Preliminary Global Value Chain Analysis for Turkey

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TRANSFORMING TURKEY'S AUTOMOTIVE INDUSTRY INTO A GLOBAL POWERHOUSE

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PRELIMINARY GLOBAL VALUE CHAIN ANALYSIS FOR TURKEY

TRANSFORMING TURKEY'S AUTOMOTIVE INDUSTRY INTO A GLOBAL POWERHOUSE

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Executive Summary

In Turkey's pursuit to integrate into the Global Value Chain (GVC), the automotive industry is one of the priority sector selected in the 11th Development Plan. As the industry globally is quite matured in terms of manufacturing and productivity given the diverse large automotive value chain that is fragmented regionally and globally, the automotive industry in Turkey is at a juncture facing three overarching challenges unique for the country and industry; advancement into new technologies, increasing productivity to support higher value add and shifting or diversifying products and markets.

The position of Turkey is quite crucial at this moment and this study breaks down the challenges into "the trilemma of the Turkey's automotive industry" and sets some key potential areas and options for the country to increase its global competitiveness in the automotive industry. These fresh new insights may provide a strong policy guidance that focuses on firm level analysis and the expansion of a GVC analysis may be crucial as an input for the 11th Development Plan.

Among the key preliminary GVC analysis outcome for the automotive industry are as follows:

• Turkey needs to carefully consider its policy options in the automotive industry based on the global value chain lenses of global firms and the emerging new trends in the automotive industry;

• The breakthrough of a local EV brand could be the right solution to the challenges faced by Turkey, however, the key challenge would be to address battery manufacturing capability;

• Turkey's automotive industry is focused on passenger vehicles exports with "Big Four" challenge – four main OEMs producing the most cars and the increasingly widening gap between the four export markets concentration.

• The current production capacity for passenger vehicle are only in smaller car segments (segment A, B and C) while competing countries have moved into producing either luxury vehicles or other segments. The trickle-down effect of the final demand has impacted the type and level of technology adopted by the tier-2 and tier-3 suppliers.

• A model was built to calculate the feasibility of absorbing EV battery supply by expanding the battery manufacturing capacity. The model estimates huge savings to the Turkish economy while providing comparative advantage in the global EV race that would take the automotive industry of Turkey to the next level as a global powerhouse.

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1. Introduction

From a global standpoint, Turkey's automotive industry can be categorized as an integral part of country's manufacturing sector and currently contributes about 4% to the GDP. Turkey is the 14th largest automotive manufacturer in the world supported by recent production growth of almost 14%. The motor vehicle production of the country soared to 1,695,731 units in 2017 which is quite outstanding given that most other countries in the region were having a decline in production.

The industry in general is export-oriented given its strong participation and integration in the Global Value Chain (GVC). The surge in automotive production at a global level was first driven by the signing of the Customs Union agreement with the European Union (EU) which followed with new export oriented investments for passenger vehicles as well as components and parts. While the share of the automotive sector in manufacturing production value is 9 percent, its share in value added is 7.6 percent and its share in employment is around 4.5 percent. When the supplier industries such as subsectors of fabricated metal products, plastics and rubbers are included, the share of the production value is estimated to approach 15 percent. The rate of value added / production value for the automotive industry is 18.5%, which is lower than the average rate of the manufacturing industry. The amount of investment in the automotive industry was around USD 15 billion between the years 2000-2018.

Partly due to these investments, the production capacity of the automotive industry increased from 800 thousand units to 2 million units. Between 2005 and 2018, automotive production increased due to strong external demand. Domestic demand also supported the increase in production. In terms of vehicle types, the passenger vehicles is about 65% of the total production, an increase from 52% in 2003. This is followed by light commercial vehicles (LCVs) with 30% in 2017 which decreased from 37% in 2003. The number of passenger cars per 1000 inhabitants in Turkey was 145 in 2017 while it was around 500 for the EU. In the next 10 years, this number is expected to reach 200-250. Share of electric vehicles in motor vehicle sales will increase due to global technological transformation. It is expected that the exports of motor vehicles will increase in the next 10 years. However, the composition of products will be dependent on the adaptation of Turkey to technological transformation. One option is the concentration in conventional products importing old technologies. Other option is to attract new technology investments.

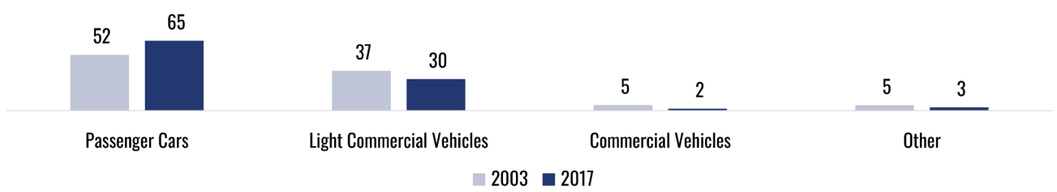

Figure 1: Production Distribution by Vehicles Type %
Source: Automotive Manufacturers Association, Turkey

2. Quantitative Analysis of the Automotive Industry in Turkey

Natural Potential

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology)

The automotive industry in Turkey is one of the industries that has maintained a steady revealed comparative advantage (RCA). As shown in Figure 2 below, the product item HS87 has shown an increasing trend in general, except for the years between 2007 and 2013 given the global financial crisis and its post effects. The RCA recovered after 2015 and has shown a steady increase in trend.

Breaking down Turkey's export by countries shows that there are two main group of countries that dominate the top 10 export destinations. The first group are the top 4 countries which are Germany, Italy, France and United Kingdom. All four countries recorded a gradual increase in export value since 2015 as shown in Figure 3. Germany is positioned as the main export destination with USD 3.31 billion in 2018. The second group of countries are United States of America, Spain, Belgium, Slovenia, Poland and Netherlands. All these countries recorded a steady increase in export value since 2009 except the United States of America, whereby the export value decreased about USD 300 million from 2017 to 2018.

In terms of imports (as shown in Figure 4), Germany dominates imports of products in HS87 between 2007 and 2018 recording on average over USD 4 billion imports. This is followed by France and Spain, while imports from Japan grew rapidly since 2014 from USD 404 million to USD 881 million in 2018.

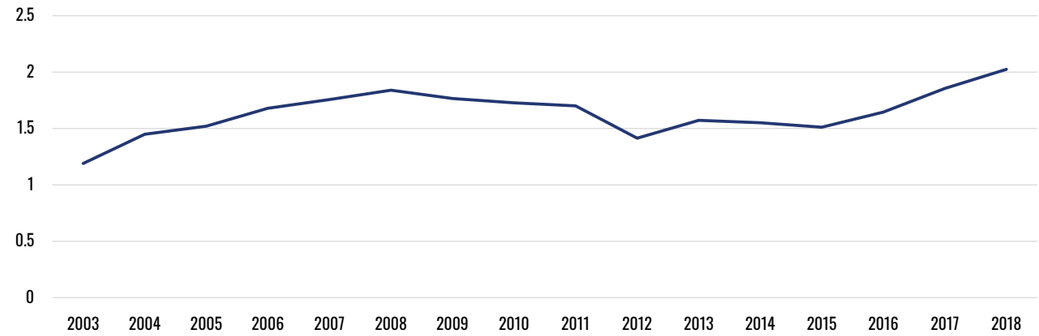

Figure 2: RCA of the Transport Equipment Industry, Balassa Index, 2003-2018

Source: Authors using UN Comtrade data

[1] M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

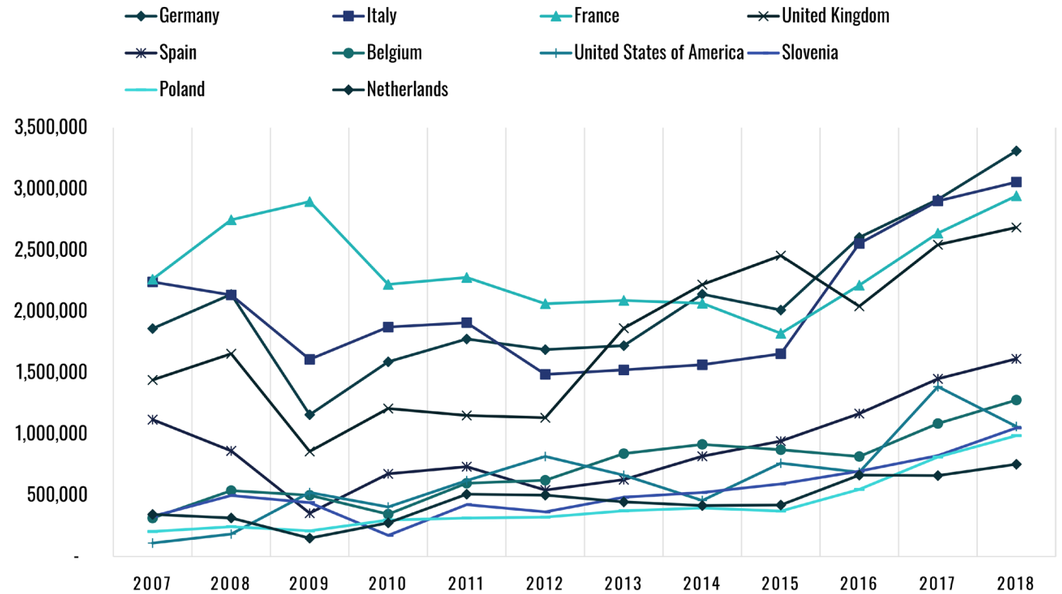

Figure 3: Turkey's Exports HS87, Vehicles (USD thousands)
Source: Authors using UN Comtrade data

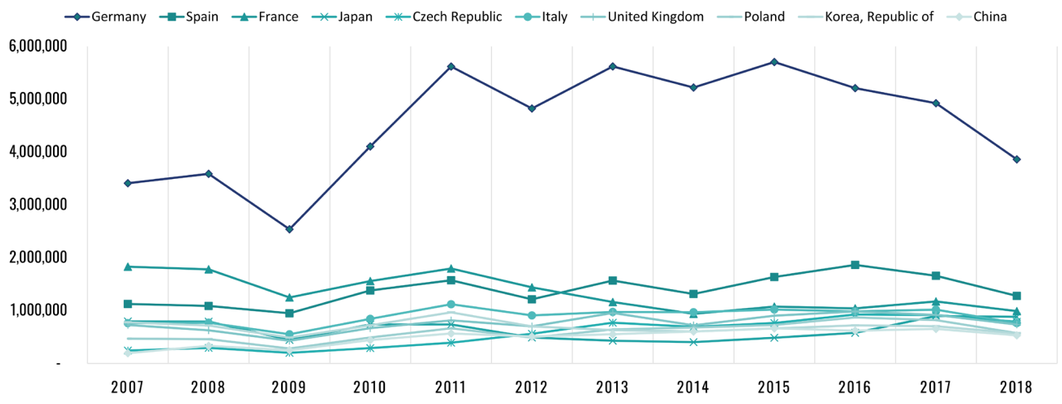

Figure 4: Turkey's Imports of HS87, Vehicles (USD thousands)
Source: Authors using UN Comtrade data

Dynamic Potential: Product Champion Index

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology [2])

By breaking down the exports data at HS4 level for the automotive industry, the Product Champion Index (PCI) was calculated and ranked according to the 6 indicators. The results are presented for PCI Static Supply, PCI Dynamic Demand and PCI Market Access. These indices reflect the potential product champions in the industry that could guide policymakers to integrate these products in the GVC. In a snapshot, the bubble chart (figure 5) shows that the bulk of exports from the automotive industry are winners in a growing sector, whereby, the country exports have shown growth trajectory in tandem with global growth in demand for these products. These are products of HS8703, HS8704, HS8708 and HS8702. Although there are some products that are losers in declining sectors, the value of exports from these products are comparatively lower than the other products.

Using IsDB's methodology, the PCI index broken into three types does not vary considerably at the HS4 level. Product HS8703, which is mainly passenger vehicles ranks first for all three indicators with some variation in ranking for other products. The top ten products are shown in Table 1 below; these are the highest potential products based on the three PCI indicators.

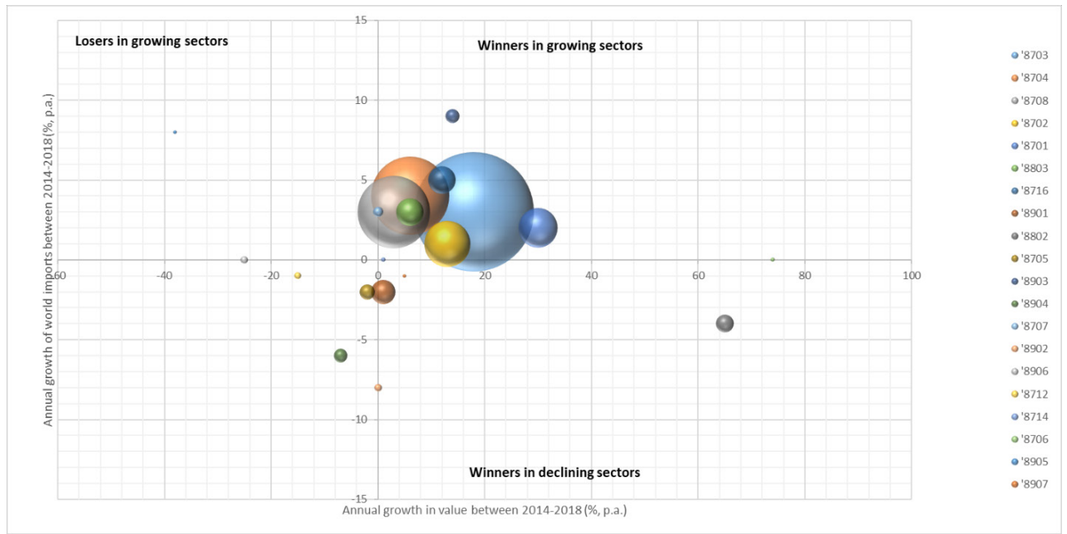

Figure 5: Quadrants of HS4 level product for HS87
Source: Authors

[2] M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

HS Code	PRODUCT	PCI STATIC SUPPLY	PCI DYNAMIC DEMAND	PCI MARKET ACCESS
'8703	Motor cars and other motor vehicles principally designed for the transport of persons, incl. ...	0.331	0.291	0.028
'8708	Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, ...	0.164	0.144	-0.078
'8704	Motor vehicles for the transport of goods, incl. chassis with engine and cab	0.156	0.165	-0.059
'8716	Trailers and semi-trailers; other vehicles, not mechanically propelled (excluding railway and ...	0.092	0.155	-0.036
'8701	Tractors (other than tractors of heading 8709)	0.060	0.109	-0.117
'8706	Chassis fitted with engines, for tractors, motor vehicles for the transport of ten or more ...	0.043	0.138	-0.242
'8702	Motor vehicles for the transport of >= 10 persons, incl. driver	0.033	0.047	-0.110
'8707	Bodies, incl. cabs, for tractors, motor vehicles for the transport of ten or more persons, ...	-0.027	0.004	-0.229
'8714	Parts and accessories for motorcycles and bicycles and for carriages for disabled persons, ...	-0.058	-0.058	-0.198
'8705	Special purpose motor vehicles (other than those principally designed for the transport of ...	-0.087	-0.112	-0.184

Table 1: PCI Index IsDB Methodology - Ranking of HS87 Products

Table 2 gives a more detailed breakdown of the products for PCI. Although some products in the top 10 are ranked higher based on export size, these products do not necessarily be a product champion. Products such as HS8706 (Chassis for tractors/large vehicles) ranked 18, HS8707 (bodies for tractors/large vehicle) ranked 13 and HS8714 (parts and accessories for motorcycles and bicycles to carry disabled people) ranked 17 were among the non-top ten export products that made it into the top ten PCI products for the automotive industry. The top ten products also vary in terms of Turkey's ranking for the products in world exports. Among the top ten PCI products, HS8704 (Motor vehicles for transport of goods) and HS8702 (Motor vehicles for the transport of more than 10) were among the top ten ranking in the world for Turkey, with HS8704 ranked in the ninth position and HS8702 ranked in the third position.

From the perspective of static supply which ranks the importance of export value and growth trend in the value of export, HS8703 (Passenger Vehicle) recorded high growth values as well as maintained high export value, ensuring the product category to have highest PCI value. For PCI static supply, four products also showed a remarkably high growth in export rate which are product of HS8706 (Chassis for tractors and large vehicles) with a 74% growth rate, HS 8701 (Tractors) with 30% growth, HS8702 (Large motor vehicles) with 13% and HS8716 (Trailers) with 12%. The large increase in exports for these products in the past 5 years shows the supply capability of the industry for these products.

The dynamic demand PCI which focuses on the global demand of the product ranks the product from the perspective of global import growth and opportunity for import substitution which is investigated using trade balance as an indicator. Among the top 10 PCI products, product of HS8716 (Trailers) recorded highest global import growth, reflecting the increase in demand for this product category with 5% growth rate. Product of HS8708 (parts for tractors and large vehicles) and HS8714 (parts and accessories for motorcycles and bicycles to carry disabled people) both showed a high potential to fulfill the domestic demand as both product categories recorded a trade deficit of USD 1.4 billion for HS8708 and USD 100 million for HS8714.

In terms of PCI market access, two indicators that are ranked on top are the market distance which is the proxy for the transportation of the exported product, while market concentration index using Herfindahl-Hirschman Index (HHI) indicates the number of markets that are already accessed for the particular product category for Turkey. The closer the value is to one, shows that the export market is only concentrated in one country and the lower the value shows more markets are penetrated. As for the transportation cost using the average distance, product of HS8703 (Passenger vehicle) with an average of 2,578km, HS8716 (Trailers) and HS8705 (Special Purpose Vehicles) have the shortest distance of all, reflecting the lower cost for transportation as a benefit for export. In terms of market concentration, product HS8706 (chassis for tractors and large vehicles) is most concentrated with 0.89 while HS8705 (Special Purpose Vehicles) is least concentrated with 0.04. In summary, the PCI index shows the top 10 products where the automotive industry of Turkey can be globally competitive taking into account static supply, dynamic demand and market access indicators. These products will be selected in the next stage for further analysis.

HS	PRODUCTS	RANKINGS		STATIC SUPPLY		DYNAMIC DEMAND		MARKET ACCESS	
hs4 code	Product	Rank by size	Ranking in world exports	Value exported in 2016 (USD thousand)	Annual growth in value between 2012-2016 (%, p.a.)	Annual growth of world imports between 2012-2016 (%, p.a.)	Trade balance 2016 (USD thousand)	Average distance of importing countries (km)	Concentration of importing countries
'8703	Motor cars and other motor vehicles principally designed for the transport of persons, incl. ...	1	14	12,441,971	18	3	6,536,031	2,578	0.07
'8708	Parts and accessories for tractors, motor vehicles for the transport of ten or more persons, ...	3	22	4,533,407	3	3	(1,433,774)	3,015	0.08
'8704	Motor vehicles for the transport of goods, incl. chassis with engine and cab	2	9	5,309,800	6	4	4,426,244	2,988	0.10
'8716	Trailers and semi-trailers; other vehicles, not mechanically propelled (excluding railway and ...	7	11	641,921	12	5	453,781	2,363	0.14
'8701	Tractors (other than tractors of heading 8709)	5	13	1,338,240	30	2	876,481	3,369	0.14
'8706	Chassis fitted with engines, for tractors, motor vehicles for the transport of ten or more ...	18	24	12,165	74	0	6,477	2,997	0.89
'8702	Motor vehicles for the transport of >= 10 persons, incl. driver	4	3	1,792,443	13	1	1,735,854	2,618	0.08
'8707	Bodies, incl. cabs, for tractors, motor vehicles for the transport of ten or more persons, ...	13	20	80,536	0	3	69,234	4,384	0.17
'8714	Parts and accessories for motorcycles and bicycles and for carriages for disabled persons, ...	17	38	13,920	1	0	(105,034)	3,078	0.10
'8705	Special purpose motor vehicles (other than those principally designed for the transport of ...	10	11	191,070	-2	-2	98,895	2,245	0.04

Table 2: PCI Key Indicators Using IsDB Methodology Source: Authors using UN Comtrade data

Surplus and Spillover Potential

(Natural potential, dynamic potential and surplus and spillover potential are part of IsDB's quantitative GVC methododology [3])

This "surplus and spillover potential" indicates the upstream and downstream linkages, the induced effects that potentially result from interconnections between industries, and optimizes the value added in a specific industry. The analysis of the composition domestic, foreign, and indirect value-add of the different industries will determine this surplus and spillover potential. Figure 1 below depicts the breakdown of output for domestic and international uses. Almost 42% of gross output of transport equipment (USD 21.6 billion) was exported (export revenue USD 9.14 billion). Of the exported product, 60% were final products and 40% were intermediate goods.

Turkey has high domestic value-add in the transport industry suggesting that the industry has a high growth potential, and key interventions addressing the critical bottlenecks in the industries' value chains and strategic enhancement of these value chains will promote economic growth with positive spillover effects to the domestic economy. The value-add analysis for transport industries show a have high domestic value added (see Figure 7). The domestic value added in the transport equipment industry in Turkey is around USD 5.38 billion, which is almost 59% of automotive exports. Foreign value added in total export in automotive industry is USD 3.8 billion. The share of domestic value added in the exports of third countries is around USD 1.27 billion.

Around 13.9% of automotive exports from Turkey are involved it third countries exports. However, a deeper analysis is required to evaluate Turkey's integration into GVCs.

Turkey's integration into automotive GVC is determined using two indices: 1) the GVC participation index which summarizes the importance of the GVC for the country and (2) the GVC position index, which identifies the role of a country as upstream or downstream position.

The participation index measures the degree of GVC participation by the sum of the shares of foreign value added in exports and share of indirect value added in exports. The GVC position index is a logarithmic difference between these shares.

Turkey's GVC participation index of automotive industry was calculated as 55%, which is high indicating the country is well integration into GVCs. In other words, 55% of the automotive exports is related to either foreign value added or domestic value added in third countries exports. Turkish automotive industry ranks 6th among other manufacturing industries in terms of GVC participation.

Turkey's automotive industry is in a relatively high downstream position suggesting the production process is complex as the downsteamness index reflects the number of production stages embodied in a good produced within the industry. Turkey's GVC position index of automotive industry was calculated as -0.22. In other words, the share of foreign value added in exports is greater than the share of exports in third countries exports, which indicates that the Turkish automotive industry is in a relatively high downstream position.

[3] M. F. S. Hamid, K. I. W. Kane, A. E. Demirhan and A. Khodary, Making Markets Work for Development through Global Value Chains, Islamic Development Bank, 2019

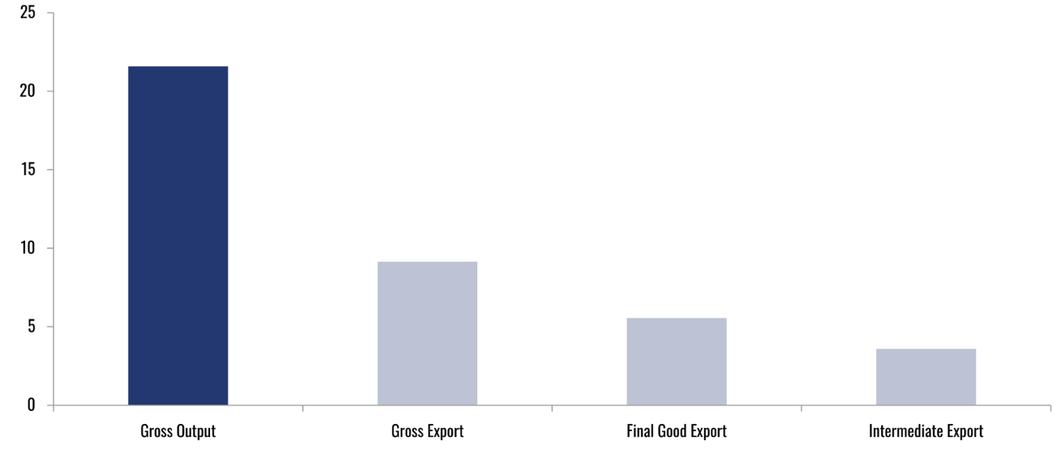

Figure 6: *Breakdown of Output and Export of Transport Equipment, US$ billion*
Source: Authors

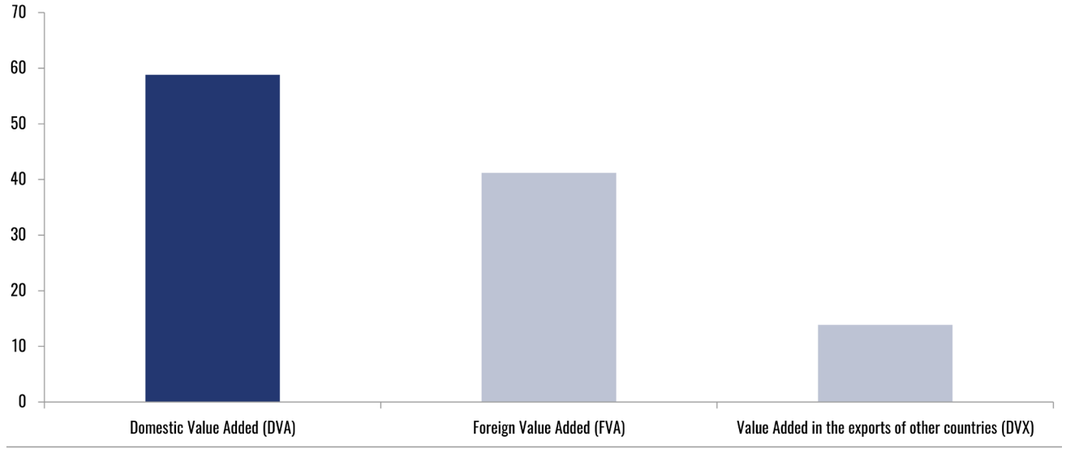

Figure 7: *The share of Value Added in the Gross Export of Transport Equipment, %*
Source: Authors

3. The Global Automotive Industry

Key trends

The automotive industry global production has peaked ("peak car") but it remains one of the largest manufacturing industries, as production is still significant. After reaching 97.4 million units in 2017, vehicle production levelled off at 96 million in 2018. Nevertheless, global production trend varies by region. The automotive trend is negative for production hubs in Europe such as Germany, and in Asia such as China. However, in US and African market the industry remains robust. Global auto exports remain strong: over the last decade, finished passenger vehicle exports reached US$976 billion in 2018 from US$729 billion in 2012.

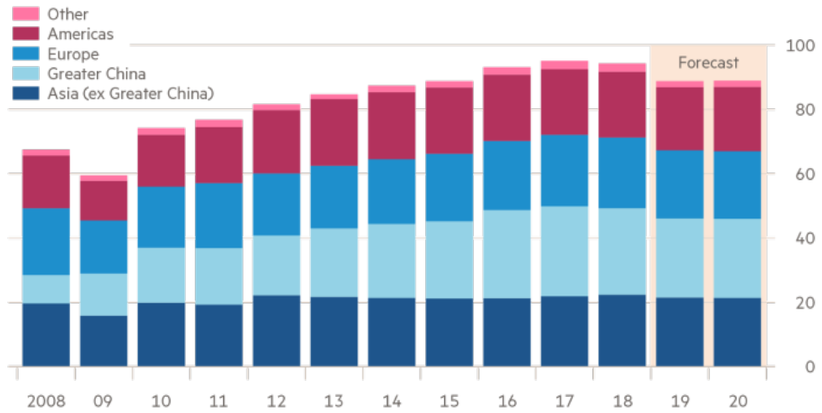

Figure 8: Global Car Production in Million Units
Source: IHS Markit

"Peak car" diminishes the appeal of investing in vehicle sharing and ride hailing apps while pushing autonomous driving vehicles far more off in the future. As global car production is set to fall in 2020 and rivaling competition from the likes of Uber, Lyft and Didi Chuxing, many carmakers that invested heavily in ridesharing and ridehailing apps have shut down. There were also miscalculation on car ownership as latest data shows an increase of car ownership in Germany from about 500 cars per inhabitants to 567 even after introduction of various vehicle sharing programmes. Traditional carmakers such as BMW and Daimler's joint ventures have around 90 million customers in more than 1,300 cities, but have struggled to attract repeat customers. The average registered driver of a car-sharing app only uses the service for 12 hours a year.

New wave of consolidation in the global automotive brands. The rising costs associated with the development of electric cars and stricter emission regulations from the EU has forced the industry to consolidate and among the latest is the merger agreement between Fiat Chrysler and Peugeot. Many other carmakers are also in talks for consolidation, which may result in layoffs and restrategizing the business models. Moody has forecast that part suppliers will also embark on joint ventures due to higher development costs.

The electric vehicle industry outlook, however, remains positive. World production was over 2 million vehicles in 2018, and it is expected to reach 2.2 million by end of 2019. Annual electric vehicle sales are forecasted at 10 million in 2025. An even more positive outlook shows that by 2040, 57% of all passenger vehicle sales will be electric. Global passenger vehicle fleet, currently still at less than 0.5%, is expected to reach 30% by 2030. In China, US, and Europe, the share of electric commercial vehicles is set to rise substantially over the next 20 years. This overall trend is driven by falling battery prices thanks to massive investments by countries such as China, the advent of the autonomous economy, and other the impact of key structural technological, institutional changes in the world economy.

China is the lead country in the electric vehicle industry driving the global trend. China has established itself as a leader by adopting strategic policies and undertaking massive investments designed to boost its imprint in the industry. As a result, the share of China electric vehicle sales is already about 4%. By 2025, China is expected to sell almost half (48%) of electrical vehicles in the world albeit leveling of around a quarter (26%) by 2040. East Asian economies such as Japan and South Korea are set to significantly boost their electric vehicle sales over the coming decades. Meanwhile in Europe, considerable political will has driven big automakers, especially in Germany, to massively invest in the electric vehicle market.

Snapshot of the industry

The automotive industry is one of the most significant global trade and the global exports in 2018 was USD 1.47 trillion with components making up USD 676 billion, subassemblies USD 76 billion and passenger vehicles, USD 720 billion. From year 2007 to 2018, the share of components has steadily increased from 40% to 46% in 2018. Subassemblies did not significantly increase as many countries have imposed localization policy and subassemblies are usually closer to the component makers. This trend also shows that since there is an increase for components exports, higher value-added activities in component manufacturing are not in the same location as the final assembly of the passenger vehicle.

Global production (in units) is dominated by China, USA, Japan and Germany, however the turnover values are significantly lower for China suggesting lower value-added activities.

As shown in Table 4, China, USA and Japan have dominated the global production with a total of about 50 million units. However, when the production is broken down into value terms, the major global carmakers which originates from Japan, USA and Germany make a turnover of around 57.6% which suggests that these countries are engaged in higher value added activities compared to China with only 4.6% of global turnover. Turkey also suffers a similar dilemma that suggest the industry is comparatively lower value added given only 1.49% of global turnover. Comparatively, the situation shows that Turkey and China may have many foreign large automotive companies operating and manufacturing in both countries, however, the production does not directly add significant value to the economy.

Value Chain Stage and Sector	Value (US$, billions)			Share of Auto-Related World Trade (%)			CAGR (%)
	2007	2012	2018	2007	2012	2018	2007-2018
Total	1,144	1,280	1,472				2%
Components	457	568	676	40	44	46	3%
Of the Body system	175	217	257	15	17	17	3%
Of the Drive train	114	150	180	10	12	12	4%
Electrical systems	76	102	146	7	8	10	6%
Of the Body system or Drive train	93	99	93	8	8	6	0%
Subassemblies	69	69	76	6	5	5	1%
Body system	3	4	4	0	0	0	0%
Drive train	66	65	73	6	5	5	1%
Final Products (Passenger Vehicles)	618	643	720	54	50	49	1%

Table 3: Global Automotive Exports by Value Chain Stage and Subsector 2007-2018 *Source: Authors using UN Comtrade data*

World	EU	Country	Production	Growth, %
1		China	29,015,434	3
2		USA	11,189,985	-8
3		Japan	9,693,746	5
4	1	Germany	5,645,581	-2
5		India	4,782,896	6
6		S. Korea	4,114,913	-3
7		Mexico	4,068,415	13
8	2	Spain	2,848,335	-1
9		Brazil	2,699,672	25
10	3	France	2,227,000	7
11		Canada	2,199,789	-7
12		Thailand	1,988,823	2
13	4	UK	1,749,385	-4
14	5	Turkey	1,695,731	14
15		Russia	1,551,293	19
16		Iran	1,515,396	18
17	6	Czech Republic	1,419,993	5
18		Indonesia	1,216,615	3
19	7	Italy	1,142,210	4
20	8	Slovakia	1,001,520	-4

Table 4: Global Automotive Production 2017 Source: Association for Automobile Manufacturers of Turkey

China moved away from petrol and diesel vehicle development to focus on Electric Vehicles and Bus Manufacturing

Realizing this contrasting situation owing to the influence and capabilities of large automotive companies from Japan, USA, Germany and South Korea, China has shifted focus to produce other vehicles such as bus and tractors in addition to focus on electric vehicles (EV). Similar shift is also seen in Turkey for bus and tractor manufacturing and the country is still in the midst of encouraging EV manufacturing. The signal from China moving into electric vehicle and infrastructure systems that support EVs is a strong indication that developing petrol and diesel engine vehicles is a race that China has abandoned and shifted its focus in developing EV capacities where the competition is still open.

The Global Automotive Value Chain

The global value chain of the automotive industry can be divided into six main stages which involves pre-manufacturing activities, manufacturing activities and post manufacturing activities. Although emphasis is usually given to the manufacturing activities up to the final product stage, the interlinkages between pre and post manufacturing activities which are usually captured as services sector data are often overlooked. The Figure 9 below, provides a detailed breakdown of the production stages in the automotive industry, including pre and post manufacturing activities. Typically, the research, design and development stage which requires more technical capacity, technology and innovation is typically a high value-added activity. The automotive industry is usually driven in this stage by huge investments from the global carmakers to develop and design new products, improve current products or create a new product. The competition between the global automakers mainly drives the companies to innovate and spend more on research.

On a global scale, automotive industry has the highest expenditure on research and development. In the global rank of 2500 enterprises with the highest expenditure on R&D in 2018 (EU Industrial R&D Investment Scoreboard), the automotive industry was clearly in the lead with Volkswagen (EUR 13.1 billion), Daimler (EUR 8.7 billion) and Toyota (EUR 7.9 billion) as shown in Table 5 below.

For the manufacturing activities, the automotive industry has a very unique value chain standardization. The value chain can be broken down to 4 main processes which are processing materials, basic components (tier 3), subsystem components (tier 2) and system modules (tier 1).

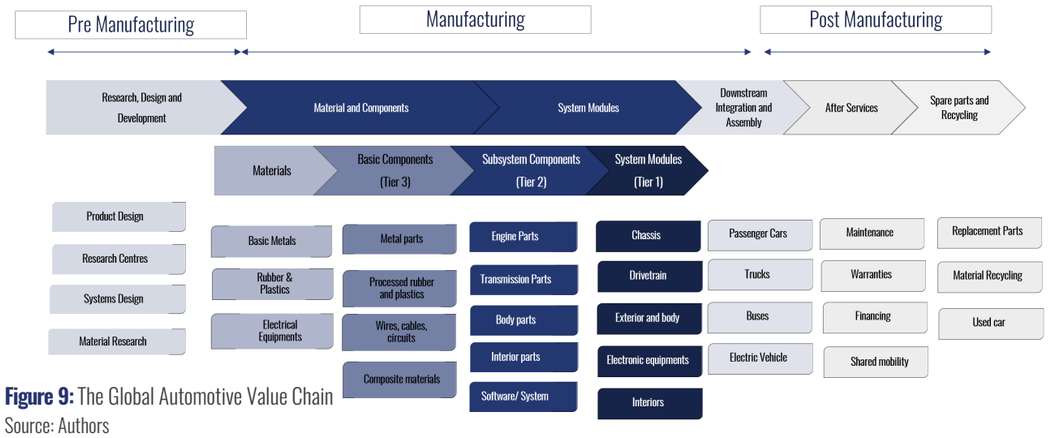

Figure 9: The Global Automotive Value Chain
Source: Authors

Each stage of the value chain and tiered approach differentiates the types of suppliers and parts that are manufactured in the value chain. Tier 1 suppliers are the most complex and needs the highest technical and quality requirements and adhere to global standards. The companies are usually larger and usually seen as the backbone of the automotive manufacturing as these companies need to coordinate between the OEMs and tier 2 suppliers. Most of the productivity gains in the automotive industry in the past 20 years has mainly been contributed by strong tier 1 suppliers with just in time manufacturing. Tier 2 suppliers on the other hand have moved to more precision parts manufacturing as the industry is moving towards lightweight and emission targets which controls the type of parts supplied by tier 2 manufacturers. The power relations between all tiers manufacturer and the efficiency of automotive industry in any country depends on to what level and extend all these three tiers of supplier are productive, efficient and adhere to high quality standards. Some trends at a global level has suggested that the move of many assembly lines to lower wage countries has resulted in the supply for lesser sophisticated tier supplies, thus limiting the type of vehicle to be manufactured in a particular country.

In post manufacturing activities, the automotive industry has seen a strong emphasis on shared mobility (ride sharing and ride hailing services). Many carmakers have entered this space, however, due to the weakening demand and cost pressures, investment in software related to shared mobility has been decreasing. The traditional post manufacturing activities such as extended warranties have also pressured the carmakers on cost while the used car industry has picked up quite significantly in the US, with companies like CarMax, grew its total revenues by 8% to USD 17.1 billion in 2018 (CarMax 2018 Annual Report).

Global ranking 2018	Company	Country	R&D in 2017/18 (€bn)	R&D intensity (%)	Rank change 2004-2018
3	VOLKSWAGEN	Germany	13.1	5.7	up 5
10	DAIMLER	Germany	8.7	5.3	down 7
12	TOYOTA MOTOR	Japan	7.9	3.6	down 7
14	FORD MOTOR	US	6.7	5.1	down 13
17	BMW	Germany	6.1	6.2	up 11
18	GENERAL MOTORS	US	6.1	5.0	down 12
19	ROBERT BOSCH	Germany	5.9	7.6	up 9
22	HONDA MOTOR	Japan	5.4	4.8	up 9
31	FIAT CHRYSLER	Netherlands	4.3	3.9	up 13
37	NISSAN MOTOR	Japan	3.7	4.1	down 3
44	CONTINENTAL	Germany	3.2	7.3	up 73
48	RENAULT	France	3.0	5.0	down 3
50	PEUGEOT	France	2.9	4.5	down 12

Table 5: Ranking of Automotive Companies in R&D Spending
Source: 2018 EU Industrial R&D Investment Scoreboard
https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113807/eu_rd_scoreboard_2018_online.pdf

4. Turkey in the Automotive Global Value Chain

Turkey is integrated into the Automotive GVC. The country is actively participating in the major value chains segments of the automotive industry, namely in final assembly, parts & components, and subassembly. As of 2018, the share of its own exports in total automotive world trade has been steady and is highest in final assembly (53%), followed by parts & components (44%), and subassembly (3%). Although, Turkey remains a small participant in the sub-assembly market, this VC segment has grown by 21% during the 2007-2018 period. Overall Turkey's automotive industry is dominated by the major world automakers in final assembly, by international top tier 1 suppliers of part & and components along with a large number of small companies which are also active in subassembly.

Subsystem components which are usually tier-2 and tier-3 suppliers grew faster compared to global average. The subsystem components (subassemblies) grew 21%, at a faster pace than global average of only 1% from 2007 to 2018. This is mainly due to the increase in exports for body system and drive train. Components under this category shows a huge potential for further development as most tier-2 and tier-3 suppliers are locally owned companies that benefit from long term technical upgrading required by the tier-1 global or joint venture companies.

Few international top automakers dominate the final assembly market in Turkey. The major players are Renault, Toyota, Hyundai, Isuzu, Mercedes, and Honda (although Honda is expected to leave Turkey in the near term). Most of the companies produce passenger cars, some light and heavy trucks. Meanwhile, few local companies share the truck, bus, pick up markets with the majors companies. In January-June 2019, Renault and Toyota produced 35.7 % and 26.5 % of all passenger cars, respectively. Isuzu produced 93.1 % of light trucks. Mercedes Benz Turkey produced 6,832 heavy trucks and Ford Otosan with a production of 2,004 trucks. Ford Otosan specialized in pick up production with a 72 % share in the market. Ford Otosan also dominates the minibus market with a production of 27,851 and a share 98.6 %. Mercedes Benz Turkey has 44.1% of the share in the bus market followed by MAN Turkey with a share of 32.6 %. Isuzu is the leading firm in the Midibus market with a 48.8 % production share. Finally, Türk Traktör produces 95.1 % tractor market with a production of 10,056 tractors in the first six months of 2019.

Ten of the top 20 Tier 1 suppliers in the world dominate the parts & component market in Turkey. Tier 1 companies such as Bosch, Denso, Magna, Faurecia, ZF, Yazaki, Delphi, Valeo, Toyota Boshoku, Cummins have established their presence in the country through foreign direct investment or joint ventures. In general, there are around 400 top suppliers in Turkey working directly with the OEMs. However, the parts & components supplier market is highly fragmented with few thousands active participating companies. These include tier 2 and tier 3 companies and are almost all local Turkish companies.

Turkish automotive industry has a highly developed supplier's network. This network covers diversified players from global top 20 suppliers to SMEs having capability to produce special, niche products for global market. At the beginning, domestic part and component producers developed through their association with to domestic OEMs. In the late 1990s, however, domestic parts and components producers started to directly integrate into GVCs, and in doing so, they became more productive as the export demand required quality upgrading. There is high geographic concentration of top tier 1 companies, most of which are located in the northwestern part of Turkey in cities such as Bursa and Istanbul.

Value Chain Stage and Sector	Value (US$, millions)			Turkey Share of World Exports (%)		Share of Turkey's Auto Exports (%)	CAGR (%)
	2007	2012	2018	2007	2018	2018	2007-2018
Total	11841	12390	17752	1.0	1.2		3%
Components	4937	6098	7832	0.4	0.5	44.1	4%
Of the Body system	2092	2540	3448	0.2	0.2	19.4	4%
Of the Drive train	1575	1746	2045	0.1	0.1	11.5	2%
Electrical systems	565	814	975	0.0	0.1	5.5	5%
Of the Body system or Drive train	705	998	1364	0.1	0.1	7.7	6%
Subassemblies	64	283	598	0.0	0.0	3.4	21%
Body system	1	2	12	0.0	0.0	0.1	28%
Drive train	63	281	586	0.0	0.0	3.3	20%
Final Products (Passenger Vehicles)	6840	6009	9322	0.6	0.6	52.5	3%

Table 6: Turkey Automotive Exports by Value Chain Segment, 2007-2018
Source: Authors using UN Comtrade data

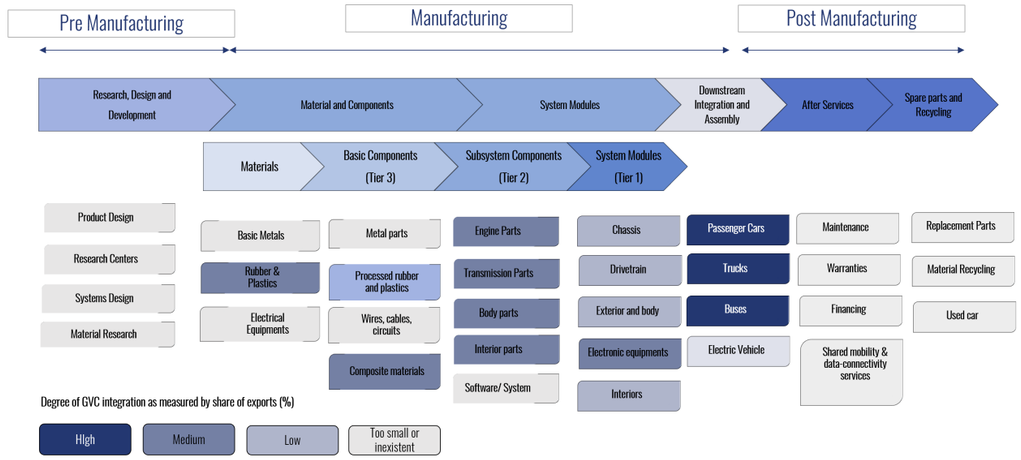

Figure 10: Turkey Automotive Participation in GVC, 2007-2018
Source: Authors

Firms	Car	Light Truck	Heavy Truck	Pick Up	Bus	Minibus	Midibus	Tractor
Isuzu	-	326	-	413	183	-	525	-
Ford	13 347	-	2004	143 464	-	27 851	-	-
Hattat	-	-	-	-	-	-	-	514
Honda	11 249	-	-	-	-	-	-	-
Hyundai	83 750	-	-	-	-	-	-	-
Karsan	-	-	-	1375	225	389	55	-
Mercedes	-	-	6832	-	2082	-	-	-
MAN	-	-	-	-	1541	-	-	-
Otokar	-	-	-	96	477	-	325	-
Renault	175 669	-	-	-	-	-	-	-
Temsa	-	24	-	-	218	-	170	-
Tofaş	78 144	-	-	53787	-	-	-	-
Toyota	130 541	-	-	-	-	-	-	-
Türk Traktör	-	-	-	-	-	-	-	10 056
Total	492 700	350	8836	199 135	4726	28 240	1075	10 570

Table 7: Production of Automotive Manufacturers in Turkey, January-June 2019
Source: Association for Automotive Manufacturers, http://osd.org.tr/sites/1/upload/files/Otomotiv_Sanayii_Uretim_Bulteni_2019.06-5435.pdf (Retrieved August 6, 2019).

The top tier 1 companies in Turkey earned almost $2 billion (2015) supplying domestically and international a wide range of parts & components, much of which is exported. These include vehicle parts and accessories (n.e.c. in heading no. 8708) (870899); engines; parts for internal combustion piston engines (excluding spark-ignition) (840999); vehicles; parts and accessories, of bodies, other than safety seat belts (870829); vehicle parts; road wheels and parts and accessories (870870); rubber; new pneumatic tyres, of a kind used on motor cars (including station wagons and racing cars) (401110); engines; parts, suitable for use solely or principally with spark-ignition internal combustion piston engines (for other than aircraft) (840991).

Turkey's participation the subassembly GVC is relatively small but steadily rising with a large number of companies directly and indirectly active in production. The subassembly market comprises mainly of subassemblies of a parts and components of a vehicle, "Body systems" consisting of tires, brakes, wheels, suspension, systems and parts (incl. shock absorbers). Other subassembly manufacturing include drive train consisting of engines; Interior Body systems subassembly of a vehicle consisting of electronic instruments. The manufacturers in Turkey of the subassembly of drive train, consisting of "Gear boxes", "Drive-axles" and "Clutches". Body system (front & rear end modules), Body system (other), Body system (panels) are relatively less competitive subassemblies of vehicles in Turkey. In general, Turkey's participation in other components of the automotive GVC is nonexistent or considerably small. Turkey has aspiration in participating in the vehicle design & development GVC component the major automotive companies are the main actors in this stage. Big companies such as General Motors, Ford, Volkswagen, Daimler-Benz, and Toyota have their design & development centers in their home countries (US, Europe, Japan, South Korea) where the competitive advantage has been development over many decades through industrial clusters.

Company	Products	ISO 500 2015	ISO 500 2014	Net Sales Revenues (mn TRY)
Bosch San.	Brake systems, sparkplugs, filters, windshield wipers, batteries, headlights and taillights, belts, horns and alarms, socket connections, relays and magnets, sensors, electric motors, starter motors, alternators, start / stop systems	22	22	2,938
Delphi Automotive Systems	Cables, electrical/electronical systems and parts, fuel pumps, injectors, valves	114	83	838
Autoliv Cankor Otomotiv	Steering wheels, seatbelts, airbags	134	138	740
CMS Jant ve Makine	Wheels	142	158	709
Yazaki Otomotiv	Electrical and electronical parts	424	-	277
Hema Endüstri	Power delivery and engine parts	144	168	679
Beyçelik Gestamp Kalıp	Sheet metal	141	156	719
Maxion İnci Jant Sanayi A.Ş.	Wheels	139	183	722
Coşkunöz Metal Form Makine	Suspension and chassis parts, fuel tanks, chassis and real axles, external parts	182	163	565
Diniz Johnson Controls	Seat systems, internal systems, metal frames			
Aunde Teknik Tekstil	Fabrics and seat covers	178	239	585
Gates Powertrain Plastik	Belt tensioners	277	282	405
B-Plas Bursa Plastik	Plastic bumpers, fuel tanks, gloveboxes, door panels, interior and exterior coated parts	387	456	302
Teknorot Otomotiv Ürünleri	Rot shafts	414	424	281
Maxion Jantaş Jant San. ve Tic. A.Ş.	Wheels	427	366	275
Bpo B-Plas Plastic	Plastic bumpers, mirror and engine covers	489		232
CMS Jant	Wheels	142	158	709
Ege Endüstri	Differential shells, axles and axle parts	318	396	364
Ermetal Otomotiv	Sheet metal shaping and installation	443	482	263
Total	19 Companies			11,239

Table 8: Automotive Top Tier 1 in ISO (Istanbul Chamber of Industry) 500 List
Source: Istanbul Chamber of Industry (İSO)

The synergy between the capabilities of parts export and the increasing imports of diesel engines should result in production of local diesel engines. The automotive industry in Turkey is capable of exporting some relatively more complex and sophisticated parts and components such as pistons for engines. However, the highest import bill is paid for "Engines; compression-ignition internal combustion piston engines (diesel or semi-diesel engines) (840820). The 15.8 % of all parts and components parts belong to this item. However, there is no domestic engine production in Turkey despite the capabilities in key components such as pistons.

Deep dive for passenger vehicles value chain

The passenger car manufacturing is dominated by four big international automakers, however, the types of car assembled locally in Turkey is limited to segment A to C (smaller engine compact cars). Turkey is established as an assembly hub in terms of the volume when it comes to passenger vehicle. However, when broken down into the OEMs, there are only four top companies that dominate the production, with Oyak Renault, 375,000 units, Tofas, 290,000 units, Toyota, 280,000 units and Hyundai Assan, 245,000 units (as shown in Figure 11).

Besides the domination by top 4 OEMs, the local assembly is focused at smaller engine models that are in segment A, B or C. Oyak Renault for example produces only Renault Clio IV (Super Mini B segment) and Renault Megane Sedan (Family C segment) while Tofas produces Fiat Egea (Compact C segment), Hyundai with Hyundai i20 (super mini B segment) and Hyundai i10 (city A segment). Toyota is the only manufacturer that introduced hybrid vehicle in Turkey with two models, Toyota C-HR and Toyota Corolla which are also C segment models.

The exports of cars are concentrated to four main countries, with a widening gap between the four countries and other export markets which indicates lack of model diversification that may impede the competitiveness of the overall industry. Turkey's car exports grew tremendously since 2007 to 2015 with four countries dominating the top four export destinations as shown in Figure12. However, after 2015, the trend shows a widening gap between the top four countries (Germany, Italy, France and United Kingdom).

One of the key factors behind this widening gap could be the lack of product differentiation in Turkey. Turkey exports similar category of vehicle (segment A-C) while other categories are imported. It also means that global firms view Turkey as a market destination and assembling smaller vehicles which are popular in the domestic market as an option for exports as well.

When a comparison was made between Turkey's focus on smaller segment cars with other competing countries with comparative ranking in global automotive exports in 2018 (as shown in Figure 13), Turkey stands out as the only country that focuses on segment A-C production. Thailand in the 14th rank of global exporter is a hub for nearly all models of BMW, Mercedes, Toyota Camry and Honda Accord, while European countries such as Slovakia exports Jaguar Land Rover, Volkswagen Touareg, Audi Q7 and Porsche Cayenne while Hungary has moved from smaller cars like Suzuki Vitara (Segment C) to luxurious brands such as Audi TT, Mercedes CLA and Mercedes B Class.

None of these competing countries are the main consumer of the models exported on a global scale suggesting that the models are produced in the countries due to their competitiveness. It also may reflect that Turkey is losing its competitiveness at the global level due to over concentration on smaller car segments for the domestic market. The difference of producing smaller vehicle against medium or large sized vehicles is the technology adoption in the automotive industry usually begins from premium vehicles. Concentration on small sized vehicles may have disrupted the upgrading trajectory of the tier-2 and tier-3 suppliers.

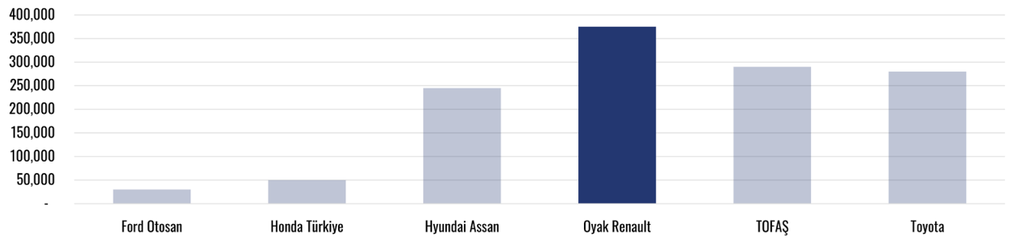

Figure 11: Breakdown of Production by Company, 2018
Source: Authors

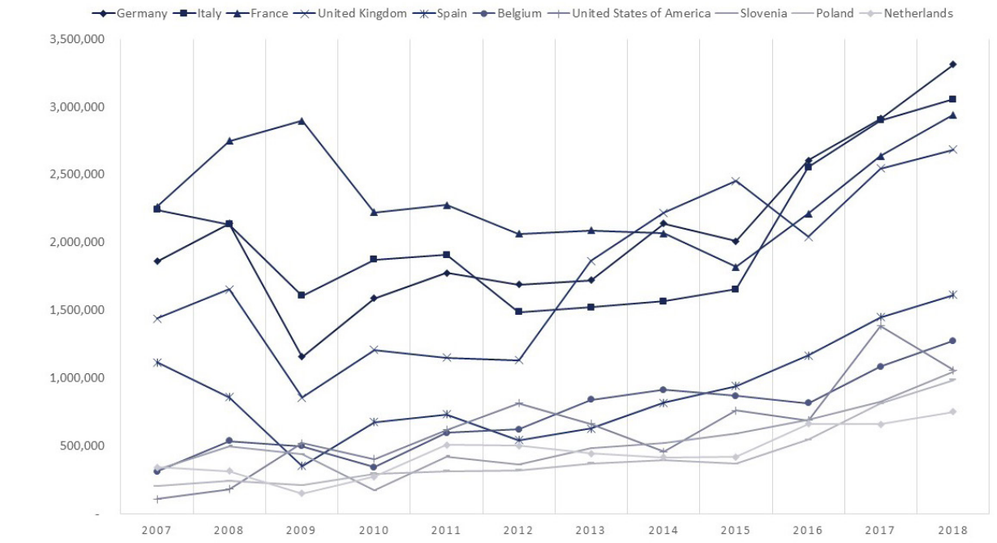

Figure 12: *Turkey exports of HS87: Vehciles (USD thousand)*
Source: Authors using UN Comtrade data

Ranking	Exporters	Exported value in 2018 (USD Thousand)
11	Belgium	51,753,080
12	Italy	44,897,197
13	Czech Republic	40,912,915
14	Thailand	30,446,948
15	Poland	29,982,813
16	Slovakia	27,845,406
17	Turkey	26,758,524
18	Netherlands	26,283,547
19	Sweden	23,618,283
20	Hungary	20,491,114

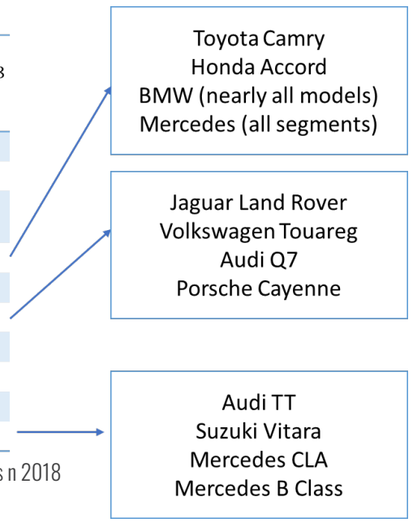

Figure 13: Competing countries and production of model types n 2018
Source: Authors

Electric Vehicle (EV) Value Chain

Although Turkey is set to produce home-grown EV, the key component to make it or break it, battery, requires a comprehensive understanding of the Global Electric Battery Value Chain. Turkey has set an ambitious target to domestically produce electric car by unveiling two prototypes developed by a consortium named Turkey's Automobile Joint Venture Group Inc (TOGG) comprising top companies in Turkey such as Anadolu Group, BMC, Kök Group, Turkcell, Zorlu Holding and the Union of Chambers and Commodity Exchanges of Turkey (TOBB). The production is set to start in 2022 with an investment of about USD 3.7 billion. It is expected to produce five models with a total output of 175,000 vehicles a year.

The main consideration for EV adoption as experienced by many EV manufacturers is electric battery which requires breakthrough strategies as many EV models are still not profitable despite the decrease in battery price. Batteries are the key differentiator among EV manufacturers and since the amount of energy stored in battery determines the range of EV and plays a vital role in consumer adoption of EV. Although battery prices have remarkably declined by cost per kWh from USD1,000 per kWh in 2010 to USD227 per kWh in 2016 [5], the profitability of EV manufacturers has not improved significantly as the introduction of EV in many countries are driven by subsidies. The bulk of battery price decline can be attributed to the policies introduced by China, however, with the cut in subsidies from China in 2018 for EVs, the sales of EVs declined and the local EV manufacturers that were dependent on the subsidies and incentives from the government are facing risks.

At this juncture, Turkey's participation in the EV manufacturing should be carefully considered from the perspective of accessing the battery value chain. EV batteries have a complex global value chain in which production is separated into stages and those stages can be completed in different locations. Figure14 shows the mapping of a global EV batteries value chain.
In the stage of pre manufacturing, the EV batteries have not arrived to a conclusive battery technology across the industry, however, the main materials that are required for the cell production of a battery are lithium ore, nickel ore, cobalt ore, manganese ore, and some salt forms of the ores. The combination of these materials make up the cathode, anode and electrolyte of the EV batteries.

In the manufacturing stage, EV batteries components and cell production can be divided into two products which is battery cells and the combination of a few battery cells makes up a battery module with case and terminals. The battery modules are then packed together according to the requirements of the EV and energy that is required for certain EVs. The battery pack is the final product that is integrated into an EV. Post manufacturing, the integration process in the EV also requires some services and software. There are also new business models such as EV battery independent leasing and some of the used batteries are also used of energy storage. Unlike the use of petroleum products in internal combustion engine that depletes the resources, EV batteries value chain needs a strong recycling strategy as most of the materials used for the batteries needs to be recycled to ensure the sustainability of the value chain.

The complex and emerging new technology from EV batteries has shifted the cost from the battery pack and modules which used to be the most expensive part in 2015 to the raw materials in 2018. The value add of an EV battery today mostly comes from the cost of active materials. The lack of scale in production of EV batteries would hamper the negotiations in price of raw materials, whereby most global mining companies are now setting up long term contracts with battery manufacturers as a way to ensure availability of material and get the best price. The power relations between global mining companies and battery manufacturers has started to shift prices towards volume and scale, where battery manufacturers with higher demand will be able to influence the long term price of materials.

[5] McKinsey & Company, Electrifying Insights, January 2017, 10

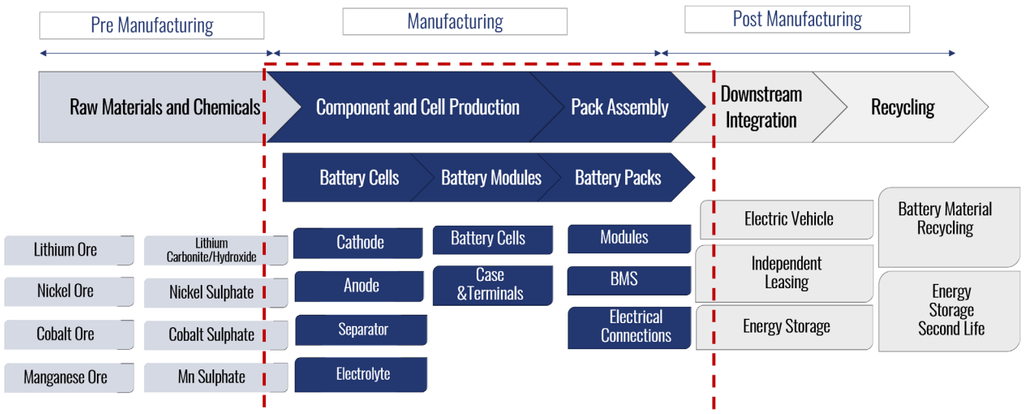

Figure 14: *Electric Vehicle Battery Value Chain*
Source: Authors

Recommended Approach for Turkey

Turkey's ambition in EV battery manufacturing should be realistic and ensure the scale and profitability of batteries that will drive the locally manufactured EV. Given the steep competition and investments by China, United States and the EU, an aggressive, yet implementable solution would be to encourage the sizeable domestic market in Turkey to absorb the EV batteries manufactured in Turkey. Depending only on TOGG's expected 175,000 annual production may not be enough to compete with the other global players. The European lithium-ion battery capacity ramp-up until 2025 includes competing countries such as Hungary with a planned 16GWh plant with Samsung SDI and 20GWh plant with SK Innovation which totals up to 36GWh capacity. LG Chem will also be building a 45GWh capacity plant in Poland.

Only focusing on Poland and Hungary, it is expected that there will be 81GWh capacity of batteries which is estimated to annually serve around 1,620,000 passenger vehicles (assuming Tesla Model 3 capacity of 50kWh). Since both Poland and Hungary have a planned OEMs manufacturing EVs in the country, the global production of EVs from both Poland and Hungary is bound to increase while both these factories have the price advantage for raw materials which forms around 50% of the cost for batteries.

Turkey needs a comparable sized factory to compete with global EV players on the cost and access to materials such as cobalt is crucial. The estimated investment for 5 GWh factory would require investment of around USD 1 billion [6]. A comparable size of 30-40 GWh may require around USD 6-8 billion initial investment while a 30-40 GWh will serve around 600,000 to 800,000 units of EVs (based on Tesla Model 3). The annual production target of the local EV in Turkey will only cover around 20-30% of the overall capacity. Given Turkey's sizeable market and capabilities in bus manufacturing, adoption of electric buses to replace diesel buses may offer a good option to absorb the demand for EV batteries and at the same time provide savings to the economy from importing fuel. Considering the number of buses currently operating in Turkey which is estimated at 215,486 [7], the opportunity to replace these buses with electric buses offers a huge advantage.

[6] Author's calculation based on BaTPac Version 3.1 by Argonne National Laboratory
[7] TurkStat, Road Motor Vehicles, July 2019

By modelling [8] an electric bus and diesel bus with its annual fuel cost, replacing a diesel bus to electric bus results in close to TRY 250,000 savings as shown in Figure 15 below. An expanded modelling which calculates the purchase cost of both buses, annual fuel cost, maintenance and all other lifetime costs of both electric and diesel bus, for each bus, with a lifetime of 10 years results in a total lifetime cost of TRY 8,083,783 while only TRY 4,796,013 for electric bus. This is with the assumption of the current battery price and average diesel price which is the low base case scenario. Even with this scenario, the savings in total lifetime cost of replacing electric bus with diesel bus would result in around TRY 3,287,770.

The calculations are then made for total expected savings for annual fuel cost and 10 year lifetime electric bus replacement of all diesel buses in the city of Istanbul and entire Turkey. Figure 16 shows that the replacement of diesel bus to electric bus for the city of Istanbul only will amount to an annual savings of TRY 10.39 billion and for entire country, would total up to savings of TRY 53.66 billion. These amounts not only shows the opportunity of breaking away from diesel fuel dependency, but also create the necessary demand for EV battery manufacturing plant that can absorb the local demand for the increase in usage of EV batteries. At the same time, the savings can also be channeled to upgrade the grid and invest in various renewable power plants planned across the country.

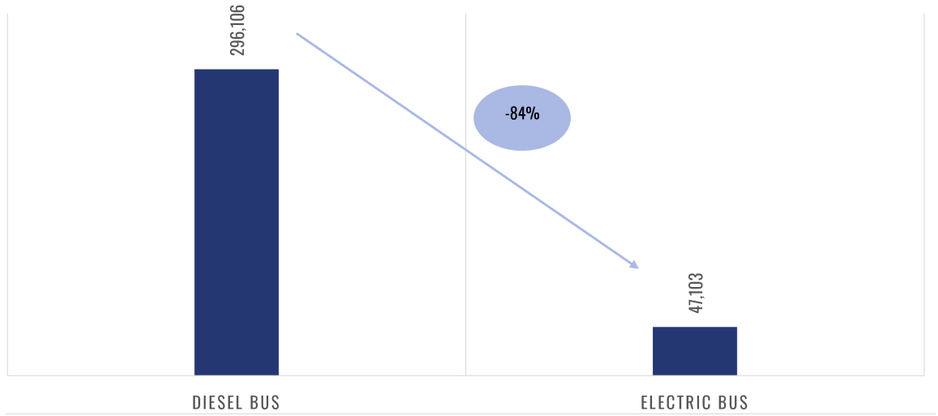

Figure 15: Annual Fuel Operational Cost Savings
Source: Authors

Diesel		Price
Diesel Consumption Per Day		
0.5 litre/km x 250 km/day		125 litres
Diesel Cost Per day		
125 km/day x TRY 6.49 liter		811.3
Annual (365 days)	**TRY**	**296,106.25**

Battery		Price
Battery Efficiency Per Day		
0.89 kwh/km x 250 km/day		222.5 kwh
Electricity Cost Per Day		
222.5 kwh/day x 58 kr/kwh		129.1
Annual (365 days)	**TRY**	**47,103.25**

Figure 16: Calculation base for diesel vs electric annual fuel operational cost
Source: Authors

Cost Type	Diesel bus	Electric bus
Capital Cost		
Purchase Cost	550,000	2,000,000
Smart Charger		6,500
Operational Costs		
Yearly Fuel/Charging Cost	2,961,063	471,033
Maintenance/Service Cost		
Preventive Maintenance	365,000	216,080
Running Maintenance	1,789,960	899,360
Servicing	131,400	43,800
Total Maintance/Service	2,286,360	1,159,240
Total Lifetime Cost 10 years	8,083,783	4,796,013

Table 9: Lifetime cost breakdown for diesel bus vs electric bus
Source: Authors

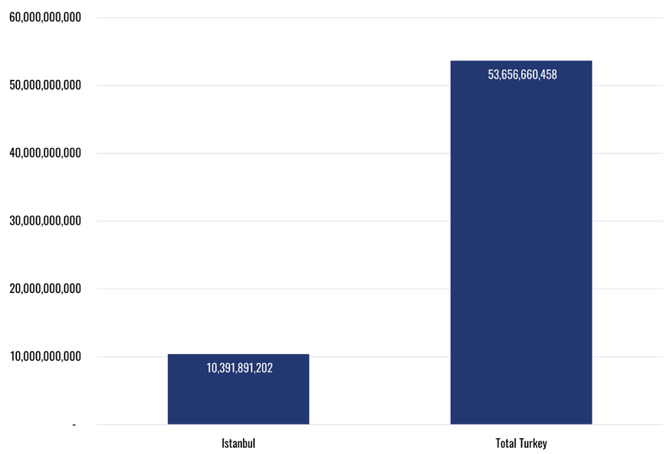

Figure 17: Total Annual Fuel Cost Savings replacing diesel bus with electric bus in TRY for Istanbul and Turkey
Source: Authors

[8] Author's own model based on referenced data points

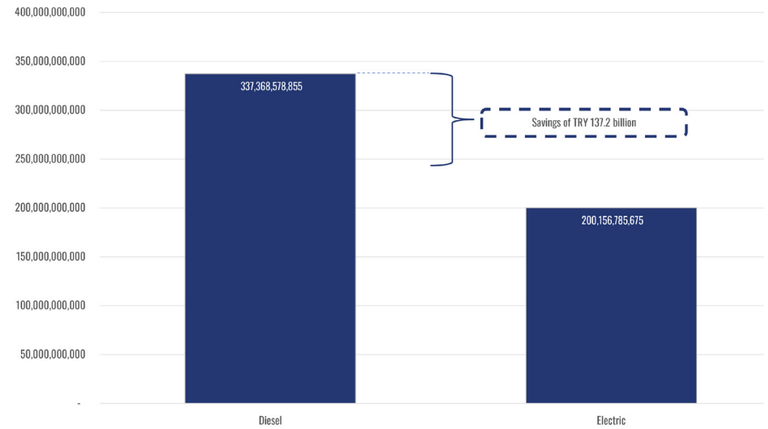

Figure 18: Lifetime Cost Comparison for Istanbul in TRY
Source: Authors

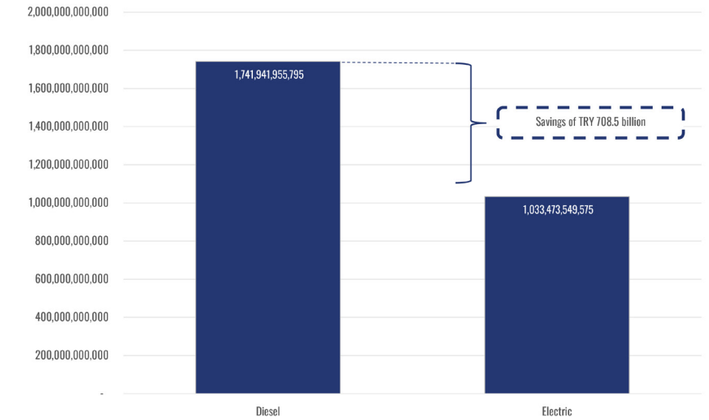

Figure 19: Lifetime Cost Comparison (10 years) for whole Turkey in TRY
Source: Authors

The final part of the model calculated the lifetime cost comparison to purchase and run diesel buses against electric buses. The consideration in these calculations took the price of current average diesel and electric buses, all the lifetime operational, maintenance and service cost for 10 years. In 10 years, lifetime cost of electric bus against diesel bus would result in savings of TRY 137.2 billion as shown in Figure 18 above. If all buses in Turkey are then converted to electric buses, the economy is expected to save around TRY 708.5 billion. These scenarios and assumptions point out that the expansion of battery usage domestically can be enhanced not only to create the scale, but also provide huge savings to the economy.

From a global perspective, it is important for the country to ensure a strong hold of battery supply to ensure export competitiveness and higher value add. Battery currently is the key component that has the majority value add in EV and the failure to have a vibrant domestic battery manufacturing industry would trap the automotive industry to be stuck with lower value-added manufacturing. The proximity of Turkey to European markets would also provide a cost advantage to export electric buses, moreover, with the emerging policy trends to incentivize EVs across many countries.

5. Opportunities and Challenges

The automotive industry in Turkey is stuck in a trilemma, where the country is promoting advancement by tapping into new opportunities based on emerging technology such as EVs, increasing productivity especially in the small passenger vehicle segment given the double-digit production growth and shifting focus from passenger vehicles to other vehicle segments such as buses and LCVs. The trilemma is described in Figure 20 below.

The question however is, how can the Turkish automotive industry leap forward and have a higher share of value add to the economy from the global market. It requires the policymakers to make a bold step that incorporates the trilemma faced by the industry and rethinking the policy options to achieve increased value add and exports while at the same time create quality jobs.

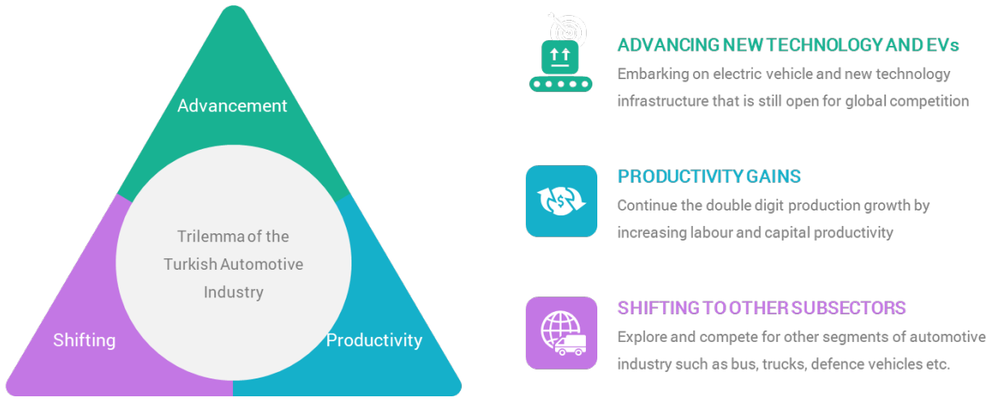

Figure 20: Trilemma of the Turkish Automotive Industry
Source: Authors

As for the advancement, the newer concepts of technological transformation that is centered around CASE (connectivity, autonomous or assisted driving, new mobility or car sharing, electrified powertrains and components) capabilities has gained global attention. Although some parts of CASE, focusing on EV was discussed in this paper, the overall emerging and disruptive technology offers Turkey an opportunity to be part of this global trend. However, this must be balanced with the current capabilities and comparative advantage of Turkey in the automotive industry. Advancing in these trending technologies would require investment and spending on R&D and besides prototypes and startup stage of the technology, implementation needs huge initial capital cost. The huge initial capital cost also needs to be complemented and coordinated across the country with practical government incentives which may require subsidies or interventions from multiple ministries and stakeholders. Another possible challenge is also the fact that many countries with strong global automotive brands have already invested and lead the development of CASE.

Another challenge with increasing value add is also centered around the focus on productivity. The automotive industry has shown tremendous double-digit growth in the past 10 years owing to productivity gains and renewed investments in passenger vehicle manufacturing. Both capital and labour productivity gains from the current passenger vehicle manufacturing has increased value added, however when comparison is made across different industries in Turkey, the automotive industry still lags in terms of value added.

The challenge of having the big four – (four brands and four export markets) shows that the over concentration on popular domestic brand and segment of vehicle as the main export product, limits the learning advantage from foreign OEMs. This limitation is quite alarming as it is also effecting the overall value add of the automotive industry. Tier-2 and Tier-3 suppliers in Turkey are supplying to smaller sized vehicles where new technology by any brand are usually introduced in medium to larger sized vehicles. The premise of offshoring older technology to Turkey also seems to take place to certain extent. As shown in this paper, competing countries like Hungary, Poland and Thailand are manufacturing latest models of medium to large segment vehicles including some luxurious brands. Renault for example moved the complete global production of its Clio model to Bursa and turned the plant in France to build EV model, Renault ZoE. The production of the type of vehicle plays an important role in the trickle-down effect to the tier-1, tier-2 and tier-3 suppliers and increasing the value add should be complemented by some changes in the type of vehicles produced in Turkey.

Shifting the automotive industry into other subsectors such as bus or heavy vehicle manufacturing and defence vehicles has started to take pace in Turkey. Besides the LCVs where Turkey has a huge comparative advantage in Europe, most of the other manufacturers such as bus, tractors and defence vehicles are domestic companies. As domestic companies, there are huge potential to increase the value added but most of these companies are struggling with small margins and do not have strong investments in R&D, thus creating products that might not increase the value add. Some of the more successful companies have penetrated the EU market which has helped gain more profits. Besides the EU market, they lack export diversification making these products dependent on the EU market. The overall value addition in this segment is also challenged with the fact that all engines used in the buses and tractors are mainly imported.

6. Selected recommendations

Recommendation 1

Given the lack of control on global OEMs that focus on smaller sized vehicle in Turkey, advancing into the Electric Vehicle industry with a national brand is likely to be more successful, however as discussed in this paper, it requires full strategy on EV battery manufacturing. It also requires Turkey to fully understand on the global EV value chain, to ensure obtaining higher value added that shifts the entire economy. Turkey can explore its privileged relationship with some IsDB member countries to export and collaborate in EV manufacturing.

Recommendation 2

Manufacturing EV batteries needs a comparable sized factory to compete with global EV players on the cost and access to materials such as cobalt which is crucial. Given Turkey's sizeable market and capabilities in bus manufacturing, adoption of electric buses to replace diesel buses may offer a good option to absorb the demand for EV batteries and at the same time provide savings to the economy from importing fuel. On the access to material, Turkey could collaborate with some of IsDB member countries, where the raw materials for battery is sourced from.

Recommendation 3

Increasing productivity with higher value-added activities by specializing in certain niche areas such as carbon fiber parts. As the automotive industry is bound for huge customization and the concept of sharing platforms, the use of composites (from carbon fiber) for car parts can be developed to target the production of luxury models in Turkey or as a hub to of carbon fiber production. Dow Chemical & Dowaska have the largest plant for carbon fiber testing in Europe. Turkey could develop R&D centers for companies to do testing and incentivize innovation in carbon fibre parts.

Recommendation 4

The automotive industry can leverage strengths of the textile industry to improve key automotive products. For instance, Turkey accounts for 6% of the global market share of car seats (metal seat and textile fabric); therefore, with R&D centers in Bursa, the automotive industry can play a key role in the production of smart fabrics for luxury cars. Turkey can seize this opportunity to specialize in these types of products, especially when the EU is shifting away from processed leather in favor of smart fabrics.

Recommendation 5

Capturing the diesel car market from EU. Due to EU's policy shift away from diesel, Turkey can leverage its industrial and geographical position to become the production hub of diesel vehicle production by first manufacturing diesel engines locally. This strategy should, however, be only for medium term as the global market shifts away from diesel. Turkey can also diversify car exports to other emerging markets of diesel-based models where demand for diesel is likely to remain steady, at least in the medium term. This would at least in the medium term increase the value-added of the industry .


IsDB