

Similarity of South Korea and Türkiye's Technological Development Paths and Path Dependence*

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Abstract: Türkiye has given importance to the development of the automobile industry since the Ottoman period. In addition, with the proclamation of the Republic, gaining the ability to develop technology in the aviation industry, as a priority from other branches of industry, gained importance. The production of aircraft with domestic technology was also brought to the agenda by Mustafa Kemal Atatürk and for this purpose, the Kayseri Aircraft Factory, affiliated with TOMTAŞ (Tayyare ve Motor Türk A.Ş) was established in 1926 with the most advanced technology of the time.

Vecihi Hürkuş, on the other hand, was able to take the crashed plane of the Italians, learn what the parts are for by reverse engineering and manufacture a domestic plane. In addition, Nuri Demirağ took part in the aviation industry and was able to manufacture domestic aircraft. In the Automotive Industry, an automobile and truck production facility was established in Istanbul by Ford Motor Company in 1929.

After the activities of the Kayseri Aircraft Factory, which lasted until 1948, came to an end, this time, Revolution car prototypes could be manufactured completely domestically in 1961. After the project, which did not go into mass production, the Koç group started to produce the domestically-made Anadol car with technology transfer from multiple sources in 1967, but the production of Anadol continued until 1984.

However, the principle of domestic automobile production was adopted by the South Korean government, and in 1971, three automobile manufacturing companies operating in the country were instructed to produce a domestic automobile within 2 years. In these years, the managers of HAYundai company, which had previously disassembled all parts of Ford automobiles by reverse engineering, learned what it was for, and then reassembled it, manufactured the Hyundai Pony as the first domestic car with the method of technology transfer from multiple sources.

This development in South Korea actually emerged as a successful re-application of the reverse engineering method used in the production of the Revolution car prototype in 1961.

In 1971, Renault cars started to be produced under the French Renault license, and TOFAŞ cars under the Italian FIAT license. Towards the end of the 1970s, creative imitation applications were made in TOFAŞ cars with the bird series. In the 1990s, the production of Japanese Honda and Toyota and South Korean Hyundai cars started.

In 2011, the idea of producing a domestic automobile emerged, the Devrim automobile was taken as an example in this project, the first Togg prototype was manufactured with technology transfer from multiple sources in December 2018, and it was announced that mass production would begin in March 2023. Since the project, which has reached the stage of mass production today, was carried out with the method of technology transfer from multiple sources, it evokes a similarity to the manufacturing technique of both Anadol and Hyundai Pony cars. However, the 12-year period from 2011 to 2023 is too long for the creation of a domestic automobile. It has been understood that this long process has been passed in order to regain the pre-1980 level of technological ability.

However, the most important thing is the transition from the creative imitation stage to the innovation stage. Our wish is that this process can be shortened with step-by-step approaches.

Keywords: automobile industry, technology transfer, technological ability, acquisition of technology development ability, technological development, domestic automobile.

Gel Codes: N70, O14 ,O31, O32

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I. Introduction: Historical Importance Given to Science and Technology: Türkiye

In the 1st Izmir Economy Congress held in 1923, the principle of rapid industrialization was adopted. Basically, the principle of realizing the industrialization move by domestic entrepreneurs with their own means was adopted, and it was decided that the state would step in when the capital of private entrepreneurs was not sufficient. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 256)

In this context, in 1923, Vecihi Hürkuş learned how an Italian aircraft works with the reverse engineering method and succeeded in manufacturing a domestic aircraft. In 1926, Kayseri Airplane Factory, affiliated to TOMTAŞ (Aircraft and Motor Türk A.Ş.), was established. The factory has succeeded in producing domestic airplanes and exporting them abroad. Nuri Demirağ entered the field of domestic aircraft production in the same years. (Yavuz, 2014, pp. 11-44; Dolanay, 2023c, p. 256)

The first facility in the automotive field was established by Ford Motor in 1929 in Istanbul. This facility did not last long due to xenophobia and the world economic depression. (Dolanay ve Oğuztürk, 2018; Dolanay, 2023c, p. 256)

II. Historical Importance Given to Science and Technology: South Korea

When we approach the subject from the perspective of history, we see that the theoretical approach that science and technology should develop with industrialization began to be put into practice in practice after the General Park government came to power in South Korea. On the one hand, with the 1960s, the export-led growth model was adopted in the economy, on the other hand, incentive measures were developed for the change in economic policy. Thus, the industrialization process was tried to be accelerated. While industrialization continued, two important developments took place in 1967. The first is the establishment of the Ministry of Science and Technology. The second is that Hyundai, one of the most innovative companies in South Korea, has also started to work in the automotive field. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 256)

When Hyundai started to work in the automotive field, they made a license agreement with Ford Motor company, and in accordance with the agreement, they disassembled the vehicles from Ford down to the smallest part through reverse engineering, learned what each part does, and produced imitations of the vehicles in a short time like 6 months. When the work, which should have been completed in two years according to the agreement, was completed in 6 months, Hyundai decided to produce its own domestic cars by terminating the agreement. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 256)

III. Technological Development in Automotive Industry of Turkey Between 1950-1980

In the 1950s, Turkey participated in the Pilot Teams Project developed by the OECD. Even though the issues included in the document prepared as a result of this meeting about what Turkey should do in science and technology were not given sufficient importance, we can say that with the establishment of TÜBİTAK (Turkish

Scientific and Technical Research Council) in 1963, the first important systematic organization in the field of science and technology was formed. (Göker, 2013; Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 257)

In the 1960s, while the production of different motor vehicles in the automotive industry could be carried out by assembly, the automobile production facility had not been established yet. However, in 1961, Turkey's first domestic automobile prototype could be manufactured in a short period of 4 months. Although the project was successful, mass production could not be started. (Şimşek, 2006; Dolanay, 2017; Dolanay and Oğuztürk, 2018: 251-275; Dolanay, 2020b: 307-344; Dolanay, 2023c, p. 257)

In 1967, the production of the Anadol automobile, which can be considered Turkey's second domestic automobile, was started. It can be said that Anadol was produced through multiple technology transfer. Anadol's body was made of an unusual fiber glass material. The production of Anadol continued until the 1980s. Since the export of Anadol was not considered and production could not be started with sheet metal bodywork instead of fiberglass, production in the project could come to an end. (Demirer and Aydoğan, 2008; Dolanay, 2017; Dolanay and Oğuztürk, 2018: 251-275; Dolanay, 2020b: 307-344; Dolanay, 2023c, p. 257)

In 1971, Renault automobiles production facility in France was established by OYAK with a license agreement, and Fiat brand automobiles production facility in Italy was established by TOFAŞ. (Azcanlı, 1995; Dolanay, 2017; Dolanay and Oğuztürk, 2018: 276-283; Dolanay, 2020b: 307-344; Dolanay, 2023c, p. 257)

IV. Automotive Industry and Technological Development in South Korea Between 1960-2000

In the 1960s, within the framework of the export-led growth model, the consumer goods industry developed rapidly, the prohibition of automobile imports and the policies of the government that allowed 3 companies in the automotive industry led to economies of scale and allowed rapid development, and in this direction, the government took over the three big automotive companies (Daewoo) in 1971. , Kia and Hyundai) to produce domestic cars within two years. Kia and Daewoo evaluated this demand of the government by performing the local production of a foreign brand, while Hyundai produced their own Hyundai Pony, using the technology transfer method from multiple sources. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 257)

In the 1980s, Hyundai produced its first completely domestically-injected automobile, which was not based on technology transfer, and this policy of Hyundai made it technologically advanced in these years, when injection engines had not yet reached widespread use. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 257)

In the 1980s and especially in the 1990s, the success of Hyundai and other South Korean automotive companies in exporting their products to foreign markets, and especially to the USA, enabled the companies to grow even more. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 257)

This growth process was interrupted by the 1998 economic crisis, while other companies in the automotive sector passed into the hands of foreigners, Hyundai, which remained as the only domestic company, continued its growth by taking the majority shares of Kia. (Dolanay and Oğuztürk, 2018; Dolanay, 2023c, p. 257)

V. Turkish Automotive Industry and Technological Development Between 1980-2023

In the 1980s, all automobile manufacturers diversified their products and tried not to be affected by the economic crisis that took place in 1980. In addition, companies had great difficulties in the transition from carburetor engine technology to injection engine technology in the 1980s and 1990s. At the same time, they had difficulty in adapting to the open economy conditions. (Azcanlı, 1995; Bedir, 2002; Dolanay and Oğuztürk, 2018; Dolanay, 2020a, pp. 527-554; Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 258)

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; Dolanay, 2020a: 527-554; Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 258)

The 1980s and especially the 1990s were the years when reports and books on science and technology increased, and institutions for technology development were established. The second Science and Technology Report was published in 1993 and after the establishment of TÜBİTAK (Turkish Scientific and Technical Research Council) in 1963, institutions such as TUBA (Turkish Academy of Sciences) and TTGV (Turkish Technology Development Foundation) were established in the 1990s. However, despite these efforts to create a national innovation system, the approach of ensuring development in the automotive industry by acquiring technology from abroad continued. (Dolanay & Oğuztürk, 2018; Göker, 2013) The targets set in the documents on science and technology in the 1980s and especially in the 1990s could not be achieved. (Göker, 2013; Dolanay, 2020a: 527-554; Dolanay, 2023a, pp. 167-171)

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) Thus, there has been a policy change in the Turkish automotive industry and Turkey has decided to produce its own domestic automobile. This policy change yielded its results only 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; Dolanay, 2020a, pp. 527-554; Dolanay, 2023a, pp. 166-171)

After this investment opportunity missed in 2006, Tata Motor planned to invest in Turkey in 2009, but this investment did not materialize. In the 2010s, it was announced that domestic automobile production was directed, and in 2015, the domestic automobile prototype was manufactured. However, after the reactions from the public, the domestic automobile production business was tendered. Turkey's Automobile Enterprise Group, which received the tender, announced that the first prototype will be manufactured in 2020 and mass production can be started in 2022. (<https://www.togg.com.tr>; <https://www.haberturk.com>; Dolanay, 2020a, pp. 527-554; Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 258)

The prototype of Togg could be manufactured in December 2018, the first Togg car came off the band in 2022, and it was announced that mass production products would be put on sale in March 2023. (<https://www.togg.com.tr>; Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 258)

However, it seems like a success that the domestic automobile project, which emerged as an idea in 2011 (Şimşek, 2020), took 7 years to manufacture prototypes and 12 years to transition to mass production, and the fact that the ongoing effort since 1923 in gaining technological talent was accomplished in 12 years, which could not be achieved in 88 years. While the prototype was produced in 4 months in the Devrim car project, it took a 7-year process in the Togg project. (Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 258)

In the 80-year period we mentioned above, there may have been periods of "we can't do it" approach and demoralization and giving up on domestic automobile production, which led to regressions in the level of technological capability and therefore delays may have been experienced in the adoption and assimilation of new technologies. (Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 259)

In addition, we can say that in a socio-cultural structure organized according to importing technology from abroad and adapting it to itself, it is normal to encounter difficulties in adapting new technologies in periods of technological change. (Dolanay, 2023a, pp. 166-171; Dolanay, 2023c, p. 259)

VI. General Evaluation

According to David (2000, 2001, 2007), production figures in any industry should increase steadily, linearly from year to year. If this is not the case, there is a path dependency in that industry. (Dolanay, 2023a; Dolanay, 2023c, p. 259)

When we examine the production figures in the Turkish automotive industry for the last three years, we see that there is no stable increase (1,297,878 in 2020, 1,276,140 in 2021, 1,352,648 in 2022). The same trend of instability

was also valid in the field of automobile production. (855,043 in 2020, 782,835 in 2021, 810,863 in 2022). (www.oica.net; Dolanay, 2023c, p. 259)

Therefore, it is possible to talk about path dependency in the Turkish automotive and automobile industry. However, when we look at it from another perspective, it is seen that the technology development stage, which is the last stage of technology transfer in the automobile industry, cannot be reached and it takes a long time to assimilate and adapt new technologies. In this case, it implies path dependency. (Dolanay, 2023c, p. 259)

According to Mahoney (2000), it is possible that the data institutional structures that have emerged with the choices made can reproduce themselves repeatedly in the long run. Thus, each step in time becomes dependent on the previous step. (Mahoney, 2000, pp. 507-548; Dolanay, 2023c, p. 259)

In this context, the institutional structure, which was weakly formed with the murder of Molla Lütfi in 1495, made it possible for the first successful flight with Hezarfen Ahmet Çelebi to be evaluated in a way that would prevent the development of more advanced aviation technologies, and to prevent the successful automobile prototype in 1961 in a way that would not lead to new technological developments. (Dolanay and Oğuztürk, 2018; Dolanay, 2022a; Dolanay, 2023c, p. 259)

Path addiction is thought to arise from a social phenomenon that has occurred in history. The execution of Molla Lütfi in 1495, as it was called at the time, reduced the interest in mental sciences, encouraged transliteration, and thus the process of scientific knowledge, which was supposed to feed technological developments, was interrupted. This interruption not only affected the military successes of the Ottoman Empire in the future, but also continued its effects until today. (Dolanay, 2020a; Dolanay, 2023a; Dolanay, 2023c, p. 259)

VII. Conclusion

According to some views, it is not possible to go back from the socio-cultural environment created by a social phenomenon that took place with a choice made in the past. However, some examples of economic development in the past have shown that this reversal is possible. As a matter of fact, it is possible for Turkey to gain the ability to develop technology in the automobile industry by creating a new development path in the automobile industry and taking lessons from the past.

As a matter of fact, South Korea's phase jumper path, which is understood to have developed its technology development path by taking advantage of the example of Turkey in the past, was adopted in the TOGG project and the production of electric vehicles was preferred instead of injection vehicles.

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