

THE MEDIATOR EFFECT OF LOGISTICS PERFORMANCE INDEX ON THE RELATION BETWEEN GLOBAL COMPETITIVENESS INDEX AND GROSS DOMESTIC PRODUCT

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Abstract

Logistics sector plays a critical role in social and economic developments of a country. Therefore understanding the relationship among the logistic performance, competitiveness and prosperity of a country is important. Logistics Performance Index (LPI) firstly published by World Bank in 2007 and repeated in the years 2010, 2012, 2014. In this research the mediator effect of LPI on the relation between Global Competitiveness Index (GCI) and Gross Domestic Product (GDP) was aimed to analyze for the years 2007, 2010, 2012, 2014. The mediator effect was measured by using hierarchical regression analyses. As a result of the analyses, the mediator effect of LPI on the relation between GCI and GDP was found statistically meaningful. Consequently, the result of the research could be suggested that the logistics ability of a country dominated the relation between competitiveness and prosperity.

Keywords: Logistics, LPI, Competitiveness, GCI, GDP

Introduction

LPI is a most important indicator to understand and compare logistics performance of the countries. Comparing domestic sources, LPI is more reliable because in some countries finding data about market size, the number of existing firms, employment, and revenue in logistic sector is difficult for researchers.

According to results provided from the sources in European Union and United States, proportion of the logistics sector in GDP is about 10 percent. In Turkey this rate is lower than 10 percent. Therefore there is substantial potential in Turkish logistics sector (Bayraktutan, Tüylüoğlu, &

Özbilgin, 2012). There are different considerations about the market size of the Turkish logistics sector. According to emerging markets logistics index report, growth in world economy and trade volume exerts influence on the sector (Agility, 2014). Similarly according to research conducted by Deloitte Turkey, growth rates of the logistics sector are in parallel with GDP growth (Deloitte, 2013). It is mentioned that by some authorities in Turkey, the potential of the sector is 10-13 percent of the GDP (Müsiad, 2013).

One of the dimensions used in this research is Gross Domestic Product (GDP). GDP is used to indicate the health of a country's economy. GDP is a quantitative measure giving information about general situation of the economy. In this research GDP is used as a dependent variable.

The other dimension used in this research is Global Competitiveness Index (GCI). GCI evaluate the countries in corporational and economic perspective in the long and short runs. Calculating the index, 12 components and 3 basic factors are used (Ovalı, 2014). In this index there are several factors determining productivity and competitiveness. 12 components are as follows; institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, financial market development, labor market efficiency, technological readiness, market size, business sophistication, innovation. These components are called as 12 pillars of competitiveness (Schwab, 2014).

Conceptual Framework

LPI is an international index calculated by means of empirical research conducted on the practical experience of logistics professionals. LPI is composed from following six dimensions :

- The efficiency of customs and border management clearance (“Customs”).
- The quality of trade and transport infrastructure (Infrastructure”).
- The ease of arranging competitively priced shipments (Ease of arranging shipments”).
- The competence and quality of logistics services—trucking, forwarding, and customs brokerage (“Quality of logistics services”).
- The ability to track and trace consignments (“Tracking and tracing”).
- The frequency with which shipments reach consignees within scheduled or expected delivery times (“Timeliness”). (Arvis, Saslavsky, Ojala, Shepherd, Busch, & Raj, 2014)

Due to playing critical role in the economy, logistics performance of a country is a catalyst for competitiveness and prosperity relation. And LPI is a most reliable indicator of logistics performance of a country. Therefore in this research LPI was proposed as the mediator variable for the relation between the GDP and GCI.

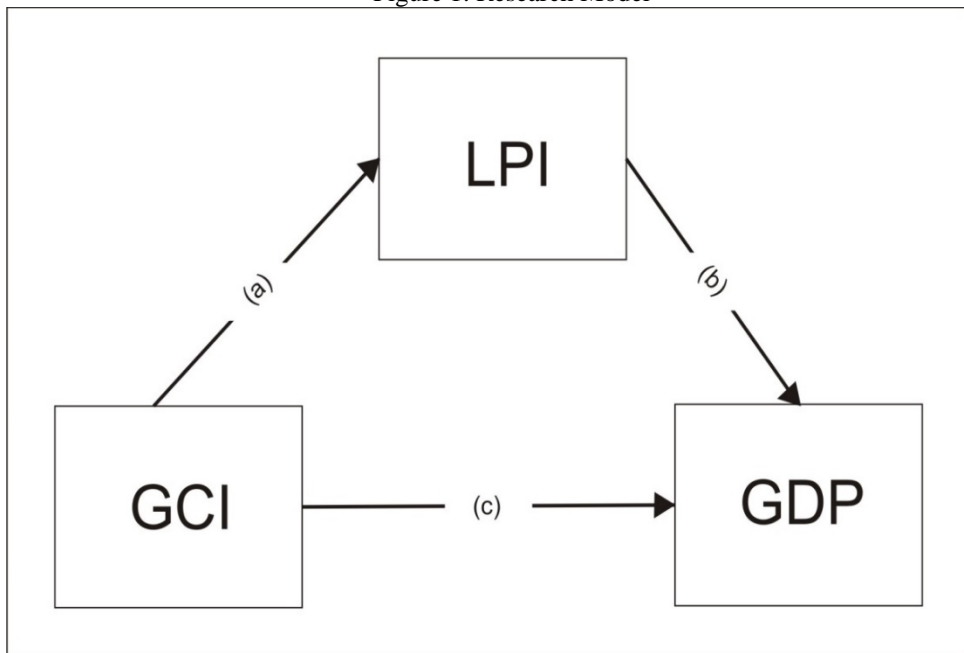
Research Model

Main research question is to understand if LPI plays a mediator role on the relation between GCI and GDP or not.

Mediator variable analysis method suggested by Baron and Kenny (1986) was used to designate the mediator role of Logistics Performance Index (LPI) on the relation between Global Competiveness Index (GCI) and Gross Domestic Product (GDP). Accordingly GCI and LPI have direct influence on GDP individually (c and b). Additionally independent variable (GCI) has a direct influence on mediator variable (LPI) (a).

Figure 1. shows the conceptual model regarding the mediator effect of Logistics Performance Index (LPI) on the relation between Global Competiveness Index (GCI) and Gross Domestic Product (GDP).

Figure 1. Research Model



Consequently four hypothesis was derived from the research model as shown on the Table 1.

Table 1. Summary of Hypothesis

H ₁ : Logistics Performance Index is positively influenced by Global Competiveness Index.
H ₂ : Gross Domestic Product is positively influenced by Logistics Performance Index.
H ₃ : Gross Domestic Product is positively influenced by Global Competiveness Index.
H ₄ : Logistics Performance Index has mediator effect on the relation between Global Competiveness Index and Gross Domestic Product.

Primarily relation among three variable was observed by means of the calculation of Pearson correlation coefficient. Table 2,3,4 and 5 showed that the correlation relation among variables are powerful and statistically meaningful for four years (2007-2010-2012-2014).

Table 2. Correlation Coefficients (2007)

		Global Competitiveness Index (GCI)	Logistics Performance Index (LPI)	Gross Domestic Product (GDP)
Global Competitiveness Index (GCI)	Pearson Correlation	1	,911*	,720*
	Sig.		,000	,000
Logistics Performance Index (LPI)	Pearson Correlation	,911*	1	,695*
	Sig.	,000		,000
Gross Domestic Product (GDP)	Pearson Correlation	,720*	,695*	1
	Sig.	,000	,000	

* Correlation is significant at the 0.01 level (2-tailed).

Table 3. Correlation Coefficients (2010)

		Global Competitiveness Index (GCI)	Logistics Performance Index (LPI)	Gross Domestic Product (GDP)
Global Competitiveness Index (GCI)	Pearson Correlation	1	,876*	,675*
	Sig.		,000	,000
Logistics Performance Index (LPI)	Pearson Correlation	,876*	1	,640*
	Sig.	,000		,000
Gross Domestic Product (GDP)	Pearson Correlation	,675*	,640*	1
	Sig.	,000	,000	

* Correlation is significant at the 0.01 level (2-tailed).

Table 4. Correlation Coefficients (2012)

		Global Competitiveness Index (GCI)	Logistics Performance Index (LPI)	Gross Domestic Product (GDP)
Global Competitiveness Index (GCI)	Pearson Correlation	1	,677*	,690*
	Sig.		,000	,000
Logistics Performance Index (LPI)	Pearson Correlation	,677*	1	,574*
	Sig.	,000		,000
Gross Domestic Product (GDP)	Pearson Correlation	,690*	,574*	1
	Sig.	,000	,000	

* Correlation is significant at the 0.01 level (2-tailed).

Table 5. Correlation Coefficients (2014)

		Global Competitiveness Index (GCI)	Logistics Performance Index (LPI)	Gross Domestic Product (GDP)
Global Competitiveness Index (GCI)	Pearson Correlation	1	,853*	,692*
	Sig.		,000	,000
Logistics Performance Index (LPI)	Pearson Correlation	,853*	1	,634*
	Sig.	,000		,000
Gross Domestic Product (GDP)	Pearson Correlation	,692*	,634*	1
	Sig.	,000	,000	

* Correlation is significant at the 0.01 level (2-tailed).

Baron and Kenny asserted the existence of following conditions in order to prove a variable as mediator (Baron & Kenny, 1986):

- a. Change in the independent variable cause the mediator variable to change,
- b. Change in the mediator variable cause the dependent variable to change,
- c. When the mediator and the independent variables are included to the analysis together, the influence of independent variable on dependent variable to decrease or completely disappear.

Hierarchical regression was used in order to test the model. Regression equations are as follows:

(a) $LPI = \beta_0 + \beta_1.GCI + \varepsilon$

(b) $GDP = \beta_0 + \beta_1.LPI + \varepsilon$

(c) $GDP = \beta_0 + \beta_1.GCI + \varepsilon$

(c') $GDP = \beta_0 + \beta_1.GCI + \beta_2.LPI + \varepsilon$

The results of the regression analysis are shown in the Tables 6,7 and 8.

Table 6. Model Summaries

Model	R	R ²	Adjusted R ²	Standard Error of the Estimate
(a)	,894	,799	,797	,24482
(b)	,718	,516	,511	1,29662
(c)	,672	,452	,446	1,38043
(c')	,721	,520	,510	1,29773

As shown in Table 6, difference between R² value of Model (c) and R² value of Model (c') was found as 0,068.

Table 7. Anova Tables

Model		Sum of Squares	df	Mean Square	F	Sig.
(a)	Regression	22,932	1	22,932	382,615	,000
	Residual	5,754	96	,060		
	Total	28,686	97			
(b)	Regression	170,357	1	170,357	101,329	,000
	Residual	159,717	95	1,681		
	Total	330,074	96			
(c)	Regression	149,042	1	149,042	78,212	,000
	Residual	181,032	95	1,906		
	Total	330,074	96			
(c')	Regression	171,768	2	85,884	50,997	,000
	Residual	158,306	94	1,684		
	Total	330,074	96			

All the models are generally meaningful as shown in the Table 7. Coefficients of the models are as shown in Table 8.

Tablo 8. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		β	Std. Error	β		
(a)	Constant	-,243	,171		-1,420	,159
	GCI	,764	,039	,894	19,561	,000
(b)	Constant	-2,691	,758		-3,551	,001
	LPI	2,443	,243	,718	10,066	,000
(c)	Constant	-3,714	,975		-3,808	,000
	GCI	1,964	,222	,672	8,844	,000
(c')	Constant	-3,181	,928		-3,427	,001
	LPI	1,997	,544	,587	3,673	,000
	GCI	,428	,467	,146	,915	,362

As shown in Table 8, the change in the independent variable cause the mediator variable to change. The change in the mediator variable cause the dependent variable to change. After the mediator and the independent variables are included to the analysis together, the influence of independent variable on dependent variable to decrease.

Conclusion & Limitations

According to these results, all the hypothesis are accepted. Therefore the mediator effect of Logistics Performance Index on the relation between Global Competiveness Index and Gross Domestic Product is statistically significant. Consequently it can be suggested that the logistics capacity of a country dominate the relation between competitiveness and prosperity. The most important contribution of this study is to provide an approach for the researchers in order to evaluate health of a country's economy in LPI perspective.

As per analysis results overall effect of following dimentions was measured. But as a limitation of this paper sub-dimension of LPI were not taken in to consideration. Namely the following dimension i.e. “the efficiency of customs and border management clearance“, “the quality of trade and transport infrastructure“, “the ease of arranging competitively priced shipments“, “the competence and quality of logistics services“, “the

ability to track and trace consignments“, “the frequency with which shipments reach consignees within scheduled or expected delivery times“ can be suggested to focus on for future researches.

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