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Historical Development in Brazil and Turkish Automotive Industry

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It is possible to say that the automotive industries of Brazil and Turkey have developed as assembly industries and showed great similarities in this context. In the 1980s, in line with the development direction of the world's automotive industry, Turkey tried to make the country's investment environment attractive for foreign international companies to produce in their country. We can say that while Brazil created the state incentive system in order to attract foreign investments to its country since the 1950s, it tried to increase its dose with the 1990s. Although, like Turkey, Brazil has thought of producing local cars, the difference between Turkey and Brazil is that it has considered exporting and was able to export not only to South America, but also to African countries. Another difference of Brazil is that it has implemented incentive policies for the automotive sector and has been able to rearrange its incentive elements according to changing conditions. Turkey, on the other hand, has decided to return from the policy of attracting foreign investments to its country since 2006, and in 2011, it was decided to produce domestic automobiles. As of December 2019, a prototype of the domestic car was produced by Turkey's Automobile Initiative Group and work for mass production began. Thus, the problem of adaptation to electric vehicle production was tried to be overcome by moving to a new phase in the way of technology development. This approach was used by the South Korean automotive industry in the 1980s and it was successful and technology development capability was gained in a short time. In order to see the success of the application of this method in Turkey, it is thought that it is necessary to wait for the result of the domestic automobile project. Brazil, on the other hand, was able to rank high in world automotive industry production with its sectoral incentive policies that can adapt to changing conditions and its structure that considers exports from the past, while Turkey lagged behind.

Keywords: automotive industry, lagging industries, gaining technology development capability, path dependency, domestic automobile

Introduction

A Portuguese saying that lauds the discoveries they have made says that if the earth were larger, we would still circumnavigate it. The Portuguese, from Vasco de Gama to Serpo Pinto, they believed that they took civilization to the places they went on the sea and on land. The Portuguese believed they were performing a

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divine mission. Christophe Colomb applied to King Joao of Portugal to be given the necessary equipment to go to Cipangu (Japan) from the west towards 1484. Because at that time, the starting point of all journeys was Portugal (Ferro, 2002, pp. 55-56; Dolanay, 2021d, p. 233).

The rivalry between Portugal and Castile had the risk of turning into a conflict from the very first discoveries. Portugal got the monopoly of African trade with the Alçovas agreement signed with Spain in 1479. However, after 1492, the great success that the Castilians began to achieve in the Atlantic, Pope III. He directed Calixtus to grant Portugal a monopoly in the Atlantic as well. Since the Pontifical Institution was the only state with worldwide authority at that time, III. Pope VI, who was the spiritual nephew of Calixtus. Aleksandre Borgia determined the areas of influence of the two countries with the Papal edict entitled Inter Caetera. Like this, the islands and landmasses, 100 leagues westward from the last of the Azores, towards India and in all other directions, were ceded to Spain. Later, Portugal objected to this sharing and with the Tordesillas agreement dated 7 June 1494, the distance was increased to 170 leagues. The text of the agreement was approved by Pope Julius II in 1506. Accordingly, the Portuguese appeared to be victorious. Because they reached India by crossing the Cape of Good Hope and gained dominance over the Arab merchants in India, they continued to be at the forefront of maritime trade. However, when Portugal came to Brazil, we could say that it started to offer South American treasures to Spain, and Spain's superior position in these lands began to become evident (Ferro, 2002, pp. 101-102; Dolanay, 2021d, p. 233).

Brief History of Brazil

Brazil was a colony of Portugal between 1500 and 1822. The economy was shaped according to the rules set by Portugal, and basically, the export or import of agricultural products produced in Brazil to Europe (especially Portugal) was in question. In the first years of colonization, especially Brazilian wood was brought to Europe. Then, in the 1530s, rapid transfer of Brazilian products (sugarcane, gold, tobacco, cocoa, cotton, coffee and rubber) to Europe began (Naritomi et al., 2009, p. 5; Dolanay, 2021d, pp. 233-234). In addition to the climate and geographical characteristics in general, the level of Portugal's demand for the products produced in the regions, the development of the Brazilian region and the determination of which activity will be carried out where. In the early years of colonization, the northeast of Brazil was chosen for sugarcane production due to its climate and soil characteristics. While there was a boom in sugar cane exports to Europe, on the other hand, by the 17th century, Brazil had become the world's main sugar producer. As of roughly 1600, 120 sugar production facilities have been identified in Brazil. Sugar production in Brazil was based on the plantation system, sugar was a profitable business between 1530 and 1760, and there were periods of increase, peak and decline. Sugar production; It was based on large land ownership, monocultural social structure and slave labor. During the sugar cane period, a class society structure required by the local aristocracy, which had production, technological, political and economic power, was formed (Naritomi et al., 2009, pp. 5-10 and p. 13; Dolanay, 2021d, p. 234).

Gold mining started in the central parts of Brazil in 1695. The first gold mine was found in the Minas Gerais region. In 1728, a diamond mine was discovered in the Matto Grosso and Goias regions. However, production started to decline with the year 1760 and ended at the end of the 18th century. With the collapse of the mining economy, it was not possible to carry out other economic activities other than mining by individual entrepreneurs and the population of metropolises decreased from 20 thousand settlers in 1740 to 7,000 settlers in 1804 (Naritomi et al., 2009, p. 10; Dolanay, 2021d, p. 234).

Gold mining was largely based on slave labor due to technological inadequacies. This was done by

sending the slaves who worked in the sugar cane fields to the mines, and the agreements between the miners and the slave owners were established with difficulty. The slaves' knowledge of the structure of the soil and their knowledge of where and how to extract the mine gave them bargaining power (Naritomi et al., 2009, pp. 10-12; Dolanay, 2021d, p. 234).

In the 19th century, industrial capitalism in Brazil was realized in the northern and southern regions by cooperatives, associations and combined entrepreneurs, and in the 1970s, this structure led to the formation of European-style social welfare. Keynesian regulations, on the other hand, have created a new social structure in which economic crises have been experienced (Ferrarini et al., p. 3).

Brazilian Automotive Industry Between 1915-2000

Brazil's first automotive assembly plant was opened in Sao Paulo in 1919 by Ford to assemble Ford T model cars and Ford TT model trucks. Ford established its own production facility in 1921. In 1926, General Motor opened an assembly plant in Sao Paulo for the production of Chevrolet cars (en.wikipedia.org; Dolanay, 2021d, p. 234).

The Brazilian automotive industry basically started mass production in the 1950s. With the establishment of the Automotive Industry Management Board (GEIA), the government began to ask the automotive industry to provide a local contribution rate of 90%-95%, especially in the parts industry (Marx and De Mello, 2014, p. 6; Dolanay, 2021d, p. 235). In 1956, Brazil's first domestic car, the Romi-Isetta, was manufactured in Sao Paulo. In 1958, Japanese Toyota's Land Cruiser model vehicles began to be produced, and in 1959, German Volkswagen Kombi model vehicles began to be produced in Sao Bernardo do Campo. Chevrolet and Ford started to produce trucks in 1957, while other business vehicles and automobiles started in the 1960s (en.wikipedia.org). In the period between 1960 and 1980, the automotive industry developed by taking advantage of the prohibition of the import of completed vehicles and parts and the encouragement of exports (Marx and De Mello, 2014, p. 6; Dolanay, 2021d, p. 235).

Sebastiao William Cardoso, a Brazilian entrepreneur, started to produce Tupi, small electric vehicles, in 1967, and Puma started selling sports cars. German Mercedes Benz started to produce buses and trucks in the 1950s and established an automobile factory in 1998 (en.wikipedia.org; Dolanay, 2021d, p. 235).

Due to the extreme increases in oil prices in the 1970s, the government considered the use of sugar cane ethanol in vehicles with the Pro Alcool program. Then, this practice spread from the automotive industry to all other industries with the scattering effect. This contributed to the development of engineering locally. The use of ethanol in vehicles continued until the 1990s, then there was a stretch towards the use of gasoline vehicles, the use of ethanol in vehicles ended, but although the use of flexible fuel in vehicles was re-established in 2003, by 2012, 95% of the vehicles produced in Brazil were flexible. It has been produced with fuel use (Marx and De Mello, 2014, pp. 6-7; Dolanay, 2021d, p. 235).

Due to the economic crises experienced in the 1980s and early 1990s, investments in technology and new models decreased, while market growth remained at very low levels. Considering these conditions, the government brought import liberalization, but we can say that this new economic policy dragged the country into a bigger market crisis (Marx and De Mello, 2014, p. 7; Dolanay, 2021d, p. 235). Thus, companies consisting of Nissan, Renault, Peugeot, Citroën, Honda, Hyundai, Mitsubishi, Chrysler and Audi started production in Brazil (en.wikipedia.org). Policy measures introduced since 1992 and 1993 included reductions

in regional and general taxes, credit incentives, and extra tax reductions for low engine displacement vehicles. Thus, these small vehicles became 70% of the market in 2002 (Marx and De Mello, 2014, p. 7; Dolanay, 2021d, p. 235).

In 1995, the Automobile Regime was adopted to create sectoral policies. This regulation included an increase in import taxes and regulations to increase automobile production in Brazil. By 1997, local production and sales records were broken and investments to increase production capacity were expanded. However, with the world financial crisis experienced in 1997, the deterioration in the automotive sector continued until 2003 (Marx and De Mello, 2014, p. 7; Dolanay, 2021d, pp. 235-236).

Brazilian Automotive Industry After 2000

With the increase in the population, income and purchasing power of the country in the 2000s, the production and sales of passenger and commercial automotive vehicles increased rapidly. This rapid increase has made the Brazilian automotive industry the 7th largest manufacturer worldwide and the fourth largest market in the world as of 2012. However, the Brazilian Technological Innovation Research (PINTEC) showed that there was no similar increase in the R&D expenditures of automotive manufacturers in the period when there was an increase in production. It has been understood that the innovations developed by the automotive manufacturers are not new to the market and according to the same research, the engines of the cars produced in Brazil have more backward technology than those in Europe. Thus, the automotive industry has become only the assembly of imported parts (Marx and De Mello, 2014, pp. 4-5; Dolanay, 2021d, p. 236).

In order to overcome this problem and increase the competitiveness of the Brazilian industry, the federal government announced the Brazil Master Plan (PBM) in August 2011. As part of the plan, Inovar Auto was announced in 2012 for the automotive industry. In order to increase the courage to invest and innovate, Inovar Auto has introduced new measures in the areas of increasing foreign trade, protecting the industry and the local market (Marx and De Mello, 2014, pp. 5-6 and p. 8; Dolanay, 2021d, p. 236). The Inovar Auto program aimed to increase competitiveness, and in line with this target, it introduced a 30% reduction in the federal tax rate on industrial products. However, in order to provide these incentives, the program stipulated that companies should allocate 0.5% of their gross income to R&D expenditures at the beginning, and it aimed to increase this rate from 0.5% to 1% in the period between 2013 and 2017. In addition, companies were asked to keep the regional contribution rate of 65%. Although the main goal of the program was to increase competitiveness, another goal was to increase energy savings. By October 2013, many multinational companies have been willing to invest locally in order to be included in the program. However, the program did not include any regulation or incentive for electric vehicle production (Marx and De Mello, 2014, pp. 8-9; Dolanay, 2021d, p. 236).

While the total production of the Brazilian automotive industry was 3,402,508 units in 2012, it decreased to 2,429,463 units in 2015 and decreased to 2,014,055 units in 2020 (www.oica.net; Dolanay, 2021d, p. 236).

We can say that Brazil’s inadequacy of science, technology and innovation capacity has been determined by its historical past. The process from the 1930s to the 1980s was spent with reducing bureaucracy for entrepreneurs, New Public Administration reforms were started to be implemented in the 1990s, modernization efforts began in the 2000s, and only from the 2010s on, innovation has been given increasing importance (www.oecd.org, 2019, p. 3; Dolanay, 2021d, p. 236).

Brief History of Turkey

Since the establishment of the Ottoman Empire, great importance has been attached to science and has been sensitive about the transfer of knowledge and technology (İnalcık, 2017; Dolanay and Oğuztürk, 2019; Dolanay, 2021a, Dolanay, 2021c). As a matter of fact, the first Ottoman Madrasa was established by Orhan Gazi in 1331 in İznik (Özilgen, 2009, p. 21; Dolanay, 2021a, Dolanay, 2021c). However, after the execution of Molla Lütfi, one of the important scholars on mental sciences, in 1495, with the decrease in the importance given to mental sciences, the process of knowledge and technology transfer began to be interrupted (Dolanay and Oğuztürk, 2019; Zelyut, 2019; Pala, 2019; Dolanay, 2021a, Dolanay, 2021c). Due to the defeats in the wars, the transfer process was tried to be revived by the trainers brought from abroad in the military field, and a hendesehane (geometry school) was opened in 1734 by Comte de Bonneval (Özilgen, 2009, p. 40; Dolanay, 2021a, Dolanay, 2021c) and this school was supported by the ilmiye class (Cihan, 2014, pp. 140-145; Dolanay, 2021a, p. 81; Dolanay, 2021c, p. 78). The Ottoman Academy of Sciences was established in 1862 and Darülfünun, which would later be accepted as a University, was established in 1863 (Özilgen, 2009, p. 63; Dolanay, 2021a, p. 82; Dolanay, 2021c).

In 1924, Madrasahs, which could be called the main pillar of the Ottoman education system, were closed (Zengin, 2002; Cihan, 2014). With the University Reform carried out in 1933, the institution of Darülfünun, which was able to establish a connection with the past knowledge once again and was formed with the knowledge gained from the Madrasa, was completely removed, and universities were established, which were required to provide education in Western norms. New trainers, mostly of foreign origin, were brought in place of the trainers. In addition, the Faculty of Language, History and Geography was established in 1935, which was understood to be aimed at completely erasing the knowledge of the Ottoman education system and aiming to create a new history thesis (Erdem, 2012, pp. 380-386; Dolanay, 2021c). The dismissal of faculty members from the university in certain periods also took place in the later years of the Republic. Thus, universities remained as institutions that transfer knowledge transferred from abroad to their students, that is, transfer knowledge (Dolanay, 2021c, p. 78).

In the system, which was implemented before 1838 and called Yed-i Vahit, the state was able to leave the trade and especially the export of a commodity in any region to a private person. In addition, the state was able to prohibit the export of this commodity during periods when there was a shortage of certain goods or foodstuffs. Before 1838, the Ottoman Empire had 3% customs duty on both exports and imports, and the internal customs tax rate was 8%. On 16 August 1838, in the mansion of Grand Vizier Reşit Pasha in Balta Harbor, the Balta Harbor Trade Agreement was signed between Reşit Pasha and the British Ambassador Possenby. With the agreement, the customs duty on exports was reduced to 12% and the customs duty on exports was reduced to 5%. While internal customs duties were abolished for foreigners, they continued to be applied to domestic traders. The customs duty on imports was increased to 8% in 1861, 11% in 1905 and 15% in 1908. Thus, we can say that the Ottoman State agreed to determine its own customs duties together with the European States (Pamuk, 1994, pp. 17-19).

Thus, the Ottoman Empire started to block the way of its own industrialists and entrepreneurs, which caused the entrepreneurs to focus only on trade. When the decline in industrial entrepreneurship combined with the decline of rational sciences in the field of science, the country began to have a state structure that only imports industrial products and exports raw materials without gaining profit. For this reason, the domestic automotive industry could not be formed, and after the Republic, foreigners were asked to establish the automotive industry in the country (Dolanay, 2020, p. 543; Dolanay, 2021b, p. 57).

Turkish Automotive Industry Between 1923-1960

At the Izmir Economy Congress convened in 1923 after the War of Independence, it was decided that rapid industrialization would be provided by the private sector, and that the state would intervene in cases where the private sector's capital was not sufficient. In this context, an assembly facility was established in 1929 by Ford Motor Company in Istanbul Tophane to produce trucks and automobiles. However, this facility was closed in a short time due to the world economic depression and hostility to foreign capital (Pamuk, 1994, pp. 17-22; Keyder, 1993, pp. 80-84; Dolanay and Oğuztürk, 2018). We can say that the automotive industry started to produce again with the military jeep assembly facility under license in the 1950s (Dolanay, 2021c, p. 79; Dolanay, 2021d, p. 238).

Although the process of establishing a national industry gained importance after 1923, the number of companies with foreign partners increased rapidly with the declaration of the Tanzimat Fermanı and we can say that the Encouragement-i Industry Law of 1913 was beneficial for companies with foreign partners (Erdaş, 2015). As a matter of fact, Franko ve Şürekasi Inc.Co., which was a foreign partner company. It was understood that one of them was (Dolanay, 2021d, p. 238).

Bernar Nahum, who played an important role in the establishment of the automotive industry in Turkey, was founded in 1928 as Franko ve Şürekasi A.Ş. He started to work within his organization and his supervisor was Joseph Kohen (Nahum, 1988, pp. 11-12; Dolanay, 2021d, p. 238).

Turkish Automotive Industry Between 1960-1980

In 1961, for the first time in the world, Turkey's first domestic automobile prototype, Devrim, was manufactured in the locomotive workshop in Eskişehir in a short period of four months. However, the mass production of Devrim could not be started (Şimşek, 2006; Dolanay and Oğuztürk, 2018). In 1960, Ford automotive products started to be produced in Otosan Koç Group Company under the leadership of Bernar Nahum (Nahum, 1988, p. 118). In 1967, the production of Anadol cars was started by the Koç Group with the multiple license method. This initiative of the Koç Group did not turn into a continuous and permanent success story due to the fact that exports were not considered and the bodywork was manufactured from the wrong material. In 1971, TOFAŞ with the Italian Fiat license and OYAK Renault facilities with the French Renault license were established (Dolanay and Oğuztürk, 2018; Dolanay, 2021c; Dolanay, 2021d, p. 238).

With the TOFAŞ Bird series, production of which started in the 1970s, it was possible to move to the stage of creative imitation in a sense, but there was no development that could turn into innovation later (Küçükerman, 2000; Dolanay and Oğuztürk, 2018; Dolanay, 2021a, p. 83; Dolanay, 2021c, p. 80).

It was thought that this was due to the lack of sufficient knowledge that could lead to the acquisition of technology development capability (Dolanay, 2021a, p. 83; Dolanay, 2021d, p. 239).

Turkish Automotive Industry Between 1980-2000

In the 1980s, all automobile manufacturers diversified their products and tried not to be affected by the economic crisis that took place in 1980 (Dolanay and Oğuztürk, 2018).

In the 1980s and especially in the 1990s, many documents on science and technology were produced. However, little has been done to ensure scientific and technological development. The objectives set out in the documents were generally not achieved (Göker, 2013).

In the 1990s, production facilities were established in Turkey by Honda, Toyota and Hyundai companies, and with the Customs Union with EU countries in 1994, automobile exports from Turkey to EU countries increased (Dolanay and Oğuztürk, 2018).

Turkish Automotive Industry After 2000

After the economic crisis experienced in 2001, serious annual economic growth rates were achieved in Turkey from 2002 until 2008. This period was also a period in which the results of the Customs Union and OEM investments of foreign companies began to be seen in the automotive industry (Dolanay and Oğuztürk, 2018; Dolanay, 2021a, p. 83; Dolanay, 2021c, p. 80).

However, when Hyundai could not get the incentives it wanted for the second factory it wanted to establish in 2006, it could not come to an agreement with Turkey and made this investment in the Czech Republic (www.hurriyet.com.tr; Dolanay, 2021a; Dolanay, 2021c; Dolanay, 2021d, p. 239). Thus, a policy change has occurred in the Turkish automotive industry and Turkey has decided to produce its own domestic automobile. Although this policy change emerged as an idea in 2011, it could only give its results in December 2018 and domestic automobile prototypes were introduced by TOGG. In July 2020, the foundation of the factory was laid (www.linkedin.com; www.odd.org.tr; Şimşek, 2020, pp. 202-205; Dolanay, 2021a, p. 85; Dolanay, 2021d, p. 239). Ford Otosan aims to increase its production capacity from 440 thousand vehicles to 650 thousand vehicles in 2021 with its new investment decision. All of the vehicles to be produced with the new investment are designed as electric and hybrid, and the company plans to continue to export 90% of its production. With this investment, a battery capacity of 130,000 was also achieved. It is thought that this investment decision was made as a result of the decision to produce electric domestic cars and thanks to the policies supporting the entrepreneur (www.okuhaber.com; Dolanay, 2021c; Dolanay, 2021d, p. 239).

Starting from 1867, the Uzel company, which had produced horse-drawn carriages with mass production technique in Ruse and in Bursa in the 1870s, continued its production as a part manufacturer and tractor assembly company in the following years, while in 2009 it succeeded in producing the first domestic tractor. However, this innovative and entrepreneurial company could not escape from bankruptcy in the following years (Dolanay and Oğuztürk, 2018, p. 216; www.hurriyet.com.tr; www.haberler.com > Ekonomi; Dolanay, 2021c, p. 82; Dolanay, 2021d, p. 240). Again, Tata Motor, which planned to establish a production facility in Turkey in 2009, failed to do so (https://tr.wikipedia.org; Dolanay, 2021c, p. 82; Dolanay, 2021d, p. 240). In February 2011, the desire to produce domestic cars was notified to the companies by the government. Again, the first domestic electric car, the prototype of which was manufactured in Hacettepe University technopark in 2015, could not be put into mass production because it could not find sufficient support and the project was canceled due to the fate of the Devrim cars project (www.youtube.com; Dolanay, 2021c, p. 82; Dolanay, 2021d, p. 240).

The inadequacy of Turkey's science, technology and innovation capacity is also due to the effect of its historical past (Dolanay and Oğuztürk, 2019). However, with the decrease in the importance given to mental sciences after the execution of Molla Lütfi, one of the important scholars of mental sciences, in 1495, the process of knowledge and technology transfer began to be interrupted (Dolanay and Oğuztürk, 2019; Zelyut, 2019; Pala, 2019; Dolanay, 2021d, p. 240).

General Assesment

While the total production of the Brazilian automotive industry was 3,402,508 units in 2012 and 3,712,380

units in 2013, it decreased to 2,429,463 units in 2015 and decreased to 2,014,055 units in 2020 (www.oica.net; Dolanay, 2021d, p. 240). Total production of the Turkish automotive industry was 1,072,978 units in 2012, 1,358,796 units in 2015 and 1,297,878 units in 2020, (www.oica.net; Dolanay, 2021d, p. 240).

While Brazil's production values have decreased continuously since 2014, Turkey's production values have followed a fluctuating course (Dolanay, 2021d, p. 240).

Brazil increased its production in the 2000s as a result of the influence of the government's economic policies and its opening to foreign Sundays (markets), production values reached their highest point in 2013, but since 2014, production values have started to decline due to the competition of another regional country, Mexico (www.oica.net; Dolanay, 2021d, p. 240).

Although the Brazilian automotive industry has fallen from 7th to 8th in the world in terms of production values in the world automotive industry ranking since 2014, it is in a higher order than Turkey. It was thought that this was due to the fact that they were more successful both in domestic automobile production and in opening up to foreign markets. It is thought that their higher performance in acquiring technology development skills and their efforts in technological improvements, especially in the 1970s, with the use of ethanol as a fuel, were also effective on this result (Dolanay, 2021d, p. 241).

Conclusion

While Brazil was a colonial country in the past, it gained its independence, but followed the same development path of the west in the automotive industry and tried to increase the production and sales of the automotive industry by thinking only of export before gaining the ability to develop technology. With this economic policy preference, in 2013, it was able to reach the highest production figures in its history, but it could not maintain and increase this production level in the following years.

Although Turkey was saved from becoming a colonial country with the War of Independence in the past, it followed the development path of the West in the automotive industry and did not consider exporting until the 1980s. However, after the 1979 economic crisis, it started to give export incentives by choosing the export-based growth model in the 1980s, and in 1994, it entered the Customs Union with the European Union and started to follow a policy of opening up to foreign markets, just like Brazil. While a very high production and sales figure was achieved in 2018 with this policy, it was observed that the figures were lower in the following years. However, since 2011, the effort to produce domestic automobiles in addition to the export-oriented production policy has reached a new stage with the production of the domestic automobile prototype in December 2018, and we can say that a new move has been made towards gaining technology development capability in the automotive industry.

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