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THE MEDIATOR ROLE OF GLOBAL COMPETITIVENESS IN THE RELATIONSHIP BETWEEN HIGH TECHNOLOGY EXPORT AND COVERAGE RATIO

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Abstract:
Global Competitiveness Index, high technology exports and coverage ratio variables were used in the study. The effects of high technology exports on the Global Competitiveness Index and coverage ratio, and the effects of the Global Competitiveness Index on the coverage ratio were analysed. Positive effects of the analyses were observed. It is also assumed that the coverage ratio is one of the most important criteria of foreign trade performance. In the study, it is seen that the Global Competitiveness Index plays an intermediary role in the effect of technology exports on the coverage ratio. Therefore, the increase in the share of technology exports in total trade affects the coverage ratio through the partial effect of the Global Competitiveness level. Therefore, it is assumed that the technological infrastructure and competitiveness of countries will play a key role in improving foreign trade performance.

Keywords:
Global Competitiveness Index, High-Tech Export, Coverage Ratio, Mediator Role

1. Introduction
The rate of dependence on imported inputs is increasing due to the reduction of trade borders, liberalisation in world economies and technological developments. This situation deeply affects especially developing countries. In order to benefit from the advantages offered by globalisation, an open economy model becomes mandatory. Therefore, the demand for technology, energy and raw materials is increasing day by day (Alam, 2003). Developing economies are becoming more dependent on foreign resources due to reasons such as older facilities and structures and technological inadequacy. Therefore, they are at a disadvantage against technologically advanced and highly competitive countries. The existence of technological poverty and the high rate of external dependency lead to an increase in the current account deficit (Bayraç & Doğan, 2018).
The aim of this study is to examine the link between the external dependency ratio of countries, technology exports and global competitiveness. In this context, firstly, the effect of technology exports on external dependence and then the effect of competitiveness on external dependence are analysed. Then, it is aimed to determine the effect of competitiveness and technology exports together on external dependence. The data on the ratio of exports to imports is used to represent external dependence.
Firstly, the concepts of Global Competitiveness Index, high technology exports and coverage ratio, which are the variables used in the study, are analysed. In the Hypothesis Development section, the relationships between these concepts are analysed and the targeted hypotheses are established. In the next section, the methodology used in the research is mentioned and the final model is drawn. Then, detailed information about the data sets used is given. In the Analysis Results section, the results of the data analysed with the help of SPSS package programme are shared and interpreted. In the Conclusion section, the conclusions related to the study are mentioned.

2. Conceptual Background

The aim of this paper is to identify the links between the Global Competitiveness Index (GCI), high technology exports and the ratio of exports to imports. Before analysing the relationship between the concepts, it is necessary to define what they mean. Therefore, in this section, the Global Competitiveness Index will be discussed first and details about the calculation methods will be given. Then, high technology exports and influential countries will be mentioned. Finally, the ratio of exports to imports will be discussed and details about foreign trade balances will be mentioned.

2.1. Global Competitiveness Index

The World Economic Forum defines the Global Competitiveness Index (GCI) as "the set of institutions, policies and factors that determine a country's level of productivity" (Sala-I-Martin, et al., 2008). The World Economic Forum has been analysing the competitiveness level of countries since 1979. Sala-I martin laid the foundations of the competitiveness index in 2004 and Michael Porter finalised it (World Economic Forum, 2015).

While calculating the GCI, more than 120 countries are used and results are obtained with approximately 20,000 data. These data are obtained from ministries, agencies, institutes, World Bank (IMF), regional development banks and affiliated organisations. Among these sources, all macroeconomic data are obtained from the IMF. Identifying a common pool at the international level is also advantageous in terms of analyses. Finally, if there is not much data on the relevant country, a survey is conducted by the World Economic Forum (World Economic Forum, 2015).

The Global Competitiveness Index is analysed under three items: core factors, efficiency enhancing factors and innovation factors. In addition, each factor has its own components. Basic factors are analysed as infrastructure, institutions, health and basic education, macroeconomic environment. Efficiency enhancing factors are examined as labour market efficiency, financial market efficiency, higher education, technological readiness, financial market development, market size. Innovation factors are analysed in sub-components as innovation, business sophistication (World Economic Forum , 2012).

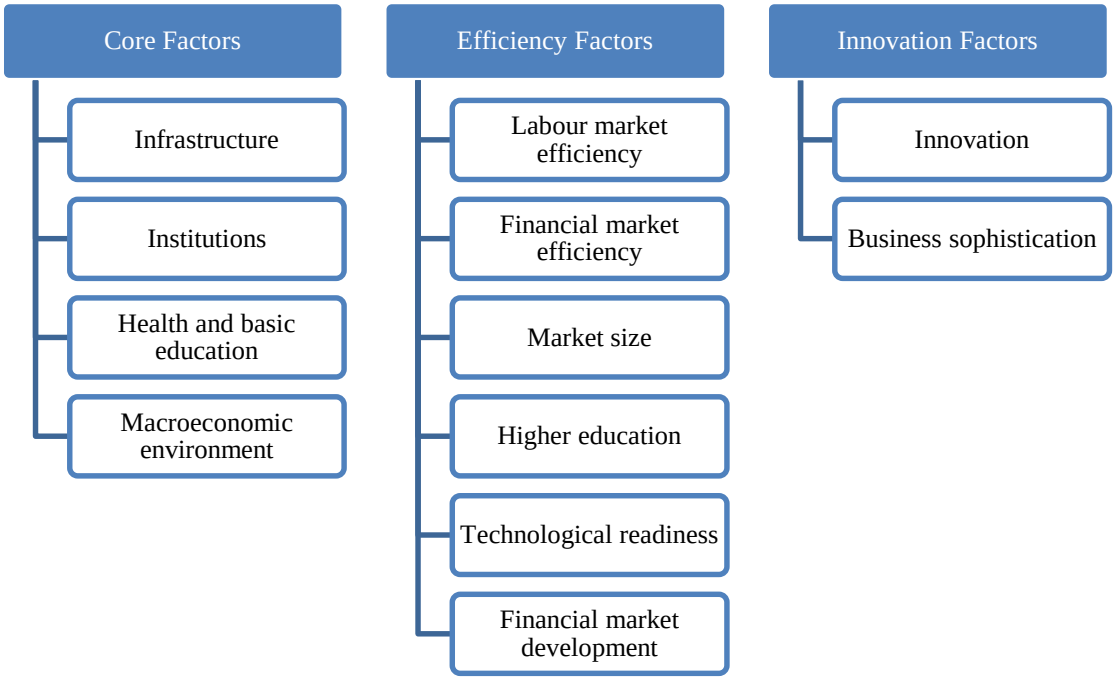

Figure 1 Global Competitiveness Index
Source: (World Economic Forum , 2012)

When calculating the Competitiveness Index, not all factors have an equal impact. During the calculation; basic factors have an impact of 60 per cent, efficiency factors have an impact of 35 per cent and innovation factors have an impact of 5 per cent. (World Economic Forum , 2012).
Countries need to follow different paths while improving their competitiveness levels. In other words, the methods to be followed by the United States of America and Turkey are different from each other. In Table 1, the development levels of countries are grouped in three stages.

Table 1 Development Levels of Countries

Level 1	Factor-driven	Countries at the factor-driven level have cheap labour and compete on the basis of price.
Level 2	Efficiency-driven	Countries at the level defined as Efficiency-driven enter the production phase with higher efficiency.
Level 3	Innovation-driven	Countries at innovation-driven level have to compete with different and new products.

Source: (Ay Türkmen & Aynaoğlu, 2017)

According to Table 1, the first level includes countries with low production efficiency and these countries can compete by producing cheap products. Countries in the second level have a developing structure, but they can now compete with production efficiency instead of cheap labour. Countries at the last level only need to produce different and new products in order to maintain their competitiveness (World Economic Forum, 2012).
Depending on the level of the countries; the effects of basic factors, efficiency and innovation also vary. To summarise, in a country with low production efficiency, the effectiveness of innovation is more limited in percentage terms. The distributions of competition indicators are analysed in Table 2.

Table 2 Competitiveness Indicators at the Development Stage

Factors / Level	Level 1	Transition from Level 1 to Level 2	Level 2	Transition from Level 2 to Level 3	Level 3
GDP for Capita	<2000	2000-2999	3000-8999	9000-17000	>17000
Basic factors	%60	%40-60	%40	%20-40	%20
Efficiency factors	%35	%35-50	%50	%50	%50
Innovation	%5	%5-10	%10	%10-30	%30
Total	%100	%100	%100	%100	%100

Source: (Ay Türkmen & Aynaoğlu, 2017)

When Table 2 is analysed, the level of national income per capita increases from the first level to the last level. For the countries at the first level, the main factors have a weight of 60 per cent, while at the second level they have a weight of 40 per cent and at the third level only 20 per cent. Efficiency has a weight of 35 per cent for the countries in the first level and 50 per cent for the others. Innovation has a weight of only 5 per cent for countries in the first level, 20 per cent for countries in the second level and 30 per cent for countries in the third level. From this point of view, the most important concepts for the countries in Level 1 are basic factors, while efficiency and basic factors for the countries in Level 2, and innovation and efficiency for the countries in Level 3 (World Economic Forum , 2012).

2.2. High-Tech Export

When important studies in the literature are analysed, it is seen that there are significant relationships between economic development and high technology exports. Singh (2007), Jarreau and Poncet (2011), Gökmen and Turen (2013) emphasised the importance of the link between high value added production, high technology exports and economic development. Again, Cuaresma and Wörz (2005), Lee (2011) have analysed the relationship between exports and economic growth in developing economies.

When the studies conducted in the last two decades are analysed, it is seen that high technology exports have a critical importance in terms of economic growth and per capita income. Newly industrialised countries increase their R&D expenditures in order to close the gap with developed countries and accordingly increase their high technology export levels. One of the driving forces underlying the rapid economic development of Far Eastern countries such as Malaysia, Thailand and China is technology exports. The main reason behind the rapid development of Malaysia is the high level of high technology exports. (Çetin, 2016). Figure 2 shows the share of technology exports in total exports in the world and Malaysia.

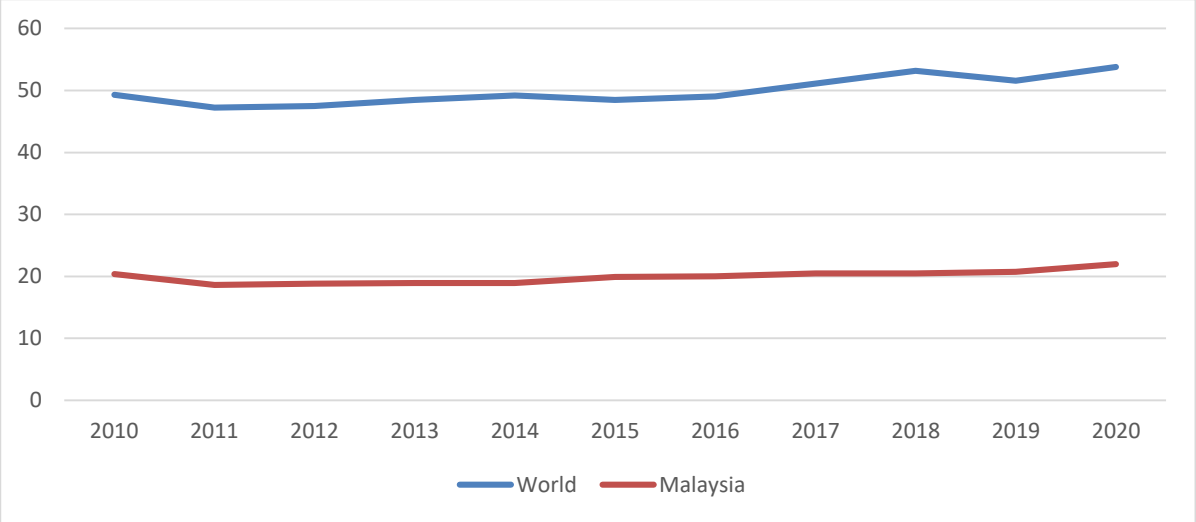

Figure 2 High Technology Export (% Total Exports)
Source: (World Bank, 2022)

Based on Figure 2, it can be said that Malaysia has a high technology export rate well above the world average. In fact, more than half of its exports are made with high technology products. It has increased its high-tech product exports ratio from close to 50 per cent in 2010 to almost 55 per cent. Worldwide, high-tech exports generally follow a horizontal course, but increased from 20% in 2010 to 22% in 2020 (World Bank, 2022).

When the share of technology exports in total exports is analysed, it is seen that the rates of Asian countries are higher. This shows that Asian countries not only make cheap production with cheap labour force, but also start to use technology more efficiently. When Table 3 is analysed, the efficiency of Asian countries in technology exports can be seen more clearly.

Table 3 Top 10 Countries with the Highest Ratio of Technology Exports in Total Trade

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Hong Kong	36,8	20,8	18,5	13,9	11,4	12,3	13,5	61,6	64,7	65,6
Singapore	52,3	47,7	48,5	50,3	50,6	52,2	52,2	53,1	51,6	51,8
Malaysia	49,3	47,2	47,5	48,5	49,2	48,5	49,1	51,1	53,2	51,6

Vietnam	13,1	18,8	27,2	33,6	32,1	36,4	38,1	41,7	40,8	40,4
Iceland	21,2	21,1	15,4	15,7	17,1	20,1	23,4	26,4	23,5	38,1
Korea, Rep.	32,1	28,2	28,2	29,8	30,1	31,2	30,5	32,5	36,4	32,4
China	32,1	30,5	30,8	31,6	29,7	30,4	30,2	30,9	31,5	30,8
Kazakhstan	35,4	25,7	31,0	38,5	39,3	43,4	32,1	24,2	23,5	29,7
Malta	47,2	47,4	45,9	38,7	34,7	30,8	21,9	30,4	33,1	29,6
France	26,3	25,1	26,7	27,2	27,4	28,2	27,9	26,0	25,9	26,9

Source: (World Bank, 2022)

According to Table 3, seven of the ten countries with the highest proportion of technology exports are Asian countries. In addition to the high rates of technology exports of Asian countries, it is also seen that they generally continue to rise. Namely; Hong Kong had a technology export rate of 36.8 per cent in 2010 and reached 65.6 per cent in 2019. Singapore has generally maintained its rate, which is already above 50 per cent. Malaysia has increased its level above 50 per cent, Vietnam has increased from 13% to 40% (World Bank, 2022).

2.3. Coverage Ratio

Coverage ratio and foreign trade deficit are concepts that are frequently used together. Although the concepts are related to each other, they do not mean the same thing. Foreign trade deficit can be defined as the difference between imports and exports. Therefore, these ratios seem to be high in developed and populous countries. This situation provides important data on foreign trade, but it is not clearly evaluated as foreign trade performance. In other words, in countries such as the United States, China and India, these numbers are generally very high or very low (Aydin, et al., 2014). Formulaic representation of foreign trade deficit:

Foreigh Trade Deficit=Export-Import

If the result of the process is above zero, it is interpreted as foreign trade surplus, and if it is below zero, it is interpreted as foreign trade deficit.

In order to measure foreign trade performance more efficiently, the ratio of exports to imports is used. The foreign trade deficit is calculated by subtracting imports from exports, while the coverage ratio is calculated by the ratio of exports to imports (Aykaç & Civelek, 2019). The formulaic representation of the coverage ratio:

Coverage Ratio=Export/Import x 100

When two countries with the same foreign trade deficit are evaluated, the coverage ratio may be different. Namely; considering that the ratio of export and import data of the first country to GDP is 10% and 15% respectively, and the ratio of export and import data of the second country to GDP is 35% and 40% respectively, the foreign trade deficit of both countries is at the level of 5%. However, when considered in terms of coverage ratio; while the coverage ratio of the first country is 67 per cent, the coverage ratio of the second country is 88 per cent. (Aydin, et al., 2014). In other words, the foreign trade performance of the second country is higher than the first country.

3. Hypotheses Development

3.1. The Effect of High-Tech Export on Global Competitiveness Index

Technological changes have various effects on competition in different ways. One of these is the decrease in labour costs. As the use of technology becomes widespread, the unit costs of labour decrease. Because many of the labour-intensive jobs are being done with technology. This situation reduces the number of personnel used for intensive labour. However, with the introduction of technology, new business areas and new employment options are created. Namely; more use of computer technologies provides more employment of professional groups such as computer engineers, software developers (Simpson, et al., 1987). In this respect, the increase in the frequency of technological use increases the need for qualified labour force.

One of the important effects of technological developments is the reduction in costs. A company that is weak in terms of technology use needs to keep more stock. However, when technological development is experienced, the

production process will also accelerate. With the acceleration of production, the response time to the customer will shorten and profitability will increase (Narin, 1999).
Again, one of the important effects of technological developments is the increase in the level of service quality. With the development of new technologies and engineering services, product quality is increasing. At the same time, the production of products of different sizes and shapes is carried out more efficiently (Narin, 1999). All these processes ensure that customer expectations are met more.
In addition to these, with the capture of the technological innovation process, it increases the competitiveness of firms in the micro dimension and countries in the macro dimension. Moreover, it is accepted that one of the most important features of technological innovations besides rapid production is to increase the level of competitiveness (Erdem & Köseoğlu, 2014).
Depend upon the extant literature the following hypothesis is constructed:
H1: High-Tech Export has a positive effect on Global Competitiveness Index

3.2. The Effect of Global Competitiveness Index on Coverage Ratio

The main element of achieving competitive advantage in foreign trade is productivity increase. It is observed that countries that try to achieve foreign trade performance or competitive advantage with different methods instead of productivity increase fail. One of these methods is to suppress employee wages. In other words, it is aimed to keep employee wages as low as possible, thus providing international competitive advantage. Although it works in the short term, it is impossible to control in the long term. Generally, this suppression process ends with wage explosions (Eşiyok, 2014).
One of the methods used to achieve international competitive advantage is the low exchange rate policy. Although it seems to provide competitive advantage or foreign trade performance in the short term, it fails in the long term. Because other countries also apply the same method (Eşiyok, 2014). For these and similar reasons, productivity is the main factor in achieving competitive advantage in foreign trade.
Depend upon the extant literature the following hypothesis is constructed:
H2: Global Competitiveness Index has a positive effect on Coverage Ratio

3.3. The Effect of High-Tech Export on Coverage Ratio

It is accepted that countries with high technology exports have better foreign trade performance, while countries with high technology imports more than exports have weaker foreign trade performance. Eşiyok (2014) analysed the technology exports and imports between Turkey and EU countries. Accordingly, Turkey has an advantageous position in technology exports with EU countries only in low technology. EU countries are more advantageous in terms of medium and high technology. In other words, Turkey has a foreign trade surplus in low technology trade with the EU. However, Turkey has a foreign trade deficit in medium and high technology products. In Turkey and similar cases, countries with low high technology exports are disadvantaged (Eşiyok, 2014).
Depend upon the extant literature the following hypothesis is constructed:
H3: High-Tech Export has a positive effect on Coverage Ratio

3.4. The Mediator Role of Global Competitiveness Index in the Relationship between High-Tech Export and Coverage Ratio

It is seen that high technology exports, Global Competitiveness Index and coverage ratio data are interrelated with the analyses made in previous chapters. However, the main subject of the study is whether the level of Global Competitiveness assumes the role of a mediating variable. In the study, while it is seen that an increase in the level of high technology exports will increase the coverage ratio, it is thought that the Global Competitiveness Index will assume a mediating role.
Depend upon the extant literature the following hypothesis is constructed:
H4: Global Competitiveness Index has a mediator role on the relationship between High-Tech Export and Coverage Ratio

4. Research Method

The Baron and Kenny approach was used to conduct the mediator analysis. When the below mentioned circumstances are true, a variable, in the opinion of Baron and Kenny, acts as a mediator (Baron & Kenny, 1986):
The mediator variable changes as the independent variable changes. When the mediator and independent variables are analyzed simultaneously, the effect of the independent variable on the dependent variable is reduced or eliminated (Çelebi, et al., 2015). Changes in the mediator variable lead to changes in the dependent variable.

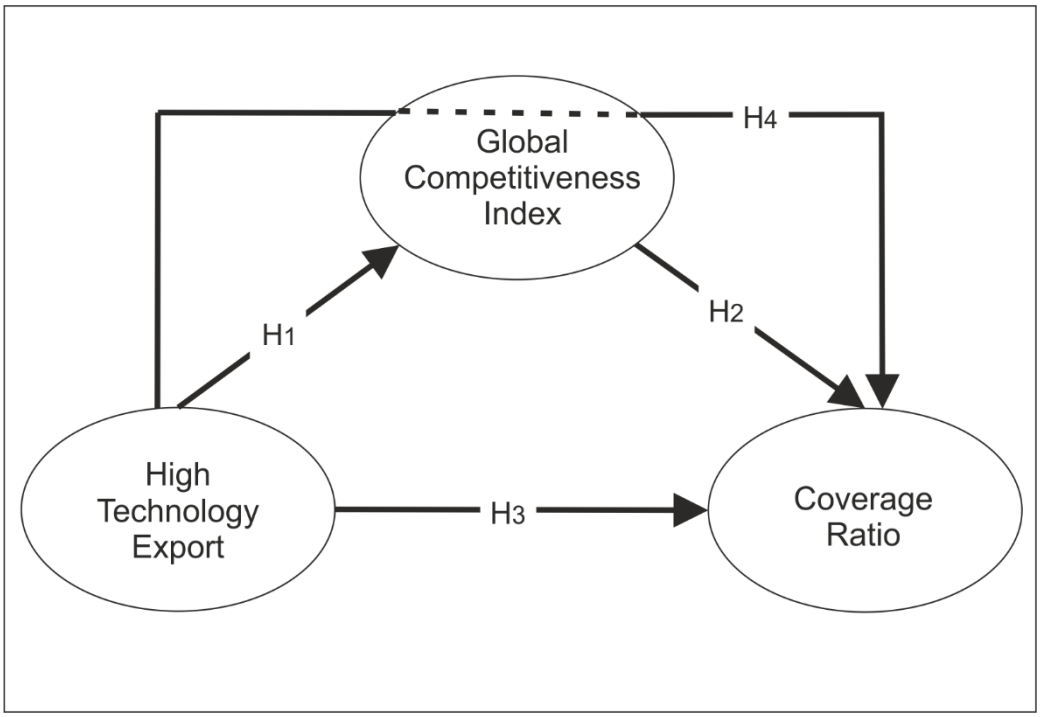

Figure 3. Conceptual Model

The conceptual model for the study is displayed in Figure 3. The hypotheses are tested using hierarchical regression. Regression models are as follows among dimensions which are High-Tech Export (HTE), Global Competitiveness Index (GCI) and Coverage Ratio (CVR):

Model 1: $CVR = \beta 0 + \beta 1.HTE + \varepsilon$ (H3)
Model 2: $GCI = \beta 0 + \beta 1.HTE + \varepsilon$ (H1)
Model 3: $CVR = \beta 0 + \beta 1.HTE + \beta 2.GCI + \varepsilon$ (H2 and H4)

5. Measures And Sampling

High-Tech Export (HTE), Global Competitiveness Index (GCI) and Coverage Ratio (CVR) were used. It was unnecessary to assess the validity and reliability of the scales because secondary data were used. High technology export data used in the study are taken from the World Bank Data Centre. Global Competitiveness Index data are compiled from the World Economic Forum's data. Coverage ratio data are obtained from Trade Map and data sets are proportioned.

6. Analysis Results

Initially, Baron and Kenny's method require significant relationship among the variables in the research model (Civelek, 2018). For this reason, Pearson correlation coefficients were obtained. As indicated in the Table 4, the relationships among variables are found as statistically significant.

Table 4. Correlation Coefficients

	HTE	GCI	CVR
HTE	1		
GCI	,514*	1	
CVR	,345*	,446*	1

* Correlation is significant at the 0.01 level

R and R2 values of the three models are shown in Table 2.

Table 5. Model Summaries

Models	R	R^2	Adjusted R^2	Standard Error of the Estimate
Model 1	0,345	0,119	0,118	24,35534
Model 2	0,514	0,264	0,263	0,52308
Model 3	0,466	0,217	0,215	22,97379

Table 6. ANOVA Tables

Models		F	Sig.
1	Regression	103,466	,000
2	Regression	275,825	,000
3	Regression	106,215	,000

In Table 6, ANOVA test results for the models are shown. ANOVA results proved that the models are statistically significant.

Table 7. Hypotheses Results

Relationship	Model 1	Model 2	Model 3
HTE → CRV	0.345*		0.157*
HTE → GCI		0.514*	
GCI → CRV			0.365*

Note: Regression coefficients are standardized.
*p<0.01

7. Conclusion

Findings in Table 4 demonstrates positive and significant relationship between HTE and GCI (βmodel2= 0.514, p< 0.01). Therefore, H1 (High-Tech Export has a positive effect on Global Competitiveness Index) was supported. H2 (Global Competitiveness Index has a positive effect on Coverage Ratio) was also supported (βmodel3= 0.365, p< 0.01). H3 (High-Tech Export has a positive effect on Coverage Ratio) was supported (βmodel1= 0.345, p< 0.01) and H4 (Global Competitiveness Index has a mediator role on the relationship between High-Tech Export and Coverage Ratio) was not supported (βmodel3= 0.157, p< 0.01). The reason is that after the inclusion of the mediator variable into the model the effect of HTE on CRV did not disappear. But the value of the β coefficient decrease. It was therefore concluded that GCI play partial mediator role between HTE and CRV.

According to the study, the increase in high technology exports leads to an increase in the Global Competitiveness Index. The Global Competitiveness Index also positively affects the coverage ratio. The increase in high technology exports increases the coverage ratio. However, the positive relationship between high technology exports and coverage ratio is realised with the help of the Global Competitiveness Index. In other words, the Global Competitiveness Index creates a link between technology exports and coverage ratio. As a result of the analyses, it is seen that this mediating variable role is not complete but partial.

Based on the study, increasing high technology exports of countries has positive effects on foreign trade performance. However, the increase in the level of competitiveness along with technology exports will further improve the foreign trade performance of countries and the coverage ratio will increase.

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