Effects Of Iron-Steel Sector On Global Competıtıon, Economıc Growth And Unemployment

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ABSTRACT

Nowadays industry which contributes to development of countries is one of the most crucial sectors, it seems to maintain its importance. The rapid advancements in technology play a crucial role in increasing product range and transporting of products. Thus, globalization gathers pace. Within this period, Iron and Steel sector which is a sub-sector of industry sector provides competitive power to countries and thus these countries get ahead of other countries.

The aim of this study is to test the effects of steel production of global raw steel production in global raw steel production on global competitiveness index, economic growth and employment by panel data analysis. In this context, the data belonging to the years 2009-2016 will be tested by panel data analysis and the extent to which iron steel production affects these variables will be investigated. Second-generation panel unit root tests were used because of the cross-sectional dependence in the series. Then, according to the PMG estimator applied, there was a short and long-term relationship between total steel production and economic growth. The 1 unit increase in total steel production increases the economic growth in the long term by 0.104 and in the short term by 1.386 units. While 1-unit increase in total steel production decreased unemployment by 0.105 units in the long term; global competition increases by 0.22 units. In the short term there is no relationship.

Key Words: *Steel, Competition, Globalization, Economic Growth, PMG Estimator.*

JEL Classification : *F62, 044, J64*

Demir-Çelik Sektörünün Küresel Rekabet, Ekonomik Büyüme Ve İşsizlik Üzerine Etkileri

ÖZ

Günümüzde ülkelerin kalkınmasına katkıda bulunan sanayi, geçmişte olduğu gibi bugün de en önemli sektörlerden biridir. Teknolojideki hızlı gelişmeler, ürün yelpazesinin genişlemesinde ve ürünlerin taşınma hacmini artırmada çok önemli bir rol oynamaktadır. Bu süreçte sanayi sektörünün bir alt sektörü olan Demir Çelik sektörü, ülkelere rekabet gücü sağlamakta ve bu sayede söz konusu ülkeler diğer ülkelerin önüne geçmektedir.

Bu çalışmanın amacı, dünya ham çelik üretiminde ilk 20 sırada yer alan ülkelerin çelik üretiminin küresel rekabet endeksi, ekonomik büyüme ve istihdam üzerine etkilerini panel veri analiziyle test etmektir. Bu kapsamda, 2009-2016 yıllarına ait veriler panel veri analiziyle test edilerek demir çelik üretiminin bu değişkenlere hangi ölçüde etki ettiği araştırılacaktır. Serilerde yatay kesit bağımlılığı olduğundan ikinci nesil panel birim kök testleri kullanılmıştır. Daha sonra uygulanan PMG tahmincisine göre de toplam çelik üretimi ile ekonomik büyüme arasında kısa ve uzun dönemli bir ilişki görülmüştür. Toplam çelik üretimindeki 1 birimlik artış ekonomik büyümeyi uzun dönemde 0.104 ve kısa dönemde 1.386 birim arttırmaktadır. Toplam çelik üretimindeki 1 birimlik artış uzun dönemde işsizliği 0,105 birim azaltırken; küresel rekabeti 0,22 birim arttırmaktadır. Kısa dönemde ise herhangi bir ilişki yoktur.

Anahtar Kelimeler: *Çelik, Rekabet, Küreselleşme, ekonomik büyüme, PMG Tahmincisi*

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INTRODUCTION

The industrial sector has emerged as a locomotive sector in terms of the development of humanity. The industrial sector, which has become the most important sector in the historical process due to the experience of the industrial revolution, continues to increase its importance on the development processes of the countries. The concept of globalization has different effects on developed and developing countries and has different consequences (Demir, 2001:85-86).

The concept of technology that has progressed from the 1980s to the present day rapidly, and the globalization process, has led to the transformation of business people into firms and increased competition for finding places in world markets. One of the sectors that play an important role in accelerating the industrialization process and also in increasing the competitive power in international markets is iron and steel sector in this process. In this study, the development of the iron and steel industry in the world and in Turkey will be examined by years and with the help of data.

I. CONCEPT OF GLOBALIZATION AND ITS DEVELOPMENT

Before mentioning the developments in the iron and steel sector, it is worth mentioning briefly the concept of globalization which is effective in increasing the sector's importance and the development of the globalization process. Globalization is one of the concepts that have been followed for a long time in terms of economic functioning. From an economic point of view, the notion of globalization, the liberation of international capital movements and labor define the growth of multinational corporations and the integration in terms of trade (Chang and Lee, 2010:153-154). In the economic sense, the process of globalization has mainly started with the industrial revolution, although it can be traced back to the beginning of commercial activities in history. Along with this, after World War II, the effect of liberalism on international trade and finance has increased, followed by policies for integration in international markets, making globalization more effective (Chang et al., 2011:420-421). In later periods, the real globalization process in international economies started with the increase of liberalism effect in international trade and finance sector. The liberalization of international trade has increased the pressure of competition on the firms (Dilek, 2016:93). It is possible to say that many scientists evaluate the concept of globalization in different dimensions with different perspectives. The globalization process has gained great momentum over time (Dikkaya and Deniz, 2006:164). It is possible to say that technological developments have impact on such development process (Atalay and Turhan, 2002:79-81).

From an economic and commercial perspective, technological developments have increased international trade and consumers have been able to access goods and services in faster manner. In this context, the technological development process is inseparable from the globalization process and has a very important share in the acceleration of globalization (Aydemir and Kaya, 2007:277). However, it is also possible to say that the globalization process is also influential in the emergence of competition on an international scale and on a sectoral basis.

In particular, the iron and steel sector has been influenced by the global competition and the sectoral competition in the international arena. Having the competitive power in terms of the sector is important for the development of the country. For this reason, it is useful to examine the iron and steel industry's development in the world and in Turkey with the help of data and in years.

II. INDUSTRIAL SECTOR IN WORLD AND DEVELOPMENT OF IRON AND STEEL INDUSTRY

The iron and steel industry is a sector that provides direct input into industrial production, and the industrial sector emerges as the most important sector in the development of countries. For this reason, it is very important that the iron and steel industry has the development and competitive power in terms of the development of the countries. For this reason, it is worthwhile to examine in detail the developments experienced in the iron and steel sector both on the world scale and in Turkey scale so that the issue can be better understood.

A.Development of Iron and Steel Sector at Global Scale

The iron and steel industry, as well as being a labor-intensive industry, also involves the investment of high-tech heavy machinery. Thus, parallel to the industrialization efforts made in the casting sector, the development of the iron and steel industry has also accelerated.

In this context, iron and steel production and consumption quantities give important clues about the level of industrialization of countries. Thus, it will be useful to examine global iron and steel industry in terms of rawe steel production and iron production.

Production of Raw Steel

In terms of crude steel production, China is the most important producer country in global scale. China still maintains its advantage over the world countries in terms of crude steel production in the 2000’s. The world's largest steel exporter, China's steel exports in 2016 has increased by 15.2% in comparison with 2015 and reached 3.9 million tons (Dünya Çelik Üretim Raporu, 2017).

Industrialization, which has increased with the industrial revolution, has led the steel industry to become one of the most important sectors in European countries, and the European steel industry has been at the forefront of both steel production and consumption. However, in the following years European countries tried to meet their steel production needs through colonial activities, but this process did not continueso long and in the 90s the steel production in Asia has been ahead of Europe with its developing activities. Within the Asian continent, China is a country with a very prominent position in terms of steel production. As stated in the World Iron and Steel Report, China exported 3.9 million pieces of steel in 2016, with the steel export volume increasing every year.

Decrease in China's steel consumption in the face of China's steel production activities, which has a production volume corresponding to almost half of the world's total steel production, caused steel prices to fall and thus global steel trade has been significantly affected (Turgut, 2016:98). For this reason, while steel production is important, it is also important for the sector to develop healthy by

developing production in accordance with the market conditions and needs in the production process. Crude steel production has varied between continents and communities over the years, and the most recent data is being given in Table 1.

Table 1. Crude Steel Production and its Division among Societies (thousand tons)

	2015	**2016***
European Union	166115	162038
Other European countries	34002	35931
Commonwealth of Independent States	101372	102180
North America	110945	110624
South America	43898	40220
Africa	12790	12189
Middle East	26973	29025
Asia	1095649	1111597
Ocenia	5717	5837
Total	1597466	1609640

Source: World Steel Association, *Steel Statistical Yearbooks*, www.worldsteel.com

As seen in Table 1, due to the investments made in recent years, the Asian continent has realized more than two thirds of the global steel production. It is also seen that European countries and the continent of America, which were the pioneers in steel production in previous periods, are now lagging far behind the Asian continent and the Asian continent seizes most of the total production.

B. Development of Iron and Steel Industry in Turkey

Due to the delay of the industrialization process in Turkey, the iron and steel sector has developed very slowly and iron and steel production has been carried out at very low levels until the 1980s. After the 1980s, the iron and steel sector, which finds more room in its development plans, has set up large scale factories and facilities by separating huge financial resources and thanks to these facilities, the iron and steel sector has developed rapidly and Turkey has entered the global iron and steel industry in this respect.

In the framework of the development plans, it is seen that the breakthroughs, investments and initiatives have been tried to be implemented for the continuous development of the iron and steel industry over the years.

III. PRODUCTION OF IRON-STEEL IN GLOBAL ECONOMY AND PLACE OF TURKEY

Iron and steel production, which provides significant contributions to the development of countries and which is of great importance in terms of industrialization, has increased considerably with investments both in the world and in Turkey. China is the undisputed leader of crude steel production. The People's Republic of China still maintains its historic first place with its steel production of 683,265 thousand tons in 2011 (Bakirci et al., 2014: 10). Japan and U.S follows China. The figures for the first 20 countries that have marks on crude steel

production are listed in Table 2 considering the years. It is worth noting that the data for the year 2016 on table consist of 11 months.

Table 2. Countries in Top 20 in Terms of Crude Steel Production in Wold (thousand tons)

	2000	**2005**	**2010**	**2012**	**2013**	**2014**	**2015**	**2016**
1	China	China	China	China	China	China	China	China
	127236	355790	638743	731040	821990	822700	803823	**808366**
2	Japan	Japan	Japan	Japan	Japan	Japan	Japan	Japan
	106444	112471	109599	107232	110595	110665	105150	**104774**
3	USA	USA	USA	USA	USA	USA	India	India
	101803	93285	80495	88695	86878	88347	89026	**95618**
4	Russia	Russia	India	India	India	India	USA	USA
	59136	66146	68321	77264	81299	83208	78845	**78475**
5	Germany	S. Korea	Russia	Russia	Russia	S. Korea	Russian	Russia
	46376	47820	66942	70426	68856	71036	70898	**70808**
6	S. Korea	Germany	S. Korea	S. Korea	S. Korea	Russia	S. Korea	S. Korea
	43107	44524	58912	69073	66061	70651	69670	**68576**
7	Ukraine	India	Germany	Germany	Germany	Germany	Germany	Germany
	31767	40862	43830	42661	42645	42946	42675	**42080**
8	Brasil	Ukraine	Ukraine	**Turkey**	**Turkey**	**Turkey**	Brasil	**Turkey**
	27865	38610	33432	**35885**	**34654**	**34035**	33256	**33163**
9	India	Brasil	Brasil	Brasil	Brasil	Brasil	**Turkey**	Brasil
	26924	31610	32928	34524	34163	33912	**31517**	**31275**
10	Italy	Italy	**Turkey**	Ukraine	Ukraine	Ukraine	Ukraine	Ukraine
	26759	29350	**29143**	32975	32771	27170	22968	**24218**
11	France	**Turkey**	Italy	Italy	Italy	Italy	Italy	Italy
	20954	**20965**	25750	27252	24080	23735	22017	**23375**
12	Taiwan	France	Taiwan	Taiwan	Taiwan	Taiwan	Taiwan	Taiwan
	16896	19481	19755	20664	22282	23250	21370	**21751**
13	Canada	Taiwan	Mexico	Mexico	Mexico	Mexico	Mexico	Mexico
	16594	18942	16870	18073	18208	18977	18225	**18809**
14	Spain	Spain	France	France	France	Iran	Iran	Iran
	15874	17904	16343	15609	15685	16331	16145	**17895**
15	Mexico	Mexico	Spain	Iran	Iran	Spain	France	France
	15586	16195	15414	14463	15422	14163	14984	**14413**
16	UK	Canada	Iran	Spain	Spain	France	Spain	Spain
	15155	15327	13013	13639	14252	16143	14844	**13624**
17	**Turkey**	UK	Canada	Canada	Canada	Canada	Canada	Canada
	14325	13248	11995	13507	12415	12595	12472	**12646**
18	Belgium	Belgium	UK	UK	UK	UK	UK	Poland
	11636	10421	9709	9579	11858	12065	10906	**9001**

19	Poland	Poland	Poland	Poland	Austria	Poland	Poland	Belgium
	10498	8444	7993	8358	7953	8260	9198	**7687**
20	S. Africa	Iran	Austria	Austria	Poland	Austria	Austria	UK
	8481	9404	7973	7421	7950	7859	7687	**7635**
World	**World**	**World**	**World**	**World**	**World**	**World**	**World**	**World**
*(1)	**847622**	**1141892**	**1430052**	**1559472**	**1649303**	**1636960**	**1597466**	**1609640**

Source: Worldsteel Association, *Steel Statistical Yearbooks*, www.worldsteel.com
World *(1): Total of 20 countries (approximately %99) of production.

Table 2, where the data of the first 20 countries in raw steel production are included, it is seen that as mentioned below, China is the country with the highest amount of production level in 2000-2016 period. China's crude steel production has increased rapidly over the years and has risen by about 6.5 times from the year 2000 by 2016. Chinese companies have not been much affected by the crisis and the effects of the shrinkage in the steel industry due to the enormous steel production and consumption that China has (Kravec and Slivková, 2013:113).

When we examine the subject of crude steel production in Turkey, it is seen that in the 2000s, Turkey lags far behind the first 20 countries. As of 2000, Turkey ranks 17th among the top 20 countries in crude steel production. However, thanks to the large investments in the iron and steel industry in Turkey in the following years and the factories established, in 2005, Turkey ranks 11th in crude steel production by climbing up 6 steps. Having increased to 10th place in crude steel production in 2010, Turkey continued its development in crude steel production in the following years and ranked up to 8th place among the first 20 countries. Although Turkey is one step fell in 2015, it regained its 8th place in 2016. Turkey, climbing 9th steps in 16th years period, reveals an important and satisfactory picture both in terms of sector and industrialization and development of Turkey.

4. AN EVALUATION ON THE BASIS OF SELECTED COUNTRIES IN TERMS OF STEEL EXPORT AND IMPORT

The most important indicator of globalization in the world economy is the increase in import and export quantities and growing market economies. Iron and steel, which have an important place in terms of industrialization of the countries and world trade, constitute the basic raw material of many sectors. For this reason, both production and export of iron and steel products play a significant role. Iron and steel products, which have an important place in the world economy, are transferred to the countries in need from the countries in which they are produced. Today, an important part of iron and steel production is made up of semi-products and finished steel. The largest share of steel production and exports belongs to China. The largest steel exporters following China are Japan, Russia, Germany and Italy, respectively.

As of 2015, Turkey ranks 6th in steel exports after Italy. Import and export values are very important indicators in terms of emerging of competitiveness of a country. For this reason, it is beneficial to examine the export numbers of Turkey in comparison with other countries in years in order to understand the competitiveness of sector.

Table 3. Semi Products and Completed Steel Export (thousand tons)

		2010	2012	2014	2015
1	CHINA	41646	54793	92907	111556
2	JAPAN	42951	41458	41346	40 804
3	RUSSIA	27382	26678	28084	29702
4	GERMANY	25352	25818	24757	25146
5	ITALY	15316	17926	17328	16475
6	BRASIL	8983	9673	9776	13708
7	**TURKEY**	**16223**	**18574**	**16024**	**14342**

Source: Worldsteel Association, *Steel Statistical Yearbooks*, www.worldsteel.com

As Table 3 shows, China's steel exports are stand slightly behind Japan in 2010. However, in the following years, although Japan's steel exports are at the same level, China's steel exports show rapid increase over the years and it seems to have the leading position in the world. This is because China is the world leader in terms of production. In 2014, China's steel exports have increased by more than 2 times compared to 2010, and in 2015 it has almost reached an export volume close to 3 times of 2010. With this production volume, China has exported 2.5 times steel than Japan, which is the closest steel exporter to China.

It is possible to examine the steel exports for years in Turkey with the help of the data given in Table 4.

Table 4. Steel Export of Turkey within Years (Thousand tons)

1992	**5044**	2000	**7499**	2008	**18535**
1993	**6321**	2001	**10587**	2009	**17413**
1994	**8340**	2002	**5068**	2010	**16223**
1995	**6211**	2003	**11142**	2011	**16688**
1996	**6697**	2004	**13159**	2012	**18574**
1997	**7227**	2005	**12279**	2013	**17305**
1998	**6555**	2006	**9180**	2014	**16024**
1999	**7552**	2007	**15393**	2015	**14342**

Source: Worldsteel Association, *Steel Statistical Yearbooks* www.worldsteel.com

Although Turkey has been producing steel for many years, its export volume has remained limited. It can be said that the implementation of outward closed economy policies and the low level of steel production were effective in Turkey's low levels of export in the 1990s. In the 2000s, steel exports, except for 2002, showed a rapid increase. In 2002, steel exports decreased more than 100% compared to the previous year. The economic crisis experienced in Turkey in 2001 has been decisive for this decline in Turkey's steel exports

It is observed that Turkey's steel exports have increased rapidly in the 2000s, especially after 2002, and it has consistently exceeded more than 10 million

tons except for 2006. Sector exports reached to peak in 2012. This increase in the production of semi-product and finished steel has been driven by the increase in the production volume of iron and steel factories in Turkey. In the following years, there is a continuous decrease.

When we analyze the steel imports of countries through data given in Table 5, it is seen that the steel exporting countries import steel in different amounts. Import of China, the country in leading position in steel production, imports in the leading position in steel production has the tendency to decrease in the period covering 2010-2015. Japan and Russia's steel imports were close to each other with low levels for the period examined. On the other hand, it is observed that Germany imports steel in almost the same amount of steel exports, while Italy has some differences in years, while in some years exports have increased and in some years imports have increased. What should be noted here is to show at what rates countries can meet their steel needs. Generally, the need for imports from exporting countries is mainly related to the country's ownership of raw materials. If a country has large iron deposits, iron and steel imports of these countries will naturally be at low level. On the other hand, countries without sufficient mineral deposits or even they do, those which possess such mines since they are technologically advanced, import iron-steel close to the amounts they export. In addition, the fact that steel imports in Italy and Germany are very close to the export volume is directly related to the industrial development of these countries and the need of steel of these countries in their industries.

Table 5. Semi Product and Finished Steel Import

		2010	2012	2014	2015
1	CHINA	17181	14154	14903	13178
2	JAPAN	5275	5733	6733	5918
3	RUSSIA	5229	6897	6442	4364
4	GERMANY	22733	22729	24263	24817
5	ITALY	16307	13899	16632	19936
6	BRASIL	5904	3777	3947	3195
7	**TURKEY**	**10746**	**11499**	**13394**	**18614**

Source: Worldsteel, Steel Statistical Yearbook, www.worldsteel.com

In Turkey, it is observed that more steel is exported from the imported steel during the period 2010 to 2014. In 2015, however, the process was reversed and more steel was imported than steel exported. Despite the increase in steel production in China, consumption declines were particularly effective in this situation. Chinese producers, who also received government support, increasingly focus on export and this has led to a decrease in the prices of manufactured goods in the international market. Our country is mostly affected by the problems derived from global supply surplus caused by China. The fact that producers operating in the Turkish steel sector can not compete with producers due to global supply surplus and increasing steel demand in domestic market in 2015, lead to an increase in steel imports in Turkey (Turgut, 2016:191).

As a result of these developments, Turkey's steel import in 2015 was realized as 18.6 million tons. The development of Turkey's steel imports over the years can also be seen in Table 6.

Table 6. Steel Import of Turkey during Years (thousand tons)

1992	2725	2000	7273	2008	13271
1993	5542	2001	5962	2009	10236
1994	3320	2002	6646	2010	10746
1995	3436	2003	8217	2011	10304
1996	3715	2004	8166	2012	11499
1997	5134	2005	10247	2013	14462
1998	5324	2006	12290	2014	13394
1999	4747	2007	13529	2015	18614

Source: Worldsteel, Steel Statistical Yearbook www.worldsteel.com

When the data in Table 6 are examined, it can be said that Turkey's steel imports tend to increase generally. Steel imports increased from 2.7 million tons in 1992 to 8.1 million tons in 2004. However, the main increase in steel imports took place between 2005 and 2008. Steel imports, which took place at a fixed level from 2009 to 2011, are expected to peak at 18.6 million tons in 2015 after a fluctuating period between 2012 and 2014. The external effects of these increases in steel imports were mentioned earlier. On the other hand, it can be said that the increase in demand deriving from the domestic market is also effective in steel import increase. Especially in recent years, it can be said that the industrialization movements that Turkey has made to improve the national industry and the rapid increase in the housing production have been effective in steel imports increase.

The Iron and Steel sector is one of the most important sectors in the development of a country. This importance of the sector comes from the fact that it provides input to many sectors operating in the field of production in the form of intermediate goods and raw materials and hence leads to an increase in employment both in the Iron-Steel sector and in the sectors where it provides input. The development of the number of employees in the iron and steel sector by years is given in Table 7.

Table 7. Number of Employees in the Iron and Steel Industry (Person), (2006-2017)

NACE Rev. 2, Section	**Section, Group and Class**	**2006**	**2007**	**2008**	**2009**
24	**Main Metal Industry** (Total Value 241, 242, 243, 245)	**47 598**	**47 486**	**46 390**	**79 410**
24.1		16 714	17 292	16 423	45 902
24.2		1 281	1 243	1 230	10 130
24.3		12 751	13 393	14 622	5 069
24.5		16 852	15 558	14 115	18 309
25.	**Fabrication of Metal Products**	**126 100**	**129 063**	**146 245**	**243 397**
TOTAL	**(24 + 25)**	**173 698**	**176 549**	**192 635**	**322.807**

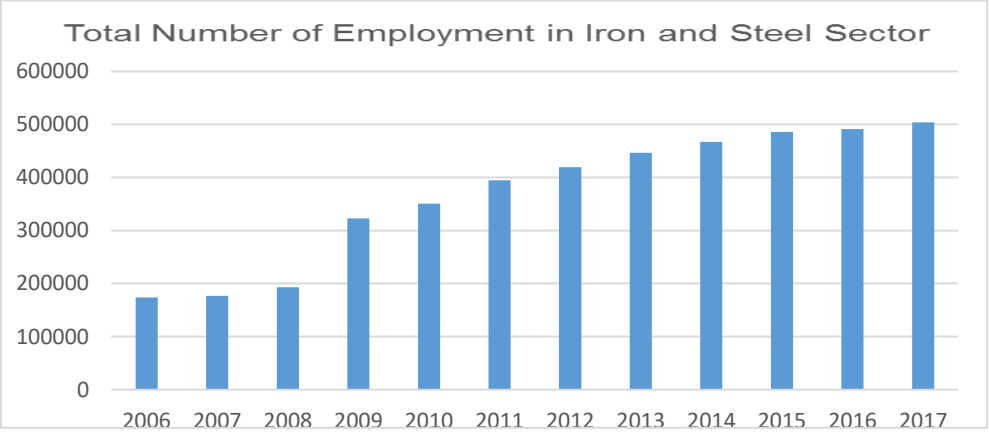
		2010	2011	2012	2013
24	**Main Metal Industry** (Total Value 241, 242, 243, 245)	**84 708**	**92 462**	**97 638**	**100 878**
24.1		47 594	51 434	54 079	55 050
24.2		10 607	11 225	12 118	13 895
24.3		5 673	6 269	6 428	6 488
24.5		20.834	23 534	25 013	25 445
25.	**Fabrication of Metal Products**	**265 582**	**301 833**	**321 822**	**345 778**
TOTAL	**(24 + 25)**	**350 290**	**394 295**	**419 460**	**446 656**

		2014	2015	2016	2017
24	**Main Metal Industry (Total Value 241, 242, 243, 245)**	**104 143**	**106 995**	**106 651**	**109 368**
24.1		56 725	58 320	57 412	59 834
24.2		14 439	15 124	15 879	15 769
24.3		6 818	7 116	7 087	7 146
24.5		26 161	26 435	26 273	26 619
25	**Fabrication of Metal Products**	**362 533**	**378 462**	**384 232**	**394 158**
TOTAL	**(24 + 25)**	**466 676**	**485 457**	**490 883**	**503 526**

Source: TUİK, http://tuik.gov.tr/PreTablo.do?alt_id=1035 (Date Accessed: 02.03.2019)
Note: Codes of Nace Rev. 2: 24.1 Manufacture of Main Iron and Steel Products and Ferro Alloys, 24.2 Manufacture of steel tubes, pipes, hollow profiles and similar fittings, 24.3 Manufacture of Other Products Obtained in the First Machining of Steel, 24.5. Metal Casting Industry, 25. Fabrication of Metal Products

When the data in Table 7 are analyzed, it is seen that the number of employment in the Main Metal Industry connected to the Iron-Steel sector has increased continuously in the period of 2007 and 2008 except for the small decrease in the year. In the 2006-2017 period, the number of employees employed in the iron and steel sector increased by 95.6%. As of 2017, 40.5% of those employed in the main metal industry are directly employed in the production of iron and steel products and ferro-alloys. The graphical representation of those employed by the metal industry is given in Graph 1.

Graph 1. Number of Main Metal Industry Employment



Source: TUİK, http://tuik.gov.tr/PreTablo.do?alt_id=1035 (Date Accessed: 02.03.2019). This graph is composed with the data obtained from TURKSTAT

Graph 1. When analyzed, it is seen that there is a regular increase in the total number of people employed in the main metal industry and fabricated metal products manufacturing industry connected with the iron and steel sector. In Turkey, where 28.2 million people were employed as of December 2017, regularly increasing and the total of those employed in the manufacturing of fabricated metal products (excluding machinery and equipment), which are employed in the main metal industry, which is the majority of the employees in the iron and steel sector, the share in total employment has been realized as 1.78%. As can be seen, the share of the employment in the iron and steel sector in total employment is quite small. However, the iron and steel sector is a sector providing input to other sectors. Therefore, it is possible to say that the Iron and Steel sector is a sector with the ability to create employment. It was determined that 1 person working in the iron and steel sector provided employment to 12 people working in other subsidiary sectors. Iron ore mining, however, leads to an additional development of about 60% of its production value. In other words, if local iron ore resources are used instead of imported ore, an additional improvement of 60% of the ore used in the economy will be achieved depending on the production activities in the sectors that provide input to the iron and steel sector (TMMOB, 2010).

In addition, the Iron and Steel sector is both technology intensive and open to competition. Therefore, the companies operating in the Turkish iron and steel industry are aware of the importance of technology in terms of achieving competitiveness and closely follow the latest technological developments in the world in iron and steel. In addition, more and more resources are allocated to the development of new products and the production of high value-added products by industry producers (Kalkınma Bakanlığı, 2014:88). This leads to an increase in the productivity of the existing employees, while the increase in the productivity of the labor force in the sector leads to a limited level of new labor force. Also dismissal of the idle workforce due to the privatizations realized and and investments to modernized the production process in the iron and steel sector, Due to the increase in labor productivity, the number of employment in the Basic Oxygen Furnace (BOF) decreased significantly after 1990 (TOBB, 2016:7). On the other hand, the fact that the new investments made in recent years are oriented towards high value-added production leads to the high quality of the labor force employed in the sector (Öcal, 2014:30). Therefore, the iron and steel sector has both the ability to create employment, the technology is being used extensively in the production process, production is being carried out with qualified workforce, although the number of employment in the sector is limited, It allows it to have significant effects on economic growth and increased GNP.

Today, the positive developments in the iron and steel sector have a positive impact on the development of the iron and steel products and materials sector. As of 2017, approximately 31 thousand businesses operate in the iron and steel goods sector and approximately 150 thousand people are employed in these establishments together with those working in the Major Metals and Other Non-Ferrous Metals (38.199 people). Casting products have an important place in iron

and steel goods sector (Ticaret Bakanlığı, 2018:2). In addition, the total number of employment in the iron and steel sector (Excluding machinery and equipment), along with employees in the fabrication of fabricated metal products, was approximately 504 thousand. By making use of the values in Table 8, it is possible to make a general evaluation for the Iron and Steel sector as of 2017.

Table 8. Turkey Iron and Steel Industry Summary Indicators (2017)

Iron Ore Imports 10.963 Thousand Tons	Scrap Imports 20.981 Thousand Tons	Semi-Product Imports 4.835 Thousand Tons	Steel Imports 16.339 Thousand Tons
Raw Steel Production 37.524 Thousand Tons	Final Product Production 39.193 Thousand Tons	Raw Steel Production Capacity 51.506 Thousand Tons	The capacity utilization rate % 73
Growth in Production % 6,19	Steel Production 36.072 Thousand Tons	Steel Exports 18.323 Thousand Tons	Share in Total Exports % 8,53
Production Value 41.1 Billion USD	Number of Initiatives 2.967 Pieces	Value Added 6.7 Billion USD	Gross Investment 2,1 Billion USD

Source: Türkiye Sınai Kalkınma Bankası, Sektörel Görünüm, Demir-Çelik, Mayıs 2018, Data Accesses: (01.03.2019), http://www.tskb.com.tr/i/assets/document/pdf/sektorel-demir-celik.pdf

As of 2017, Turkish Iron and Steel sector has 37.5 million tons of crude steel production volume, 0.52% of total employment in industrial sectors and 10.3% of total exports of all sectors with export of 18.3 billion dollars. In this aspect, the iron and steel sector is among the most exporting sectors and is one of the key sectors of the industry due to this feature.

5. DEVELOPMENT OF IRON STEEL SECTOR IN TURKEY AND ITS INTEGRATION TO COMPETITION

The liberalization and globalization movements in the Turkish economy since the 1980's have also been an important milestones in development of the iron and steel industry. The establishment of the Electric Arc Furnace (EAF) plants in the iron and steel sector led to significant increases in the production of the sector and, accordingly, significant developments took place in the iron and steel sector. In the post-1980 period, the sector's producers are predominantly oriented to electric arc furnace plants in the production process, since these plants can be installed at lower costs than other production plants and they are capable of producing various steel products (TOBB, 2014:19). In this respect, iron and steel factories could be established in many parts of Turkey after 1980. A list of factories established in Turkey before and after 1980 can be seen in Table 9.

Table 9. Operating Iron and Steel Factories in Turkey and their Establishing Years)

Management	**Establisment**	**Manage.**	**Estab.**	**Manage.**	**Estab.**
MKEK	1928	Diler	1984	Sider	2006
Kardemir	1937	Habaş	1987	Mega	2009
Erdemir	1965	İDÇ	1987	Bilecik	2009
Çolakoğlu	1969	Çebitaş	1989	Ede	2010

Kroman	1969	Ekinciler	1989	Platinum	2010
İçdaş	1970	Sidemir	1992	Tosçelik	2010
Çemtaş	1972	Yazici	1994	Özkan	2010
İsdemir	1977	Yeşilyurt	1997	MMK-Atakaş	2011
Asil Çelik	1979	Kaptan	2002	Cansan	2012
Ege Çelik	1982	Nursan	2005	Koç Çelik	2013

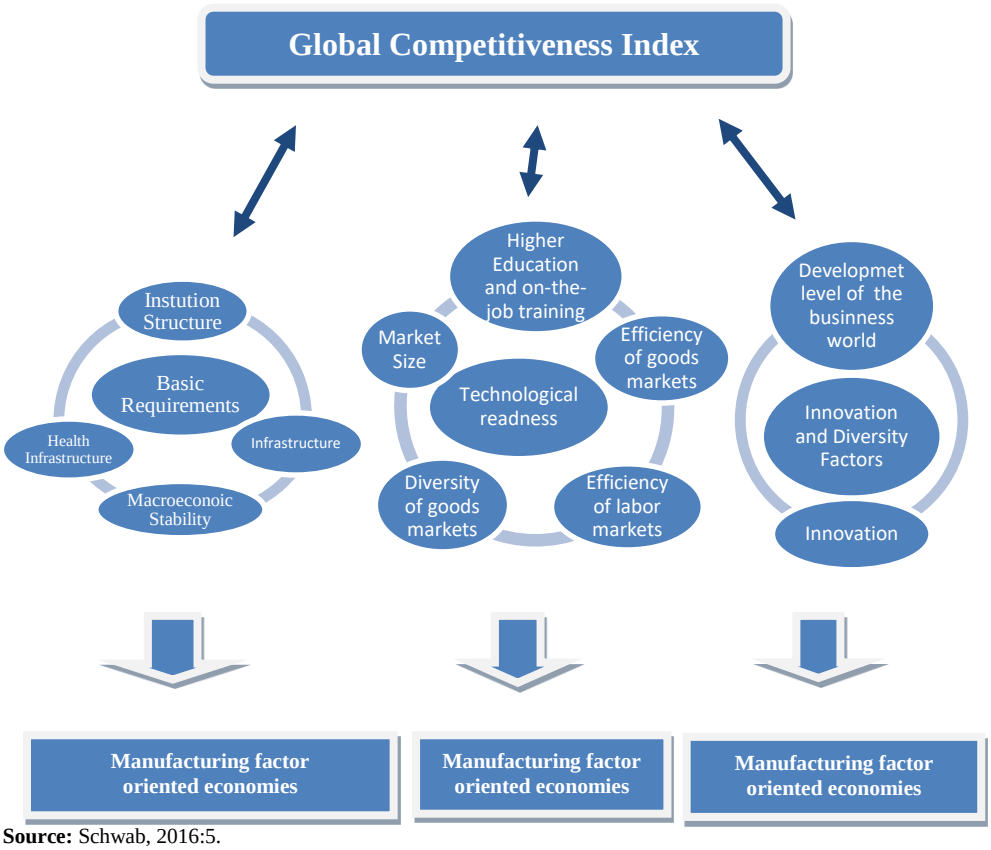
Source: Yaşar (2015), A Research in the Field of Industrial Geography: Iron-Steel Industry Cluster in Hatay and Osmaniye Provinces, pg. 389.**M**http://proje.akdeniz.edu.tr/mcri/mjh/5-1/MJH-26-Okan_YASAR.pdf

As seen in Table 9, 9 iron and steel factories were established in Turkey in the beginning of 1980, whereas 21 factories were established after 1980 (Yaşar, 2009: 48). This increase in the number of factories can be mostly explained by producers' preferences towards Electric Arc Furnaces. Thanks to these factories established in the iron and steel sector, Turkey's iron and steel production has increased and the quality of the products has been improved. In addition, with the liberalization of foreign trade activities known as 24th January decisions, Turkish iron and steel sector was opened to international competition and integrated into global markets. At this point, together with the process of globalization, the integration of many countries with each other has played a major role.

Furthermore, in addition to the direct investments in the iron and steel sector, the increase in investments for other sectors connected to this sector have played an important role in the development of the Turkish iron and steel industry and becoming a major iron and steel producer country in global markets.

In 1979 The Global Competitiveness Index (GCI), which was built on the original idea of Klaus Schwab and developed under the cooperation of the World Economic Forum and Sala-i Martin in 2005, combines the 114 indicators that are important for economic and long-term prosperity and constitute the index value. In this context, it creates 3 sub-indices and compares 138 countries with various indicators (Schwab, 2016: 4). The framework consists of three building blocks. These; endowment is macroeconomic competitiveness and microeconomic competitiveness. Riches are advantages such as natural resources that directly affect welfare, geographic location and a large internal market. Macroeconomic competitiveness is a combination of social infrastructure and institutions and macroeconomic policies. Finally, microeconomic competitiveness shows the stage of development of the quality of the business environment, the stage of the clusters and the strategies of the companies (Ülengin et al., 2010: 14).

Graph 2: Global Competitiveness Index



Source: Schwab, 2016:5.

The 12 variables used in this index are based on 3 basic legs. Institutions, the legal and administrative structure in the country; infrastructure, physical infrastructure that facilitates trade; macroeconomic stability refers to the economic structure to ensure sustainable economic growth and health infrastructure to be healthy. Increasing efficiency in higher education and on the job training, higher education enrollment rates; efficiency of goods markets, the effectiveness of demand conditions required for competition; efficiency of labor markets indicates that employees are used in efficient areas; diversity of goods markets, a large number of goods markets and directed to active areas; readness indicates the extent to which the technological environment is ready and the market gives you a view of how much markets allow economies of scale. In terms of innovation and diversity, development level of the business world represents the level of competition of the business world and innovation is the innovation that will be created by human capital.

6. LITERATURE REVIEW

The literature on iron and steel production is not very wide. The studies focus more on iron and steel production in terms of efficiency, competition and foreign trade. We can briefly abstract these works as follows.

In the study prepared by Yavuz and Demirci (2014) in order to analyze the efficiency of selected Turkish iron and steel companies in the same geographical region between 2005 and 2010, Turkish iron and steel companies have benefited from the Total Envelope Analysis productivity changes. As a result of the analysis, regardless of the size of the company, it was determined that the effect of iron and steel companies on the efficiency of the global financial crisis, but not in the early stages.

Ersoz et al (2015), 5 million tons and above by iron and steel exporting countries of 2003-2012 years through the use of export figures had been done between Turkey and a comparison of world countries in the study was made, were compared using multivariate one of the statistical techniques Cluster Analysis. The comparison and the evaluation result of Turkey and Iron is an important sector for the world have reached the conclusion that it has a very important place in the global economy, the steel industry, as well as in the Turkish economy and industrialization of having the leading sector nature of the iron -steel exports could be seen at what level.

Ersoz et al. (2016) in order to analyze whether there is a significant relationship between countries' development levels and steel production numbers, raw steel production data of between 1980 and 2012 period from World Archives' archives and their study by using Anova method, between countries' steel production numbers and development levels they concluded that there was no significant relationship. In addition, continued operation, steelmaking that countries have grouped performing cluster analysis based on the average production figures and made cluster analysis result, Turkey, Belgium, Canada, France, Mexico, Poland, took part in the 9th cluster together with Spain and the UK.

Kara and Erkan (2016), in order to determine the relationship between the level of productivity in the iron and steel industry and the comparative degree of superiority in the export of this industry, and to develop feasible political proposals for the future of iron and steel industry, has been compiled from the base of the electronic data distribution system of the Central Bank of Turkey. In the study prepared by using the covering data, the Explained Comparative Advantage coefficients of the iron and steel industry were determined by the Balassa Index. The production efficiency of the industry was determined by Data Envelopment Analysis (DEA) and Malmquist Total Factor Productivity (TFP). As a result of the analysis and analysis, a positive correlation was found between the efficiency level of the iron and steel industry and its comparative advantage.

Ozcan and Anil (2017) examined the productivity performance of 13 firms of the iron and steel sector among the 500 largest companies of our country in the period of 2013-2015. Malmquist total factor productivity index based on Data Envelopment Analysis (DEA) and Data Envelopment Analysis (DEA) was used. According to the results of the Malmquist total factor productivity index, it was determined that eleven firms showed positive progress.

Turker (2017), The Turkish iron and steel competitiveness occurring in the change of the industry, "Revealed Comparative Advantage" by using the method, from between 1989 and 2016 were analyzed for the period of the analysis result, in all these years along Turkey's total iron and steel industries of comparative advantage but the competitiveness index value, which was higher in previous years, decreased in recent years.

In the study prepared By Cestepe and Tuncel (2018), in order to determine the international competitiveness of Turkish iron and steel sector by using the m revealed comparative advantages rekabet method, the competitiveness of the Turkish iron and steel sector was examined in the three-digit sub-sector for the period 2007-2016. For this purpose, the indices developed by Balassa and Vollrath were calculated separately and the results were compared with each other. As a result of the study, it has been concluded that the competitiveness of the Turkish iron and steel sector in the group of flat products used in the production of high value-added products is low, while in the long product group with low value-added, the competitiveness is high.

In this study, total steel production is discussed in terms of global competition, economic growth and unemployment and thus it is aimed to make a new contribution to academic literature.

7.DATA SET, ECONOMETRIC METHOD AND FINDINGS

A. Data Set and Econometric Model

Data belong to top 20 countries[1] in crude steel production were tested with panel data analysis for the period 2009-2016. The steel production data used in the study shows the total crude steel production as "thousand tons" and it is listed as "WP" in the analysis. The global competition index reflects the index values and is called "GCI" in the analysis. Moreover, is called the economic growth “GROW” and the unemployment rate are included in the analysis as “UNEM”.

The E-views 10 and STATA 14 package programs were used to estimate the empirical model created within the framework of panel data analysis. 3 different models will be estimated in the study.

$$WP_{it} = \alpha + \boldsymbol{\beta}1\ GCI_{it} + \varepsilon_{it} \qquad i=1,\ldots,N;\ t=1,\ldots T \qquad (1)$$

$$WP_{it} = \alpha + \boldsymbol{\beta}1\ GROW_{it} + \varepsilon_{it} \qquad i=1,\ldots,N;\ t=1,\ldots T \qquad (2)$$

$$WPit = \alpha + \boldsymbol{\beta}1\ UNEM_{it} + \varepsilon_{it} \qquad i=1,\ldots,N;\ t=1,\ldots T \qquad (3)$$

In the model, the independent variable is total crude steel production, while the dependent variables are global competitiveness index, unemployment and economic growth.

B. Econometric Method and Evaluation of Findings

In this study, firstly, it should be examined whether the horizontal section units are interconnected, in other words, in the case of any shock in the series, whether all the horizontal sections are affected by this shock at the same level (Akçay ve Erataş, 2012:12).

[1] China, Japan, USA, India, Russia, Germany, South Korea, Ukraine, Brazil, Turkey, Italy, France, Taiwan, Canada, Mexico, Spain, Iran, Belgium, United Kingdom, Poland.

Hypotheses of CD_{LM} test can be expressed as follows:

H_0: There is no cross-sectional dependence.

H_1: Horizontal cross-sectional dependence.

When the probability value to be obtained is less than 5%, at the 5% significance level, the H_0 hypothesis is rejected and it is decided that there is a cross-sectional dependence between the units forming the panel. (Pesaran, 2008:17).

Table 10 shows the cross-sectional dependence test of variables.

Table 10: Cross-Sectional Dependence Test of Variables (CDLM Test)

CD Test	Test Stat.	Prob.
CD_{LM1} (Breusch-Pagan LM)-WP	657.2004	0.0000
CD_{LM2} (Pesaran scaled LM)-WP	23.96687	0.0000
CD_{LM3} (Pesaran CD)-WP	20.12738	0.0000
Bias-corrected scaled LM-WP	22.53830	0.0000
CD_{LM1} (Breusch-Pagan LM)-GROW	565.3443	0.0000
CD_{LM2} (Pesaran scaled LM)-GROW	19.25476	0.0000
CD_{LM3} (Pesaran CD)-GROW	19.16116	0.0000
Bias-corrected scaled LM-GROW	17.82619	0.0000
CD_{LM1} (Breusch-Pagan LM)-GCI	451.5404	0.0000
CD_{LM2} (Pesaran scaled LM)-GCI	13.41674	0.0000
CD_{LM3} (Pesaran CD)-GCI	11.20154	0.0000
Bias-corrected scaled LM-GCI	11.98817	0.0000
CD_{LM1} (Breusch-Pagan LM)-UNEM	520.1262	0.0000
CD_{LM2} (Pesaran scaled LM)-UNEM	16.93512	0.0000
CD_{LM3} (Pesaran CD)-UNEM	2.126057	0.0335
Bias-corrected scaled LM-UNEM	15.50655	0.0000

According to Table 10, the probability value in all four tests is less than 5% and as a result there is a cross-sectional dependence between the units forming the panel for all variables.

According to these results, a shock to one of the countries' total steel production affects the relevant indicators in other countries. For this reason, decision-makers in these countries should take into account the policies implemented by other countries and the shocks affecting the total steel production of these countries. In the next phase of the study, the 2nd generation unit root tests, which take into account the cross-sectional dependence, should be used for all series. In this case, the stability of the series was analyzed by CADF test developed by Pesaran (2006), a second generation unit root test which can be used in case of cross-sectional dependence. The unit root test can be performed in each horizontal section unit (for each country) in the series forming the panel with CADF. The unit root statistics (CADF) and test statistics for the overall panel (CIPS-IPS W st.) Are calculated in Table 11 for each country forming the panel.

Table 11: CADF Unit Root Test Results

Var. / Cou.	WP-test stat.		GROW-test stat.		GCI- test stat.		Δ GCI- test stat.		UNEM- test stat.		Δ UNEM-test stat.	
CHINA	-1.8966		-2.4160		-1.8301		-1.7914		-0.5571		-2.5833	
JAP	-1.0146		-3.1215		-0.0378		-1.6346		-1.7994		-7.7023	
USA	-1.1263		-1.9509		-1.0013		-8.7638		-0.7906		-3.6981	
IND	-0.8257		-6.4083		-2.9243		-1.4640		-1.7876		-3.7268	
RUS	-2.9805		-1.4522		0.2709		-1.2380		-2.6251		-1.3861	
GER	-3.7013		-9.0963		0.3470		-1.9504		-2.0480		-1.7078	
KORE	-4.2792		-13.115		-2.2286		-2.9131		-2.2163		-1.6543	
UKR	-1.1676		-2.0201		-2.3305		-6.8483		-0.8161		-1.8785	
BRA	-0.1746		-0.3551		-3.7816		-2.0364		-0.0155		0.2012	
TURK	-3.6347		-2.2573		-1.6936		-1.1750		-2.9484		-1.2314	
ITAL	-2.5419		-2.1843		-1.4629		-2.2904		-1.3488		-1.4667	
FRAN	-0.7677		-6.9804		-1.6743		-1.6980		-1.2155		-1.1147	
TAIW	-1.4322		-2.7349		-1.6013		-3.0916		-3.7956		-1.1148	
CAN	-1.7936		-2.3333		-1.5584		-4.5811		-5.2039		-1.1431	
MEX	-3.8949		-1.9527		-1.0049		-6.0216		0.9836		-1.5229	
SPA	-2.1737		-0.5972		-1.4169		-3.4164		-1.9927		-0.4999	
IRAN	-2.0049		-1.3210		-2.2088		-2.3360		-1.6910		-2.4787	
BEL	-3.6769		-3.9414		-0.9038		-3.5948		-1.7327		-2.2500	
UNKN	-2.6486		-1.2835		-1.7374		-2.7296		-0.8549		-1.4121	
POL	-2.0373		-2.7650		-0.8731		-2.9836		-0.2329		-1.5212	
IPS – W stat.	**St.**	**Prob.**	**St.**	**Prob.**	**St.**	**Prob.**	**St.**	**Prob.**	**St.**	**Prob.**	**St.**	**Prob.**
	-1.8729	0.0305	-5.4338	0.0000	0.17842	0.5708	-4.3144	0.0000	-0.2627	0.3964	-1.3101	0.0951

Note: The delay length was determined according to the SIC criteria and the delay value was found to be 1. Critical values are discussed in the fixed model.

According to the results of Table 11, the global competition index and unemployment data remained stagnant at the level of raw steel production and economic growth data. Since the series is stationary, the model is estimated with ARDL model. The appropriate delay length should be determined in the ARDL model. Table 12 shows the appropriate delay length.

Table 12: Appropriate Delay Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-39.63071	-	0.00011	2.237472	2.408094	2.298690
1	216.6648	446.8782	4.93e-10	-10.08537	-9.232266	-9.779287
2	247.7882	47.88217	2.33e-10	-10.86093	-9.325339*	-10.30998
3	276.5093	38.29474*	1.31e-10	-11.5133	-9.295214	-10.71747
4	298.8593	25.21543	1.09e-10*	-11.83894*	-8.938370	-10.79824*
5	313.6712	13.67247	1.50e-10	-11.77801	-8.194952	-10.49244
6	328.4339	10.59889	2.49e-10	-11.71456	-7.449016	-10.18412

As seen in Table 12, the LR, FPE, AIC, SC and HQ information criteria showed the appropriate delay length of 4. Then, in this frame, a PMG estimator was used, which is organized by Pesaran et al. Table 13 gives PMG estimator results.

Table 13: The Results of PMG Estimator

Dependent Variable: D(LOGGRWL)			
Variable	Coefficient	t-Statistic	Prob.
Long Run Equation			
LOGWP	0.104151	11.71686	0.0000
Short Run Equation			
COINTEQ01	-0.639822	-7.303855	0.0000
D(LOGWP)	1.386319	3.620930	0.0005
Dependent Variable: D(LOGUNEM)			
Long Run Equation			
LOGWP	-0.105252	-2.329524	0.0219
Short Run Equation			
COINTEQ01	-0.296315	-2.676206	0.0087
D(LOGWP)	-0.032612	-0.218407	0.8276
Dependent Variable: D(LOGGCI)			
Long Run Equation			
LOGWP	0.221504	7.113102	0.0000
Short Run Equation			
COINTEQ01	-0.493332	-2.537150	0.0131
D(LOGWP)	0.017011	0.270452	0.7875

According to Table 13, the fact that the error correction parameter is negative and significant (-0.63) indicates that there is a long-run total steel production relationship between and growyh. The error correction parameter also indicates that all series will not be stable at the same time, so that even if they deviate from balance, they will rebalance. According to these results, there is a short and long-term relationship between total steel production and economic growth. When the long-term coefficients are examined, the crude steel production coefficient is about 0.104. Accordingly, a 1-unit increase in crude steel production increases economic growth by 0.104 in the long term. When the short term coefficients are examined, the 1 unit increase in crude steel production increases the economic growth by 1,386 units. When analyzed in terms of unemployment, 1 unit increase in total steel production decreases unemployment by 0,105 units in the long term. The short term coefficient is meaningless. When examined in terms of the last variable global competition index, the 1-unit increase in total steel production increases the global competition in the long term by 0.22 units, while the short term coefficient is meaningless.

RESULTS AND RECOMMENDATIONS

The iron and steel sector is one of the most important sectors in terms of the contribution it provides to the development of the countries and the fact that it is an indicator of the development of the countries. Thus, both developed and developing countries attach great importance to the iron and steel sector and are investing heavily in this sector. This, in turn, leads countries to enter into a competitive challenge in iron and steel industry. It is possible to say that in these developments of the countries in the global scale in the iron and steel sector, there has been a considerable share of investments and facilitation made in the sector in recent years. Today, countries such as China, Japan, India and the USA are at the forefront of the world's largest steel producers and exporters, both in terms of size of mineral deposits and reserves and in terms of the development of sector structures, and many countries are still incapable of competing with these countries

in the iron and steel sector. It is worth mentioning that in among these four countries, which have a large share of world iron and steel production, it is necessary to keep China in a separate place from every aspect and that China is the leading country in the mentioned sector. It can be said that European countries are relatively behind these first four countries in terms of iron and steel production volume and competitiveness.

Besides the ownership of iron and steel deposits as one of the leading factors in development of the iron and steel sector in the countries, since the iron and steel sector is a labor-intensive sector, another important factor in the need for countries is to have cheap labor force. If it is looked closer, it will be seen that countries such as China and India are the two most populous countries in the world, and these countries have gained considerable competitive power in the iron and steel sector against other countries due to their cheap labor power. Furthermore, the need for capital accumulation in large quantities respect to iron and steel sector in relation to the labor force is also decisive in the fact that such countries with such capital power on the global scale carry them a step forward in iron and steel sector and allow them to have the competitive power in the sector in question. Finally, it can be said that some incentive policies and implementations in the form of government incentives for the sector, tax reductions, low interest financial support and subsidies contribute significantly to the development of sector and countries involving these incentives have achieved competitive power in the iron and steel sector.

In this study, panel data analysis of the effects of total steel production on global competition, economic growth and unemployment was tested in the first 20 countries in the raw steel production for the period 2009-2016. In the study, horizontal cross-sectional dependency was found in the series and series 2 unit panel root tests were used to stabilize the series. The coefficient of the relationship with the PMG estimator was estimated and a short and long term relationship was found between total steel production and economic growth. According to these results, 1 unit increase in total steel production increases economic growth in the long term by 0.104 and in the short term by 1.386 units. While 1-unit increase in total steel production decreased unemployment by 0.105 units in the long term; global competition increases by 0.22 units. In the short term there is no relationship.

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