



The Analysis of Turkey's Foreign Trade Based on the Modes of Transportation and the Marmara Region Impact on Foreign Trade

Taşıma Modlarına Göre Türkiye'de Dış Ticaretin Analizi ve Marmara Bölgesi'nin Dış Ticarete Etkisi

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Öz

Ulaştırma, küresel ekonomin en az görünen ancak en hayati bileşenlerinden biridir. Hammaddeler, ara ürünler ve bitmiş ürünlerin taşımacılığı, yük taşımacılığının, dolaylı yoldan da küreselleşmenin ve küresel ekonominin önemli bileşenleridir. Türkiye transit geçiş ülkesi olmakla beraber coğrafi avantajı sayesinde bölgenin aynı zamanda lojistik üssü de olabilecek bir konuma sahiptir. Bununla birlikte Türkiye ihracat ve ithalatının büyük kısmını denizyolu ile gerçekleştirmektedir. Ancak hem coğrafi etkenler hem de yetersiz altyapı nedeniyle yurtiçi yük taşımacılığı %90 oranda karayolu ile sağlanmaktadır. Karayolu taşımacılığı denizyolu ve demiryolu taşımacılığına göre daha esnek bir taşıma imkânı sunmakla beraber hem düşük hacimle yük taşınması hem de maliyet açısından diğer iki taşıma moduna göre daha dezavantajlıdır. Buna bağlı olarak hem uluslararası ticarete hem de yurtiçi yük taşımacılığında navlun maliyetlerini arttırmaktadır. Bu çalışma kapsamında da Türkiye'nin gerçekleştirmiş olduğu dış ticaret hacminin ulaştırma modları arasında dağılımı yük ve paha bakımından açıklanan ihracat ve ithalat verileri incelenmiş aynı zamanda da en çok ithalat ve ihracatı gerçekleştiren iller ve bölgeler analiz edilmiştir. Sonuç olarak, i) kamu yatırımlarının tüm lojistik modlar arasında daha dengeli bir şekilde dağıtılması, ii) ulaştırma sektöründe eksik altyapı çalışmalarının tamamlanması gerekliliği, iii) daha çevre dostu ve maliyeti karayoluna göre daha düşük olan demiryolu ve kabotaj denizyolu yük taşımacılığının özellikle yurtiçi yük taşımacılığı kapsamında geliştirilmesi, iv) ihracat ve ithalat yapan üretim tesislerinin sadece belirli bir bölgeye değil tüm ülkeye homojen bir şekilde dağılması, sürdürülebilir kalkınma ve sürdürülebilir bir taşımacılık için önerilmiştir.

Anahtar Kelimeler: Ulaştırma Modları, Dış Ticaret, Uluslararası Taşımacılık, Lojistik, İthalat-İhracat

ABSTRACT

Transportation is one of the least apparent yet vitally important components of global economy. Transportation of raw materials, intermediate products or the final products are important components of freight shipment and indirectly globalization as well as global economy. While being a transit country, Turkey, by virtue of its geographical advantage, can be considered as a logistic site in the region due to its location. At the same time, Turkey conducts large sum of its exports and imports via maritime lines. However, due to geographical factors and insufficient infrastructures, road transportation is used at the national level in the ratio of 90%. In contrast to maritime and railroad transportation, road transportation offers a more flexible transportation, yet, it is at a disadvantage due to freightage in low volumes and costs. Correspondingly, it increases the freight costs both in international trade and national freight shipment. In the scope of this study, first, the distribution of Turkey's foreign trade volume in between the modes of transportation is examined by utilizing the data on imports and exports based on freight and value; second, the cities and regions that principally take part in exports and import activities are analyzed.

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As a result, for sustainable development and sustainable transportation it is recommended that there is a necessity: i) to provide balanced distribution of public investments among all modes of logistics, ii) to complete the omitted infrastructure works, iii) in the context of particularly national freight transportation to develop the railroad and coaster maritime transportations as eco-friendly and as cost-efficient transportation modes in contrast to road transportation, iv) to homogeneously disperse the production facilities involved in imports and exports not only to specific regions but throughout the country.

Keywords: Modes of Transport, Foreign Trade, International Transport, Logistics, Import-Export

INTRODUCTION

Transportation is comprised of various elements allowing the transport of raw materials, equipment, semi-products, finished products or individuals from one point to another (Görçün, 2018). Although the conceptualization of transportation encompasses both passengers and cargos, in modern times, the concept of transportation is mainly used for cargo and freight shipment, whereas the term should involve “passenger” for all the passenger transportation activities (Özoğlu & Demirci, 2021).

Transportation sector is one of the sectors that are directly affected by national and international developments. Particularly in the periods when an increase in foreign trade volume is observed, it is confirmed that transportation has shown a sectoral growth, whereas in the periods where a decrease in foreign trade volume, reverse sectoral developments have been observed (Kalkınma Bakanlığı, 2018).

The impact of Covid-19 pandemic on global trade in services has been deeper compared to its impact on trade in goods. The lockdowns and restrictions at the global scale has negatively affected a significant number of service sectors, notably tourism and transportation sectors (Türkiye İhracatçılar Meclisi, 2021). After hitting the bottom line in the first half of 2019, a very strong comeback has been observed in freight shipment in 2021 yet causing significant capacity problems and an increase in freight costs which in turn shifted the transportation sector from being an undesirable one into a sector in demand (KPMG Türkiye, 2021).

Turkey continues to have a significant potential in the transportation and logistics sector owing to its capacity in tourism and its critical geographical location (Takım & Ersungur, 2015). In this context, this article analyzes the different modes of export and import transportation in Turkey with respect to their advantages and disadvantages; and in line with the Republic of Turkey's 100th year objectives, it provides a list of improvements that needs to be achieved in the transportation sector.

LITERATURE REVIEW

Numbers of international trade is a great indicator for the economics of countries. Therefore forecasting in international trade and logistics is critically important. In the literature, several studies can be found that issues the forecasting on international trade. Shibasaki and Watanabe (2012) developed a prediction system in order to support discussions aimed at realizing trade liberalization and efficient transport among the APEC economies. Rashed et al. (2018) have used a combined approach to forecast container throughput of Hamburg-Le Havre ports. As a result, it has been shown that there exists a longrun relationship between the trade indices of EU19 and the total container throughput. Jaganjac, Obhodas and Jerkovic (2020) have forecasted the growth of e-commerce in Bosnia and Herzegovina.

It can be seen that in estimation and forecasting studies, many different methods have been used. Single Exponential Smoothing is one of the most widely used among these methods. In this paper, Single Exponential Smoothing method has been used. In the literature, the cement production in Turkey in 2017, 2018 and 2019 based on the data for the years 2000-2016 with the single exponential smoothing method has been estimated by Tüzement and Yıldız (2018). Container throughput of Ambarlı Port from 2022 to 2027 has been estimated by using single exponential smoothing İncaz and Karaköprü (2021). Uçakkuş and Koçyiğit (2019) estimated the use of surgical gauze in a hospital in Ankara based on historical data using the single exponential smoothing method. Yiğit (2016), who also forecasted the demand for medical supplies in hospitals by using the single exponential smoothing method.

1. Transportation Sector in Turkey and in the World

In the scope of the objectives of the 100th Anniversary of the Republic of Turkey, the largest sum of the budget is devoted to the transportation sector for the purposes of infrastructure investment. When looked at the sectoral breakdown of public investments made in the last four years (see Table 1), it is seen that the transportation sector has received the highest amount of sectoral investments. In the last twenty years though, the same sector has received more than 1 trillion TL; and the 60% of this budget, with the value of 600 billion TL, has been allocated for investments in highways (Ulaştırma ve Altyapı Bakanlığı, 2019).

Table 1. Sectoral Breakdown of Public Investments (Million TL) (Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı, 2019)

Sector/Year	2016	2017	2018	2019
Agriculture	7.767,00	10.090,00	11.961,00	7.795,00
Mining	936,00	1.365,00	989,00	1.043,00
Production	606,00	673,00	645,00	773,00
Energy	3.494,00	4.710,00	8.708,00	13.603,00
Transportation	23.460,00	28.115,00	42.681,00	31.304,00
Tourism	463,00	541,00	505,00	385,00
Housing	242,00	683,00	590,00	688,00
Education	10.967,00	12.632,00	14.022,00	16.419,00
Health	5.291,00	6.490,00	6.894,00	6.320,00
Other Services	13.053,00	16.021,00	17.706,00	17.709,00

Total	66.279,00	81.320,00	104.701,00	96.039,00
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When the breakdown of the other transportation and communication investments in between transportation modes are examined for the same period; it is seen that railroads took the second place after the highways, receiving a 20% share with the value of 200 billion TL in total. Whilst airlines received 10% share with the value of 100 billion TL, maritime lines share remained limited to 1% with the value of 10 billion TL (Ulaştırma ve Altyapı Bakanlığı, 2020).

When the transportation modes adopted by the EU Member States are observed, it is seen that almost 40% of the exports are done via maritime lines, 25% via airlines, 25% via highways, and the remaining 10% via railroads and other transportation modes. For the imports, it is observed that the 51% of transportations are done via maritime lines, 22% via airlines, 21% via highways, and approximately 6% via railroads and other transportation modes (Eurostat , 2021).

As for the United States of America (USA), whilst 81% of exports are done via maritime lines, 9% via highways, 6.6% via railroads, 3.3% via pipeline transportation. For the imports, 59% of transportations are done via maritime lines, 12% via highways, 10% via railroads, and 17.8% via pipeline transportation (United States Department of Transportation, 2021).

2. Modes of Transportation

Freight transportation is divided into different modes based on the methods of transport: road transport, maritime transport, air transport, rail transport, pipeline transport, and combined transport. All modes of transportation have various advantages and disadvantages. The preferences on the mode of transportation must be made optimally in terms of freight costs, and appropriately in terms of the type of products from the viewpoint of timing and transportation capacity. Freight should be within the minimum range of logistics balance of costs as well as the capacity conditions, and inclusive of the limits of travel time (Zeng, Hu, & Huang, 2013).

In their study, Meixell and Norbis emphasized that for making a choice on the mode of transportation, matters such as international growth and international problems should be taken into account; and henceforth, modes that sustain low energy consumption in the process of supply chain must be preferred, and all these processes should be supported by logistics information systems (Meixell & Norbis, 2008).

2.1. Maritime Transportation in Turkey

As shown in Table 2, in the period of 2019-2020, 496.642.652 tons of cargo were handled at the Turkish ports; 138.902.823 tons of exports, 226.539.473 tons of imports took place; 504.742 semi-trailer trucks were transported via Ro-Ro ships internationally, and 11.626.650 TEU containers were handled (Ulaştırma ve Altyapı Bakanlığı, 2019).

Tablo 2. Total Handled Cargo (Ton) (Ulaştırma ve Altyapı Bakanlığı, 2019)

Year	Loading	Unloading	Transit	Total Handled Cargo
2011	103,033,885	195,933,688	64,379,150	363,346,723
2012	114,176,944	216,524,857	56,724,431	387,426,232
2013	115,630,332	215,643,211	53,657,215	384,930,758
2014	113,522,539	220,525,259	49,072,821	383,120,619
2015	118,047,006	234,904,592	63,085,097	416,036,695
2016	121,055,111	242,182,744	66,963,307	430,201,162
2017	143,590,078	264,154,093	63,429,725	471,173,896
2018	139,975,189	248,550,111	71,628,260	460,153,560
2019	159,927,595	249,266,519	74,974,298	484,168,412
2020	168,666,379	255,573,301	72,402,972	496,642,652

When the maritime transportation is compared with other transportation modes, it is seen that it has a comparative advantage on cost-effectiveness since it is more suitable for transporting products with larger volumes. Nonetheless, global rates of freight change is directly proportional to the supply-demand prices. The freight costs from port to port (see Table 3) has at most times exceeded 10.000 US dollars, primarily from ports in China to the rest of the world due to the constraints imposed on containers as a result of the Covid-19 pandemic.

Table 3. Rates for Transport by Sea Container (Costs From Port to Port - USD) (Alliance Experts, 2021)

Route	20ft Container	40ft Container
USA-CANADA	600-800 USD	900-1100 USD
USA-CHINA	1600-1800 USD	2400-2700 USD
UK-SPAIN	700-900 USD	1100-1300 USD
UK-AUSTRALIA	2500-2800 USD	4000 - 4500 USD

2.2. Rail Transportation in Turkey

As an environment friendly mode of transportation, railroad transportation is widely preferred across the EU Member States. In fact, railroads are so much identified with the EU Member States that the most of the European cities' central points has train stations. However, both in Europe and Turkey, the inflexibility of railroads in contrast to highways, and the technical problems frequently encountered during the freight transportation cause significant delays and a loss of interest.

Tablo 4. Length of High Speed and Conventional Lines of Turkey (KM) (Ulaştırma ve Altyapı Bakanlığı, 2020)

Length of High Speed & Conventional Lines	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Length of Conventional Lines (Km)	11052	11112	11120	11209	11272	11319	11319	11395	11527	11590	11590
Length of High Speed Lines (Km)	888	888	888	888	1213	1213	1213	1213	1213	1213	1213
Total (Km)	11940	12000	12008	12097	12485	12532	12532	12608	12740	12803	12803

Despite being environment-friendly and more cost-efficient than road transportation, railroad transportation in Turkey, due to its geographical location and due to investments being made on passenger train routes rather than freight train routes, has not been developed like the other modes of transportation; and the conventional rail length has only reached from 7671 km as measured in 1950 to 11590 km in 2020 (see Table 4) (Polatoğlu, 2021).

2.3. Air Transportation in Turkey

In the civil aviation sector in Turkey, there are 10 airline companies that transport passengers and cargo. In the inventory list of these airline companies, the registered number of aircraft in 2015 were recorded as 489, whilst in 2020 this number has reached 554. As shown in Table 5, out of these aircrafts, 523 of them are passenger and 31 of them are cargo aircrafts belonging to the airline companies including THY, MNG ACT and ULS (Sivil Havacılık Genel Müdürlüğü, 2020).

Table 5. Number of Aircraft Carrying Cargo (Sivil Havacılık Genel Müdürlüğü, 2020)

YEAR	TURKISH AIRLINES	MNG AIRLINES	ACT AIRLINES	ULS AIRLINES	TOTAL
2018	15	6	5	3	29

2019	16	6	5	3	30
2020	18	5	5	3	31

The total carrying capacity (cargo+mail+luggage) of the planes used in airline transportation is recorded as 2.453.450 kg. When the mail and luggage items are excluded, the cargo traffic in 2019 has experienced a 10.10% drop in its carrying capacity with the weight of only 1.368.577 kg in total (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü , 2021).

Table 6. Total Air Cargo Traffic of Turkey (Ton) (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü , 2021)

Year	Domestic Line	International Line	Total Cargo Traffic(Ton)
2013	100.097	631.865	731.962
2014	104.941	737.300	842.241
2015	101.447	803.314	904.761
2016	81.587	951.356	1.032.943
2017	75.254	1.180.969	1.256.223
2018	52.807	1.335.815	1.388.622
2019	65.667	1.456.737	1.522.404
2020	51.043	1.317.533	1.368.576

The matter of speed gaining importance in the context of a competitive environment, airline transportation is mostly preferred for the items light in weight and heavy in value. In 2010, airline transportation has increased its share in exports from 6.4% to 8% with the addition of new aircrafts allocated for cargo transport (see Table 5). As seen in Table 6, freight transported via international flights recorded as 631.865 tons in weight in 2013 yet reaching the weight of 1.317.533 tons with an increase of 108% in total (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü , 2021).

2.4. Road Transportation in Turkey

As shown in Table 7, the domestic transportation rates recorded in 2018 show that 89.2% of the transportation was done via road transportation; whilst in contrast to the 2000s, a reduction in the shares of railroad and maritime transportation in the same year was recorded in the same year (Çevre, Şehircilik ve İklim Değişikliği Bakanlığı).

Table 7. Domestic Freight Rates (%) (Çevre, Şehircilik ve İklim Değişikliği Bakanlığı)

	Air Transport	Maritime Transport	Rail Transport	Road Transport
2000	0,2%	7,8%	5,3%	86,7%
2001	0,2%	8,6%	4,3%	86,9%
2002	0,2%	6,3%	4,3%	89,2%
2003	0,2%	5,8%	5,1%	88,9%
2004	0,2%	4,2%	5,4%	90,2%
2005	0,2%	3,5%	5,0%	91,3%
2006		3,6%	5,0%	91,4%
2007		4,8%	4,9%	90,3%
2008		5,5%	5,3%	89,2%
2009		5,8%	5,2%	89,0%
2010		5,9%	5,3%	88,8%
2011		6,9%	5,1%	88,0%
2012		6,6%	4,8%	88,6%
2013		6,9%	4,4%	88,7%
2014		5,9%	4,6%	89,5%
2015		6,3%	3,9%	89,8%
2016		6,1%	4,1%	89,8%
2017		6,4%	4,3%	89,3%
2018		6,0%	4,8%	89,2%

Apart from taking the lead in the domestic transportation, road transportation takes the second place after maritime transportation in foreign trade transactions in Turkey. Besides, Turkey is one of the leading countries in Europe that has one of the largest vehicle fleets (TÜSiAD, 2012).

One of the main reasons for that can be explained based on the fact that road transportation with the largest share in the budget, is much more developed than other modes of transportation since Turkey has a transit location and is considered as an important logistics base. Particularly after the operationalization of the new highways, it became possible to bypass the roads in city centers hence shortening the travel time in general. With the investments used for the operationalization of Kuzey Marmara and İstanbul-İzmir highways, the length of the highways has reached 3523 km in 2020 from 2080 km recorded in 2000 (see Table 8) (Ulaştırma ve Altyapı Bakanlığı , 2021).

Table 8. Highway Length of Turkey (KM) (Ulaştırma ve Altyapı Bakanlığı , 2021)

Highway Length	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
State Highways (Km)	31.395	31.372	31.375	31.341	31.280	31.213	31.106	31.066	31.021	31.006	30.974
Provincial Roads (Km)	31.390	31.558	31.880	32.155	32.474	33.065	33.513	33.896	34.153	34.165	34.136
Motorways (Km)	2.080	2.119	2.127	2.244	2.278	2.282	2.542	2.657	2.842	3.060	3.523
Total (Km)	64.865	65.049	65.382	65.740	66.032	66.560	67.161	67.619	68.016	68.231	68.633

2.5. Pipeline Transportation in Turkey

Turkey, due to its geostrategic location has an important place in the global energy market. Also being a transit country in between petroleum and natural gas producer and consumer countries, increases Turkey’s role at the regional level (Güneş, 2018). In this context, the state investments on natural gas pipelines continue increase. As seen in Table 9, the natural gas pipeline with the length of 1126 km in 1995 has reached 3060 km in 2019. When looked at the new pipeline projects developed in years, it is seen that Turkey as a country which is neighboring the central petroleum and natural gas reserve basins in the world, is able to import the petroleum and natural gas it needs via these pipelines and at the same time contributes to the energy transport as a transit country due to its geographical location (European Commission, 2021).

Table 9. Length of Oil Pipelines (KM) (European Commission, 2021)

YEAR	LENGTH OF OIL PIPELINES (KM)
1995	1126
2000	2112

2005	3065
2010	3038
2015	3053
2018	3060
2019	3060

Turkey, whilst supplying with the energy import that it needs via these pipelines, as a transit country, it also takes the advantage of the projects it is involved on the petroleum and natural gas pipelines. Foremost among these advantages is the payments made to the transit country by the importing countries; and the supply of the petroleum or natural gas resources from the reserves saved for the transit transfer in the cases of sudden increase in the consumption of these energy resources (Enerji ve Tabii Kaynaklar Bakanlığı, 2021).

3. Foreign Trade in Turkey by Modes of Transport

3.1. Export by Modes of Transport

As it can be seen in Table 11 and Table 12, in the last decade, the maritime transportation has received the largest share in exports in terms of the value of the freight. Road transportation on the other hand takes the second place in terms of providing added value to Turkey's exports. Nonetheless, when these two modes of transportation are examined, it is seen that road transportation had 40.88% share in exports whereas this has dropped down to 30.7% in 2020; and maritime transportation in the same period has increased from 51.42% to 59.7%.

Table 10. Percentage Shares of Transport Types in Exports by Years (By Percent) (Güler, 2020)

YEAR	ROAD TRANSPORT	AIR TRANSPORT	MARITIME TRANSPORT	RAIL TRANSPORT	OTHER*
2010	40,88	6,84	51,4	0,88	0
2011	37,6	6,42	55,05	0,93	0
2012	33,35	14,4	51,58	0,67	0
2013	35,66	8,61	55,09	0,64	0
2014	35,29	9,01	55,11	0,59	0
2015	32,7	12,1	54,64	0,56	0

2016	31,62	12,54	55,39	0,45	0
2017	29,59	10,98	58,99	0,44	0
2018	28	8,25	63,31	0,44	0
2019	30,36	8,28	60,82	0,54	0
2020	31,3	7,5	59,5	0,8	0,9
2021 (JAN.- OCT.)	30,7	8	59,7	0,7	0,9

*Includes; the pipeline, postal services, electric power transmission and self-propelled vehicles.

When Turkey’s exports are examined based on weight, parallel results are obtained with that of the value-based results. Particularly based on value, in 2015 the value of the exports recorded as 79.762.173 billion dollars, whereas in 2021, this value has reached 120.387.912 billion dollars. Airline and railroad transportations on the other hand get a small share in Turkey’s exports due to their limited capacities and insufficient levels of infrastructure or unsuitable geographical conditions. It is foreseen that the shares of airline transportation are likely to increase when the value of the exported products increase (Güler, 2020).

Table 11. Export by Mode of Transport 2013-2021 (General Trade System-USD) (Güler, 2020)

YEAR	ROAD TRANSPORT	AIR TRANSPORT	MARITIME TRANSPORT	RAIL TRANSPORT	OTHER*	TOTAL
2013	57.804.104	13.200.118	88.197.732	994.652	1.284.309	161.480.915
2014	61.133.176	14.388.661	88.900.953	964.170	1.117.902	166.504.862
2015	51.946.113	17.400.190	79.762.173	861.740	1.011.898	150.982.114
2016	49.537.436	17.908.782	80.139.270	673.816	987.696	149.246.999
2017	50.988.408	17.217.240	93.378.625	699.915	2.210.432	164.494.619
2018	52.222.468	14.127.905	108.802.681	753.544	1.262.157	177.168.756
2019	54.461.860	14.849.231	109.114.264	971.021	1.436.347	180.832.722

2020	53.127.588	12.732.561	100.907.927	1.287.765	1.581.914	169.637.755
2021	62.304.873	16.810.158	120.387.912	1.487.369	2.103.226	203.093.538

3.2. Import by Modes of Transport

As it can be seen in Table 12 and Table 13, the 58.5% of Turkey's imports based on the value and weight are made via maritime lines and 18.3% via highways.

Table 12. Percentage Shares of Transport Types in Imports by Years (By Percent) (Güler, 2020)

YEAR	ROAD TRANSPORT	AIR TRANSPORT	MARITIME TRANSPORT	RAIL TRANSPORT	OTHER*
2010	26,75	9,54	62,16	0,88	0,67
2011	21,97	10,62	65,85	0,93	0,63
2012	20,26	12,23	66,31	0,67	0,53
2013	18,69	15,21	65,28	0,64	0,18
2014	18,23	12,07	69,11	0,59	0
2015	19,09	11,11	69,14	0,56	0,1
2016	19,16	12,83	67,22	0,45	0,34
2017	18,01	16,33	65,1	0,44	0,12
2018	17,88	14,4	67,09	0,44	0,19
2019	20,56	16,17	62,47	0,54	0,26
2020	19,1	17,9	52,3	0,7	10
2021 (JAN.- OCT.)	18,3	10,1	58,5	1,1	12

*Includes; the pipeline, postal services, electric power transmission and self-propelled vehicles.

When the statuses of import and export are examined based on different modes of transportation, the most visible changes involve the dropping back of the share of railroad transportation to 18.3% in imports and the statistical data on the share of the other modes of transportation rising up to 12.63% of the total imports.

Table 13. Import by Mode of Transport 2013-2021 (General Trade System - USD) (Güler, 2020)

YEAR	ROAD TRANSPORT	AIR TRANSPORT	MARITIME TRANSPORT	RAIL TRANSPORT	OTHER*	TOTAL
2013	43.544.972	32.759.358	146.444.550	1.784.905	36.289.018	260.822.803
2014	40.577.283	24.889.608	147.778.523	1.253.892	36.643.124	251.142.429
2015	37.840.932	20.159.751	126.868.187	1.434.902	27.315.439	213.619.211
2016	36.716.500	23.107.208	121.013.276	1.768.602	19.583.655	202.189.242
2017	40.374.083	34.439.948	138.596.809	1.294.504	24.009.784	238.715.128
2018	39.129.380	28.756.745	136.737.402	1.299.419	25.229.537	231.152.483
2019	37.177.012	29.238.406	112.967.845	1.447.897	29.514.041	210.345.203
2020	41.883.477	39.260.478	114.838.355	2.144.863	21.389.634	219.516.807
2021	44.167.395	23.833.328	141.174.732	2.626.105	30.641.730	242.443.290

The most important reason for this is the use of pipelines in the category of the other modes of transportation to import energy resources (natural gas and petroleum). One other change took place in the airline transportation based on both value and weight; and the reason for that is the use of airline transportation for the goods heavy in value as shown in Table 14 (Güler, 2020).

Table 14. Average Value of 1 Kilogram Cargo (USD) (Güler, 2020)

Year	ROAD TRANSPORT		AIR TRANSPORT		MARITIME TRANSPORT		RAIL TRANSPORT	
	Export	Import	Export	Import	Export	Import	Export	Import
2016	4,59	1,76	184,65	21,1	0,63	1,02	1,66	1,2
2017	4,36	1,79	259,32	18,15	0,66	1,03	1,45	1,02
2018	4,27	1,8	253,14	13,1	0,68	1,07	1,45	1,2
2019	4	2,06	245,54	11,35	0,55	0,89	1,38	1,42

2020 (JAN-OCT)	4,18	2,04	423,35	22,36	0,53	0,75	1,65	1,35
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4. Imports and Exports by Region and the Modes of Transport Used

When Turkey's export and import numbers are analyzed based on the regions and cities, it is observed that there is not a homogenous distribution as far as the geographic context is concerned. Table 15 and Table 16 show that in 2021, 62.7% of Turkey's exports took place in the Marmara, 12% in the Aegean, 8.5% in the Central Anatolia, 6.6% in the Mediterranean, 6.2% in the Southeast Anatolian, 3.5% in the Black Sea, and 0.5% in the East Anatolian regions. When the Marmara region is analyzed separately, it is observed that the 68.5% of the total exports are carried out by the firms registered in the county town of İstanbul. The import numbers also show that the Marmara region takes the lead with 62.8% share in imports; and it is followed respectively by the Central Anatolia region with 7.8%, the Mediterranean and the Aegean regions with 6.4%, the Southeast Anatolian region with 3%, the Black Sea region with 1.5%, and the East Anatolian region with 0.6%. With regards to the import numbers, there is also a registered confidential data worth 27.326.000 dollars. The breakdown of the imports based on cities show that İstanbul takes the lead with 51.2% followed by Kocaeli, Ankara and İzmir (TÜİK, 2021).

Table 15. Export By Regios & Cities (General Trade System – Thousand Dollars) (TÜİK, 2021)

CITY	2013	2014	2015	2016	2017	2018	2019	2020	2021	REGION
UŞAK	260.347	269.267	224.144	249.915	249.737	244.766	253.834	241.619	368.638,20	Aegean Region
AFYONKARAHİSAR	358.935	359.751	303.355	309.292	339.840	369.665	408.669	371.264	380.794,60	Aegean Region
KÜTAHYA	172.286	182.039	169.214	180.545	216.016	217.305	220.825	234.443	390.691,95	Aegean Region
MUĞLA	292.520	344.727	383.567	415.924	448.790	508.257	567.509	608.142	774.043,30	Aegean Region
AYDIN	681.424	726.715	622.624	607.401	692.652	717.904	746.879	768.614	859.202,55	Aegean Region
DENİZLİ	2.694.157	2.774.038	2.483.397	2.374.601	2.742.274	3.063.896	2.883.701	2.866.931	4.574.358,28	Aegean Region
MANİSA	1.823.648	1.962.498	1.817.853	1.848.106	1.971.952	2.269.716	2.438.424	2.276.515	5.205.188,31	Aegean Region
İZMİR	10.862.890	11.110.894	9.458.963	9.713.438	10.934.381	12.264.536	12.168.872	11.609.970	12.230.575,02	Aegean Region
BAYBURT	316	1.249	7.361	6.912	117	1.227	485	7	44,53	Black Sea Region
BARTIN	20.299	11.176	12.473	13.806	19.646	33.585	29.025	25.731	26.009,15	Black Sea Region
TOKAT	27.758	27.641	23.080	17.456	18.034	19.318	18.817	34.217	33.866,28	Black Sea Region
SİNOP	31.314	25.829	19.530	21.296	19.586	28.624	30.225	29.981	35.220,88	Black Sea Region
ARTVİN	67.654	85.779	66.927	56.118	52.924	52.693	48.809	55.557	55.840,94	Black Sea Region

GÜMÜŞHANE	6	208	27	37	51.258	34.226	49.532	38.076	67.407,72	Black Sea Region
AMASYA	86.267	97.920	88.776	75.690	93.050	109.959	114.220	91.634	71.659,62	Black Sea Region
BOLU	155.361	178.446	119.093	133.024	141.110	144.544	122.652	111.110	152.084,16	Black Sea Region
RİZE	354.741	315.612	196.017	160.977	160.852	151.009	169.351	165.692	207.348,18	Black Sea Region
GİRESUN	149.461	212.722	190.551	165.990	153.803	149.693	229.184	259.960	356.088,95	Black Sea Region
ORDU	169.078	202.317	221.045	163.115	225.273	204.168	245.986	234.774	365.099,15	Black Sea Region
KASTAMONU	129.290	43.813	42.803	43.797	92.534	124.748	94.494	302.499	401.470,37	Black Sea Region
DÜZCE	95.493	94.396	88.783	97.474	107.650	109.025	184.610	225.156	407.230,95	Black Sea Region
KARABÜK	257.739	296.191	214.224	244.913	325.786	367.166	382.771	414.947	627.843,31	Black Sea Region
ZONGULDAK	297.579	401.000	189.361	231.719	313.874	471.771	404.698	408.934	816.864,08	Black Sea Region
ÇORUM	174.953	241.303	333.283	209.640	171.714	714.557	1.539.823	909.396	1.123.906,43	Black Sea Region
TRABZON	1.183.247	1.324.443	1.552.530	1.342.442	1.200.923	1.064.045	1.164.033	1.060.371	1.183.889,62	Black Sea Region
SAMSUN	423.397	465.377	402.714	367.582	461.934	642.185	730.349	743.703	1.272.513,86	Black Sea Region
YOZGAT	21.495	16.921	11.091	10.648	11.952	9.522	13.499	15.284	16.417,14	Central Anatolia Region
SİVAS	78.550	91.375	77.886	80.166	93.109	96.098	92.752	92.338	71.713,22	Central Anatolia Region
KIRIKKALE	14.956	17.310	16.625	19.913	10.472	11.124	12.731	11.130	77.404,13	Central Anatolia Region
NİĞDE	68.923	68.184	57.106	58.898	61.202	59.106	58.414	62.848	79.750,26	Central Anatolia Region
NEVŞEHİR	49.038	46.818	36.890	50.052	61.227	54.539	69.545	51.085	95.056,00	Central Anatolia Region
KIRŞEHİR	209.242	213.225	169.609	167.988	189.169	225.213	222.932	203.441	126.958,99	Central Anatolia Region
AKSARAY	74.124	85.363	78.672	79.949	99.344	113.748	119.092	111.958	170.446,66	Central Anatolia Region
KARAMAN	334.817	357.482	299.508	305.597	318.170	301.870	266.526	257.227	274.941,73	Central Anatolia Region
ÇANKIRI	61.253	69.252	68.575	78.858	148.618	183.927	250.693	232.216	286.466,14	Central Anatolia Region
ESKİŞEHİR	818.979	904.060	827.323	856.794	896.696	1.048.551	1.134.818	927.266	1.165.351,84	Central Anatolia Region

KAYSERİ	1.889.386	2.120.071	1.809.533	1.743.457	1.876.654	2.362.967	2.496.210	2.625.497	2.897.741,78	Central Anatolia Region
KONYA	1.353.485	1.482.362	1.354.000	1.314.247	1.548.956	1.782.997	1.990.513	2.166.857	2.997.558,21	Central Anatolia Region
ANKARA	7.921.971	8.494.588	7.181.228	6.679.492	6.930.439	7.827.802	8.464.471	8.006.398	9.321.527,95	Central Anatolia Region
TUNCELİ	43	328	237	131	520	646	229	225	332,64	Eastern Anatolia Region
KARS	635	411	0	136	361	208	487	1.247	1.274,10	Eastern Anatolia Region
MUŞ	32.148	8.943	868	496	7.260	5.948	1.633	134.865	2.263,31	Eastern Anatolia Region
BİNGÖL	6.295	8.551	3.559	1.202	1.688	971	1.134	2.836	4.676,77	Eastern Anatolia Region
ARDAHAN	510	1.208	1.054	1.835	2.055	1.315	1.893	3.583	5.339,12	Eastern Anatolia Region
BİTLİS	3.471	4.550	3.534	2.663	3.989	6.369	5.379	4.782	7.196,96	Eastern Anatolia Region
ERZİNCAN	7.430	6.062	6.251	9.219	10.501	11.244	14.935	20.483	24.068,53	Eastern Anatolia Region
ERZURUM	38.514	33.140	19.992	17.516	17.073	15.283	22.362	23.549	28.480,26	Eastern Anatolia Region
AĞRI	60.085	86.395	91.152	59.136	52.047	30.602	36.150	33.671	34.565,96	Eastern Anatolia Region
HAKKARİ	280.612	389.443	185.799	23.588	72.050	58.522	44.440	38.204	35.319,33	Eastern Anatolia Region
VAN	27.561	28.784	20.435	38.790	44.740	38.797	49.591	25.358	59.131,55	Eastern Anatolia Region
İĞDIR	140.707	123.497	132.433	97.566	106.302	91.360	76.377	86.198	94.477,32	Eastern Anatolia Region
ELAZIĞ	262.529	234.682	169.676	252.668	321.291	221.191	209.767	148.940	335.893,82	Eastern Anatolia Region
MALATYA	307.737	311.199	250.101	248.397	235.780	224.177	278.957	288.953	425.127,67	Eastern Anatolia Region
KIRKLARELİ	256.097	400.155	502.029	183.247	164.326	175.743	188.102	179.744	16.000,87	Marmara Region
EDİRNE	31.353	42.830	36.947	39.333	42.166	51.762	60.057	68.188	63.041,71	Marmara Region
ÇANAĞKALE	198.011	149.209	129.482	108.963	124.917	152.911	169.681	147.071	78.834,47	Marmara Region
BİLECİK	80.079	79.830	124.304	77.180	96.923	101.366	89.502	109.546	116.290,89	Marmara Region

BALIKESİR	619.082	533.940	516.550	519.248	533.760	598.754	579.246	604.146	789.924,79	Marmara Region
YALOVA	305.967	265.139	256.569	358.030	380.152	310.864	438.857	528.665	855.675,96	Marmara Region
TEKİRDAĞ	1.819.296	1.760.276	1.541.084	1.495.402	1.616.206	1.913.609	1.948.239	1.925.277	1.370.410,98	Marmara Region
SAKARYA	2.352.657	2.724.406	2.077.529	2.685.657	5.364.278	5.735.632	5.351.062	4.623.705	5.099.790,15	Marmara Region
BURSA	9.456.295	9.970.943	9.140.463	10.364.727	11.066.414	11.716.921	10.898.036	9.548.796	14.959.238,46	Marmara Region
KOCAELİ	9.346.061	9.068.910	7.403.620	6.495.764	8.134.520	9.035.750	9.917.083	7.719.019	17.331.600,63	Marmara Region
İSTANBUL	81.576.600	84.831.850	79.274.723	77.766.581	83.448.092	88.203.471	88.827.640	82.853.001	88.860.053,20	Marmara Region
BURDUR	137.863	201.607	209.606	179.272	206.913	201.993	206.446	222.113	291.240,58	Mediterranean Region
OSMANIYE	133.794	93.680	136.783	142.724	163.040	273.180	306.476	205.294	423.902,19	Mediterranean Region
ISPARTA	135.478	137.670	127.334	151.793	193.367	198.749	210.895	205.589	440.204,12	Mediterranean Region
KAHRAMANMARAŞ	846.406	907.913	811.532	866.656	935.686	978.598	890.749	861.150	1.395.484,32	Mediterranean Region
ANTALYA	1.289.253	1.257.890	1.184.483	1.268.978	1.581.492	1.668.718	1.769.892	1.990.744	1.865.831,32	Mediterranean Region
ADANA	1.901.578	1.913.737	1.666.503	1.597.913	1.836.671	2.017.698	1.947.764	1.869.258	2.492.154,91	Mediterranean Region
MERSİN	3.383.857	3.231.017	2.469.650	2.633.264	2.682.629	2.814.211	3.091.336	3.209.165	2.601.046,15	Mediterranean Region
HATAY	2.889.945	2.302.460	1.903.731	1.827.033	2.410.737	2.965.359	3.063.174	2.657.968	4.046.191,65	Mediterranean Region
BATMAN	44.646	46.655	32.114	26.924	47.867	44.443	35.728	36.852	41.704,26	Southeastern Anatolia Region
SİİRT	9.785	1.368	13.053	133.296	27.990	19.762	39.485	75.151	87.961,07	Southeastern Anatolia Region
ADIYAMAN	100.376	339.028	548.636	344.303	137.788	85.269	67.278	88.468	116.176,02	Southeastern Anatolia Region
ŞANLIURFA	224.891	267.067	274.787	191.625	143.509	150.115	153.873	153.412	166.348,34	Southeastern Anatolia Region
DİYARBAKIR	281.376	254.084	192.754	159.575	198.064	212.778	218.852	254.446	231.252,13	Southeastern Anatolia Region
KİLİS	26.183	46.023	83.167	107.300	86.940	94.543	71.293	68.204	309.401,32	Southeastern Anatolia Region

ŞIRNAK	1.140.825	770.362	578.779	475.614	567.565	429.143	464.039	642.193	820.105,32	Southeastern Anatolia Region
MARDİN	1.091.117	975.263	913.616	923.368	982.816	905.276	832.736	962.941	958.756,63	Southeastern Anatolia Region
GAZİANTEP	6.707.624	6.950.431	6.719.406	6.860.579	6.990.184	7.208.951	7.811.872	8.163.001	10.092.165,38	Southeastern Anatolia Region
Unknown	259.758	21.566	8.048	12.040	2.233	40.502	21	5.735		Unknown
TOTAL	157.021.244	161.848.326	146.795.813	145.109.321	159.805.310	172.046.963	175.751.304	164.553.514	203.247.200,38	

The data shown in Table 15 and Figure 1 proves that İstanbul, Kocaeli and Bursa are the leading cities wherein the large part of Turkey's exports take place. Table 16 on the other hand shows that İstanbul and Kocaeli are the two main cities involved in Turkey's imports (TÜİK, 2021).

Table 16. Import By Regions & Cities (General Trade System – Thousand Dollars) (TÜİK, 2021)

CITY	2013	2014	2015	2016	2017	2018	2019	2020	2021 (JAN-DEC)	REGION
Afyonkarahisar	57 119	57 136	47 619	110 438	103 279	79 265	76 357	83 624	45 061	Aegean Region
Aydın	256 492	238 189	261 192	240 885	241 434	245 139	199 303	205 615	289 633	Aegean Region
Denizli	2 105 092	2 078 609	1 785 947	1 527 304	1 910 261	1 922 732	1 429 327	1 459 302	1 906 230	Aegean Region
İzmir	11 769 194	11 114 600	9 808 915	9 743 666	10 912 751	10 585 579	8 676 072	8 476 251	9 864 108	Aegean Region
Kütahya	122 292	180 481	131 185	102 321	148 381	104 410	83 804	131 122	122 054	Aegean Region
Manisa	2 717 724	3 275 865	3 209 470	2 535 749	3 079 661	2 750 865	2 382 351	2 432 464	2 961 668	Aegean Region
Muğla	415 710	114 983	119 809	171 629	267 090	248 252	318 136	281 519	261 753	Aegean Region
Van	45 414	50 399	32 574	58 308	106 321	83 147	163 016	18 091	20 813	Aegean Region
Amasya	25 568	36 315	26 285	42 798	40 065	48 448	39 855	38 515	41 706	Black Sea Region
Artvin	36 495	30 454	29 275	24 747	36 298	23 336	23 673	17 793	27 394	Black Sea Region
Bartın	7 897	8 411	11 964	11 472	10 250	12 881	6 269	4 204	3 631	Black Sea Region
Bayburt	4 099	2 720	4 027	12 264	583	225	4	72	72	Black Sea Region
Bolu	211 132	190 215	177 909	146 799	191 322	173 379	157 832	164 838	158 024	Black Sea Region
Çorum	111 137	305 160	283 250	231 677	220 071	514 916	1 656 627	2 647 202	818 022	Black Sea Region

Düzce	81 322	83 275	91 626	73 520	80 686	82 215	118 182	134 964	194 265	Black Sea Region
Giresun	9 445	14 426	13 520	14 628	16 436	21 379	14 048	23 568	18 955	Black Sea Region
Gümüşhane	2 127	77	1 306	159	138	4 830	1 287	2 958	1 008	Black Sea Region
Karabük	519 719	568 411	629 783	418 266	683 140	733 438	742 764	615 593	1 099 433	Black Sea Region
Kastamonu	54 256	60 810	159 444	150 512	189 837	238 641	87 262	149 194	156 953	Black Sea Region
Ordu	33 729	50 922	48 359	38 814	62 391	35 981	20 970	22 497	30 953	Black Sea Region
Rize	38 155	38 423	20 596	16 874	10 397	16 287	26 984	34 263	44 504	Black Sea Region
Samsun	778 068	773 568	645 672	558 050	764 740	828 304	706 924	788 046	1 016 234	Black Sea Region
Sinop	6 027	6 419	9 914	10 405	5 123	10 040	7 371	9 444	7 996	Black Sea Region
Tokat	21 216	21 255	24 671	18 341	19 318	17 605	14 621	12 787	12 792	Black Sea Region
Trabzon	109 882	113 044	201 246	87 504	68 566	87 873	90 319	98 371	113 505	Black Sea Region
Aksaray	46 112	48 192	58 068	48 540	49 271	73 734	36 420	39 703	52 791	Central Anatolia Region
Ankara	10 669 185	11 077 124	9 676 835	10 755 943	12 178 015	13 410 355	11 027 600	11 457 722	13 349 313	Central Anatolia Region
Çankırı	31 792	91 846	70 720	91 881	139 882	143 689	182 155	133 051	156 704	Central Anatolia Region
Eskişehir	710 580	764 562	682 810	681 300	779 451	890 272	852 173	779 237	876 321	Central Anatolia Region
Karaman	103 101	102 398	117 282	121 133	114 115	89 356	87 267	102 098	72 419	Central Anatolia Region
Kayseri	1 529 514	1 470 946	1 282 317	1 329 596	1 784 386	1 340 390	1 066 746	1 229 581	1 560 433	Central Anatolia Region
Kırıkkale	7 974	8 237	10 056	17 304	5 958	11 924	20 824	11 072	17 877	Central Anatolia Region
Kırşehir	188 694	195 180	185 536	204 563	279 245	326 462	281 822	252 088	331 220	Central Anatolia Region
Konya	1 073 134	1 277 380	1 049 628	916 891	970 334	828 158	752 777	877 587	1 056 955	Central Anatolia Region
Nevşehir	35 081	37 235	42 137	32 401	33 762	47 942	40 664	23 325	27 456	Central Anatolia Region
Niğde	32 119	47 704	30 270	34 757	28 425	36 839	45 578	60 877	56 022	Central Anatolia Region

Sivas	122 578	49 377	44 975	54 889	50 254	50 958	45 692	37 476	50 061	Central Anatolia Region
Zonguldak	1 349 958	1 186 590	1 037 874	771 108	1 306 689	1 350 582	1 177 306	1 174 579	1 687 479	Central Anatolia Region
Ağrı	91 022	67 245	90 232	133 152	191 469	93 976	96 295	68 367	76 525	Eastern Anatolia Region
Ardahan	189	-	156	337	96	-	-	158	45	Eastern Anatolia Region
Bingöl	966	1 110	681	1 028	16 351	988	485	952	598	Eastern Anatolia Region
Bitlis	1 971	2 622	1 786	16 092	7 937	3 186	1 718	1 333	1 593	Eastern Anatolia Region
Elazığ	21 624	22 485	19 816	45 108	50 804	22 688	22 166	26 250	19 833	Eastern Anatolia Region
Erzincan	22 806	18 360	8 237	6 788	8 410	4 723	1 763	1 425	1 797	Eastern Anatolia Region
Erzurum	34 301	37 611	36 258	30 184	38 237	43 095	34 106	45 022	97 152	Eastern Anatolia Region
Hakkari	40 586	70 818	8 457	10 118	48 591	38 001	44 705	37 135	67 200	Eastern Anatolia Region
Iğdır	11 120	17 184	15 264	16 715	30 184	21 378	15 508	13 048	15 881	Eastern Anatolia Region
Kars	2 780	3 385	1 336	2 263	4 273	10 350	3 241	1 046	1 082	Eastern Anatolia Region
Malatya	77 548	86 767	73 124	88 893	125 892	102 412	94 189	114 404	98 893	Eastern Anatolia Region
Muş	2 859	1 663	1 389	2 189	1 086	1 371	1 315	111 663	78 492	Eastern Anatolia Region
Tunceli	771	62	486	279	2 662	93	478	135	922	Eastern Anatolia Region
Yalova	173 144	177 283	191 955	169 424	610 612	573 198	641 957	649 002	973 090	Eastern Anatolia Region
Balikesir	611 161	495 317	437 317	395 799	402 148	398 221	412 547	401 905	495 865	Marmara Region
Bilecik	102 732	138 192	89 357	110 827	122 158	119 226	52 414	53 889	73 815	Marmara Region
Bursa	8 266 123	8 465 324	8 361 708	9 139 341	9 524 265	8 892 031	7 982 429	7 606 514	7 779 946	Marmara Region
Çanakkale	96 702	80 548	78 401	79 552	87 016	85 086	67 659	86 511	97 741	Marmara Region
Edirne	102 278	106 793	72 828	79 949	95 580	66 722	90 074	108 731	107 346	Marmara Region

İstanbul	146 056 467	139 891 414	121 178 389	117 092 959	135 791 869	125 175 604	109 280 926	126 858 302	124 802 730	Marmara Region
Kırklareli	158 238	115 969	102 929	325 991	132 565	149 754	190 144	152 196	176 753	Marmara Region
Kocaeli	12 810 449	13 015 339	9 579 959	8 899 210	22 006 951	14 508 972	8 848 257	9 560 514	13 360 713	Marmara Region
Sakarya	1 769 366	1 751 246	1 600 861	2 205 251	3 185 522	3 244 739	3 035 322	2 915 926	2 858 180	Marmara Region
Tekirdağ	2 797 361	1 977 055	1 572 873	1 405 695	1 559 286	1 707 202	1 639 959	1 651 160	2 181 662	Marmara Region
Yozgat	7 216	8 050	9 114	27 538	28 453	21 884	25 331	20 980	13 296	Marmara Region
Adana	2 604 864	2 460 616	1 836 681	1 682 349	1 979 631	2 062 409	2 114 734	2 127 118	3 142 392	Mediterranean Region
Antalya	879 485	1 012 889	1 125 977	1 258 975	1 285 505	993 249	1 055 288	1 155 561	1 176 473	Mediterranean Region
Burdur	23 844	21 520	27 909	38 253	45 991	36 548	18 410	24 419	36 921	Mediterranean Region
Hatay	4 163 225	3 533 621	3 626 195	2 988 212	4 254 361	4 142 469	3 882 827	3 733 336	5 875 406	Mediterranean Region
Isparta	54 431	48 055	45 530	96 247	85 254	46 601	36 467	38 084	48 719	Mediterranean Region
Kahramanmaraş	1 172 399	1 217 453	1 004 577	1 170 703	1 320 502	1 126 245	1 134 298	982 322	1 128 069	Mediterranean Region
Mersin	4 377 188	3 906 526	2 417 512	2 430 207	2 715 794	2 293 598	2 767 004	2 841 198	3 413 407	Mediterranean Region
Osmaniye	648 343	836 973	692 040	566 328	623 175	709 091	480 150	494 677	711 173	Mediterranean Region
Adıyaman	47 060	56 103	44 987	53 069	86 507	47 771	42 078	67 091	64 284	Southeastern Anatolia Region
Batman	31 401	29 522	24 016	36 750	147 832	68 856	40 407	42 537	21 967	Southeastern Anatolia Region
Diyarbakır	98 839	55 507	54 834	53 582	73 880	71 022	72 234	104 696	93 717	Southeastern Anatolia Region
Gaziantep	5 072 731	5 381 079	4 478 431	4 507 358	5 068 823	4 874 476	5 065 632	5 276 938	6 525 930	Southeastern Anatolia Region
Kilis	21 051	21 795	39 832	35 410	41 245	65 091	36 984	50 794	56 852	Southeastern Anatolia Region
Mardin	122 885	149 789	104 442	101 532	153 438	151 829	261 592	327 557	327 092	Southeastern Anatolia Region
Siirt	5 259	11 719	7 550	97 930	11 817	40 565	25 944	13 887	30 126	Southeastern Anatolia Region

Şanlıurfa	225 819	244 690	147 622	141 829	162 498	148 534	203 018	231 523	307 451	Southeastern Anatolia Region
Şırnak	208 813	104 909	93 824	89 481	83 195	46 719	69 205	60 877	63 746	Southeastern Anatolia Region
Uşak	204 844	240 015	193 973	196 307	242 088	208 473	165 217	180 443	195 353	Unknown
Confidential Data	31 650 160	29 287 655	21 953 872	14 878 639	9 262 206	21 086 862	27 624 317	17 239 472	27 326 081	
Nonspecified	511 247	199 217	102 428	73 967	110 643	177 350	6 024	7 018	5 167	
TOTAL	243 379 180	234082 565	213619 211	187757 252	222 052 270	215 216 240	197 179 851	206 446 910	226 992 785	

When the regional impact of foreign trade is analyzed, the export and import mobility in geographical terms, fitted tightly within 200 square kilometer north-south and east-west lines; and this tightness brings along certain risks. In fact, despite export-import activities go on in this region with all modes of transportation, heavy road, i.e., truck/lorry mobility is experienced; and due to the positioning of the production facilities near to transfer ports, airports or railroads condenses heterogeneously the population density in these regions

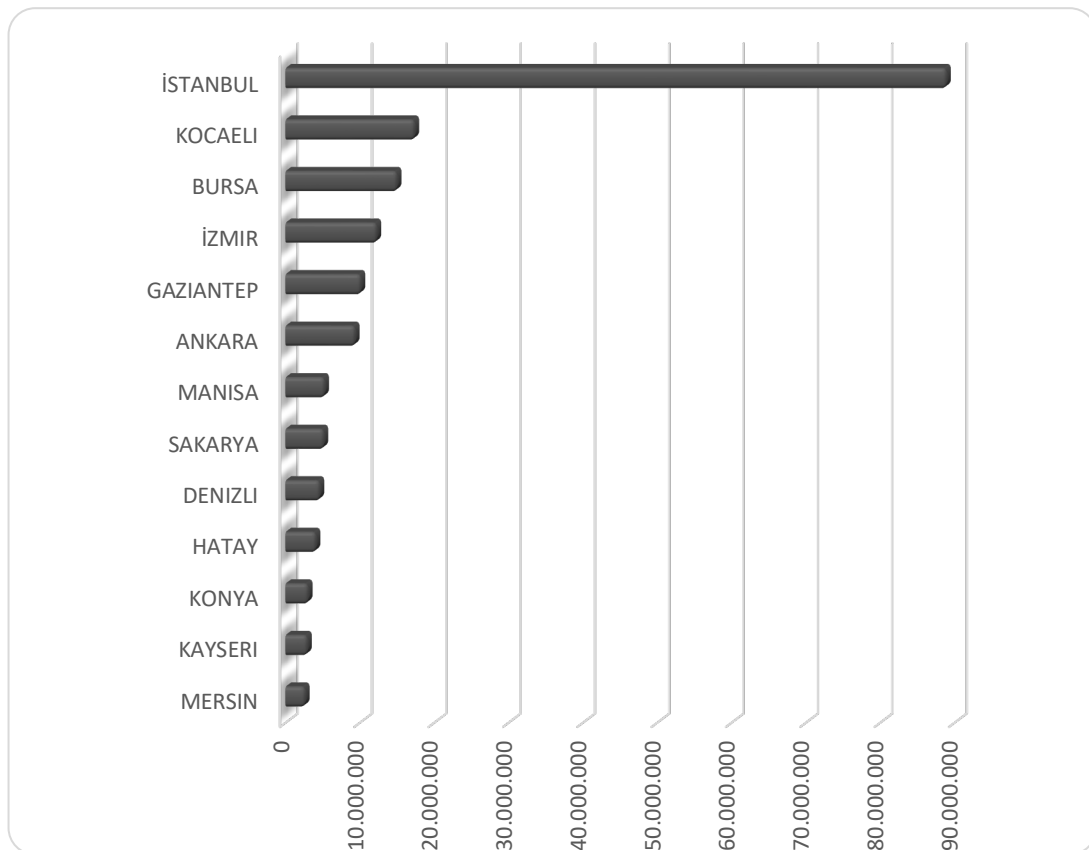


Figure 1. 10 Biggest Turkish Exporting Cities (Thousand Dollars) (TİM, 2021)

METHODS:

In this study, estimation was made using the single exponential smoothing method. In the single exponential correction method, the most recent observation value in the data pattern

is given the highest weight, and the previous observation values are given a decreasing weight. Here, the aim is to mathematically reduce historical data to reduce randomness a way to fix it. The estimation in the single exponential smoothing technique is as follows: calculated as:

$$St+1 = \alpha Dt + (1 - \alpha)St$$

Here: $St+1$: forecast value for period t+1

α : A fixed correction factor

St : predicted value at time t

Dt : actual value at time t

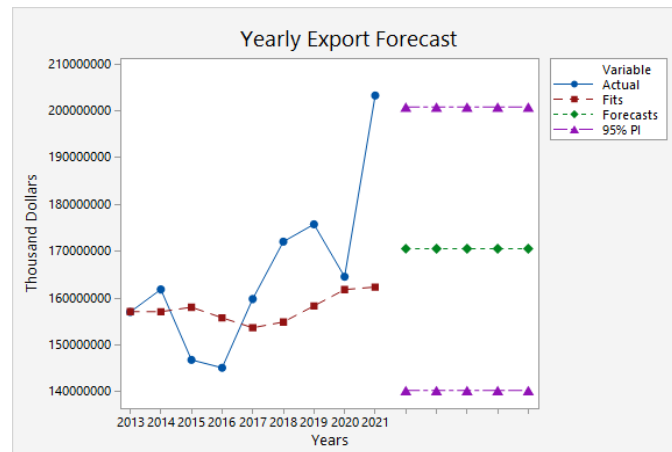


Figure 2. Yearly Export Forecast

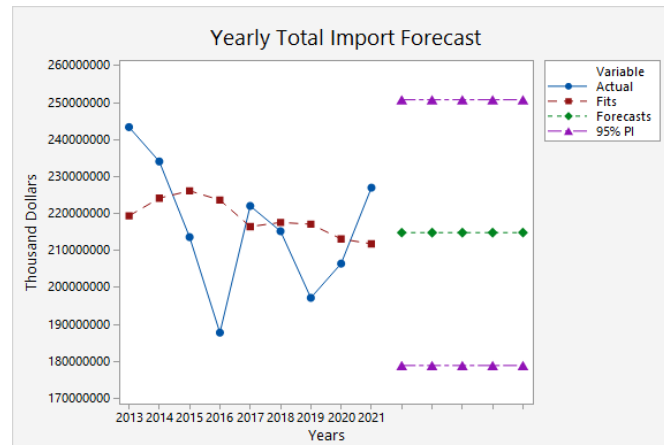


Figure 3. Yearly Import Forecast

RESULTS:

For the first time in history, whilst Turkey’s exports in 2021 have risen at the rate of 32.9% compared to the previous year with the value of 225 billion 368 million dollars; its foreign trade volume has reached 496.7 billion dollars; and the export/import coverage ratio has increased with the margin of 5.8% compared to the previous year, reaching up to 83.1% in 2021. Also in 2021, while all the 81 cities in Turkey have their share in exports, the total number of export firms has risen to 101.386.

When the modes of transportation of exports registered in 2021 is examined, it is observed that the “Maritime Line” is used at the utmost for exports (120.387.912 billion dollars), which is then followed by “Road” (62.304.873 billion dollars) and “Airline” (16.810.158 billion dollars) transportations respectively. In case of the modes of transportations of imports, while the “Maritime Line” takes the lead again (141.174.732 billion dollars), it is followed by “Road” transportation (44.167.395 billion dollars), and “Other Transportation Modes” (30.641.730 billion dollars).

When the general statistics are evaluated, along with a decrease in the air cargo transportation compared to the previous year, it followed a different course than air passenger transportation. One of the main reasons for that air cargo sector was affected by the Covid-19 pandemic to a lesser extent since it was necessary to continue with the global supply chain, and to transport medical equipment and medicines. In addition to that, it is observed that the maritime exports of the products that are particularly light in value but large in volume has shrunk 9% in ratio due to the breakdown in production and shrinking in demands because of Covid-19 pandemic. With the restart of the production process in factories in 2021 and with Turkish Lira reaching the competitive levels particularly in foreign trade, it is observed that the exports have increased 20% in ratio. Along with the airline and maritime transportation, one other important change that needs to be empathized is the one that took place in railroad transportation. In fact, whilst the railroad exports remained at the value of 753.544.000 dollars in 2018, with the exports via the Baku-Tbilisi-Kars (BTK) Pipeline Route and the exports to China via the Middle Corridor known as the “Iron Silkroad”, these number has risen to 50.6% in ratio, reaching the total value of 1.487.369.000 dollars.

In our analysis the forecast of the change in imports and exports in the next 5 years is predicted as follows: the export between 2022 and 2027 (see figure 2), the average is expected to be 170,532,620 (thousand dollars) at the 95% confidence interval (Lower bound 140.273.234, Upper bound 200.792.006 (thousand dollars)). For the import between 2022 and 2027 (see figure 3), the average is expected to be 214,827,800 (thousand dollars) at the 95% confidence interval (Lower bound 178.862.812, Upper bound 250.792.788 (thousand dollars)).

CONCLUSION:

Whilst road transportation is preferred mostly for interurban freight transportation in Turkey, the highest amount of investment within the budget is made on the development of highway infrastructure. Road transportation provides flexible option on short distance transportations and door to door deliveries but is not considered as cost-efficient or sustainable in long distance transportations due to its limited carrying capacity. Coastal shipping on the other hand does not come to fore as a transportation mode as flexible as road transportation due to its ability to provide service within a restricted geographical location. In terms of flexibility, airline transportation has similar infrastructure problems that are encountered by maritime and railroad transportation; and it is mostly used finitely for products that are heavy in value or perishable supplies due to high costs. Pipeline transportation does not feature a significant privilege in terms of freight cost reduction as it is usually preferred for the transportation or transit transformation of limited range of products. At this point, it can be stated that the railroad transportation should be popularized as an option that allows transfer of goods in

higher capacity in contrast to road transportation, and as a more flexible transportation mode in contrast to maritime transportation.

As part of exports and imports, the 60% of the handled products during loading and unloading are done via maritime line. Road transportation integrating maritime transportation through combined transportation get a share of 30% in exports whereas it gets a share of 20% in imports. The most important reason for that is because Turkey heavily uses pipeline transportation in imports; and uses road transportation for exports to the neighboring countries and regions. At this point, it can be emphasized that through reasserting combined transportation applications used in developed countries and the railroad transportation in domestic logistics, the reduction of freight costs and the development of sustainable logistics strategies can be achieved.

In conclusion, for Turkey to develop its exports in parallel to its transportation infrastructures it is necessary: (1) to change the unbalanced resource allocation among the transportation systems; and the shifting of the weight from road transportation to railroad and maritime transportation, (2) to give weight to combined transportation system to reduce the cost and time spent on individual transportation systems, (3) to redistribute the infrastructure investments in a balanced manner, particularly the investments concerning the railroads that remain in the background, (4) to disconnect the railway routes for the passenger trains and freight trains, (5) to expend the hinterlands of ports and make them suitable for combined transportation mode, to spread the production facilities homogenously across all regions and (7) to use more efficiently and effectively the logistics information system technologies.

Compliance with Ethical Standard

Conflict of Interests: The authors declare that there is no conflict of interest.

Ethics Committee Approval: Ethics committee approval is not required for this study.

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