ANALYSIS OF THE RELATIONSHIP BETWEEN HIGH-TECH PRODUCT IMPORTS AND CURRENT ACCOUNT DEFICIT IN THE TURKISH ECONOMY

TÜRKİYE EKONOMİSİNDE YÜKSEK TEKNOLOJİLİ ÜRÜN İTHALATI İLE CARİ AÇIK ARASINDAKİ İLİŞKİNİN ANALİZİ

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Abstract: The aim of this study is to explain how the current account balance of the Turkish economy is affected by high technology product imports and this trade within the framework of causality analysis. One of the most important factors affecting the current account balance of a country is the import item. As a result of the lower export revenues of the country in return for the imports, the current account balance is adversely affected. The factor that provides the highest return in the production process of the country is the production of high-tech products. While some countries are at the top in the production of high-tech products, others are in the position of importers. Countries that are importers of high-tech products generally have current account deficit problems. However, all countries are trying to build their production structures to produce high-tech products. In this study, the relationship between high technology product imports and current account deficit in the Turkish economy was tested with Granger Causality Analysis. The current account deficit data obtained from the CBRT and the import level of high technology products obtained from TURKSTAT are used monthly between 2013-2021. As a result of the analysis carried out, no causal relationship could be determined between the import of high technology products and the current account deficit.

Key Words: High Technology, Import, Current Account Deficit

Öz: Bu çalışmanın amacı Türkiye ekonomisinin yüksek teknolojili ürün ithalatı ve bu ticaret sonucunda cari dengesinin nasıl etkilendiğini nedensellik analizi çerçevesinde açıklamaktır. Bir ülkenin cari işlemler dengesini etkileyen en önemli unsurlardan birisi ithalat kalemidir. Gerçekleştirilen ithalat karşılığında ülkenin elde etmiş olduğu ihracat gelirlerinin daha düşük olması sonucunda cari denge olumsuz etkilenmektedir. Ülkenin gerçekleştirdiği üretim süreci içerisinde en fazla getiriyi sağlayan unsur ise yüksek teknolojili ürün üretimi olmaktadır. Kimi ülkeler yüksek teknolojili ürün üretiminde üst sıralarda iken kimileri ise ithalatçı konumdadır. Yüksek teknolojili ürün ithalatçısı konumunda olan ülkelerin genellikle cari açık sorunları bulunmaktadır. Ancak bütün ülkeler üretim yapılarını yüksek teknolojili ürün üretmeye yönelik inşa etmeye çalışmaktadır. Bu çalışmada Türkiye ekonomisinde yüksek teknolojili ürün ithalatı ve cari açık arasındaki ilişki Granger Nedensellik Analizi ile test edilmiştir. TCMB'den elde edilen cari açık verileri ve TÜİK'ten elde edilen yüksek teknolojili ürün ithalat düzeyi 2013-2021 arasında aylık olarak kullanılmıştır. Gerçekleştirilen analiz sonucunda yüksek teknolojili ürün ithalatı ile cari açık arasında nedensellik ilişkisi tespit edilememiştir.

Anahtar Kelimeler: Yüksek Teknoloji, İthalat, Cari Açık

JEL: B10, E10, O14

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1. Introduction

Mobility of resources between countries increases due to globalisation. In this respect, obstacles to capital movement are removed and redirected to countries which can yield higher income. While this may make it easier to access foreign capital, especially for developing economies, it also increases the risk posed by a significant amount of foreign capital coming out of the country on the balance of payments. While some countries take short-term measures against such speculative capital inflows and outflows with instruments such as interest rates, some other countries may choose to implement a longer-term policy by attracting foreign direct investments, on account of their production structures.

As a result of the liberalization of capital movements in recent years, it is possible to comment on the economic performance of the country by looking at economic indicators. In particular, the current account deficit of the country affects the debt payment capacity of the country in the long run. Accordingly, while developed countries implement policies for the export of high value-added products that will provide high returns in the long run, developing countries prefer policies that will provide high foreign capital inflows in the short term with high interest rates, which increases their dependence on imports in their production.

Constructing the production structures of developing countries, especially on imported intermediate goods, affects their current account balances negatively. Applying a high return policy into the foreign capital in the short run while the rate of imported inputs in productions being high in the long run increases the current account balance risk.

When we look at the main features of the countries that have maintained their current account balance and have a current account surplus, we mostly see countries with high production potential, great export of high technology products, political and economic stability. At the same time, human capital and skilled labour are given importance in these countries, and as a result, technology levels increase in the long run. However, countries that cannot maintain their current account balance for a long time do not have economic and political stability and the majority of their production is dependent on imports. The low level of income in these countries also reduces their level of savings and increases their dependence on foreign capital. Since their R&D expenditures are low, their efforts towards innovation are not sufficient.

Table 1: Exports (M$)

Country Name (M$)	2018	2019	2020	2021
Canada	30.479	31.536	25.572	29.085
China	731.318	715.302	757.458	942.314
Germany	209.722	208.148	182.351	209.744
European Union	682.653	692.282	642.558	700.717
United Kingdom	75.580	76.894	58.143	66.699
Indonesia	6.382	6.281	6.408	7.492
India	20.182	23.470	21.583	27.446
Italy	32.487	32.548	32.892	38.884

Japan	110.741	103.896	102.751	116.513
Latin America & Caribbean	90.464	-	-	-
Middle East & North Africa	17.235	16.868	-	-
North America	184.291	185.461	167.111	198.303
OECD members	1.369.885	1.337.481	1.254.352	1.222.142
Sub-Saharan Africa	2.911	2.542	-	-
Turkiye	3.735	4.280	4.172	5.715
United States	153.808	153.923	141.538	169.217
World	2.910.852	2.853.594	-	-
South Africa	2.091	1.832	1.835	-

Source: WorldBank Data, 2022

Table 1 shows the foreign trade of high-tech products realized by some countries and regions in the world. According to Table 1, high technology product exports are at the forefront in developed countries such as Germany, Japan and the USA. However, exports of high-tech products are low in regions such as the Middle East, Africa, and Turkey. It is possible to see the reason for this in Table 2:

Table 2: R&D Expenditures (% of GDP)

Country Name (%)	2017	2018	2019	2020
Canada	1,69	1,68	1,59	1,70
China	2,12	2,14	2,24	2,40
Germany	3,05	3,11	3,17	3,14
European Union	2,15	2,19	2,22	2,32
United Kingdom	1,66	1,70	1,71	-
Indonesia	0,24	0,23	0,27	0,28
India	0,67	0,66	-	-
Italy	1,37	1,42	1,46	1,53
Japan	3,17	3,22	3,20	3,26
Latin America & Caribbean	0,66	0,66	0,67	-
Middle East & North Africa	-	-	-	1,60
North America	2,80	2,90	3,05	3,32
OECD members	2,51	2,59	2,67	2,96
Sub-Saharan Africa	-	-	-	-
Turkiye	0,95	1,03	1,06	1,09
United States	2,90	3,00	3,17	3,45
World	2,13	2,20	2,33	2,63
South Africa	0,76	0,69	0,62	-

Source: WorldBank Data, 2022

Table 2 shows how much R&D expenditures countries have made compared to their GDP. As can be seen here, while R&D expenditures are high in countries that export high-tech products, R&D expenditures are low in countries with inadequate exports of high-tech products.

Production in countries such as Turkey, whose production structure is dependent on imported inputs, is mostly for consumer goods and these products are imported because the human capital required for the production of high-tech products is not sufficient. In addition, inputs must be imported for the production of these products. As a result, the current account deficit increases (Ünal, 2020:175-203). That is, the dependence of especially intermediate goods on imports causes a process that feeds the current account deficit.

In the globalizing world, the evolution of countries to an export-oriented production structure has increased the import dependency of developing countries to produce these goods. At the same time, the demand for foreign direct investments to enter the country has increased the need for imports of intermediate goods required to produce high-tech products (Ünal, 2020:205-219). The fact that production in Turkey is more dependent on consumer goods prevents the production of high-tech products.

Some questions will be answered in this article. What are the factors affecting the production of high-tech products? What are the main features of countries producing high-tech products? What are the drawbacks of high-tech product importing countries? How is the current account balance affected as a result of Turkey's high-tech product imports? In this study, the effect of high-tech product imports on the current account deficit performance of countries will be analyzed; high-tech product, current account deficit and the relationship between these two notions will be discussed.

2. Literature Review

As a result of the inflow and outflow movements in the current account, which is one of the main accounts in the balance of payments, the concepts of current account deficit or current surplus emerge. The current account includes trade in goods, trade in services, incomes and current transfers sub-accounts.

The goods trade account includes the export and import of goods. The services trade account includes transportation, tourism income and expenses, construction services, international banking and insurance services, financial services, consultancy services and official services. Profits and payments taken by foreign companies operating in the country are recorded as negative in the income account, while profits and payments brought into the country by companies operating outside the country are recorded as positive. Elements such as goods, services and money entering the economy without any resource output can be seen in the current transfers account (Aslan, 2013: 293-294).

Factors affecting the current account deficit are economic growth, inflation, exchange rate, foreign direct investments, interest rate, budget deficit, amount of savings and foreign borrowing. With economic growth, investments become larger than savings and the current account deficit increases (Calderón et al. 2007: 191-209), causing local currency to be more valuable, especially in developing countries, and the current account deficit is negatively affected (Magda and Joshua, 2015: 28-33). The increase in macroeconomic uncertainty along with inflation causes deterioration of the

investment environment and increase in savings, thus increasing the current account deficit (Calderon et al. 2002: 15). In countries where the exchange rate increases in value, the trade effect boosts the current account deficit (Vieira and McDonald, 2020: 68).

Companies that operates in the country with foreign direct investments realize high-efficiency production, gain competitive advantage by reducing costs, have the potential to export to their parent companies abroad at a higher level and all these factors make them contribute to the current account deficit (Lesher and Miroudot, 2008: 18). While interest rates are low, investments and trade volume increase and trade deficits occur to meet the increase in demand (Franjo, 2018: 1-13). High interest rates cause individuals to increase their savings and reduce their expenditures, and this has a positive effect on the current account balance (Ferrero, 2015: 261-293). In countries where high public debt causes a budget deficit, CDS increases and this may lead boosting the current account deficit by increasing the cost of borrowing (Furceri and Zdzienicka, 2018: 9-20). However, if public borrowing is directed to activities with high returns in the long run, the current account deficit risk decreases (Handoyo et al. 2020: 8). As domestic savings cause an increase in investments and production, the export volume increases and the current account deficit decreases (Gulzar et al. 2007: 666). While capital inflows into the country can reduce the current account deficit in the short run because of external borrowing (Jawaid and Raza, 2012: 365), the current account deficit may be adversely affected as a result of dependence on foreign capital in the long run.

The ability to finance the current account deficit is an important topic of discussion in terms of the sustainability of the account deficit. In the financing structure of the current account deficit, foreign capital is generally preferred due to the closing effect created by the inflow of capital. Foreign direct investments are encouraged, especially since their long-term returns are high and sustainable. The speculative nature of the foreign capital drawn into the country by raising interest rates poses a threat to the financing and sustainability of the current account deficit.

According to the Intertemporal Approach, one of the theories to explain the current account deficit, the current account deficit is expected to increase growth in the future, but high reserves, financial depth, and sustainable borrowing are needed for this to happen (Freund, 2000: 2-17). In the Flexibility Approach, the foreign trade balance after devaluation consists of the sum of the effects of activities that lead to foreign exchange savings and foreign exchange earnings. If there is an external deficit in the fixed exchange rate system, its negative effects can be eliminated through devaluation (Seyidoğlu, 2003: 4-5). In the Mundell-Fleming Model, while capital movements are free, capital movements continue until foreign and domestic interest rates are equalized, which causes a deficit or surplus in the balance of payments (Pınar and Erdal, 2013: 268-270). In the Monetary Approach, capital movements cause current account deficit and a relationship is established between excessive monetary expansion and current account deficit. If there is an external deficit in an economy, the loan stock should be reduced (Uygur, 2012: 9). In the Total Expenditure (Appraisal) Approach, the balance in foreign payments is affected by total income and total expenditures, and if expenditures are more than income, it indicates that the level of imports is greater than the level of exports (Paya, 2007: 141-142). According to the Structural Approach, the causes of current account deficit in developing countries are structural, and the solution to this is industrialization policies through import substitution (Edwards, 2001: 24).

Technology can be defined as the application of science since technological developments are advanced based on previous scientific studies (Schatzberg, 2018: 1). Technology is a guide that helps to reach the final product. It includes the inputs, equipment and technical processes to oversee in order to achieve the end product are stated (Dosi and Nelson, 2009: 8-9).

Although it is difficult to define high technology in general, some features stand out. Here, not only the functionality of the product, but also the production and marketing processes are kept in the foreground. Since the average life span of the products is low, renewal and development activities are carried on continuously. In order not to lose competitive advantage, the continuity of innovative studies is important (Viardot, 2004: 6-12). The flexibility in the technology structure in high-tech sectors has the ability of changing the existing product and marketing structure (McCarthy et al. 1987: 313-315).

Countries which possess high technology, the knowledge base expands with R&D, which contributes to the formation of new technologies, and leads to a competitive advantage by meeting international standards (Forbes and Wield, 2000: 1095-1103). As long as new fixed capital investments are supported by R&D, the creation of new technologies gains continuity (Parisi et al. 2005: 2038-2058). New technologies created by inventors encourage technological developments by providing a temporary monopoly right to the owner with the patent system (Griliches, 1990: 1661-1663). The increase in the number of qualified workers also increases the renewal rate of technology and the sustainability of innovation can be ensured (Acemoglu, 1998: 1-23). When savings rates are low, the capital-labor ratio is also low, which reduces the marginal efficiency of capital and reduces the productivity of labor (Buscemi and Yallwe, 2012: 128). Foreign direct investments directly affect the level of technology in a country, and to the extent that domestic firms use the technologies of foreign firms, an increase in the level of technology in the country can be observed (Findlay, 1978: 1-14). The openness of countries also leads to the development of international trade, and the speed of technological development increases as a result of the facilitation of human capital and R&D transfer processes (Le, 2008).

There are two methods in order to determine the sectors with high technology levels according to OECD. One of these methods is dividing the total of R&D expenditures, intermediate goods and investment goods to the total production. The other one is R&D expenditures according to added value and production of a country. Thus, sectors with low technology level are; furniture and other manufacturing, wood and cork products, paper and paper products, printing and publishing, food products and beverages, tobacco products, textiles, clothing, leather and shoes. Sectors with medium low technology level are; construction and repair of sea vehicles, manufacture of plastic and rubber products, manufacture of coke, refined petroleum products and nuclear fuel, manufacture of other non-metallic mineral products, basic metal industries metal goods (except machinery and equipment) industries. Sectors with medium high technology level are; manufacture of electrical machinery and devices, manufacture of motor vehicles, trailers and semi-trailers, manufacture of railway and tramway locomotives and wagons, manufacture of chemicals and products, manufacture of machinery and equipment. Sectors with high technology level are; manufacturing of air and space vehicles, manufacturing of chemical and herbal products used in pharmacy and medicine, manufacturing of office, accounting

and data processing machines, manufacturing of medical instruments, precision and optical subs and watches (TÜSİAD, 2008).

The literature over technology level in varies according to the economic point of view of the period. The view that economic activity will increase with the division of labor and specialization emphasized by the Classical Approach is also valid for scientists. In other words, if every scientist works on his own area, the development of that area is faster (Smith: 17-25). According to Marx, the productivity of labor and therefore the relative surplus value increases with mechanization, but the rate of profit decreases gradually as technical developments are capital-intensive (Little, 2021). Neoclassicals argue that technology increases workforce efficiency and production capacity (Banton, 2021). Schumpeter introduced the concept of "creative destruction" to the economics literature. This concept suggests the existence of an ongoing innovation process within capitalism, and as a result, the innovative perspective of entrepreneurs continues (Pfarrer and Smith, 2015: 1-3). According to Keynes, the productivity of workers increases and working hours decrease with technology. This increases their productivity by increasing the time they devote to themselves (Folgieri, 2019: 75-76). Solow states that in the long run, growth depends on technology, and real income growth is determined by technology (Vitasek, 2011). Kaldor states that the level of demand will increase with technology, which will lead to economies of scale, leading to specialization and economic growth (Çetin, 2009). Pasinetti argues that technological development causes an increase in productivity in all sectors, and as a result, production techniques improve, increasing real income and demand for consumer goods (Pasinetti, 1993: 1-45). According to Baumol, in order to achieve sustainable growth, technological developments must be followed, so the process of creating innovation continues (Baumol, 2002: 144-153).

3. Econometric Analysis

3.1. Dataset and Methods

In this study, the analysis of the effect of high-tech product imports on the current account deficit in Turkey was carried out with the Granger Causality Test. Import data, according to the high-tech product groups that emerged as a result of the OECD categorizing the products according to the technology intensity, via TUIK; current account deficit data is obtained from the CBRT data system. Since there are negative values in the current account deficit data in the model, absolute values are used. The current account deficit was used as the dependent variable and the import level was used as the independent variable.

3.2. Empirical Findings

At the beginning of the study, the Extended Dickey Fuller (ADF) Test was applied to determine whether the series were stationary or not.

Table 3: ADF Test Results for Current Account Deficit

Variable	No Trend and Intercept
%1 level	-2.587.172
%5 level	-1.943.912
%10 level	-1.614.713
t-Statistic	-4.902.437
Prob	0.0000

As a result of the test for the current account deficit, it is concluded that the series is stationary.

Table 4: ADF Test Results for Import

Variable	No Trend and Intercept	With Intercept	With Trend and Intercept
%1 level	-2.587.607	-3.495.021	-4.047.795
%5 level	-1.943.974	-2.889.753	-3.453.179
%10 level	-1.614.676	-2.581.890	-3.152.153
t-Statistic	-0.238015	-2.882.819	-5.800.105
Prob	0.5982	0.0508	0.0000

As can be seen, in the ADF test for import, the series became stationary after the trend and intercept were added to the model.

Also KPSS test was done as follow:

Table 5: KPSS Test Results for Current Account Deficit and Import

Variable	Current Account Deficit	Import
Coefficient	83.31912	10177112
Std. Error	21.48950	146391.1
t-Statistic	4.016804	69.52002
Prob	0.0001	0.0000

In the KPSS test for import and current account deficit, the series are stationary.

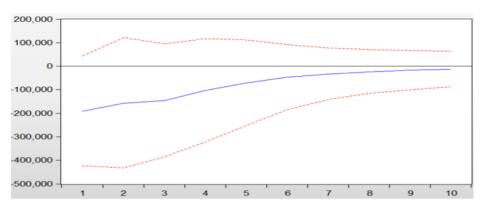In the next step, the lag length of the series was determined in order to perform the Granger Causality Test.

Figure 1: IRF Test

According to the IRF test in the Figure 1, response of import to current account deficit innovation using Cholesky Factors, the blue line shows the current account deficit. It is stated that measurements related to the 95% confidence interval will affect a production current account deficit that will occur in imports.

LM test was performed to check if there is autocorrelation in the series:

Table 6: Breusch-Godfrey Serial Correlation LM Test

Variable	Value
F-statistic	41.94200
Obs*R-squared	30.67332
Prob (1,103)	0.0000
Prob.Chi-Square (1)	0.0000

There is autocorrelation since the probe is smaller than 0.05. After taking the difference of the series, the correlation has been removed.

Table 7: Difference Series

Variable	Value
Coefficient	-1.35E-05
Std. Error	1.38E-05
t-Statistic	-0.978308
Prob.	0.3302

There is also homoscedacity in the Model.

Table 8: Heteroskedasticity Test: Breush-Pagan-Godfrey

Variable	Value
F-statistic	2.987356
Obs*R-squared	2.959786
Scaled explained SS	11.62494
Prob. (F1,104)	0.0869
Prob. Chi-Square (1)	0.0854
Prob. Chi-Square	0.0007

Table 9: VAR Estimates

Lag	LR	FPE	AIC	SC	HQ
0	NA	1.23e+17	4.502.951	4.508.362	4.505.137
1	6.354.407	6.68e+16	4.441.633	44.57867*	44.48190*
2	9.786.891	6.52e+16	4.439.147	4.466.203	4.450.076
3	9.274.965	6.38e+16*	44.36997*	4.474.876	4.452.297
4	1.078.553	6.87e+16	4.444.238	4.492.940	4.463.910
5	5.099.575	7.04e+16	4.446.605	4.506.129	4.470.648
6	6.986.158	7.04e+16	4.446.491	4.516.837	4.474.906
7	1.748.136	7.51e+16	4.452.789	4.533.958	4.485.575
8	5.169.086	7.67e+16	4.454.586	4.546.578	4.491.744
9	2.735.842	8.07e+16	4.459.449	4.562.263	4.500.978
10	3.423.785	8.42e+16	4.463.269	4.576.906	4.509.170
11	8.870.710	8.13e+16	4.456.286	4.583.745	4.509.559
12	11.52452*	7.54e+16	4.451.095	4.586.376	4.505.738

The lag length is chosen as 1 in the model.

The results of the Granger Causality Test are as follows:

Table 10: Granger Causality Test

H₀	F-Statistic	Prob
Imports are not the cause of the current account deficit.	2.442.265	0.4939

Since the probe value is greater than 0.05, the H_0 hypothesis is accepted, that is, imports are not the cause of the current account deficit.

4. Conclusion

Due to its production structure, the Turkish economy is an importer of intermediate goods. In order to realize a large part of its production, it needs the import of intermediate goods. When we look at the production structure in general, the production and export of the automotive sector, chemicals and textile sector are at the forefront. As a result of the import of intermediate goods realized here, production and economic growth increase, which leads to an increase in the current account deficit. Nevertheless, as a result of high-tech product imports, the production structure in the country does not change, and imports are generally made for consumption. Thus, the causal relationship between imports of high-tech products and the current account deficit disappears.

The production and export of high-tech products requires a significant human capital structure. For the production of such products, a long-term R&D process and therefore significant investments in R&D and innovation are required. When we look at the countries that export high-tech products, it is seen that human rights and the superiority of law are at the forefront, education policies are given importance, large investments are made in human capital and entrepreneurship is constantly supported. In order for Turkey to be an exporter of high-tech products, it must first attach importance to education policies and create qualified human capital. Nonetheless, it should aim to produce products that will provide high returns in the long run by increasing R&D investments. As a result, both the production and export of high-tech products will increase and its contribution to the current account balance will heighten.

References

Acemoglu, D. (1998). Why do new technologies complement skills? Directed technical change and wage inequality. *Forthcoming Quarterly Journal of Economics*, *113*(4) 1055-1089.

Aslan, N. (2013). *KPSS ve kurum sınavları için makro iktisat.* İstanbul: Marmara Kariyer Akademisi.

Banton, C. (2021). *Neoclasical growth theory.* https://www.investopedia.com/terms/n/neoclassical-growth-theory.asp adresinden alındı

Baumol, W. (2002). *The free market innovation machine.* New Jersey: Princeton University Press.

Buscemi, A., & Yallwe, A. H. (2012). Fiscal deficit, national saving and sustainability of economic growth in emerging economies: A dynamic gmm panel data approach. *International Journal of Economics and Financial Issues, 2*(2), 128.

Calderon, C., Chong, A., & Loayza, N. (2002). Determinants of current account deficits in developing countries. *Contributions to Macroeconomics, 2*(1), 15.

Calderón, C., Chong, A., & Zanforlin, L. (2007). Current account deficits in Africa: Stylized facts and basic determinants. *Economic Development and Cultural Change, 56*(1), 191-209.

Çetin, M. (2009). Kaldor büyüme yasasının ampirik analizi: Türkiye ve AB ülkeleri örneği. *Afyon Kocatepe Üniversitesi İİBF Dergisi, 11*(1), 355-373.

Dosi, G., & Nelson, R. (2009). Technical change and industrial dyniamics as evolutionary processes. 8-9. Pisa.

Edwards, S. (2001). *Does the current account matter?* Chiago: University of Chicago Press.

Ferrero, A. (2015). House price booms, current account deficits and low ınterest rates. *Credit and Banking, 47*(1), 261-293.

Findlay, R. (1978). Relative backwardness, direct foreign ınvestment, and the transfer of technology: A simple dynamic model. *The Quarterly Journal of Economics, 92*(1), 1-14.

Folgieri, R. (2019). *Technology, artificial intelligence and Keynes' utopia: A realized prediction?* https://www.researchgate.net/publication/331328435_Technology_Artificial_Intelligence_and_Keynes'_Utopia_A_Realized_Prediction adresinden alındı

Forbes, N., & Wield, D. (2000). Managing r&d in technology followers. *Research Policy*, *29*(9) 1095-1109.

Franjo, L. (2018). International interest rates, the current account and housing markets. *Economic Modelling, 75*, 1-13.

Freund, C. (2000). Current account adjustment in industrialized countries. *International Finance Discussion Papers*, 2-17.

Furceri, D., & Zdzienicka, A. (2018). Twin deficits in developing economies. *IMF Working Paper*, 9-20.

Griliches, Z. (1990). Patent statistics as economic indicators: A survey. *Journal of Economic Literature, 28*(4), 1661-1663.

Gulzar, S., Feng, H. X., & Yajie, W. (2007). The current account balance of Pakistan 1972-2005: A cointegration analysis. *Information Technology Journal, 6*(5), 664-671.

Handoyo, R. D., Erlando, A., & Astutik, N. T. (2020). Analysis of twin deficits hypothesis in Indonesia and its impact on financial crisis. *Heliyon, 6*(1), e03248.

Jawaid, S. T., & Raza, S. A. (2012). Dynamics of current account deficit: A lesson from Pakistan. *Transition Studies Review , 19*(3), 357-366.

Le, H. Q. (2008,). The theroies of trade, fdi and technology transfer: A survey. *DEPOCEN Working Paper*.

Lesher, M., & Miroudot, S. (2008). FDI spillovers and their interrelationships with trade. *OECD Trade Policy Papers,* (80), 18.

Little, D. (2021). *Marx's thinking about technology*. https://understandingsociety.blogspot.com/2013/07/marxs-thinking-about-technology.html adresinden alındı

Magda, K., & Joshua, G. (2015). The impact of cyclical factors on the U.S. balance of payments. *International Journal of Business, Economics and Law, 6*(3), 28-33.

McCarthy, D., C. Spital, F., & Lauenstein, M. (1987). Managing growth at high-technology companies: A view from the top. *The Academy of Management Executive*, *1*(4), 313-323.

Parisi, M. L., Schiantarelli, F., & Sembenelli, A. (2005). Productivity, innovation and r&d: evidence for Italy. *European Economic Review, 50*(8), 2038-2058.

Pasinetti, L. (1993). *Structural economic dynamics.* Cambridge: Cambridge University Press.

Paya, M. (2007). *Para teorisi ve para politikası.* İstanbul: Filiz Kitabevi.

Pfarrer, M., & Smith, K. (2015). *Creative destruction.* Wiley Encyclopedia of Management.

Pınar, A., & Erdal, B. (2013). *Para-banka-kredi ve para politikası.* Ankara: Turhan Kitabevi.

Schatzberg, E. (2018). *Technology: critical history of a concept.* Chicago: The University of Chicago Press.

Seyidoğlu, H. (2003). *Uluslararası iktisat teori politika ve uygulama.* İstanbul: Güzem Can Yayınları.

Smith, A. (tarih yok). *The wealth of nations.* 17-25.

TÜSİAD. (2008). Türkiye sanayiine sektörel bakış.

Uygur, E. (2012). Türkiye'de cari açık tartışması. *Türkiye Ekonomi Kurumu Tartışma Metni*, 9.

Ünal, E. (2020), Industrial growth models by input–output analysis and an institutional approach to the automotive industry in China and Turkey, *Evolutionary and Institutional Economics Review, 18*(1), 175-203.

Ünal, E, (2020), Import dependency on intermediate goods in Turkey: An input-output analysis, *Verimlilik Dergisi*, *4*, 205-219.

Viardot, E. (2004). *Succesful marketing strategy for high-tech firms.* Norwood: Artech House.

Vieira, F. V., & McDonald, R. (2020). The role of exchange rate for current account: a panel data analysis. *Economia, 57*(72), 68.

Vitasek, K. (2011). *Robert solow: Innovation, technology - and math- make all the difference*. https://futureofsourcing.com/robert-solow-innovation-technology-math-make-difference adresinden alındı