low interest loan campaign of state banks for domestic production vehicles was extended for 3 months. The growth in the automotive industry will stop in 2020 in the world. Even in very large markets such as China and the USA, slight shrinkage is expected. The course of trade wars between the USA and China will affect this trend.

Consumers are also confused. Firms shorten or lift diesel engine production. It offers electric and hybrid products. Since the consumers are confused, the developments in the supply pillar will not be reflected on the market immediately.

The main strength of Turkey's automotive exports to European countries. This means both power and risk. This has to change, and automotive exports with neighboring countries must increase. Turkey sells vehicles to Mexico, but not Georgia as well as Iraq. It is expected to look at ways to sell cars to neighbors. Turkey's automotive sector may enter in Africa, Middle East and other Turkish Republics.

Volkswagen investment in Turkey, Turkey has managed well the management incentives and foreign companies, except for political reasons convinced. This investment is probably still expected to take place in Turkey. With this investment, it is also expected to increase investment in related supplier industries.

United Kingdom is very important in terms of trade for Turkey. It was decided there, but the implementation process will not be as easy as decision-making. In fact, Turkey ready for this. Automotive Industry Association and Government worked extensively on this issue. Turkey does not consider the impact of USA sanctions would be too on the automotive industry.

There are 60 supplier companies behind the domestic car. These companies are trying to give parts to TOGG. At this point, the question of how much of the vehicle parts will be domestic comes to mind. Cars are now digitalizing and the supplier industry

needs to adapt to this transformation. However, there is an opportunity. Turkey needs to take this opportunity to good reviews.

There is a problem with trust for domestic goods in Turkey. Managers and people need to rely on automobiles produced in Turkey. Automotive manufacturing plants in Turkey are on the top position in the world in terms of quality. Turkey's automotive production and supply industries are competing with the Japanese ones. Consumers need to be more confident in this.

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