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AN ANALYSIS OF THE WORLD PAPER INDUSTRY WITH A FOCUS ON EUROPE AND TRADE PERSPECTIVE

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Abstract: The pulp and paper manufacturing industry is currently facing sweeping changes due to the fact that supply and demand are dominated by different global players. These changes have significant effects not only on the paper and pulp production of countries but also on world economies thanks to the high level of trade between countries around the world. Based on the historical development of paper, our study examines today's production around the world economies, shows the latest commercial trends in the paper and pulp trade, and makes a prediction on the effects of the data belonging to this sector on the trade of countries through using panel regression models. According to our results, we determined a significant relationship between the total world paper and cardboard production in Turkey and the European Union and the amount of pulp. On the other hand, a partial relationship was found between the European Union and Turkey's paper production. In addition, we concluded that the amount of pulp used in paper and cardboard production was the factor causing the total paper production in the European Union and Turkey. In other words, we have established as a result of the analysis that as the amount of pulp used in paper and cardboard production increases, paper and cardboard production also increases at the same rate.

Keywords: Paper, Production, Export, Import, Amount

JEL CODES: A11, C4, C5, D4, D51, E2, L16, O13, Q0

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1. Introduction

Taking into account the historical development of paper, we see that it was first produced by the Egyptians from the papyrus plant and entered our lives in this way. A flexible, smooth, ink-free mold was obtained from a plant called Cyperus Papyrus, which grew around the Nile River around 3000 BC (Shenoy & Aithal, 2016). However, the oldest known paper was traced back to 200 BC in China. For this purpose, archaeologists found a prayer/praise written on paper, similar to a prayer, on the mud brick of a house. What confirms this claim is that Ts'ai Lun, who worked for the Chinese emperor in M.S. 105, announced the papermaking process and started the use of paper (online: "History of Papermaking Around the World").

Most of the early papers were used either for religious purposes by the government or by wealthy people for business transactions. For centuries, the Chinese kept their knowledge of paper and its production as a secret. However, culture and some trade relations in the past revealed the secret of this confidentiality, and the secrets of paper production tended to spread to Vietnam and then to Tibet. After the 4th century, Korea was included in paper production and then Japan, Nepal and India were included in this ranking with the 6th century (Bloom, 2017).

In the 10th century, paper production spread to Africa and then to Europe reached England in 1494 and became a more industrial production. After England, paper production accelerated and contributed to the emergence and use of money for the purpose of cleaning, newspapers, textiles, magazines, packaging materials and, most importantly as a financial exchange tool (Hunter, 1978).

In 1690, the first paper mill in the USA was built by William Rittenhouse in "Memphis" Pennsylvania, allowing paper to enter the economy and human life as an industrial product. At the end of the 1860s, the first wood-based paper was produced by the Americans and the adventure of paper thus came to life as a commercial material and started to be used extensively in many different fields and sectors (Weichelt, 2016).

When we analyze the paper production in some world countries and the production of paper in factories, the ranking is as follows; Spain (Xativa) 1150, France (Herault) 1189, Italy (Fabriano) 1260, Germany (Nuremberg) 1389, Switzerland (Marry) 1400, Belgium 1407, Netherlands (Gennep) 1428. England (Hertfordshire) 1488, Sweden (Motala) 1532, Denmark 1540, Russia (Moscow) 1690 USA (Germanstown, Pa.) 1690.

Paper is a consumable that is used almost everywhere in daily life, and it is also an intermediate good used in the fields of printing, packaging and health. Especially with the spread of e-commerce, advances in the logic industry and increasing environmental awareness, the importance of paper in the packaging industry has gradually increased.

Addressing the production process of paper, it is seen that it is produced in different textures and contents according to the place of use and feature (Bajpai, 2015). The basic structure of paper production is wood-based, agricultural product-based and waste paper-based production differentiation. Due to the differences in production methodologies, the production quality and content of paper also change. These differences have led to the birth of many types in terms of the color, thickness, weight, smoothness, etc. of the paper. These differences have led to production according to the usage area and purpose of the paper to be used rather than a product diversification logic. For example, the paper used in the notebook and the production of tissue paper, wrapping paper and even banknote money paper are different from each other.

When the paper is examined as a raw material, the fact that it has wood fiber shows that it can be produced from straw, grass, or other annual plants. In particular, the recycling rate of this type of paper can be higher, which is considered to lead to more efficient use of raw materials. It should also be stated that it is produced from recycled or secondary fiber material.

The historical development of paper production forms the basis of the econometric study presented in Chapter 4. Cross-country comparative analysis aims to verify whether geographical proximity and trade freedom between countries minimize costs and maximize production levels and whether these factors play a role through econometric analysis results.

2. Theoretical framework and literature

The main raw material of paper is composed of annual plants such as wood, jute, hemp and reed, and with the development of today's industry, waste paper raw materials are combined with cellulose, wood pulp and old paper pulp intermediates (Oktay & Şahiner, 2007).

However, due to the increased consumption in recent years and the deterioration of the natural balance, the damage to the population of woody plants, which are the basic materials used in pulp production, is increasing.

We should clearly state that the paper industry constitutes a monopoly market in the whole world. Due to the fact that paper production and diversity reveal that the industry requires a serious capital power in this sense, it is a structure and organization that requires serious investments (Kandemir, 2011).

We see 20 world countries in the list of world countries being paper importers in the whole world. The USA and Canada are the leading countries among them. Table 1 above shows this information and data.

Table 1 The world's biggest importer countries in GTIP (Customs Tariff Statistics Positions (2011-2015)

Importer Country	Import Value - Thousand $				
	2011	2012	2013	2014	2015
World	57.324.365	49.678.328	50.874.296	51.055.816	49.805.221
1. China	18.907.489	17.247.792	17.305.501	17.413.168	18.037.211
2. Germany	5.502.344	4.499.600	4.702.262	4,549,477	4.243.772
3. USA	4.176.528	3.501.860	3.779.114	3.753.136	3.431.962
4. Italy	2.710.056	2.214.290	2.392.653	2.292.986	2.285.937
5. S. Korea	2.260.885	1.872.487	1.930.576	1.831.579	1.813.321
6. France	1.894.623	1,492.013	1.642.336	1.533.531	1.692.590
7. India	1.304.878	1.284.958	1.370.354	1.656.701	1.608.822
8. Japan	1.666.829	1.450.372	1.394.869	1.426.658	1.332.710
9. Indonesia	1.800.657	1.551.373	1.733.163	1.749.473	1.282.399
10. Netherlands	2.016.034	1.728.831	1.541.968	1.475.360	1.121.216
11. Spain	1.091.243	887.836	1.040.861	916.001	969.517
12. Mexico	1.158.705	950.994	957.783	995.800	964.719
13. England	1.194.408	846.370	815.777	869.652	857.089
14. Austria	934,481	830.570	785.507	846,441	829.616
15. Turkey	602.625	560.063	645.109	683,453	737.712
16. Thailand	787.456	683.570	594.620	625.992	700.541
17. Poland	607.631	547.117	654.834	702.729	681.610
18. Belgium	993.546	844.101	898,423	831.656	672.318
19. Taiwan	915.683	777.512	755.774	704.323	633.238
20. Brazil	374.380	339.185	336.674	347.257	338.712

Source: TURKSTAT (Turkish Statistical Institute)

Table 2 The world's biggest 20 exporter countries in GTIP (2011-2015)

Exporting Country	Export Value - Thousand $				
	2011	2012	2013	2014	2015
World	49,914,004	44.384.449	45,476.355	45.525.816	42.917.468
1. USA	10.102.766	9.311.759	8.965.490	8.967.772	8.731.257
2. Canada	7.604.177	6,757.051	6.829.200	6.782.181	6.284.810
3. Brazil	5.001.622	4.705.931	5.185.987	5.298.146	5.603.405
4. Chile	2.792.483	2.531.060	2.806.239	2.891.711	2.575.564
5. Sweden	2.869.227	2.570.925	2.665.904	2.728.112	2.440.334
6. Finland	1.935.559	1.752.833	2.093.220	2.138.369	2.002.877
7. Indonesia	1.557.698	1.546.881	1.845.815	1.721.456	1.727.845
8. Germany	1.756.358	1.448.108	1.541.655	1.531.369	1.342.367
9. Russia	1.361.360	1.215.523	1.125.233	1.194.710	1.150.260
10. Japan	1.269.176	1.142.559	1.135.918	1.048.001	981.048
11. Netherlands	1.764.218	1,447,884	1.143.494	1.096.782	904.396
12. France	1.143.253	1.005.087	907.119	911.038	848.868
13. England	997.939	849.825	784.633	793.811	762.390
14. South Africa	966.237	687.065	699,495	830.321	760.058
15. Belgium	1.134.477	953.849	941.026	841.093	750.697
16. Portugal	743.390	677.101	709.262	672.737	704.438
17. Spain	1.239.471	1.056.575	1.092.869	949.715	574.647
18. New Zealand	534,905	476,900	509.366	558.202	513.261
19. Singapore	246,409	218.698	390.996	449.478	404.154
20. Czech Rep.	417.665	357.227	388.111	369.548	363.466

Source: TURKSTAT

When we analyze the countries and export rates in Table 2, we observe that the USA ranks first. Next comes Canada. Considering the data of 2015, the USA took first place by exporting an amount of 8.73 billion dollars. On the other hand, Canada maintained its second place by exporting 6.28 billion dollars in the same year. And Brazil maintains its third place with 5.6 billion dollars.

Table 3 First 20 countries with pulp foreign trade surplus in GTIP (2011-2015)

Country	Balance of Trade - Thousand $				
	2011	2012	2013	2014	2015
1. Canada	7.236.411	6.431.510	6.532.185	6,463,980	5.956.479
2. USA	5.926.238	5.809.899	5.186.376	5.214.636	5.299.295
3. Brazil	4.627.242	4.366.746	4.849.313	4.950.889	5.264.693
4. Chile	2.744.569	2,494,641	2.764.575	2.847.890	2.540.357
5. Sweden	2.271.909	2.041.574	2.665.904	2.728.112	2.440.334
6. Finland	1.553.900	1.403.318	1.796.749	1.866.438	1.738.423
7. Russia	1.244.737	1.077.996	971.590	1.044.998	1.017.969
8. South Africa	897.278	625.302	607.402	711.712	648.637
9. Portugal	666.508	612.960	622.652	583,423	621.033
10. New Zealand	519.235	465.134	501.203	531.155	480,792
11. Indonesia	-242.959	-4.492	112.652	-28.017	445.446
12. Czech Rep.	286,200	227.755	251.405	225.755	211.855
13. Norway	340.867	327.491	289,932	286.154	210.403
14. Hong Kong	263,165	232.404	201.999	171.359	159,983
15. Singapore	142,097	-44.845	111.376	152.064	100,588
16. Belgium	140,931	109.748	42.603	9,437	78.379
17. Estonia	101.498	88.214	80.892	94.814	74,905
18. Slovakia	-.27.452	46.204	27.528	37.508	56.661
19. Bulgaria	52.693	39.130	45.307	50.309	47.139
20. Free Zones	8.561	2.396	3.606	7.301	47.035

Source: TURKSTAT

As shown by the data in Table 3, we see that Canada, the USA and Brazil rank in the first three places.

If we want to evaluate the paper industry in terms of Turkey, we note that it is a foreign-dependent country in terms of paper and production (Adıgüzel, 2018).

Before Turkey, Beykoz Paper Factory was one of the most successful initiatives in this field during the Ottoman period and was established on March 14, 1804. But later, this factory was operated for 28 years and its operation was not continued and it was closed (Ersoy, 1959).

Discussing the other world countries, due to the fact that the population of woody plants, which is the raw material of paper and paper production, is rich in forest populations especially in China, the USA, Brazil, Russia and Finland, this contributes to their dominance in the paper industry (Damlıbağ, 2015).

When we want to create a perspective on world paper production and use, we see that the production and export rates of the strongest countries in terms of industry support each other (Sekmen, 2011).

Regarding the industrial structure of the European Union countries and Turkey, we observe that European countries with developed industrial power are leading Turkey. For this reason, Turkey's dependence on foreign paper reveals the relationship between industry and economic power. Turkey does not have a great industrial power in this sense (Ünal, 2018).

Likewise, Turkey has lagged behind many world countries in terms of developed industry and production. This situation obliges Turkey to make foreign-dependent and import-oriented production (Yaşar, 2015).

Unlike production-based consumption, Turkey prefers import-oriented production or consumption. For this reason, it meets its paper need by importing from other world countries (Eskikurt, 2014).

From the perspective of inputs and outputs of the industry, we determine that Turkey is foreign-dependent in terms of many different sectors. Therefore, Turkey meets its need for paper, which is an intermediate good, by importing it (Ketboğa, 2019).

Evaluating the situation with all aspects, we noticed that there was a decrease in 2016 in terms of world paper producers on the basis of GTIP code between the years 2015 and 2019. However, considering the world paper sector figures in 2015, we see that an export volume of 156 billion dollars was realized (Schandl et al., 2020).

Discussing the paper industry in terms of other world countries, we can say that there have been ups and downs in the last ten years. It is observed from data of 2009 that the total amount of imports worldwide is 153 billion dollars. Likewise, the total import figures were realized as 157 billion dollars. In 2011, the total export figure was 189 billion dollars and the total import figure was 192 billion dollars (Doğu Marmara Kalkınma Ajansı, 2020).

When we address the paper industry around the world in terms of imports and exports in the last 10 years, we can state that it has achieved an increase of 17 billion dollars in exports and 12 billion dollars in imports (Doğu Marmara Kalkınma Ajansı, 2020).

Discussing the volume and share of the paper industry among other industrial sectors around the world, we can disclose that it has decreased from 1.24% to 0.90% in the last ten years (Doğu Marmara Kalkınma Ajansı, 2020).

After analyzing the annual paper production of China being the world's largest paper producer, we can signify that it produces 99.3 million tons. This production rate reflects China's dominance in the world's paper industry (Kong et al., 2013).

About financial inputs and outputs in developed world economies, it is necessary to mention the important effects of paper sector applications on accounting systems (Shkulipa, 2021A).

The dominance and power of the United States of America, which is also a major paper producer, in the sector are quite high. Likewise, the input of its power in this direction to the country's economy is also quite large (Caverley, 2007).

When we look at the financial economy and the financial management systems applied around the world, we observe that especially the developing world countries include different applications in terms of SME financing (Ademosu & Morakinyo, 2021). For this reason, we can say that paper finance and its practices differ in this sense about financial management and practices of many developing world countries. Especially China and the USA have different practices in this

regard. Again, the fact that China is among the world's largest importing countries in GTIP creates a different conceptual dimension.

From the financial statements of some developed and developing world countries that dominate the international and paper sector economy, we see that the foreign trade balances differ. For this reason, we can assure that the foreign trade balance and its reporting and analysis are an important conceptual dimension in terms of the sector (Shkulipa, 2021B).

Analyzing the intercontinental paper sector capital strength, we have to say that there are differences. In particular, we see that the first 20 countries with a foreign trade pulp surplus in GTIP in Table (3) are located on different continents. Thus, we see the fact that there is also a variability in the paper sector capital market (Nageri, 2020).

3. Data and methodology

In the light of the evidence discussed above, we can say that there are differences in the paper sector and foreign trade balance between countries. We have determined that especially paper raw material production is concentrated in regions where forest areas are dense. Regarding the developed world economies, we observe that the paper industry also contributes to the development of these countries. For this reason, it is important to determine the foreign trade relations and the affecting factors both in terms of understanding the sector and adding an extra dimension to the development differences between countries.

To answer this question, we first tried to identify country-specific relationships by running a regression of the total share of paper production and raw materials in Turkey and the EU region over a set of variables that could intuitively explain this relationship. With causality analysis, we looked for which variables (positive or negative) were the causes of the other.

Correlation and regression analyses show the extent to which the variables are related. Considering the time series available for our estimates, we designed a panel regression for all paper-producing EU countries and Turkey by using data from the period 2000-2015.

This study was prepared by using data from FAO (Food and Agriculture Organization of the United Nations) for the years 2000-2015 regarding the paper sector. The analysis aims to determine how the import, export figures and values related to the paper industry affect each other. Within the scope of this analysis, the data of all countries of the world, the European Union and Turkey were examined separately.

The data obtained from this research were analyzed with E-Views 8.0 and SPSS program. Following the Panel data, Correlation, Granger causality and Panel data regression analyzes, the dynamics of the paper industry were determined.

Research Hypotheses
H1: There is no relationship between Paper Board and Pulp for paper statistics for the World, EU and Turkey.
H2: There is no causality between the paper industry variables.
H3: Paper industry variables are normally distributed.
H4: There is no relationship between total world paper board statistics and total world pulp for paper statistics.
H5: There is no relationship between European Union paper board statistics and European Union pulp for paper statistics.
H6: There is no relationship between Turkey's paper board statistics and Turkey's pulp for paper statistics.

3.1. Results

Variable definitions
TWPPB: Total world paper board production
TWPFP: Total world pulp for paper production
EUPPB: EU paper board production
EUPFP: EU pulp for paper production
TRPPB: Turkey paper board production
TRPFP: Turkey pulp for paper production

Group statistics
Paper and Paper Board and Pulp for Paper statistics summary tables for the paper industry are given below for the total world, European Union and Turkey.

Table 4 Group statistics

	TWPPB	TWPFP	EUPPB	EUPFP	TRPPB	TRPFP
Mean	7.84E+13	13240183	7.84E+13	11606562	1012523.	250323.4
Median	1.01E+14	12457267	1.01E+14	11648688	500599.0	89964.00
Maximum	3.67E+14	23993948	3.67E+14	18332868	2711329.	1032300.
Minimum	37423128	4623818.	32814942	4218374.	47435.00	0.000000
Std. Dev.	9.13E+13	5173955.	9.13E+13	4010198.	953897.3	299903.8
Skewness	1.134.359	0.399021	1.134.359	0.161519	0.617002	0.921387
Kurtosis	3.968.085	2.260.795	3.968.085	2.086.866	1.692.521	2.705.906
Observations	64	64	64	64	64	64

Source: Author's computation

3.1.1. Correlation analysis

Correlation analysis is a statistical analysis method used to determine whether there is a relationship between two continuous variables and if there is, the direction and

severity of this relationship. The most commonly used correlation analysis is the Pearson correlation coefficient. The Pearson correlation coefficient is used when the data have a normal distribution, and the p value must be less than 0.05 for the correlation to be considered significant. If the correlation coefficient is negative, there is an inverse relationship between the two variables, that is, "as one variable increases, the other decreases". If the correlation coefficient is positive, it is interpreted as such; "as one of the variables increases, the other one also increases".

Interpretation of correlation coefficient (r);
r<0.2 indicates very weak or no correlation
0.2-0.4 indicates weak correlation
0.4-0.6 indicates moderate correlation
0.6-0.8 indicates high correlation
0.8> indicates very high correlation.

H1: There is no relationship between Paper Board and Pulp for paper statistics for the World, EU and Turkey.
The results of the correlation analysis are presented as follows.
Among the statistics of the paper sector,

1) Total world paper and paper board statistics were found to be associated with Turkey pulp for paper statistics at the highest level.
2) Total world paper and paper board statistics were found to be associated with the European Union pulp for paper statistics at the highest level.
3) European Union paper and paper board statistics were found to be associated with the Turkey pulp for paper statistics at the highest level.
4) European Union paper and paper board statistics were found to be associated with the total world pulp for paper statistics at the highest level.
5) Turkey paper and paper board statistics were found to be associated with the Turkey pulp for paper statistics at the highest level.
6) Turkey paper for paper statistics was found to be associated with the Turkey paper and paper board statistics at the highest level.

Table 5 Correlation analysis

	TWPPB	TWPFP	EUPPB	EUPFP	TRPPB	TRPFP
TWPPB	-	0.2096	-	0.1787	0.3335	0.3469
TWPFP	0.2096	-	0.2096	0.9808	0.8025	0.8487
EUPPB	-	0.2096	-	0.1787	0.3335	0.3469
EUPFP	0.1787	0.9808	0.1787	-	0.7209	0.7444
TRPPB	0.3335	0.8025	0.3335	0.7209	-	0.9487
TRPFP	0.3469	0.8487	0.3469	0.7444	0.9487	-

Source: Author's computation

3.1.2. Granger causality test

Granger causality test is one of the statistical tests used to determine the direction of the causality relationship when there is a time-delayed relationship between two variables. The first assumption of the Granger causality test is that the cause occurs before the effect, that is, there is a delay between the cause and the effect. The second one is that causality can only be determined for a group of stochastic processes. It is not possible to know causality between two deterministic processes (Işığıçok, 1994). First, the number of lags in the models should be determined for the Granger causality test. Since the Granger causality test is based on the VAR model, the number of lags should be determined first by using the AIC and SC criteria according to the VAR model.

H2: There is no causality between the paper industry variables.

When the causality relationships between the variables were examined, it was determined that some probe values were less than 0.05 and the H0 hypothesis should be rejected. For this reason, there is a causality relationship between women's statistics.

1) There is a causality relationship between total world paper board and European Union paper board statistics.
2) There is a causality relationship between total world pulp for paper board and European Union paper board statistics.
3) There is a causality relationship between total world pulp for paper board and European Union pulp for paper board statistics.
4) There is a causality relationship between the European Union paper board and Turkey paper board statistics.
5) There is a causality relationship between the European Union pulp for paper board and Turkey paper board statistics.

Table 6 Causality analysis

Pairwise Granger Causality Tests
Sample: 2000 2015

Null Hypothesis:	Obs	F-Statistic	Prob.
TWPFP does not Granger Cause TWPPB	56	1.63242	0.2055
TWPPB does not Granger Cause TWPFP		1.49268	0.2344
EUPPB does not Granger Cause TWPPB	56	1.80114	0.1755
TWPPB does not Granger Cause EUPPB		**0.9775**	**0.0356**
EUPFP does not Granger Cause TWPPB	56	1.80114	0.1755
TWPPB does not Granger Cause EUPFP		1.22079	0.3035
TRPPB does not Granger Cause TWPPB	56	1.87918	0.1631
TWPPB does not Granger Cause TRPPB		2.89670	0.0643
TRPFP does not Granger Cause TWPPB	56	1.84612	0.1682

TWPPB does not Granger Cause TRPFP		1.20831	0.3071
EUPPB does not Granger Cause TWPFP	56	1.49268	0.2344
TWPFP does not Granger Cause EUPPB		**1.63242**	**0.0055**
EUPFP does not Granger Cause TWPFP	56	5.13409	0.0093
TWPFP does not Granger Cause EUPFP		**6.13663**	**0.0041**
TRPPB does not Granger Cause TWPFP	56	0.98434	0.3807
TWPFP does not Granger Cause TRPPB		0.43461	0.6499
TRPFP does not Granger Cause TWPFP	56	1.08360	0.3460
TWPFP does not Granger Cause TRPFP		0.13765	0.8717
EUPFP does not Granger Cause EUPPB	56	1.80114	0.1755
EUPPB does not Granger Cause EUPFP		1.22079	0.3035
TRPPB does not Granger Cause EUPPB	56	1.87918	0.1631
EUPPB does not Granger Cause TRPPB		**2.89670**	**0.0443**
TRPFP does not Granger Cause EUPPB	56	1.84612	0.1682
EUPPB does not Granger Cause TRPFP		1.20831	0.3071
TRPPB does not Granger Cause EUPFP	56	0.37734	0.6876
EUPFP does not Granger Cause TRPPB		**0.67085**	**0.0157**
TRPFP does not Granger Cause EUPFP	56	0.02294	0.9773
EUPFP does not Granger Cause TRPFP		0.48550	0.6182
TRPFP does not Granger Cause TRPPB	56	0.27775	0.7586
TRPPB does not Granger Cause TRPFP		1.73510	0.1866

Source: Author's computation

3.1.3. Kolmogorov Smirnov normal distribution test

The standard normal distribution shows the situation where the mean is zero and the variance is one in a sample. Normal distribution analysis is applied before choosing statistical analysis. While parametric analyzes are used for data sets suitable for normal distribution, compliance with normal distribution is not sought for non-parametric analyzes. One Sample Kolmogorov Smirnov test is one of the tests applied for normal distribution. If these test results are significant with a value less than 0.05, it means that the data set does not show a normal distribution while if the test results are greater than 0.05, it means that the data set has a normal distribution.

H3: Paper industry variables are normally distributed.

Kolmogorov Smirnov test can be used to determine the distribution of time series. It is important to use series with normal distribution in order to be able to perform regression with time series. Kolmogorov Smirnov test results are summarized below.

Accordingly, when the paper industry series are examined, it can be stated that the series with probability values greater than 0.05 are normally distributed.

Table 7 One-Sample Kolmogorov-Smirnov test

	Kolmogorov-Smirnov Z	Prob. Asymp. Sig. (2 tailed)
Total world paper and paperboard	2.031	0.601
Total world pulp for paper	0.812	0.524
European Union paper and paperboard	2.031	0.501
European Union pulp for paper	0.784	0.570
Turkey paper and paperboard	1.753	0.864
Turkey pulp for paper	2.078	0.850

Source: Author's computation

3.1.4. Regression analysis

Regression analysis is concerned with whether there is a relationship between variables. There is a mathematical expression of the relationship between the variables examined in the regression analysis. Regression analysis is determined between the dependent and independent variables and the effect and direction of the independent variable on the dependent variable is determined.

H4: There is no relationship between total world paper board statistics and total world pulp for paper statistics.

When the total world paper board volume statistics and the total world pulp for paper statistics are examined together, the following results have been obtained. The fixed effect is 1.47E+14 and when the total world pulp for paper quantity increases by one-unit, total world paper board statistics increase by 17011426 units.

Table 8 Regression analysis 1

Method: Panel Least Squares
Sample: 2000 2015
Periods included: 16
Cross-sections included: 4
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.47E+14	1.33E+14	-1.105053	0.2751
TWPFP	17011426	10013940	1.698774	0.0964

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.545900	Mean dependent var	7.84E+13
Adjusted R-squared	0.349812	S.D. dependent var	9.13E+13
S.E. of regression	7.36E+13	Akaike info criterion	66.94735
Sum squared resid	2.38E+29	Schwarz criterion	67.62200
Log likelihood	-2122.315	Hannan-Quinn criter.	67.21313
F-statistic	2.783946	Durbin-Watson stat	1.465200
Prob(F-statistic)	0.002580		

Source: Author's computation

H5: There is no relationship between European Union paper board statistics and European Union pulp for paper statistics.

When the European Union paper board volume statistics and the European Union pulp for paper statistics are examined together, the following results were obtained. The fixed effect is 1.35E+13 and when the amount of European Union pulp for paper increases by one-unit, European Union paper board statistics increase by 7917739 units.

Table 9 Regression analysis 2

Method: Panel Least Squares
Date: 01/07/17 Time: 21:25
Sample: 2000 2015
Periods included: 16
Cross-sections included: 4
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.35E+13	1.56E+14	-0.086623	0.9314
EUPFP	7917739.	13433259	0.589413	0.5586

Effects Specification			
Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			
R-squared	0.519908	Mean dependent var	7.84E+13
Adjusted R-squared	0.312595	S.D. dependent var	9.13E+13
S.E. of regression	7.57E+13	Akaike info criterion	67.00301
Sum squared resid	2.52E+29	Schwarz criterion	67.67767
Log likelihood	-2124.096	Hannan-Quinn criter.	67.26879
F-statistic	2.507844	Durbin-Watson stat	1.302585
Prob(F-statistic)	0.006049		

Source: Author's computation

H6: There is no relationship between Turkey's paper board statistics and Turkey's pulp for paper statistics.

When Turkey paper board volume statistics and Turkey pulp for paper statistics are examined together, the following results were obtained. The fixed effect is 408722.9 and when the amount of pulp for paper in Turkey increases by one unit, Turkey paper board statistics increase by 2.412080 units.

Table 10 Regression analysis 3

Method: Panel Least Squares
Date: 01/07/17 Time: 21:33
Sample: 2000 2015
Periods included: 16
Cross-sections included: 4
Total panel (balanced) observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	408722.9	74983.31	5.450852	0.0000
TRPFP	2.412080	0.276249	8.731552	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			
R-squared	0.958709	Mean dependent var	1012523.
Adjusted R-squared	0.940878	S.D. dependent var	953897.3
S.E. of regression	231939.9	Akaike info criterion	27.79665
Sum squared resid	2.37E+12	Schwarz criterion	28.47130
Log likelihood	-869.4928	Hannan-Quinn criter.	28.06243
F-statistic	53.76825	Durbin-Watson stat	0.761775
Prob(F-statistic)	0.000000		

Source: Author's computation

4. Conclusions

In general, the importance of the paper industry within the economy is quite high. It is among the results determined following the literature review and analysis that especially developed world countries and world countries with good economy have a voice in the sector. We can say that the paper industry contains an important import product for many different world countries as it has a high place in the economy of 20 different world countries due to being an intermediate product. In terms of the paper industry, we see that especially the European Union Countries and the United States, Canada and Brazil, which have serious economic power, have a say in the sector and guide the sector.

As a result of our study, the results of causality analysis indicate that the increase or decrease in the world's total cardboard and pulp for paper production affects EU cardboard production. Paper products production of EU countries is affected by the change of production or figures in other countries of the world. Similarly, European Union paper and cardboard production statistics are related to pulp for paper statistics of Turkey and the world. The fact that the European Union countries are among the countries importing the highest paper products confirms this result. In addition, we have determined that cardboard production in Turkey is also affected by the EU cardboard and pulp for paper production. In this respect, Turkey's production is clearly dependent on EU countries; in other words, paper production in Turkey is directly dependent on its imports with the EU. As a result of the additional analysis, pulp for paper statistics of Turkey and the European Union are related to the total world paper production. We have found that the figures for pulp for paper, which is the paper raw material produced by Turkey and the European Union, affect the total world trade. Turkey's paper and cardboard production statistics are also related to its own pulp for paper statistics. Although Turkey is a net exporter in the paper sector, the fact that pulp for paper production is related to its own paper and cardboard production is a positive factor for Turkey's foreign trade balance.

In addition, the effect of pulp for paper amount on total paper production was investigated by regression analysis. When the total world paper board volume statistics and the total world pulp for paper statistics are examined together, the fixed effect is 1.47E+14 and when the total world pulp for paper quantity increases by one-unit, total world paper board statistics increase by 17011426 units. When the European Union paper board volume statistics and the European Union pulp for paper statistics are examined together, the fixed effect is 1.35E+13 and when the amount of European Union pulp for paper increases by one-unit, the European Union paper board statistics increase by 7917739 units. When Turkey paper board volume statistics and Turkey pulp for paper statistics are examined together, the fixed effect is 408722.9 and when the amount of pulp for paper in Turkey increases by one unit, Turkey paper board statistics increase by 2.412080 units.

According to the results and findings of the analysis, we have determined that Turkey meets the need for paper as an intermediate good via import; however, Turkey cannot respond to the domestic market in terms of production. It is among the remarkable results that the European Union countries predominate among the 20 different world countries being the producers of the paper industry. However, it is seen that the countries being the locomotive powers among the 20 different world countries with the highest production and economic income in terms of paper industry are the USA, Canada and Brazil.

The fact that China is one of the largest importing countries of the world in the GTIP creates a different economic dimension. The fact that China, which has an important place in the world economy and finance, being a paper importer is among the results determined within the sector.

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Author contributions

MK conceived the study and was responsible for the data curation, methodology, formal analysis, and discussion of the results. AA was responsible for the introduction, literature review and conclusion.

Disclosure statement

The authors do not have any competing financial, professional, or personal interests from other parties.

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