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APPLYING GREY RELATIONAL ANALYSIS TO ITALIAN FOOTBALL CLUBS: A MEASUREMENT OF THE FINANCIAL PERFORMANCE OF SERIE A TEAMS

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Abstract

Extant literature on the financial analysis of football clubs has applied a vast array of techniques in determining the fiscal stability of such entities. Although many studies have provided useful comparisons and analyses of the states of various clubs, direct research comparing the financial performance among various clubs is still scant. Hence, we present an application of financial ratio analysis to the greater Italian football market within the Serie A. The main purpose of this study is to assess the financial performance of the top three Italian football clubs currently listed on the Borsa Italiana (Italian Stock Exchange), those being: Juventus F.C., A.S. Roma, and S.S. Lazio. In accomplishing this, we offer a comparative analysis of these clubs through the usage of grey relational analysis (GRA), an optimal performance technique derived from engineering. Overall, our results suggest that S.S. Lazio appears to be the most financially stable club among the sampled, publicly traded Serie A teams. In light of these findings, this study furthers the application of economic evaluation into larger segments of international football.

Among several models, 18-20-1 structured MLP has best explanatory level with 0.893 R^2 and 0.207 MSE values. This was followed the 18-16-1 structured MLP which had the minimum MSE as 0.025 and 0.88 R^2. These are models 1 and 2 respectively. It is also observed that ECE (Economic Calendar Events) and 'Other' variables have notable effects that explain on the fluctuation of the index. Similarly, the two variables have shown their significant in other models as well. Prediction of opening is more successful than closing. ECE has greater success forecasting open prices.

Key words: Serie A, Italian football clubs, financial ratios, financial performance, grey relational analysis.

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I. INTRODUCTION

Football is the most played, watched, and followed sport in the world. With over 3.5 billion fans (Pattnaik and Bag, 2015), nearly half of the entire world's population, football is iconic around the globe. With Europe as its epicenter, the sport has experienced a steady market growth across the "Big Five" European soccer leagues (i.e., Bundesliga, La Liga, Ligue 1, Premier League, and Serie A). Just last year, the leagues were able to collectively generate €13.6 billion in revenue, an increase from €12.1 billion in the previous year (Deloitte, 2016). Teams along the European continent have basked in the success of this growth, experiencing escalations in their overall worth. Within recent years, scholars in both economics and sports analytics have attempted to measure this growth and quantify differences between interleague clubs.

From both an on-field and economic perspective, clubs that thrive in one area tend to do well within the other. For instance, some of the most successful and most valuable clubs in the world, such as Real Madrid, Barcelona, and Manchester United, report very high revenue figures whilst realizing collective triumph within their respective leagues. Nevertheless, financial performance is not solely dependent on revenue and overall club worth. For instance, clubs, such as Deportivo de la Coruña, Marseille, Glasgow Rangers, Borussia Dortmund, as well as Valencia, have had difficulty translating success on the pitch toward monetary attainment. Within this list of exemplary clubs, Deportivo, in particular, has experienced some of the greatest adversities in this respect. Over the years, Deportivo has undergone a series of upheavals from functional prominence with an appearance in the Champions League semifinals in 2004 to relegation and near insolvency during the early 2010s. Their financial adversities persist, as the club has most recently filed for bankruptcy security along with fellow La Liga affiliate, Valencia (Franck, 2014).

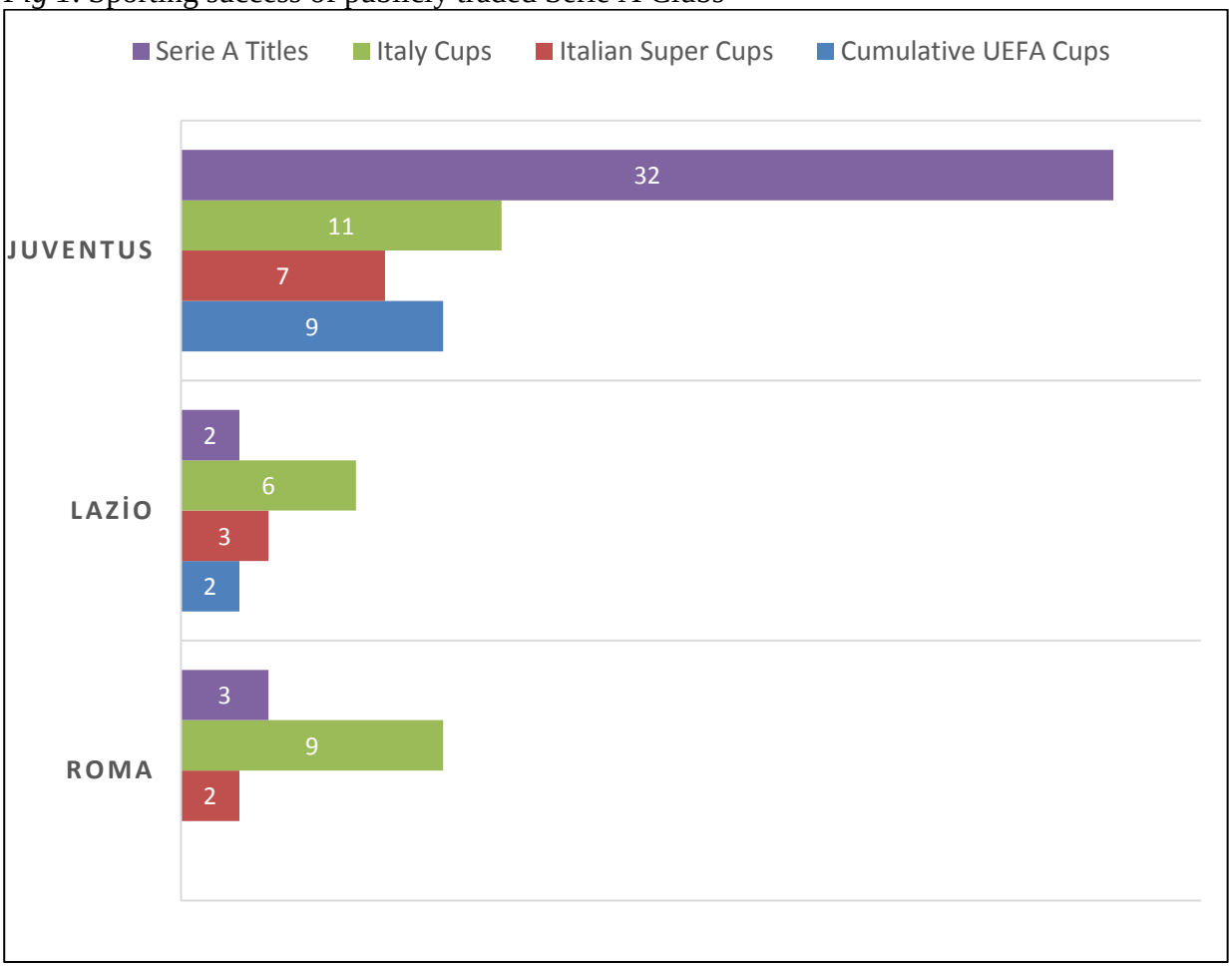
Taking this example into consideration, economic success within football is determined by a holistic view of financial records, involving a series of assessments accounting for revenue along with debt, assets, working capital, and effectual management of other liabilities. In other words, financial analyses of football clubs must be considered from a wider perspective and must examine simply how performance as well as club management translates to financial success. In view of such financial success and on-field performance, Italy may provide a noteworthy façade for such financial analyses. While some of the most valued clubs in the world have predominantly originated from England and Spain, Italian clubs of the Serie A have steadily surfaced at the top of this list. For instance, Forbes (2016) has valued Juventus F.C. ($1.299 billion) and A.C. Milan ($825 million) as the respective ninth and eleventh most valuable clubs in the world. At present, Inter Milan ($559 million; i.e., sixteenth most valuable) and Napoli ($396 million; i.e., nineteenth most valuable) have also joined

their Serie A competitors in the top 20 (Forbes, 2016). While fluctuations in revenue and debt have led to diminishments in the overall value, clubs such as A.S. Roma as well as S.S. Lazio have frequently appeared on these top valued lists over the past decade.

Interestingly, however, A.S. Roma, S.S. Lazio, and Juventus F.C. are currently the only three clubs that publicly offer shares on the Italian Stock Exchange, the Borsa Italiana. Lazio first released its initial public offering (IPO) in 1998, followed by Roma in 2000, and Juventus in 2001 (Günnemann, 2005). Over their time on the Borsa Italiana, each club has reasonably increased their share values due to both effective club management in addition to strong performance within the Serie A. Among the three floating clubs, Juventus has been far and away the most successful team. With a total of 32 *Scudettos* (league titles), 11 *Coppas Italia* (Italy Cups), 7 *Supercoppas Italiana* (Italian Super Cups), and 2 Union of European Football Associations (UEFA) Champions League trophies (Juventus Football Club S.p.A., 2016), their accomplishments as an Italian club are unprecedented. During the past five seasons, the club has continued to thrive on the pitch, most recently capturing their fifth consecutive Serie A title, 2 Italy Cups, 3 Italian Super Cups, and finishing as runner-up in the UEFA Champions League final in 2015 and qualifying to the round of 16 in 2016.

Contrarily, Roma and Lazio have not had near the on-field success resembling Juventus. With a mere 5 Serie A league titles and 5 Italian Super Cups between them, their on-field performances have been feeble in comparison (A.S. Roma, 2016; S.S. Lazio, 2016). However, in this time, Roma has seen an upsurge in performance, having had a span of some of their finest seasons in their existence, finishing in the top three in the Serie A from the 2013/14, in which they qualified for the Italy Cup, to the 2015/16 seasons. In contrast, with the exceptions of the 2012/13 season where Lazio won the Italy Cup and the 2014/15 where they finished third in the Serie A, Lazio's performance over the past five years has been subpar, as the club has not been a top contender within league play or international competition. Nevertheless, Lazio has been able to maintain their place within the top 10 of the Serie A over the past five years. Thus, the incongruence in performance on the pitch between these clubs has been favorably dominated by Juventus, as also displayed in Figure 1. Although these teams may each be in different classes with regards to sporting success, an examination of their economic statuses could potentially reveal variations in the present context.

Fig 1. Sporting success of publicly traded Serie A Clubs



(Sources: A.S. Roma [2016], Juventus Football Club S.p.A. [2016], S.S. Lazio [2016]).

II. LITERATURE REVIEW

Prior work on financial analysis in football has often evaluated the economic performances of various clubs. Predominantly, previous research has centered upon applying various techniques to compare the financial effectiveness of such teams. Within the greater European front, many studies have focused on English Premier League (EPL) teams. With numerous examinations on the financial profitability of the EPL itself (Hamil and Walters, 2010), game-related performance evaluations on financial efficiency of publicly traded clubs (Zuber, Yiu, Lamb, and Gandar, 2005), as well as linear analyses on productivity (Guzman and Morrow, 2007), case-by-case analyses have been lacking. Recently, Gunardi (2014) conducted a financial case analysis of Manchester United, examining ratios in determining financial performance. Keeping the UEFA's Financial Fair Play (FFP) initiative in mind, Gunardi (2014) reported that Manchester United although solvable, struggled with respect to profitability given the high presence of debt. While Manchester United may have reported high revenue figures, their overall present state was erratic even though performance on the pitch was

robust. Consequently, these results truly reflect the discrepancy between on-field performance and overall financial performance.

Further within the financial analyses of football, existing literature has examined some cases from Italian football. For instance, Baroncelli and Caruso (2011) analyzed the fundamentals of top Italian football clubs and related economic aspects. They also provided an overall evaluation of the financial situation in Italian football, noting that these clubs have not been able to maximize commercial success through worldwide broadcasting. Boeri and Severgnini (2014) have indicated that the financial conditions of Italian football are extremely punitive given the high mortality rate amongst clubs. According to the authors, among 37 teams participating in the Serie A from the 2001/02 to 2010/11 seasons, approximately 25 percent of these clubs have had to declare bankruptcy. Considering this, the balance between debt and profit and/or losses of teams are of great concern on the Italian front. Building upon this, Barros and Rossi (2014) have proposed a Bayesian stochastic frontier model to analyze the technical efficiency of Serie A Italian football clubs. The findings from their study also show that efficiency varies drastically among clubs.

Furthermore, there also exist a number of studies of financial performance in other contexts of European football. Berument et al. (2006) have demonstrated the effects of foreign wins among Turkish clubs. They report that for some clubs, specifically Beşiktaş, match success in the *Winner's Cup* against international clubs can translate to share returns. However, Demir and Danis (2011) have shown how the stock prices of various Turkish clubs may have an asymmetric association between financial returns and on-field performance. Dependent on the public presentation, the club's stock prices were significantly affected by domestic cup wins in comparison to European cup wins. In relation to the vast research of Turkish clubs as well as hierarchal methods of club analysis, Ecer and Boyukaslan (2014) have offered a useful financial evaluation of the performances of the top four clubs in Turkey whose shares are being traded on the Istanbul Stock Exchange, Borsa Istanbul. Using a series of financial ratios as well as grey relational analysis (GRA), they were able to reveal the financial states of Galatasaray, Beşiktaş, Fenerbahçe, and Trabzonspor. Overall, their analyses indicated that Fenerbahçe was the most financially successful club among the four floating Turkish teams. In sustenance, Sakinç (2014) conducted follow-up analyses employing a modified set of financial ratios to compare these four clubs. Using similar GRA methods, Sakinç (2014) was able to sustain Fenerbahçe's place as the top ranked financially stable club and provide support for findings by Ecer and Boyukaslan (2014).

Among the hierarchal pieces of financial analysis, many methods can be employed to measure various clubs among competitors. Using Multi-Criteria Decision-Making (MCDM) techniques (e.g., Data Envelopment Analysis [DEA] and Technique for Order of Preference by Similarity to Ideal

Solution [TOPSIS]), Kiani Mavi et al. (2012) studied the efficiency of German Bundesliga clubs, evaluating the performances of such teams using financial accounts from the 1999/2000 season. Within the EPL, Barros et al. (2006) utilized an econometric frontier model to determine how various factors could influence financial efficiency. Overall, they delivered a comprehensive ranking of the top EPL clubs, finding clusters of clubs characterized by elite, middle, or low financial performance. Within Italian football, ordinal analyses have characterized Serie A teams according to performance on the pitch. Montanari et al. (2008) examined how the stability and tenure of team members could affect performance. Not surprisingly, they report that these variables can have a positive impact on team performance.

However, from a financial standpoint, Serie A clubs have been the target of discrepant evaluation due to volatility within the Italian market. As shown by Baroncelli and Lago (2008), during the early 2000s financial crises, Italian clubs suffered from a revenue standpoint. Given the presence of some teams floating shares on the stock exchange, Boidoa and Fasanob (2007) have elucidated some precarious cases within the Serie A. Likewise, these authors provide evidence for sports performance-based influences on financial performance of the Serie A clubs. However, in terms of hierarchical procedures among the Italian teams, there exists a gap in this sector of football. Considering this, the Serie A clubs may present a promising avenue for analysis to be conducted.

Thus, in this study we aim to evaluate the performances of Italian football clubs through an examination of financial statements from the past five most recent seasons of play in the Serie A (i.e., the 2011/12-2015/16 seasons). In extension of the work by Ecer and Boyukaslan (2014), this paper will utilize a series of financial ratios as the primary data to rank the financial performance of the sampled clubs. In doing so, we intend to conduct a grey relational analysis (GRA) to systematically rank the three Serie A clubs floating on the Borsa Italiana, the Italian stock exchange market (i.e., Juventus F.C., A.S. Roma, and S.S. Lazio). The remainder of this study is organized as follows: in Section 3, a description and computation of financial indicators of performance is offered. The GRA method is introduced in Section 4. Subsequently, the results of the GRA analysis are reported in Section 5. A discussion of our findings is presented in Section 6. Finally, future directions for research and conclusions are offered in the final segment of this study, Section 7.

III. FINANCIAL INDICATORS OF PERFORMANCE

In determining each club's current financial performance, we provide a calculation of a series of financial ratios, as also employed by Ecer and Boyukaslan (2014; see Table 1). In doing so, we seek to examine each club's performance through an assessment of indicators of liquidity, liability, and profitability. Measures of liquidity are represented by the current (CR) and liquid asset

ratio (LAR). Liability is signified by net working capital/total assets (NWC/TA), total liabilities/total assets (TL/TA), total liabilities/equity (TL/E), short-term liability/equity (STL/E), fixed assets/equity (FA/E), and tangible assets/total assets ratios (TA/TA). Short-term liabilities are defined as current liabilities due in the present year. Fixed assets involve entities to be held in the long term, such as property and equipment. Tangible assets deal with both fixed and current assets (i.e., inventory, cash, and cash equivalents). Finally, profitability is denoted by earnings per share (EPS), net capital/equity (NC/E), and net profit/total assets (NP/TA). Ecer and Boyukaslan (2014) propose that the higher each liquidity and the lower each liability ratio, the more likely a club is able to manage liabilities with their capital, minimize financial risk, and ultimately provide higher profit margins for investors. Therefore, the goal for businesses is to reach higher ratios of liquidity and profitability to reflect financial potency. Contrariwise, clubs with higher liability ratios pose greater risk for prospective investors. As a result, the aim for these ratios are lower values of liability.

Table 1. Financial ratio formulas

Financial Indicator	*Ratio*	*Formula*	*Goal*
Liquidity	Current Ratio (CR)	$\frac{\text{Current Assets (CA)}}{\text{Current Liabilities (CL)}}$	Higher
	Liquid Asset Ratio (LAR)	$\frac{\text{Liquid Assets (LA)}}{\text{Current Liabilities (CL)}}$	Higher
Liability	Net Working Capital (NWC)/Total Assets (TA)	$\frac{\text{Current Assets (CA) - Current Liabilities (CL)}}{\text{Total Assets (TA)}}$	Lower
	Total Liabilities (TL)/Total Assets (TA)	$\frac{\text{Total Liabilities (TL)}}{\text{Total Assets (TA)}}$	Lower
	Total Liabilities (TL)/Equity (E)	$\frac{\text{Total Liabilities (TL)}}{\text{Equity (E)}}$	Lower
	Short Term Liability (STL)/Equity (E)	$\frac{\text{Current Liabilities (CL)}}{\text{Equity (E)}}$	Lower
	Fixed Assets (FA)/Equity (E)	$\frac{\text{Fixed Assets (FA)}}{\text{Equity (E)}}$	Lower
	Tangible Assets (TA)/Total Assets (TA)	$\frac{\text{Tangible Assets (TA)}}{\text{Total Assets (TA)}}$	Lower
Profitability	Net Capital (NC)/Equity (E)	$\frac{\text{Net Capital (NC)}}{\text{Equity (E)}}$	Higher
	Net Profit (NP)/Total Assets (TA)	$\frac{\text{Net Profit (NP)}}{\text{Total Assets (TA)}}$	Higher

Note. Adapted from Ecer and Boyukaslan (2014).

III.I. Financial Ratio Analysis

In evaluating each Serie A club, we present financial ratio analyses from the past five seasons using the average respective figures in determining the present states of each club (see Table 2 for financial figures). Our primary set of analyses assess each club's financial standing with respect to its fellow Serie A competitors. As previously noted, these teams were selected as comparative cases given that they all similarly float on the Italian Stock Exchange. In examining each of the ratios, illustrated in Table 3, we can summarize our findings as follows:

- *CR:* In comparison to Lazio and Roma, Juventus' CR is quite low, signaling that the club may have some difficulty meeting its current liabilities using current assets. Among the clubs,

Roma and Lazio appear to respectively have the best abilities to manage debts given the higher CR.

- *LAR:* Overall, each club has relatively weak cash power. However, Juventus struggles the most in this aspect given its marginal LAR.
- *NWC/TA:* Within this area, each of the clubs holds negative capital ratios, which may suggest insufficiency in regards to liquidity.
- *TL/TA:* With respect to total liabilities over total assets, Lazio appears to have the least difficulty in this matter. Roma holds a TL/TA ratio over 1, signaling a slight struggle to manage liabilities with assets, while Juventus appears to be approaching such difficulties.

Table 2. Financial values for selected Serie A clubs

Team	Financial Figure	2011/12	2012/13	2013/14	2014/15	2015/16	5-year Average
Juventus F.C.	Net Profit	(48,654,550)	(15,910,649)	(6,674,430)	2,298,263	4,062,312	(12,975,811)
	Current Assets	74,038,541	100,373,367	143,724,605	107,895,678	127,166,806	110,639,799
	Liquid Assets	653,650	1,777,036	1,586,969	3,126,754	42,810,719	9,991,026
	Fixed Assets	165,434,492	159,652,162	157,896,670	161,237,406	160,841,009	161,012,348
	Tangible Assets	239,473,033	260,025,529	301,621,275	269,133,084	288,007,815	271,652,147
	Total Assets	427,780,347	443,366,100	495,921,231	474,268,339	577,558,246	483,778,853
	Current Liabilities	258,593,305	295,551,017	357,376,057	312,813,033	267,057,963	298,278,275
	Total Liabilities	363,171,764	394,735,085	453,294,731	429,622,895	524,174,658	432,999,827
	Equity	64,608,583	48,631,015	42,626,500	44,645,444	53,383,588	50,779,026
	Earnings Per Share	(0.09)	(0.02)	(0.01)	0.00	0.00	(0.024)
A.S. Roma	Net Profit	(58,253,000)	(40,130,000)	(38,558,000)	(41,166,000)	(14,130,000)	(38,447,400)
	Current Assets	78,524,000	61,874,000	93,064,000	121,367,000	112,100,000	93,385,800
	Liquid Assets	24,709,000	10,894,000	9,108,000	35,031,000	8,700,000	17,688,400
	Fixed Assets	636,000	521,000	481,000	862,000	1,500,000	800,000
	Tangible Assets	79,160,000	62,395,000	93,545,000	122,229,000	113,600,000	94,185,800
	Total Assets	188,397,000	173,966,000	215,086,000	298,580,000	344,000,000	244,005,800
	Current Liabilities	142,046,000	191,293,000	188,487,000	202,281,000	234,800,000	191,781,400
	Total Liabilities	240,983,000	240,132,000	296,602,000	401,003,000	461,000,000	327,944,000
	Equity	(52,586,000)	(66,166,000)	(81,516,000)	(102,423,000)	(117,000,000)	(83,938,200)
	Earnings Per Share	(0.26)	(0.18)	(0.17)	(0.10)	(0.04)	(0.1500)
SS.. Lazio	Net Profit	580,492	(5,394,585)	7,068,190	5,812,193	(12,625,154)	(911,773)
	Current Assets	34,888,041	32,844,789	42,015,358	43,087,955	22,252,006	35,017,630
	Liquid Assets	8,338,443	5,938,190	3,958,477	2,940,539	3,621,951	4,959,520
	Fixed Assets	39,472,826	38,730,949	40,267,562	41,462,466	40,627,659	40,112,292
	Tangible Assets	74,360,867	71,575,738	82,282,920	84,550,421	62,879,665	75,129,922
	Total Assets	263,697,029	232,545,620	174,890,394	177,369,842	166,627,240	203,026,025
	Current Liabilities	90,805,507	74,872,109	67,046,442	68,569,687	79,189,359	76,096,621
	Total Liabilities	180,126,522	154,422,159	159,170,113	155,825,442	157,757,520	161,460,351
	Equity	83,570,507	78,123,461	15,720,281	21,544,400	8,869,720	41,565,674
	Earnings Per Share	0.01	(0.09)	0.10	0.09	(0.19)	(0.016)

Note. All figures in Euros. Sources: Investing.com (2016) and Morningstar (2016a, 2016b, 2016c, 2016d, 2016e, 2016f).

- *TL/E, STL/E, FA/E:* As accounted for by these factors, Juventus and Lazio pose a possibility of financial hazard seeing as the cumulative equity ratios, those being TL/E, STL/E, and FA/E, are quite high. Such ratios suggest that Juventus' and Lazio's equity capital may not be sufficient in meeting liabilities. Notwithstanding, Roma also appears to be in a precarious situation given the negative global equity ratios.

- *TA/TA:* With respect to tangible asset capability, Lazio appears to manage this area best among the clubs, being the most flexible in this arena given the lower ratio. Roma and Juventus have similar TA/TA ratios.
- *NC/E:* For each club, the NC/E ratio is equal to 1, suggesting a balance between investments owned by shareholders and those retained by club management.
- *EPS:* Regarding share profits, each club has a negative EPS ratio, signaling that each club has been generally operating at a loss over the past five years.
- *NP/TA:* In terms of profitability from assets, Lazio ranks first, followed by Juventus. However, each club has a negative NP/TA ratio, signaling potential risks of loss stemming from its assets.

Table 3. Financial ratios of Serie A clubs

Financial Indicator	Ratio	Juventus F.C.	A.S. Roma	S.S. Lazio
Liquidity	CR	0.37	0.49	0.46
	LAR	0.03	0.09	0.07
Liability	NWC/TA	-0.39	-0.40	-0.20
	TL/TA	0.90	1.34	0.80
	TL/E	8.53	-3.91	3.88
	STL/E	5.87	-2.28	1.83
	FA/E	3.17	-0.01	0.97
	TA/TA	0.56	0.39	0.37
Profitability	NC/E	1.00	1.00	1.00
	EPS	-0.02	-0.15	-0.02
	NP/TA	-0.03	-0.16	-0.004

Note. Ratios calculated using 5-year average data from 2011/12-2015/16 seasons.

IV. GREY RELATIONAL ANALYSIS (GRA)

In order to analyze the ratio data, we conducted a grey relational analysis (GRA) to determine each club's performance with respect to their Serie A rivals. GRA is a multi-step procedure that provides a comprehensive ranking system for limited sets of data (Huang and Liao, 2003). According to Sakinç (2014), data are normalized, converted into grey relational coefficients, and subsequently ranked based on the resultant grades. To begin with, data are organized using a matrix system based upon specific metrics, in this case financial ratios. If larger values are desired, the benefit type factor calculations are required. However, if smaller outcomes are preferred, the defect type factor is utilized in computing coefficients.

Following this, the grey relation degree is calculated by normalizing data using absolute differences between the referential series point (RF; denoted by the highest or lowest column value contingent upon the desired ratio outcome; Wu, 2002) and each data point within the matrix columns. Then, the difference scores are scaled by summing the matrix columns' minimal difference and maximum column difference. This value is then scaled through multiplication by a selected distinguishing coefficient (i.e., most commonly 0.5; Ecer and Boyukaslan, 2014; Sakinç, 2014). Subsequently, the difference scores and the calculated distinguishing column difference are divided by the scaled value. Finally, the relational degree is computed by summing each row indicators' coefficient scores and dividing by the proportion of the row factors and total row indicators. The process of the GRA calculation is displayed in Table 4.

Table 4. The GRA process

Steps	**Formula**	**Variables**
Step 1	$x = \begin{bmatrix} x_1(1) & x_1(2)\dots & x_1(n) \\ x_2(1) & x_2(2)\dots & x_2(n) \\ x_m(1) & x_m(2)\dots & x_m(n) \end{bmatrix}$	Matrix = Set of observed values x = Observed data point m = Data group n = Indicator
Step 2	*Benefit Type* $x_i(k) = \frac{x_i(k) - \min x_i(k)}{\max x_i(k) - \min x_i(k)}$ *Defect Type* $x_i(k) = \frac{\max x_i(k) - x_i(k)}{\min x_i(k) - \max x_i(k)}$	$x_i(k)$ = Observed data point $\min x_i(k)$ = Minimum observed data point $\max x_i(k)$ = Maximum observed data point
Step 3	$\Delta x_i(k) = \lvert x_0(k) - x_i(k) \rvert$	$\Delta x_i(k)$ = Absolute difference score $x_0(k)$ = Referential normalized data point $x_i(k)$ = Observed normalized data point
Step 4	$\xi_i(k) = \frac{\Delta \min + p\Delta \max}{\Delta x_i(k) + p\Delta \max}$	$\Delta \min$ = Minimum column difference $\Delta \max$ = Maxmimum column difference $\Delta x_i(k)$ = Observed difference score p = Distinguishable coefficient $\xi_i(k)$ = Grey relational coefficient
Step 5	$r_i = \sum [w(k)\, \xi(k)]$	w(k) = Number of indicators used in data $\xi(k)$ = Proportion of influence indicators to total indicators r_i = Relational grade

Note. Source: Sakinç (2014).

V. RESULTS

V.I. Performance Analysis

In conducting the GRA, several considerations were made prior to performing the analysis. Since Roma reported negative equity in each of the five sampled seasons, we utilized the absolute value of this figure in the calculations of each corresponding ratio for the GRA. In addition, due to the NC/E ratio equaling 1 across the teams, we omitted this variable in our analyses as it was negligible for the purposes of the GRA. Lastly, given that the NWC/TA ratio was negative for each club, values closer to 1 were used as the RF value in the analysis.

The initial stage of the GRA involves arranging the comparison matrix composed of the financial ratios of each club, as displayed in Table 5. The RF value is derived from the set of ratio data. In the case of higher ratios signaling better performance, the RF value arises from the maximum value within the data set. However, if lower values are desired, the minimum value within the series of ratios is used as the RF indicator.

Table 5. Comparative ratios of selected Serie A clubs

	Liquidity			*Liability*					*Profitability*	
	CR	*LAR*	*NWC/TA*	*TL/TA*	*TL/E*	*STL/E*	*FA/E*	*TA/TA*	*EPS*	*NP/TA*
RF	0.49	0.09	-0.20	0.80	3.88	1.83	0.01	0.37	-0.02	-0.004
JUVENTUS	0.37	0.03	-0.39	0.90	8.53	5.87	3.17	0.56	-0.02	-0.03
ROMA	0.49	0.09	-0.40	1.34	3.91	2.28	0.01	0.39	-0.15	-0.16
LAZIO	0.46	0.07	-0.20	0.80	3.88	1.83	0.97	0.37	-0.02	-0.004

Subsequently, the next step of the GRA is normalization of the data based upon the RF values. In doing so, we employ either the higher (benefit type) or lower value (defect type) equation dependent on the desired ratio size. Table 6 presents our calculation of the normalized data matrix.

Table 6. Normalized ratios for selected Serie A clubs

	Liquidity			*Liability*					*Profitability*	
	CR	*LAR*	*NWC/TA*	*TL/TA*	*TL/E*	*STL/E*	*FA/E*	*TA/TA*	*EPS*	*NP/TA*
JUVENTUS	0.000	0.000	0.077	0.818	0.000	0.000	0.000	0.000	0.940	0.854
ROMA	1.000	1.000	0.000	0.000	0.995	0.888	1.000	0.917	0.000	0.000
LAZIO	0.769	0.539	1.000	1.000	1.000	1.000	0.698	1.000	1.000	1.000

Next, the absolute differences of the normalized data are computed using the Step 3 equation displayed in Table 4. Absolute values are calculated by taking the absolute difference of each data point. In this case, a value of 1 is utilized, given the normalization of the data. Our normalized matrix is illustrated in Table 7.

Table 7. Absolute differences of normalized data

	Liquidity			*Liability*					*Profitability*	
	CR	*LAR*	*NWC/TA*	*TL/TA*	*TL/E*	*STL/E*	*FA/E*	*TA/TA*	*EPS*	*NP/TA*
JUVENTUS	1.000	1.000	0.923	0.182	1.000	1.000	1.000	1.000	0.060	0.146
ROMA	0.000	0.000	1.000	1.000	0.005	0.112	0.000	0.083	1.000	1.000
LAZIO	0.231	0.461	0.000	0.000	0.000	0.000	0.302	0.000	0.000	0.000

Following our absolute difference calculations, the grey relational coefficients are generated by employing the Step 4 equation from Table 4. Based on previous research (Ecer and Boyukaslan, 2014; Sakinç, 2014), we selected the value of 0.5 for ξ. Table 8 displays the calculation of the grey relational coefficients.

Table 8. Grey relational coefficients

	Liquidity			*Liability*					*Profitability*	
	CR	*LAR*	*NWC/TA*	*TL/TA*	*TL/E*	*STL/E*	*FA/E*	*TA/TA*	*EPS*	*NP/TA*
JUVENTUS	0.333	0.333	0.351	0.733	0.333	0.333	0.333	0.333	0.893	0.774
ROMA	1.000	1.000	0.333	0.333	0.990	0.817	1.000	0.857	0.333	0.333
LAZIO	0.684	0.520	1.000	1.000	1.000	1.000	0.623	1.000	1.000	1.000

Ultimately, in order to generate the comprehensive ranking of the GRA, we employ the Step 5 equation from Table 4. This calculation summates the grey relational coefficient and subsequently weighs each grade based on the proportion of the number of indicators utilized in determining each factor (i.e., the ratios used to indicate liquidity, liability, and profitability) by the singular ratio. The overall grade is similarly produced by summing all the ratios and then harmonizing the entire grade by the total number of indicators.

Table 9. Serie A grey relational coefficient assessment and club rankings

	Liquidity (64.52%)		**Liability (68.73%)**		**Profitability (72.24%)**		**Overall**	
	Relation Grade	*Rank*	*Relation Grade*	*Rank*	*Relation Grade*	*Rank*	*Relation Grade*	*Rank*
JUVENTUS	33.33%	3	40.30%	3	83.37%	2	47.52%	3
ROMA	100.00%	1	72.18%	2	33.33%	3	69.98%	2
LAZIO	60.24%	2	93.72%	1	100.00%	1	88.28%	1

V.II. Results of GRA

According to the global relation grades, as presented in Table 9, with a score of 72.24%, profitability is the most potent indicator of financial performance for the measurement of Serie A football clubs that were examined in our study. Liability closely follows this with a score of 68.73%, while liquidity is last with 64.52%. In regards to liabilities, our results indicate that Lazio ranks first on liability (ri = 93.72%) with Roma and Juventus respectively following with grades of 72.18% and 40.30%. Our analyses also indicate that Lazio ranks first in profitability, with a relational grade of

100.00%. Juventus trails slightly with a grade of 83.37%, but Roma falls behind in this regard with a mere 33.33% efficiency score on profitability. Taken together, the results of the GRA illustrate that Lazio (ri = 88.28%) is the top ranked financial performer followed by Roma (ri = 69.98%) as the second ranked and Juventus (ri = 47.52%) as last among the sampled clubs.

V.III. Supplementary Analyses

Further analysis on the financial ratios using the negative equity for Roma as opposed to the absolute value (see Table 2) in the GRA marginally altered the final results. In terms of the ranking structure, Lazio remained as the top overall financial performer (ri = 77.66%) followed by Roma (ri = 71.91%) and Juventus (ri = 47.52%) respectively. Using a paired-samples t-test to compare the original and further analyses, there was no significant difference in the relational grades, $t(2) = 0.74$, $p = .54$, $d = 0.43$. In addition, a Wilocoxon Signed-rank test indicated that the overall ranking structures did not significantly differ from each other ($z = -.45$, $p = .66$). This was also verified by a perfect Spearman's rank-order correlation between the two ranking structures, $rs(3) = 1.00$, $p < .001$. Thus, the results from the original analyses were corroborated.

VI. DISCUSSION

Taken as a whole, the GRA results rank S.S. Lazio as the holistically best financial performer over the past five years, followed by A.S. Roma and then Juventus F.C. In evaluating our findings, Roma ranks first in liquidity, as examined through current and liquid asset ratio values. In comparison to Juventus and Lazio, Roma appears to be much more capable of effectively managing their current and liquid assets than their competitors. Alternatively, however, another explanation for this disparity may be that Roma maintains a well-balanced debt/asset proportion and can more easily pay its short-term debts while converting current assets to cash or liquid value. Another striking issue from our findings lies within Juventus' ineffectiveness in covering liabilities. Consequently, the club could potentially face massive financial difficulties in overcoming its short-term debts, as illustrated by the measures of liquidity (i.e., current and liquid assets). As a result, Juventus must treat asset management with great care in the short term.

Due to the lack of positive equity, it must be stressed that Roma's shares are quite risky due to their paltry asset structure and total asset value. Furthermore, over the past five years, there seems to be a growing trend of increased liabilities for both Roma and Juventus. While Lazio has been quite stable in this regard, they have not managed to bolster their total assets during this period. However, this may shed light on the club's ability to remain in accordance with UEFA's FFP regulations and thereby, avoid bankruptcy. Accordingly, compared to Lazio, Roma does not maintain a balanced debt

to asset ratio, indicating that the club has relatively more liabilities than its assets. Nonetheless, Roma's liabilities include most of its debt as short-term liabilities, which they have been able to successfully regulate, as complemented by the ensuing liability relational grade.

Although Juventus has had a series of exceptional accomplishments during the past five seasons, the club has not been able to convert on-field success to their financial status. According to the findings, it seems that Juventus has selected a development model with higher assets and higher debt. Nevertheless, Juventus has translated this fiscal model into strong performance in profitability. This advantage may have sound implications for the club going forward, even though Juventus ranks last on the overall grade. Conversely, Roma falls short of profit distribution and reflects the worst earnings performance among the Serie A clubs, contrary to having better control over liability and greater liquidity than Juventus. As a result, Lazio appears to be rewarded by this balance in financial and on-field performance by taking first place in the overall ranking of the Serie A clubs included in our study through their effective management of liquidity, liability, and profitability.

VII. FUTURE DIRECTIONS FOR RESEARCH, LIMITATIONS, AND CONCLUSIONS

From a global perspective, we can confidently state that football is the most attractive sport. In view of this, clubs face the issue of generating massive financial figures each and every day in order to compete with rival teams as well as the growing market. Nowadays, football clubs are eagerly looking for strong financial execution from management as well as outstanding performance from their players on the pitch. In reviewing prior cases throughout the history of football, many clubs have suffered financial difficulties as a result of not being able to use their sportive accomplishments as leverage to enhance their respective club's economic infrastructures. Simply put, success is a two-way street given that football clubs are not only assessed with their on-field success, but also with the financial dealings with their stakeholders and their fans. This financial race and pressure for absolute success urges economic and sports analytics researchers to make more comprehensive analyses on this subject.

Within the extant literature in the financial analysis of football clubs, several MCDM methods can be used in measuring club financial performance, such as TOPSIS, VIKOR, Analytic Hierarchy Process (AHP) and so on (Opricovic and Tzeng, 2004; Yu, 2002). In covering the limitations of our study, naturally there exist a plethora of techniques that could have been applied as alternative procedures or perhaps even comparative or complementary analytic cases. In addition, although A.C. Milan, Inter Milan, alongside Juventus F.C. are known as the "Big Three" of the Serie A due to their respective unprecedented dominance in domestic play, we were limited by the use of Juventus, Lazio,

and Roma as a result of these other clubs not floating on the Borsa Italiana. Thus, we were not able to present these clubs in our research.

However, we offer interesting directions for future studies as clubs such as these begin to trade publicly on the Borsa Italiana. In fact, with respect to future investigations, novel studies could concurrently examine not only each of the Serie A clubs, but also other "Big Five" league teams to uncover the world's most financially successful club. By utilizing financial accounts provided by publicly traded teams, future research could determine the type of financial structure that could benefit clubs the most in terms of liquidity, liability, and profitability. In doing so, sports scholars may be able to aid in the work of practitioners within the industry of football.

Taken together, financial performance is an extremely intricate issue in today's sports world. Although many clubs may seem to simply play to win, the ability to succeed is dependent on not only on-field performance, but also financial management. With this, we hope to inspire further studies of financial analysis in the realm of football to shed light upon the true states of international football clubs. Appropriately, the present study offers an application of financial analysis through the measurement of the economic conditions of floating Serie A football clubs using their financial tables from the 2011/12 to 2015/16 seasons. The GRA method has become a trending technique within the academic research world. Its appeal lies within its adaptability by means of rational and realistic outcomes using relation grades with limited data. Using the GRA method, we were able to classify the Serie A football clubs traded publicly on the Borsa Italiana.

Given that Lazio is ranked first by the GRA, we must consider these results along with success on the pitch, which has been dominated by Juventus. In other words, the competitive parity among the floating Serie A clubs may be closer than as indicated by our measures of financial performance. In delving further into this issue, we offer some evidence to ensure rationality in solving the abovementioned incongruences, while concertizing the internal consistency for our study. Consistent with this point of view, we can assume that possessing riskier financial structures, in the manner of Juventus, may deter the overall grade. Nevertheless, clubs like these provide opportunities for greater returns for investors in spite of the high risks. As a result, the clubs may be on more even playing field when taking into consideration liquidity, liability, as well as profitability.

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FOREIGN DIRECT INVESTMENTS AND ECONOMIC GROWTH: HOW WELL DOES THE TECHNOLOGY CHANNEL WORK IN TURKEY?*

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Abstract

The main purpose of this study is to assess the impact of the technology spillovers as a driving force for economic growth of Turkey in terms of manufacturing industry using the data of 1988-2012 period. For this aim, the dynamic interactions between export of the manufacturing industry (EXP) as a measure of technology spillover, gross domestic product (GDP), gross fixed capital formation (GFCF) and FDI in manufacturing industry were investigated via cointegration and causality tests in addition to the innovation accounting techniques in the vector autoregressive (VAR) framework. While the cointegration test yields no clear evidence of long-run equilibrium relationship among these variables Granger causality test indicates that there is a univariate causality running from the EXP to the all other variables, and FDI is not Granger cause for the other variables. Nevertheless, the positive impact of FDI on the GDP and EXP variables is observed within the results of the innovation accounting analysis. From this point of view, it is concluded that the FDI leads economic growth more significantly in indirect ways rather than through direct ways. Under the light of these empirical outcomes, proposing policies based on strategies which encourage FDI inflows to the sub-sectors of manufacturing industry with higher technological gaps seem as effective and valuable in terms of promoting economic growth.

Keywords: Foreign direct investment, economic growth, manufacturing industry, technology spillovers.

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I. INTRODUCTION

Stable and sustainable growth is among primary objectives, as well as the base of welfare increase. In this context, it is necessary to benefit from foreign direct investments (FDI) alongside

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local resources and saving-investment activities to develop productive capacity with appropriate structural transformation. The interaction between foreign direct investments (FDI) and economic growth is one of the frequently discussed issues in the literature, both theoretically and empirically. The role of different channels through which FDI promotes economic growth is an aspect that should be focused on.

In line with technological developments in electronics, communication and transportation, worldwide multinational enterprises (MNEs) have carried out their production activities to different geographical areas. Thus, the share of FDI in the world economy has increased gradually.

Economic literature on FDI, which has been expanded after 1970s, is related especially with the impacts of these investments on economic growth at host countries. Considering this relationship there are a lot of positive and negative impacts that can be dealt with. In the context of these impacts, making a contribution to income and employment growth through technology and knowledge spillovers are the positive ones and causing environmental degradation and crowding out domestic investments and domestic financial resources are the negative ones.

In this study, the positive impacts of FDI on economic growth through both gross fixed capital formation, and exportation realized thanks to technology and knowledge externalities and spillovers and the development of competitiveness will be discussed, and the impact of FDI on economic growth in Turkey has been researched with a special attention to technology channel. From this point of view, the manufacturing industry, which owns the most of the technology spillovers stem from FDI, has been investigated. The contribution of inward FDI in the manufacturing industry to economic growth has been inquired by taking the exports of the manufactured products (EXP) and gross fixed capital formation (GFCF) into consideration.

II. FDI AND TURKISH EXPERIENCE

FDI is a kind of international investment that made by an investor in one country with a resident FDI establishment in another country, for the purpose of establishing a longlasting relationship based on interest and getting permanent income. The concept of “permanent income” points out long-term relationship between investor and enterprise, and the efficiency of foreign direct investor in control of the enterprise. Permanent income realized depends upon 10% or more control use of investor. It does not involve only the first transaction which lead to connection between investor and enterprise, but also their all former transactions with subsidiary enterprises (Duce, 2003: 2; Durlauf, and Blume, 2008; IMF, 2009: 101; OECD, 2009: 17).

FDI have a lot of contributions to host countries. Especially, in developing countries, they lead to new employment areas, increase foreign exchange reserves of host countries, obtain capital accumulation that is the most important factor for national income increasing, transfer higher technology. Through acquisition of new technologies, new knowledge and skills in host countries, will be important outcomes. The most important channel for developing countries would be technology spillover as a result of FDI inflows. (Sonmez and Pamukcu, 2011: 3).

It is assumed that technology level of home country is superior than host countries'. Although the utilization capacity of countries and firms from the technology of foreign ones can be differed, it is possible to produce much more and cheaper, and more qualified goods and services, and to provide increases in consumer welfare in all host countries (Lipsey and Sjöholm, 2005: 24).

FDI benefit to developing countries by improving technology level as a result of both efficient use of technology and the adoption of this technology by local firms. Inward FDI, which include capital flows as well as technology transfer, play an increasing role in economic growth for the host country by either channels (Saggi, 2002: 208, 217).

The developments of electronics, machinery, transportation, knowledge and communication technologies have been decreased investment costs which countries are faced with and have had an important role for the investment decisions in micro and macro frame in particular by 2000s. As well as these improvements, increased trade openness has positively affected technology spillovers.

As of 1980s, Turkey has liberalized the real and financial sectors, increased the openness ratio despite instable macroeconomic environment, and parallel to this, the volume of FDI has expanded. This process has been accelerated particularly at the 2000s with the exception of the economic crisis of 2001 when FDI inflows decreased. After this crisis Turkey made some important legal regulations to attract FDI which are more credible than speculative short-term investments.

Law 4875 on FDI which goes in effect in 2003 instead of Law 6224 on Encouragement of Foreign Capital brought important changes. FDI has been encouraged, foreign investors have been considered equal to domestic ones, and their rights have been protected, and permission and approval system has been transformed into information system. With the legislative regulations mentioned above, and the acceleration of the negotiations for the EU membership, Turkey has experienced a clear increase in FDI inflows particularly in the period of 2003-2012.

III. LITERATURE REVIEW

In spite of the existence of attempts to determine the efficiency of different channels on which FDI support economic growth, using microeconomic and macroeconomic variables, empirical studies about these channels are quite limited.

Borenzstein, et. al. (1998) tested the effect of FDI on economic growth in a cross-country regression framework utilizing data on FDI flows from industrial countries to 69 developing countries over two decades, and suggested that FDI are an important vehicle for the transfer of technology, contributing relatively more to growth than the domestic investments.

Hansen, and Rand (2005) investigated FDI-GDP relationship for 31 developing countries for the period of 1970-2000. They observed a strong long-term causality relationship between FDI and GDP. Additionally, the higher FDI in gross capital formation, the higher positive impact on GDP.

Kar, and Tatlisoz (2008) investigated Turkey's inward FDI determinants for 1980-2003 period. They found a positive relationship between inward FDI and net international reserves, gross national product (GNP), openness ratio, electrical power production index, and investment incentives; and a negative relationship between inward FDI and real exchange rate, and labor costs.

Wang (2009) using a panel data analysis for 12 Asian economies over the period of 1987-1997 put forward that total FDI flows considerably affect economic growth through manufacturing sectors which have a significant role and positive effect on this variable.

Chimobi (2010) examined the contribution of FDI and exportation on economic growth by using cointegration and Granger causality tests. According to this study, there is a bilateral but statistically insignificant relationship between FDI and economic growth.

Turan Koyuncu (2010) studied inward FDI of Turkey for the period of 1990-2009, using structural vector autoregressive analysis. According to this study, inward FDI are significantly influenced from the amount of FDI of the former period, GDP, trade openness and alternation of the net international reserves.

Doytch, and Uctum (2011) put forward that total FDI increase economic growth usually by the channel of manufacturing sector, especially in Latin America and Caribbean Region, Europe and Central Asia, low-income countries and economies with large manufacturing basis.

Sonmez, and Pamukcu (2011) using the data of 2003-2006 period, investigated the existence of intra-industry technology spillovers which related with FDI in Turkish manufacturing industry. For the related period, the presence of the horizontal technology spillovers which tend towards the local firms from the foreign ones that operate in the same industry and which have a positive effect on the growth of the firms through increasing total factor productivity is available. On the other hand, for the firms which operate locally, such a relationship is not observed. For these firms, FDI related spillovers have a very little impact on total factor productivity and growth rates, and there is a poor connection between the manufacture exporters and the foreign firms operating in Turkey.

Our analysis differs from the current literature in terms of model and variables selected, sample, time period and methodology, and address an important aspect of FDI, specifically technological reflection at the context of economic growth which is main drive of international competitiveness and export performance.

IV. DATA AND METHODOLOGY

Variables were chosen assuming that changes in GDP reflects economic growth and exports of manufacturing industry is an indicator of structural change of the economy. The data on the variables GDP, GFCF, FDI and EXP that are used in the empirical analysis covers the period of 1988 to 2012, and were obtained from the Central Bank of the Republic of Turkey, various issues of the FDI bulletins published by the Ministry of Economy, and the World Development Indicators by the World Bank. The data were constructed in the annual basis, due to the lack of the monthly/quarterly series, and expressed in logs to address the skewness. The length of the data can be assumed to be moderate and adequate to reach enough degrees of freedom for estimation of long and short-run relationships among the variables. A well-known econometrics package for time series analysis was used. The summary of descriptive statistics of data is in Table-1.

A four-step procedure was employed as the estimation strategy for the dynamic interaction between the variables. These procedures are the unit root test, the cointegration and the Granger causality tests in the vector autoregression (VAR) framework, and the innovation accounting techniques including both the impulse response function analysis and the forecast error variance decomposition method.

Table 1: Summary statistics of the data

Statistics	FDI	GDP	GFCF	EXP
Mean	1.13E+09	3.49E+11	7.25E+10	4.22E+10
Median	5.04E+08	2.50E+11	5.02E+10	2.26E+10
Maximum	4.29E+09	7.89E+11	1.69E+11	1.19E+11
Minimum	2.07E+08	9.09E+10	2.37E+10	7.49E+09
Std. Dev.	1.31E+09	2.37E+11	4.70E+10	3.66E+10
Skewness	1.6288	0.7631	0.8430	0.8217
Kurtosis	4.0866	2.0264	2.2030	2.1859
Jarque-Bera	12.2845	3.4137	3.6228	3.5038
Probability	0.0022	0.1814	0.1634	0.1734
Sum	2.82E+10	8.72E+12	1.81E+12	1.05E+12
Sum Sq. Dev.	4.15E+19	1.34E+24	5.31E+22	3.21E+22
Observations	25	25	25	25

IV.I. Unit Root Test

Most of the macroeconomic variables increase over the time period and they frequently indicate nonstationary time series. Different definitions of stationarity exist in the recent literature. However, mean stationarity is the most widely used concept for many applications due to the strict assumptions of the rest of the definitions. The main assumption of the mean stationarity concept is that the mean of the time series is time invariant.

Nonstationarity in time series yields misleading parameter estimates. In other words, using nonstationary time series leads spurious regression between the variables yielding erroneous conclusions. This is why checking the stationarity of the time series before modeling is a mandatory procedure. The presence of the nonstationarity and the order of the integration for each of the variables are checked with the Augmented Dickey-Fuller (ADF) unit root test. ADF test uses the estimation of the following equation for each of the time series (Dickey and Fuller, 1981):

$$\Delta X_t = \delta_0 + \delta_1 t + \delta_2 X_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta X_{t-i} + \varepsilon_i \qquad (1)$$

where, Δ is the first difference operator, X_t denotes the natural logarithm of the variable X at time t, δ_0, δ_1, δ_2, and α_i are parameters to be estimated, k denotes the number of the augmenting lags used and ε_i is the white noise process.

The number of the augmenting lags used in the ADF test to rid the serial correlation of the residuals which bias the results is selected automatically based on info criteria. The ADF test was conducted with constant and time trend in addition to constant for the levels of the variables and their first differenced form. The null hypothesis of the ADF test states that there is a unit root, and the presence of a unit root implies the nonstationarity of the time series. Calculated *t*-statistics were compared with the critical values at conventional degrees of significance to make a decision on stationarity. If the absolute value of the calculated *t*-statistics is higher than the absolute value of the critical value, then the null hypothesis should be rejected. Stationarity of the time series was also confirmed by the inspection of the autocorrelation and partial autocorrelation functions (also known as correlogram and partial correlogram, respectively).

IV.II. Cointegration Test

Cointegration test is basically used to capture whether the linear combination (weighted average) of a set of nonstationary time series is stationary or not. If the linear combination of these time series is nonstationary, then a cointegration does not exist among time series. Otherwise, in a case where a cointegration does exist since they are integrated of the same order, it can be interpreted as a valid empirical evidence of a long-run relationship which does not diverge over time. Engle-Granger, Phillips-Ouliaris and Johansen-Juselius (henceforth JJ) methods are well-known procedures for testing the cointegration. In this study, JJ as a multivariate method which gives invariant results with respect to the direction of the normalization by making all the variables explicitly endogenous was preferred due to the number of the variables in the data set.

A VAR of order *p* that is used for estimating the cointegration matrix is the first step for the JJ method as given in Eq.2:

$$y_t = \mu + A_1 y_{t-1} + \ldots + A_p y_{t-p} + \varepsilon_t \quad (2)$$

where μ is any constant, ε_t is the white noise process and y_t denotes the variable y at time t. It is crucial to determine the appropriate lag length of the VAR model. Because if the chosen lag length is less than the appropriate value, there will be a model misspecification. On the other hand, the lag length is limited for mainly three reasons: lag lengths over the appropriate value may consume additional degree of freedom, lead inefficient estimations and increase the computational time. The lag length can be selected through some criteria such as sequential modified LR test statistics, final prediction error (FPE), Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ) and Schwarz information criterion (SIC). Constructing of the VAR model with an appropriate lag length

will make the residuals uncorrelated and homoskedastic. The appropriateness of the selected lag length can be confirmed by normality, autocorrelation and stability tests.

After the cointegration matrix is obtained with the estimation of the VAR model with the appropriate lag length, trace and maximum eigen-value of the cointegration matrix should be calculated. These are the two test statistics that are offered in the JJ method to determine the rank(s) (*r*) which shows the number of the cointegration vector(s) by making a decision on the tested hypotheses.

Trace and maximum eigen-value tests rarely lead different conclusions. However, trace test is a joint test whereas the maximum eigen-value test considers all of the eigen-values. Trace and maximum eigen-value statistics can be calculated as follows, respectively.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{k} \ln(1-\hat{\lambda}_i) \quad (3)$$

$$\lambda_{\max}(r, r+1) = -T \ln(1-\hat{\lambda}_{r+1}) \quad (4)$$

where T and $\hat{\lambda}_i$ are the length of the sample and the value of i^{th} largest canonical correlation, respectively. If the calculated values of the trace and maximum eigen-value statistics are higher than the critical values for the selected significance level, then the null hypothesis of cointegration vector can be rejected.

IV.III. Granger Causality Test

If the variables of a data set are integrated of order one and also cointegrated, then a casual linkage must run among the variables in at least one direction. However, the cointegration test does not point out the direction of the linkage. Additionally, the presence of a casual linkage among the variables is independent of the existence of a cointegration vector. Therefore, adequate evidence for full clarification of the casual relationships cannot be obtained by only the cointegration test. In this study, Granger causality test is employed in order to assess the direction of the casual linkages, if exists, between the variables.

Granger causality has been frequently estimated via VAR models in the recent literature. However, specifications of the VAR model depend on the outcomes of the unit root and cointegration tests. When all of the variables in concern are stationary, a VAR model in levels should be used. As another case, a VAR model in the first differences should be used if the related variables are integrated of order one and also not cointegrated. Finally, when the variables are integrated of order one and

also cointegrated, an estimation of the vector error correction model in the first differences as given in Eq.5 should be conducted:

$$\begin{aligned}
\Delta LGDP_t &= \alpha_1 + \sum_{i=1}^{p} \chi_i \, \Delta LGDP_{t-i} + \sum_{i=1}^{p} \beta_i \, \Delta LGFCF_{t-i} + \\
&\quad \sum_{i=1}^{p} \vartheta_i \, \Delta LEXP_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta LFDI_{t-i} + \psi_1 \, ECT_{t-1} + \varepsilon_{1t} \\
\Delta LGFCF_t &= \alpha_2 + \sum_{i=1}^{p} \chi_i \, \Delta LGDP_{t-i} + \sum_{i=1}^{p} \beta_i \, \Delta LGFCF_{t-i} + \\
&\quad \sum_{i=1}^{p} \vartheta_i \, \Delta LEXP_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta LFDI_{t-i} + \psi_2 \, ECT_{t-1} + \varepsilon_{2t} \\
\Delta LEXP_t &= \alpha_3 + \sum_{i=1}^{p} \chi_i \, \Delta LGDP_{t-i} + \sum_{i=1}^{p} \beta_i \, \Delta LGFCF_{t-i} + \\
&\quad \sum_{i=1}^{p} \vartheta_i \, \Delta LEXP_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta LFDI_{t-i} + \psi_3 \, ECT_{t-1} + \varepsilon_{3t} \\
\Delta LFDI_t &= \alpha_4 + \sum_{i=1}^{p} \chi_i \, \Delta LGDP_{t-i} + \sum_{i=1}^{p} \beta_i \, \Delta LGFCF_{t-i} + \\
&\quad \sum_{i=1}^{p} \vartheta_i \, \Delta LEXP_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta LFDI_{t-i} + \psi_4 \, ECT_{t-1} + \varepsilon_{4t}
\end{aligned} \tag{5}$$

where Δ, L, p, ε_{1t} and ECT_{t-1} refer to the first difference operator, natural logarithm, optimal lag length, white noise process and one period lagged error correction term, respectively. The error correction term should be excluded if there is no cointegration among the variables.

IV.IV. Techniques For Innovation Accounting

Causality tests cannot capture all interactions between the variables of a multivariate VAR model. Interpreting the VAR model via impulse response function and variance decomposition techniques gives a complementary perspective for clarifying the dynamic relationships among the variables in concern. For this aim, the VAR model should be represented in the form of a vector moving average process. The casual ordering of the variables which can be determined with the help of the causality tests or macroeconomic assumptions is an important parameter for obtaining proper results when these two techniques are employed.

Impulse response functions of a VAR model give the opportunity to simulate the instantaneous and continuing response of an endogenous variable over the selected response horizon to a one time and one unit shock (innovation) of that variable and the rest of the endogenous variables in the model. In general, the shock that is introduced to the system is one standard deviation shock in

the error term of the variable. Typically, the impulse response functions considerably differ with the selected horizon length.

On the other hand, the proportion of the movement in a sequence due to its own shocks versus shocks to the other variables can be determined by the forecast error variance decomposition (Enders, 1995: 311). Forecast error is the difference between the actual value and the value estimated by the model. If the forecast error variance of a variable in a system cannot be explained at any of the forecast periods by the shocks of the rest of the variables, then that variable should be concluded as exogenous. Otherwise, that variable can be assumed as endogenous. Typically, variables can explain their forecast error variance with higher proportions in short horizons and with lower proportions in long horizons. Relative importance of the variables in a particular variable can be achieved by comparing their ability to explain the forecast error variance of that particular variable.

V. ESTIMATION AND RESULTS

Results of the unit root, cointegration and causality tests are included in this section. Impulse response functions and forecast error variance decomposition of the estimated VAR model are also presented.

V.I. Stationarity

Result of the ADF unit root test that was utilized to check for the stationarity of the variables is reported in Table-2. The lag length of ADF test was chosen automatically with a maximum lag length of 5 based on the SIC.

Table 2: Results of the ADF unit root test

	Only constant[1]		Constant and trend[2]	
Time series	*T*-Statistic	Probability[*]	*T*-Statistic	Probability[*]
LGDP	-0.82	0.7928	-2.53	0.3115
DLGDP	-5.48	0.0002	-5.34	0.0014
LGFCF	-0.87	0.7778	-2.35	0.3910
DLGFCF	-5.42	0.0002	-5.29	0.0015
LEXP	-0.01	0.9481	-2.17	0.4823
DLEXP	-4.36	0.0025	-4.24	0.0142
LFDI	-1.44	0.5428	-2.50	0.3229
DLFDI	-5.47	0.0002	-5.44	0.0011

[1] Critical values for the ADF test are -3.737, -2.991 and -2.635 for the significance levels of 1%, 5% and 10%, respectively.
[2] Critical values for the ADF test are -4.394, -3.612 and -3.243 for the significance levels of 1%, 5% and 10%, respectively.
[*]MacKinnon (1996) one-sided p-values.
L denotes that the variable is expressed in logs and D denotes the first difference.

Table-2 indicates that the null hypothesis of the unit root cannot be rejected for all of the variables in their levels at 1%, 5% and 10% level of significance in only constant and constant with trend conditions. However, when the first differenced variables are considered, the null hypothesis can be rejected under the same conditions.

Stationarity of the first differenced variables was also checked with autocorrelation and partial autocorrelation functions. When the correlogram and partial correlogram were considered, both correlation values were in the 95% confidence bounds, confirming that all of the variables are stationary in their first differences. Thus, it is concluded that all of the variables are integrated of order 1 or *I* (1).

V.II. Long-Run Relationships

Cointegration test with JJ procedure was carried out for uncovering the long-run relationships among the variables. Selection of the appropriate lag length is a preliminary procedure and Table-3 reports the FPE, AIC, HQ and SIC criteria for lag length selection. In accordance with Table-3, the optimal lag length has been identified as 1, whereas all of the criteria confirm the selection. Also, the roots of the inverse characteristic polynomial of the VAR model were inside the unit circle of the complex plain, indicating that the modulus of all of the inverse roots is smaller than unity, and the stability of the VAR model with 1 lag length is confirmed.

Table 3: Selection of the appropriate lag length

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-17.990	NA	8.69E-05	1.999	2.198	2.046
1	49.362	104.104*	8.41e-07*	-2.669*	-1.677*	-2.435*
2	58.934	11.312	1.79E-06	-2.085	-0.299	-1.664
3	80.055	17.280	1.86E-06	-2.550	0.028	-1.943

* Appropriate lag length for the particular criterion.

Table-4 provides an overview of the trace values and the maximum eigen-values of the cointegration matrix. Both the trace and eigen-value tests indicate that the null hypotheses (see column 1) can be clearly accepted at the 99% significance level because the calculated values are less than their critical values. Based on these results, no cointegration vector exists in the model, and the variables do not move together in the long run. Thus, one can assume that there is no long-run relationship among the variables in concern.

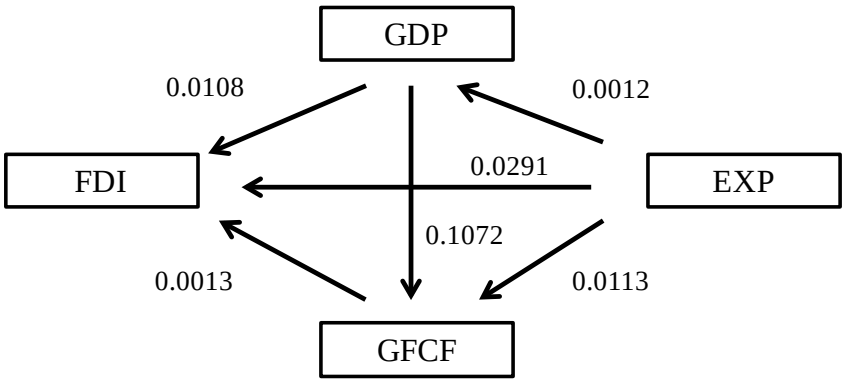
Table 4: Results of the cointegration test with JJ procedure

Trace test				Maximum eigen-value test			
H_0	H_1	Trace statistic	Critical value (%1)	H_0	H_1	Eigen-value statistic	Critical value (%1)
r=0	r >,=1	36.47	47.85	r=0	r=1	16.02	27.58
r <,=1	r >,=2	20.45	29.79	r <,=1	r=2	12.88	21.13
r <,=2	r >,=3	2.57	15.49	r <,=2	r=3	6.83	14.26
r <,=3	r >,=4	0.74	3.84	r <,=2	r=3	0.74	3.84

V.III. Causality

Causal linkages between the variables of the model estimated by Granger causality test via the VAR model considering the order of integration and optimum lag length are summarized in Figure-1. Statistically significant causalities are revealed among the variables at 10 percent significance level. Figure-1 illumines that all causal linkages are unidirectional and a significant causality from EXP to the rest of the variables exists. Additionally, GDP cause both GFCF and FDI. There is also a significant causal linkage from GFCF to FDI. Finally, results of the Granger causality test give no evidence of a causal linkage from FDI to the rest of the variables.

Figure 1: Casual linkages among the variables*

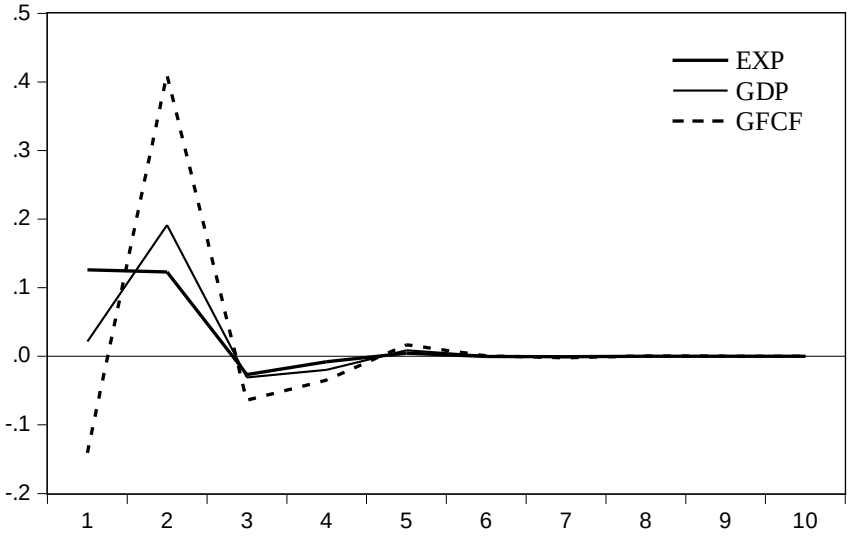


* Values represent the probability of the causal linkages. Causal linkage from GDP to GFCF is included despite to its probability value that is slightly over the 10% level.

V.IV. Innovation Accounting

The median impulse response of the FDI in the VAR model to a shock of one standard deviation in the error terms of the variables GDP, EXP and GFCF for a horizon of 10 periods are depicted in Graph-1.

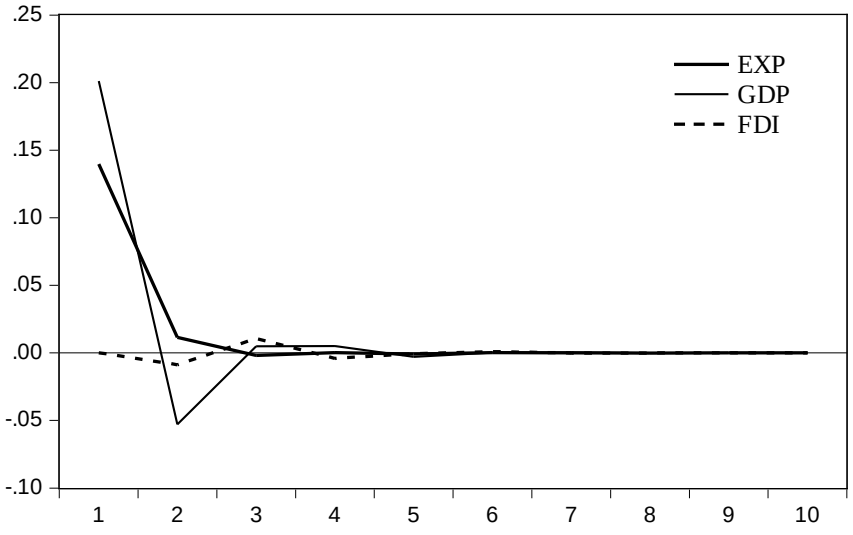
Graph 1: Response of FDI to Cholesky one standard deviation innovations



After an appreciation in the first two periods, FDI depreciates in the subsequent two periods in response to the shocks of the EXP and GDP, and then stabilizes after the fifth period. When the shock of the GFCF is considered, FDI depreciates in the first period and appreciates in the subsequent period. After depreciation in the third and fourth periods, FDI stabilizes after the sixth period.

The median impulse response of the GFCF in the VAR model to a shock of one standard deviation in the error terms of the variables GDP, EXP and FDI for a horizon of 10 periods are depicted in Graph-2. After an appreciation in the first two periods, GFCF stabilizes in response to the shock of the EXP after the third period. In the first four periods, GFCF appreciates in response to the shock of GDP except the second period and stabilizes after the fifth period. The shock of the FDI does not yield a significant response of GFCF along the horizon considered.

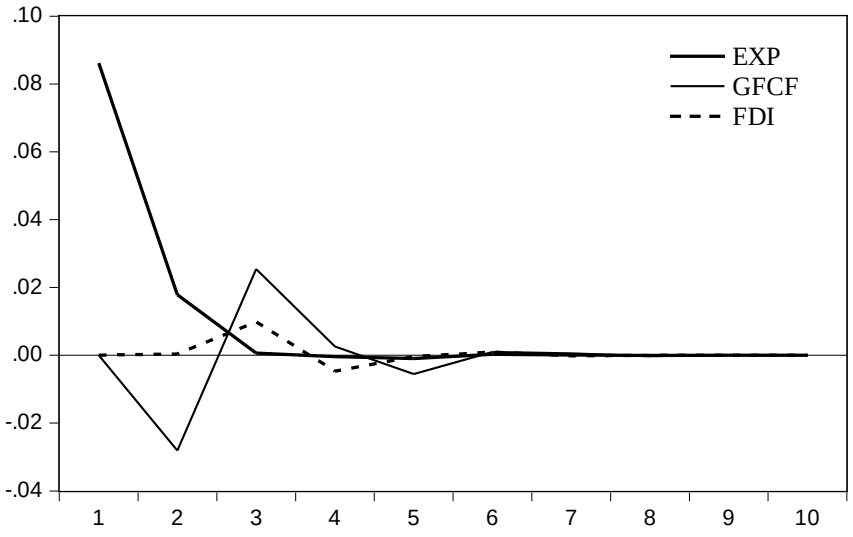
Graph 2: Response of GFCF to Cholesky one standard deviation innovations



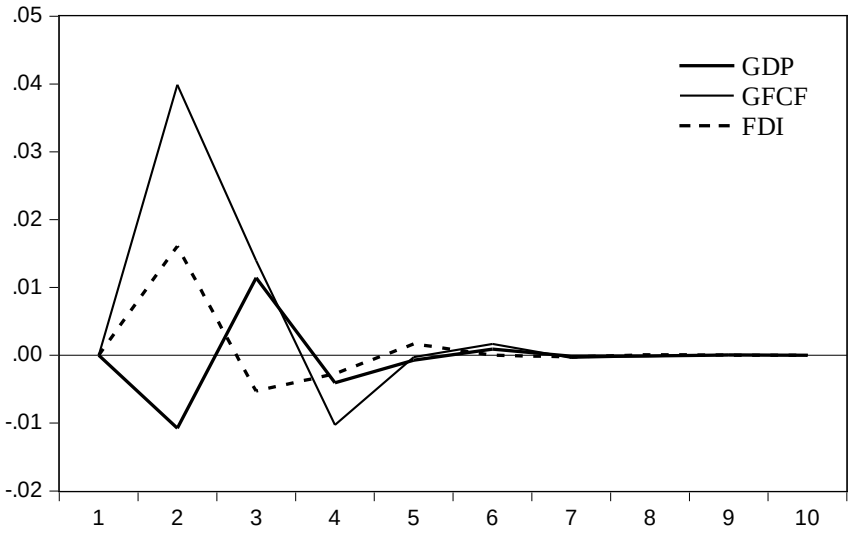
The median impulse response of the GDP in the VAR model to a shock of one standard deviation in the error terms of the variables EXP, GFCF and FDI for a horizon of 10 periods are depicted in Graph-3. After an appreciation in the first two periods, GDP stabilizes in response to the shock of the EXP after the third period. GDP does not response to the shocks of the GFCF and the FDI in the first period. However, response of the GDP to the both variable fluctuate in the subsequent five periods and finally stabilizes.

The median impulse response of the EXP in the VAR model to a shock of one standard deviation in the error terms of the variables GDP, GFCF and FDI for a horizon of 10 periods are depicted in Graph-4. In the first period, EXP does not response to the shocks of the variables. EXP appreciates in the second period in response to the shock of the GFCF and FDI, in contrast with GDP. In the subsequent four periods response of the GDP fluctuates in response of the shocks of the all variables and stabilizes after the seventh period.

Graph 3: Response of GDP to Cholesky one standard deviation innovations



Graph 4: Response of EXP to Cholesky one standard deviation innovations



Results of the variance decomposition as a complementary technique to the impulse response are tabulated in Table-5 over a 6 year of period. Variance decomposition reveals that the forecast error variance of the EXP is completely explained by itself in the first period. At the end of the sixth period, 12.4 percent of the forecast error variance of the EXP is explained by GFCF, while the contribution of the GDP and FDI is limited to 3.6 percent in total. The forecast error variance for the GDP is explained by its innovation and EXP in the first period with a distribution of 78.8 and 21.2 percents, respectively. At the end of the sixth period, 19.8 percent of the forecast error variance of the GDP is explained by EXP, while the contribution of the GFCF and FDI is limited to 4.1 percent in total. The forecast error variance for the GFCF is explained by its innovation, GDP and EXP in the first period with a distribution of 14.2, 57.9 and 27.9 percents, respectively. At the end of the sixth period, domination of the GDP continues with a contribution of 58.1 percent to the forecast error variance of the GFCF, while the contribution of the FDI is limited to 0.3 percent. The forecast error variance for the FDI explained by its innovation is 85.6 percent in the first period, while the GFCF shock explains nearly 40 percent of the variance of the FDI in the second period. The explanatory power of the variables GDP and EXP is limited under 14.4 percent in total at the end of the sixth period, while the forecast error variance for the FDI explained by the GFCF shock stays at nearly 40 percent at the same time.

Table-5: Variance decomposition of the variables

Forecast error variance decomposition of EXP				
Period	EXP	GDP	GFCF	FDI
1	100.000	0.000	0.000	0.000
2	86.710	0.782	10.757	1.749
3	84.687	1.628	11.792	1.890
4	83.973	1.722	12.380	1.923
5	83.954	1.725	12.378	1.941
6	83.935	1.730	12.393	1.940
Forecast error variance decomposition of GDP				
Period	EXP	GDP	GFCF	FDI
1	21.204	78.795	0.000	0.000
2	20.288	77.645	2.065	0.000
3	19.876	76.192	3.685	0.245
4	19.852	76.145	3.698	0.302
5	19.834	76.088	3.774	0.302
6	19.833	76.085	3.776	0.304
Forecast error variance decomposition of GFCF				
Period	EXP	GDP	GFCF	FDI
1	27.933	57.888	14.178	0.000
2	26.587	58.515	14.792	0.104
3	26.409	58.147	15.187	0.254
4	26.389	58.137	15.195	0.276
5	26.378	58.119	15.224	0.277
6	26.377	58.118	15.225	0.278
Forecast error variance decomposition of FDI				
Period	EXP	GDP	GFCF	FDI
1	6.294	0.184	7.876	85.643
2	6.562	7.849	39.903	45.685
3	6.590	7.901	40.025	45.482
4	6.578	7.952	40.126	45.342
5	6.577	7.961	40.150	45.310
6	6.577	7.961	40.150	45.311

VI. CONCLUSION

In this study, the impact of the technology spillovers as a potential driving force in economic growth of Turkey across the manufacturing industry was investigated between the years of 1988 and 2012. In accordance with this purpose a vector autoregression (VAR) model was adopted to explore both the long and short run relationships among the selected macroeconomic variables: FDI inflows

to manufacturing industry, gross domestic product, gross fixed capital formation and volume of manufactured exports.

As a preliminary procedure, stationarity of the variables was checked. Augmented Dickey Fuller test revealed that all of the variables in concern are not stationary at their levels, but stationary in their first differences implying that the variables of the study are integrated at first order. Where all variables are *I*(1), Johansen-Juselius cointegration analysis can be employed in order to investigate the existence of the long-term relationships among the variables. The findings of the cointegration analysis showed that there is no long-term relationship among the related variables. When the foreign direct investment in manufacturing industry is considered in particular, the absence of the long-term relationship can be linked with the lack of the ability of the domestic firms to use foreign direct investment as a potential source of productivity gain via technology spillovers where the level of human capital is of great importance.

It is evidently identified that short-term relationships among the variables can be established in many cases where there is no cointegration. Concerning this, Granger causality test was performed in order to assess the direction of the casual linkages if exists between the variables. Results of the causality test revealed that there is a significant unidirectional causality from the volume of manufactured exports to the rest of the variables, while there is no evidence of a causal linkage from FDI to the rest of the variables. This statement was also reinforced with innovation accounting techniques as a complementary perspective. Results of both impulse response and forecast error variance decomposition revealed that FDI positively influence growth indirectly through its significantly limited contribution on volume of the manufactured exports in Turkey for the years between 1988 and 2012.

These results are reasonable when the low level of FDI in Turkish manufacturing industry despite its remarkable potential is taken into account. Achieving a higher level of technology intensive FDI will lead Turkey to have a more sophisticated export basket that will make the country more globally competitive which yields a larger market share and consequently growth. A policy agenda which is focused on a better investment climate will help to increase the level of FDI. Additionally, the absorption capacity of the domestic manufacturing industry, as well as macroeconomic stability plays an important role for using the FDI as a driving force of the sustainable growth. Technology gap, research and development expenditures and human capital must be considered as the main indicators of absorption capacity while forming such a policy agenda.

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HOW DID TURKEY'S EU EXPORTS AFFECTED BY THE 2008 FINANCIAL CRISIS?

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Abstract:

In this study it is aimed to examine the effects of financial crisis on Turkey's exports to the EU at the time of financial crisis in 2008. For this purpose the financial crisis has been compared within the 5-year period before and after the crisis. The effects of the crisis on Turkey's trade volume is examined using econometric models. According to the results, before the financial crisis period (2003-2007) Turkey's exports increased in the motor vehicles sub-sectors; but sub sectors of meat and meat products, the textile and fertilizer wasn't provided a sufficient level of development. On the other hand, after the financial crisis period (2008-2013) sub-sectors of meat and meat products, the printing industry showed improvement; but motor vehicles, iron and steel financial crisis experienced decline.

In the analysis of the results, the period before the financial crisis experienced growth in both exports and imports of Turkey's foreign trade. The increase in the share of the EU's trade before the crisis made a positive effects on the relations between Turkey and the EU. The financial crisis affected Turkey' exports to the EU in a negative way as a result of weakened the EU and axial dislocation in the trade relations.

Keywords: Customs Union, the 2008 Financial Crisis, Export, Turkey, EU

Jel Code: C51, C22, F3, G01

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I. INTRODUCTION

In this study, the effects of the 2008 financial crisis on Turkey's trade with the EU were analyzed through models created by export figures between 2003 and 2013. The main purpose of the study is to determine the effects of the crisis on the export volume of Turkey to the EU.

In the first part of this study, previous studies about the effects of the Customs Union (CU) on Turkey were evaluated. In the second part, the commercial relations of the member countries of the Customs Union with Turkey are presented by taking into account the period between 2003 and 2013, namely the five years before and after the crisis. In the last section, the Augmented Dickey-Fuller (ADF) test results were generated by looking at autocorrelation to create time series and eliminate error terms. In the direction of this information, the positive and negative effects of the variables are taken into account for both the regression and in between themselves. The conclusion is based on the findings of the regression in relation to general trends in exports.

Data used in the study were formed by statistics from the Turkish Statistical Institute (TURKSTAT) and the Central Bank of the Republic of Turkey (CBRT). Monthly values were used when generating data sets. In this study, econometric analysis methods were used by using EViews 8.0 program. Structural tests were also applied to test the accuracy of the regression generated. In addition, CUSUM square test was applied to regression to see the effect of CU on net exports of Turkey after the crisis.

II. THE IMPACT OF THE CUSTOMS UNION ON TURKEY

Many studies have been carried out on the effects of the Customs Union on Turkey. Within these studies, Tonus (2007) stated that the Customs Union agreement between Turkey and the EU would facilitate trade and that Turkey's industrial products would directly affect productivity and production positively by creating competition in foreign countries. However, Morgül (2000) stated that the static and dynamic effects of the Customs Union will have adverse effects on the trade of Turkey. The static effects that are mentioned in that study are the effects of CU on the formation and diversion in Turkey while the dynamic effects are mentioned as effects such as increasing competition, technological development and capital mobility. In the study of 2012, Hatipler indicated Turkey's exports grew at an increasing rate of imports between 2000 and 2008, meaning that Turkey's exports to the EU increased faster than imports after the CU agreement. Accordingly, we can say that Turkey has increased its ability to compete against EU countries. By examining the sectoral dimensions of the Customs Union effects; Yenilmez ve Kılıç (2014) state that CU has an effect in the direction of increment of the drug industry export while Özer and Özçelik (2009) argue that

production will increase in agricultural products and textiles but that the increase in prices due to demand will cause a contraction, but that full integration will lead to an increase in welfare. Apart from this, the fact that Filiztekin (2003), in relation to the contraction, also mentioned a trade creative effect as well as trade deflector effect after the period of CU can explain both the cause of the increase and the reason of the contraction.

Some of the studies before and after CU are as follows; Harrison, Rutherford and Tarr (1993) examined Turkish foreign trade before the CU and examined the situation after the CU in the 1997 article. They stated that the effect of Turkish foreign trade would be insufficient to increase the welfare in the post-CU period. In addition, Mercenier and Yeldan (1997) concluded that CU is inadequate to increase the country's well-being. Besides, we can find the effects of CU on our foreign trade in the most descriptive manner in TÜSİAD 2014 Evaluation Report. According to this report; since Turkey is not compatible with the EU in some sectors, it is treated as a third world country, which partially obstructs the operation of CU. On the other hand, it has also been analyzed that the share of services with the EU in the last 15 years has increased steadily.

It has been seen that in the literature of economics, researchers have applied many tests by creating many models. Aydın, Çıplak and Yücel (2004) studied Turkey's export and import demand by establishing two separate models, long and short period between 1987-1.quartile-2003-fourth quarters. Another research was carried out by Khan (1974) model. In this model, export-import demand functions of 15 different countries are created and analyzed together with Turkey. However, although Khan estimates these functions by the OLS method concludes that the prices in developing countries are influential on exports and imports, and found that the Marshall-Lerner condition is met (Akgündüz, 2015). Finally, Bahmani-Oskooee (1986) created export and import models for 7 different countries. As a result, they stated that the terms of trade are more interacting than the prices in the market rather than the effect of exchange rate.

III. THE EFFECTS OF THE CUSTOMS UNION ON TURKEY'S FOREIGN TRADE BETWEEN 2003-2013

Import and export volume figures of the Customs Union in the period of 2003-2013 in Turkey are shown in Figure I below.

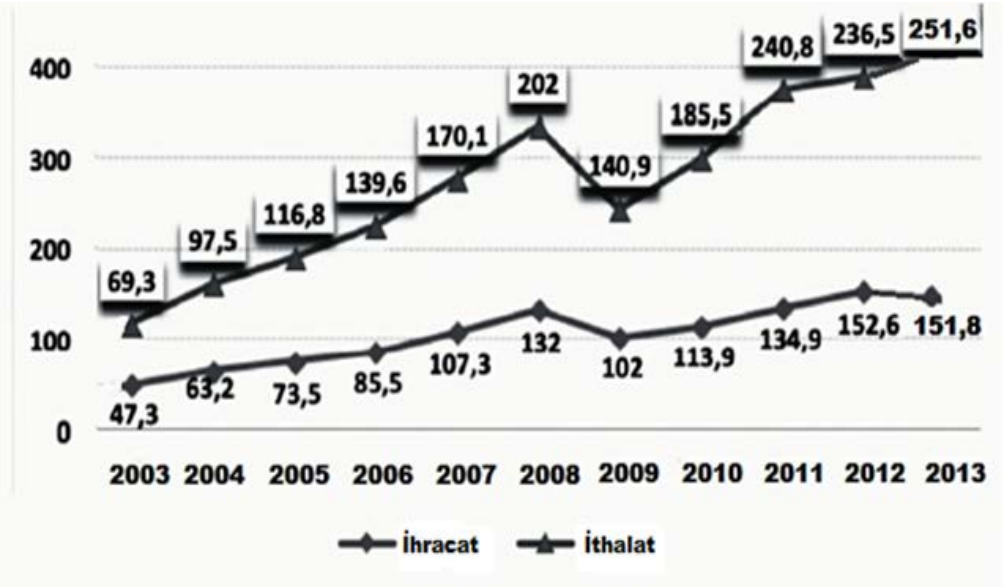

Figure I. Import and Export Volume of Turkey, (2003-2013)

As seen in figure I, the rate of increase in imports and exports of Turkey since 2003 continued until the end of 2008. However, as of the third and fourth quarters of 2008, foreign trade figures have fallen. The primary reason for this is the fact that the global crisis that financial institutions are facing has a negative impact on Turkey and that the domestic market is kept alive instead of imported products. In short, slowing economic activity has directly affected foreign trade. The exports and imports figures, which began to rise again by the 2009-2010 period, reached 403.4 billion dollars of foreign trade volume in 2013. However, this increase in the volume of foreign trade brought an increase in the foreign trade deficit with itself.

Table I. Foreign Trade- Proportion of Export/Import According to Years, (%, Annual)

YEARS	Export/Import (%)
2003	68,1
2004	64,8
2005	62,9
2006	61,3
2007	63,1
2008	65,4
2009	72,5
2010	61,4
2011	56
2012	64,5
2013	60,3

Import coverage rate of exports; is the ratio of the total financial value of the products that a country sells abroad to the total financial value of the products that it receives from abroad. When this rate shrinks, it has a direct impact on the prosperity of a country. In addition, this rate shows us how much of the foreign currency required for imports is covered by the foreign exchange obtained in the export, and how much should be paid in other ways (Eğilmez, 2014). Table I shows the export and import coverage rates of Turkey between 2003 and 2013. According to Table I, the coverage rate, which was 68.1% in 2003, has been steadily decreasing until 2007 with the enactment of regulations and audits following the 2001 crisis and reached 61.3% at the end of 2006. However, balances were broken with the eruption of the 2008 global crisis between 2007 and 2009, and the crisis affected foreign exchange on behalf of Turkey, which resulted in an increase in export imports. In 2009, the rate rose to 72.5%, reaching its lowest level in 2011 at 56% and at the end of 2013 it was 60.3%.

III.I. The Effects of the Customs Union Before the 2008 Crisis on Foreign Trade in Turkey

The Customs Union has been extremely positive from 2001-2002, when Turkey entered a period of restructuring, to the 2008 global crisis. Commercial agreements with EU countries, tax and legal regulations imposed by Turkey have a large share in foreign trade development.

Table II. Turkey's Foreign Trade and the Share of the EU, (2003-2007)

YEAR	Turkey's Foreign Trade (Thousand Dollars)			EU(28) Foreign Trade (Thousand Dollars)			
	Export	***Import***	***TOTAL***	***Export***	***Import***	***TOTAL***	**Share (%)**
2003	47.252.836	69.339.692	**116.592.528**	27.479.360	35.156.836	**62.636.195**	0,53
2004	63.167.153	97.539.766	**160.706.919**	36.698.919	48.130.900	**84.829.819**	0,52
2005	73.476.408	116.774.151	**190.250.559**	41.532.953	52.781.362	**94.314.315**	0,49
2006	85.534.676	139.576.174	**225 110 850**	48 148 628	59.447.587	**107.596.215**	0,47
2007	107.271.750	170.062.715	**277 334 464**	60 754 022	68.472.309	**129.226.331**	0,46

Table II shows Turkey's import and export trade with EU countries between 2003 and 2007. We can also see from the table that the EU is the most important foreign trade partner after the participation of Turkey to the CU. Having an average 50% share in our foreign trade between 2003-2007, we see that the EU gives the biggest support to trade in the 2008 global crisis (Table IV). In 2003, Turkey's foreign trade was $ 116 billion, but in 2007 it doubled from 2003 to 277 billion dollars. It is a fact that a strong economy like EU has a 50% share in foreign trade of Turkey means that it will be beneficial for the development of the country and we have seen that, in the 2008 crisis, we will be economically affected in a more profound way in case of an economic crisis in EU.

Table III. Turkey's Sectoral Dimension Foreign Trade Development, (2003-2007)

YILLAR / FASILLAR	2003		2004		2005		2006		2007	
	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT
Mineral yakıtlar, mineral yağlar	11 575 069	980 133	14 407 288	1 429 186	21 255 586	2 641 145	28 859 098	3 567 425	33 883 135	5 147 932
Plastikler ve mamülleri	3 235 625	926 036	4 763 094	1 323 732	5 795 589	1 722 148	6 918 411	2 214 266	8 688 044	2 822 051
Demir ve çelik	4 747 844	2 969 012	8 031 522	5 359 512	9 457 831	4 973 475	11 525 251	6 273 353	16 182 379	8 372 266
Kazanlar, makinalar, mekanik cihazlar, aksam ve parçaları	10 293 923	2 992 983	13 456 962	4 125 934	16 400 315	5 246 419	18 998 763	6 516 726	22 570 359	8 781 251
Pamuk	1 641 454	997 278	1 982 197	1 219 991	2 079 291	1 179 569	2 090 189	1 338 306	2 829 539	1 611 317
Motorlu kara taşıtları, aksam, parça, aksesuarı	5 383 395	5 272 017	10 237 024	8 288 799	10 552 792	9 566 435	11 408 441	11 886 092	12 397 295	15 903 675
Eczacılık ürünleri	2 019 378	179 444	2 710 136	248 216	2 849 272	282 796	3 035 614	312 613	3 523 655	357 776
Etler ve yenilen sakatat	181	18 720	277	22 487	277	36 217	86	29 468	97	46 518
Ayakkabılar,getrler,tozluklar vb eşya ve aksamı	191 058	183 788	303 284	204 917	412 786	215 793	514 970	237 069	569 929	316 740
Meşrubat,alkollü içkiler ve sirke	18 716	70 429	48 982	113 696	52 122	148 627	74 179	147 177	92 569	174 557
Gübreler	394 233	20 371	640 339	39 178	755 397	37 755	784 415	37 558	997 460	84 346
Basili kitap,gazete,resim vb baski sanayi mamulu,el yazmalari	92 871	30 945	119 050	37 212	137 963	49 499	131 590	53 956	153 560	74 789

The Customs Union has had a positive impact on the growth of some sectors by ensuring the development of Turkey's import and export capacity. Table III shows that the customs union's fastest development in total exports of Turkey is in the sub sectors of 'motor vehicles, parts, accessories'. Apart from this, the increase in boilers, machinery, mechanical parts, plastics and products, iron and steel sub-sectors is striking. But meat and meat products, fertilizers, textile sub-sectors did not develop as much as export competence. When we look at import in more detail; it is seen that the sectors which do not show increase in exports show an increase of imported products. These developments coincide with the predictions that Turkey is one of the important production centers in the automotive, white goods, machinery and electronics sectors in middle and high technology level in the Ninth Five-Year Development Plan (DPT, 2006).

III.II. Effects of the Customs Union after the 2008 Crisis on Foreign Trade in Turkey

The relationship of Turkey's import and export volume with the EU countries between 2008 and 2013 is shown in Table IV.

Table IV. Turkey's Foreign Trade and EU's Share, (2008-2013)

YEAR	Turkey's Foreign Trade (Thousand Dollars)			EU(28) Foreign Trade (Thousand Dollars)			
	Export	***Import***	**TOTAL**	***Export***	***Import***	**TOTAL**	***Export***
2008	132.027.196	201.963.574	**333.990.770**	63.719.097	74.513.444	**138.232.541**	0,41
2009	102.142.613	140.928.421	**243.071.034**	47.228.119	56.616.302	**103.844.421**	0,42
2010	113.883.219	185.544.332	**299.427.551**	52.934.452	72.391.053	**125.325.505**	0,41
2011	134.906.869	240.841.676	**375.748.545**	62.589.257	91.439.406	**154.028.664**	0,40
2012	152.461.737	236.545.141	**389.006.877**	59.398.377	87.657.462	**147.055.839**	0,37
2013	151.802.637	251.661.250	**403.463.887**	63.039.810	92.457.992	**155.497.803**	0,38

Table IV shows the share of EU in import and export volume of Turkey between 2008-2013. According to this, total foreign trade in Turkey increased in 2008 compared to 2007, but the share of the EU decreased by 41% compared to the previous year. The reason for this is that with the beginning of the global crisis, Europe's trade has weakened and the purchasing power has fallen. In 2009, Turkey was affected by the crisis and lost about one third of its foreign trade. However, the share of the EU remained at the same level despite the contraction in volume. We see that with the declining EU share between 2010 and 2013, Turkey is heading to different regions and trade areas because Europe is losing its power. The EU share, which was 41% in 2010, has reached 38% by the end of 2013. From 2003 to 2013, it is observed that the share of EU-originated foreign trade volume has gradually decreased in recent years.

Table V. Turkey's Sectoral Dimension Foreign Trade Development, (2008-2013)

YILLAR / FASILLAR	2008		2009		2010		2011		2012		2013	
	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT	İTHALAT	İHRACAT
Mineral yakıtlar, mineral yağlar	48 281 193	7 531 776	29 905 305	3 921 300	38 497 229	4 469 479	54 117 539	6 539 030	60 117 407	7 708 169	55 917 155	6 724 654
Plastikler ve mamülleri	9 385 517	3 563 148	6 944 490	3 093 759	9 730 432	3 716 596	12 578 501	4 580 258	12 505 398	5 012 899	13 881 017	5 608 724
Demir ve çelik	23 160 241	14 946 358	11 351 640	7 641 010	16 120 796	8 740 067	20 424 235	11 225 329	19 642 041	11 332 482	18 690 888	9 918 794
Kazanlar, makinalar, mekanik cihazlar, aksam ve parçaları	22 539 348	10 258 590	17 131 962	8 132 787	21 266 830	9 413 411	27 110 683	11 560 990	26 315 986	11 999 300	30 156 654	12 989 247
Pamuk	2 331 906	1 633 650	2 098 707	1 278 472	3 385 753	1 449 154	3 608 860	1 922 073	2 377 563	1 785 532	2 989 181	1 928 176
Motorlu kara taşıtları, aksam, parça, aksesuarı	12 789 717	18 326 711	8 975 864	12 251 734	13 419 356	13 812 677	17 184 080	15 803 438	14 514 293	15 148 114	16 808 266	17 000 250
Eczacılık ürünleri	4 360 581	421 134	4 080 491	429 061	4 410 051	558 172	4 697 445	566 797	3 995 652	661 783	4 151 045	754 085
Etler ve yenilen sakatat	906	89 124	1 600	154 896	250 174	208 012	513 600	390 255	97 179	532 489	25 275	614 698
Ayakkabılar,getrler,tozluklar vb eşya ve aksamı	672 917	344 890	539 468	289 473	659 674	395 624	871 464	441 247	863 682	545 923	992 947	723 219
Meşrubat,alkollü içkiler ve sirke	111 785	194 316	128 229	180 748	138 969	229 518	212 984	258 721	213 852	285 734	265 435	295 391
Gübreler	1 481 756	217 321	1 057 507	83 679	1 016 777	205 484	1 374 434	200 598	1 382 438	147 397	1 492 105	98 501
Basili kitap,gazete,resim vb baski sanayi mamulu,el yazmaları	169 591	82 212	127 847	84 745	138 097	84 248	170 942	89 759	166 170	88 778	176 832	94 698

If we look at the attitudes of the sectors in terms of exports after the global crisis; The sectors most affected by the 2008 global crisis are mineral fuels, mineral oils, iron and steel, motor vehicles, components and parts sub-sectors. On the other hand, the sectors which are not affected by the crisis but in contrast the ones increased are; pharmaceutical products, meat and meat products, printed books, newspapers and printing industry products. When we look at sectoral values for imports, the global crisis has seen a decline in the sub-sectors of mineral fuels, mineral oils, iron and steel, boilers, machinery, mechanical appliances and motor vehicles. However, the increase continued over the following years and resulted over the exports.

In general, if we make the assessment of the Customs Union over Turkey between 2003 and 2013, Turkey has seen an average of 50% of its imports and exports in the EU countries between 2003 and 2008, with the effect of this crisis, which was experienced in Europe with the 2008 crisis, the decline in terms of foreign trade. As a result, the positive effects created by the Customs Union have decreased. The inability of Turkey to sell the goods which it has produced to Europe caused new trade gates to open, which in turn transformed it into trading with African countries under the Arab Spring name between 2008-2011. During this period, the import deficit declined and the current account deficit was reduced, but with the recovery of the EU over time, the import volume increased and the current account deficit continued to increase. In short, we can say that the customs union has

achieved a steady increase in Turkey's trade with the EU countries at the same rates until the crisis period. Even though this situation did not seem to lead to a loss in the commercial market of Turkey at that time, negative effects after the global crisis took place in the Turkish economy.

IV. AN EMPIRICAL STUDY ON THE EFFECTS OF THE CUSTOMS UNION ON EXPORT VOLUME OF TURKEY BEFORE AND AFTER THE 2008 CRISIS (2003-2013)

In this section, the research model will be developed first. Then, in the process of estimating the model, the method, the universe and the sampling, the collection of the data, the analysis and interpretation of the data will be given respectively. In the research model, a regression will be created that primarily includes macroeconomic variables that are effective in Turkey's exports. While the dependent variable of this regression is exports, the independent variables are imports, inflation, exchange rate, policy rate and Foreign Capital. In the created model, stationarity and unit root tests, cointegration and autocorrelation corrections are done in time series. The study includes analyzing Turkey's trade performance between the EU Customs Union in 1996 and the trade process between 2003 and 2013 and the effects of variables affecting foreign trade on Turkey's exports. The variables determining the exports, namely Imports, Inflation, Exchange Rate, Policy Rate and Foreign Equity variables are added to the model. Data used in the study are monthly time series covering the period 2003-2013. The data used are obtained from the web sites of the CBRT, the Turkish Statistical Institute (TURKSTAT) and the Ministry of Treasury's electronic data distribution system. Exports are expressed as variables of import (million $), foreign capital variables (billion dollars), exchange rate change, policy interest rate and inflation (wholesale price index).

IV.I. Analysis of Data and Regression Tests

In this section, unit root tests analysis, general model expansion, cointegration and autocorrelation applications will be discussed by regression.

IV.I.I. Analysis of Unit Root Tests

Before estimating the variables, the figures should be plotted and then the stagnation of the variables will be examined using the Augmented Dickey-Fuller (ADF) test. Within the model; EXPORT: Exports, IMPORT: Import, POLITIKAFAIZ: Policy Interest Rate, DOVIZKURU: Exchange Rate, FDI: Foreign Capital, TEFE: Inflation. However, the logarithmic results are obtained by taking the first differences for each variable to be sufficient for describing the model.

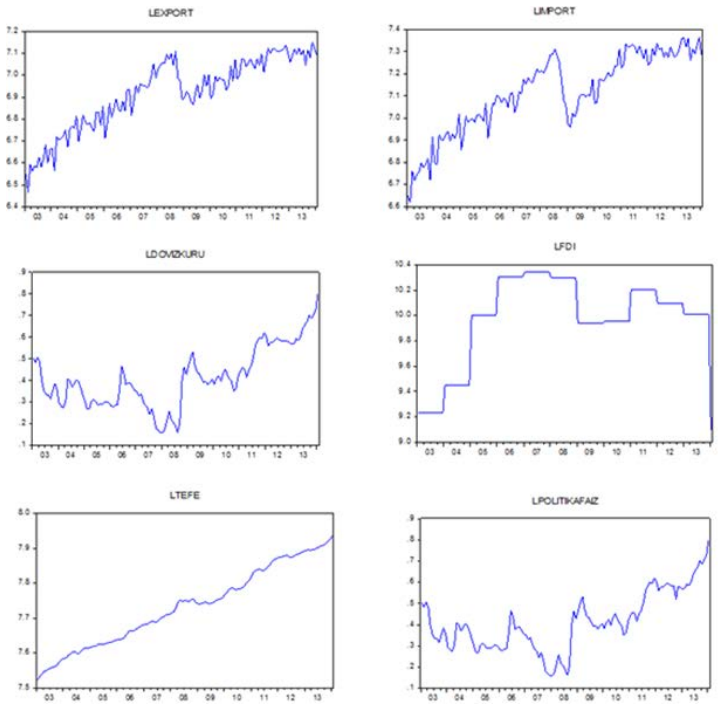

Figure II. Time Series Figures of Variables

When we examine the figures; we see that the LTEFE, LIMPORT and LEXPORT charts have a positive trend. In addition, LIMPORT and LEXPORT variables declined in early 2008 and began to increase towards the end of 2008. However, LDOVIZKURU and LPOLITIKAFAIZ variables have a positive trend even though they have cyclical fluctuations between 2003 and 2013. However, it is not possible to say the same for LFDI because the positive trend in 2003-2007 declined in the following years and showed a negative trend from the middle of 2010 to the end of 2013. According to these figures, we can say that there is no stagnation in this time series.

After interpreting the time series figures of the variables, the ADF tests; Export, import, foreign capital, exchange rate, policy interest rate and inflation were conducted to determine whether these variables are stationary.

Table VI. ADF Unit Root Test Results (Level)[†]

	ADF TEST					
Variable	*Coefficient*	*Std. Error*	*ADF t-stat*	*Probability*	*R-squared*	*Durbin-Watson stat*
LEXPORT	-0.069751	0.02839	-2.45692	0.0153	0.044374	2.874977
LIMPORT	-0.066356	0.025339	-2.61871	0.0099	0.050108	2.685993
LPOLITIKAFAIZI	-0.005878	0.023589	-0.24916	0.8036	0.000477	1.428032
LDOVIZKURU	-0.004222	0.022945	-0.184	0.8543	0.00026	1.348044
LFDI	-0.042313	0.027376	-1.54565	0.1246	0.018045	1.431452
LTEFE	-0.001231	0.003098	-0.39737	0.6918	0.001213	1.157479

According to the ADF t-stat values, only LIMPORT is stationary at the level and other variables are not stationary. However, the ADF test is not taken at this stage since we can see the 1.difference values in autocorrelation.

IV.I.II. General Model

In the study, it is aimed to see how the effects of macro variables such as imports, foreign capital, exchange rates, interest rates and inflation on exports. According to this; in the research model; Exports are dependent variable and import, foreign capital, exchange rate, policy interest rate and inflation are independent variables. Equation of model:

$$Y = \alpha + \beta 1\ limport + \beta 2\ ldovizkuru + \beta 3\ ltefe + \beta 4\ lfdi + \beta 5\ lpolitikafaiz + ut$$

LEXPORT = f (LIMPORT, LDOVISURE, LTTE, LFDI, LPOLITHICAFAIS)

LEXPORT from the variables in the model, the meaning of the terms are: LIMPORT: Import (Million $), LFDI: Foreign Capital (Million $), LDOVIZKURU: Exchange Rate, LPOLITIKAFAIZ: Interest Rate (%), LTEFE: Inflation (wholesale price index, %) : ut: the error term and L: logarithm.

[†] ADF test critical values; 1% level; -3.480425, at the 5% level; -2.883408 and at the level of 10%; - 2.578510.

IV.I.III. Cointegration Analysis

The cointegration analysis is the analysis of parameters to determine whether the parameters which are static at the level but can be stable in the long run. Then, the stability of the unit root test error term is examined. According to this, it can be decided whether long-term equilibrium is established or not.

H_0: No cointegration for all units.

H_1: Some units have cointegration.

Analysis of the cointegration of variables according to the formation of hypotheses has been carried out. A new long-run equilibrium model was established within the statistical results of the model in Table VII.

Table VII. Long Term Balance Model

Dependent Variable: LEXPORT Method: Least Squares Sample: 2003M01 2014M01 Included observations: 133				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMPORT	0.560368	0.058376	9.599341	0
LFDI	0.024237	0.013384	1.810972	0.0725
LTEFE	0.595012	0.108202	5.499062	0
LDOVIZKURU	0.503298	0.513	0.981087	0.3284
LPOLITIKAFAIZ	-0.627149	0.511045	-1.22719	0.222
C	-1.860837	0.474276	-3.92353	0.0001
R-squared	0.961514	Mean dependent var		6.918121
Adjusted R-squared	0.959999	S.D. dependent var		0.165369
S.E. of regression	0.033074	Akaike info criterion		-3.936047
Sum squared resid	0.138928	Schwarz criterion		-3.805655
Log likelihood	267.7471	Hannan-Quinn criter.		-3.883061
F-statistic	634.5775	Durbin-Watson stat		1.427619
Prob(F-statistic)	0			

When we look at the model results, it is seen that variables are generally meaningful by looking at the t-statistic values. However, since the variables LDOVIZKURU and LPOLITIKAFAIZ are statistically insignificant, the long-term model is estimated again by subtracting these two variables from the model.

Table VIII. New Long-Term Balance Model

Dependent Variable: LEXPORT Method: Least Squares Sample: 2003M01 2014M01 Included observations: 133				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIMPORT	0.64267	0.051352	12.51503	0
LFDI	0.036775	0.013067	2.814361	0.0057
LTEFE	0.360236	0.068389	5.267451	0
C	-0.806576	0.284832	-2.83176	0.0054
R-squared	0.958562	Mean dependent var		6.918121
Adjusted R-squared	0.957598	S.D. dependent var		0.165369
S.E. of regression	0.034052	Akaike info criterion		-3.892215
Sum squared resid	0.149585	Schwarz criterion		-3.805287
Log likelihood	262.8323	Hannan-Quinn criter.		-3.856891
F-statistic	994.6866	Durbin-Watson stat		1.235161
Prob(F-statistic)	0			

The reproduced long term model was found to be statistically significant and the unit root test (ADF) was applied to the error term (ut) of the long run parameters obtained.

Table IX. Error Term in Long Term Model ADF Test Result

Critical Values of the Test

	Test Kritik Değerleri		
ADF Test Stat.	1%	5%	10%
3.155634	-2.6522	-1.954	-1.6223

As can be seen from Table IX, there is no unit root in the model according to ADF test result. If the error in the long-run model does not include the unit root, it indicates that this series is co-integrated.

IV.I.IV. Autocorrelation Analysis

If the stationarity of the variables is tested with the ADF and if we have to interpret by the SIC, the presence of autocorrelation is determined in Table VI and re-evaluation is required by entering the necessary delay values on it. In addition, in the reconstructed long-run model, the Durbin-Watson value of 1.2351 in Table VIII indicates that autocorrelation is present. Accordingly, we need to perform autocorrelation analysis for the new long-term model. Because, in order to be able to see the accuracy of the regression, it should be applied by correcting autocorrelation. On the other hand, what delays are included in Annex 1 have also been analyzed.

Table X. Removal of autocorrelation in the new long term model

Dependent Variable: LEXPORT				
Method: Least Squares				
Sample (adjusted): 2003M09 2014M01				
Included observations: 125 after adjustments				
Convergence achieved after 16 iterations				
MA Backcast: 2003M01 2003M08				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.305112	0.42581	-0.71655	0.4751
LIMPORT	0.762841	0.054043	14.11557	0
LFDI	-0.002363	0.01658	-0.14255	0.8869
LTEFE	0.235463	0.08284	2.842375	0.0053
AR(1)	0.374392	0.085122	4.398307	0
AR(8)	-0.217349	0.111637	-1.94693	0.0539
MA(8)	0.70208	0.086794	8.089024	0
R-squared	0.960052	Mean dependent var		6.940514
Adjusted R-squared	0.958021	S.D. dependent var		0.143464
S.E. of regression	0.029394	Akaike info criterion		-4.161679
Sum squared resid	0.101953	Schwarz criterion		-4.003293
Log likelihood	267.1049	Hannan-Quinn criter.		-4.097335
F-statistic	472.6429	Durbin-Watson stat		2.03257
Prob(F-statistic)	0			
Inverted AR Roots	.82+.31i	.82-.31i	.36-.75i	.36+.75i
	-.27-.76i	-.27+.76i	-.72+.31i	-.72-.31i
Inverted MA Roots	.88+.37i	.88-.37i	.37-.88i	.37+.88i
	-.37+.88i	-.37-.88i	-.88-.37i	-.88+.37i

The autocorrelation in the regressions can be seen depending on whether Durbin-Watson value is close to "2" or not. According to the obtained results, if we compare the values of the new long model before autocorrelation with those after autocorrection; The Durbin-Watson value was increased from 1.2351 to 2.0325, and the autocorrelation was removed from this value by decreasing the Durbin-Watson value to 2.0325, even though R-squared was high in both models, as the significance of the model was interpreted to be zero (F-statistic). Correlogram lengths are specified in Annex-2.

IV.I.V. CUSUM Square Test

At the end of the econometric analysis, the CUSUM square test, which is the cumulative sum of the squares of the error terms, was applied to test the instability of the variables in the model. The CUSUM square test is more sensitive than other structural fracture tests and is based on the calculation of consecutive residues. The confidence limits are determined by drawing a figure of the model errors in a confidence interval specified by this test. If it is outside the limits of confidence, it is decided that there is a structural change, and if it does not, it is decided that there is no structural change. CUSUM square test can also be used to determine the period of structural break. It is possible to see the effects of the 2008 global crisis according to the result of the model.

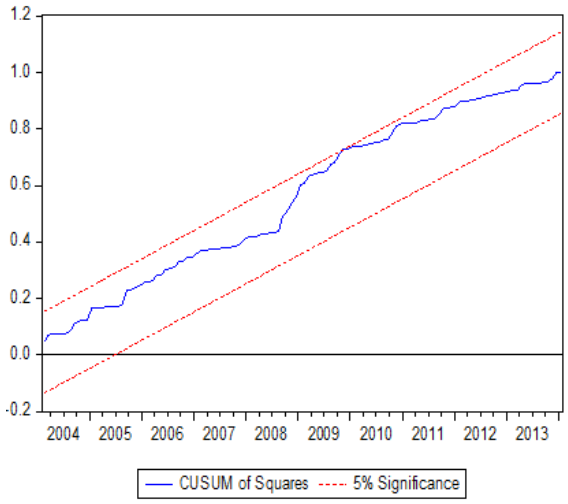

Figure III. CUSUM Square Structural Fracture Test (2003: 1-2014: 1)

According to figure 3; there is no deviation from the specified confidence interval. It is only possible to say that these variables are not unstable because they do not exceed the confidence interval of 5%, even though they are close to the confidence intervals in June-July 2009. According to the model results obtained after eliminating autocorrelation; a 1% increase in exports could lead to an increase of 0.7628% in imports, a decrease in foreign capital inflows of 0.0023% and an increase in inflation of 0.2354%. The result of the CUSUM square test is an indication that the variables move together. Again, after autocorrelation, the value of R2 = 0.96 reveals the export explanation power of the model independent variables. As an example of independent variables explaining exports, 1 unit increase in imports can make 1 unit effect on exports; 1 unit increase in foreign capital has resulted in 1 unit decrease in exports.

V. CONCLUSIONS AND RECOMMENDATIONS

We will arrive at an econometric analysis of the effects of Turkey's macro exports on exports; the development of Turkey's exports is primarily dependent to the participation of the EU Customs Union, the increase in imports, the closure of the current account deficit resulting from the importation of foreign capital, and the exchange rate relationship with inflation.

As seen after the 2008 financial crisis, the effects of the Customs Union diminished, exports declined and imports decreased. The Customs Union seems to encourage direct exports as well as encourage exports. We can say that the positive and negative effects of the EU Customs Union will have an impact as structural breaks in the period take place. In the analysis, it is observed that the increase in foreign trade in the period between 2003 and 2007 has increased both in export and import, and that the share of trade within the EU has increased with time by increasing the need for the

Customs Union. In the context of the global crisis between 2008 and 2013, the EU has lost power and the foreign trade has shifted to different countries, by this way the ineffectiveness of the EU Customs Union has also emerged.

In the econometric analysis carried out in the study, it was concluded that exports were directly affected by other variables. As a result, if Turkey could increase its export capacity in its own economy and develop its foreign trade by selling technology-intensive products in developed markets, the sensitivity of Turkey to the EU Customs Union will be further reduced. In this sense, it can be predicted that Turkey can have a real growth both in terms of economic and financial and social welfare, and that its external commitment can be reduced to a certain extent, thereby lowering its current deficit.

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APPENDICES

Table A.I Autocorrelation in the New Long-Term Model

Sample: 2003M01 2014M01

Included observations: 125

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|* |	.|* |	1	0.136	0.136	2.3607	0.124
.|. |	.|. |	2	0.026	0.008	2.4499	0.294
.|. |	.|. |	3	0.042	0.038	2.6819	0.443
.|. |	.|. |	4	-0.005	-0.017	2.6856	0.612
.|. |	.|. |	5	0.045	0.048	2.9514	0.707
*|. |	*|. |	6	-0.102	-0.118	4.3433	0.630
*|. |	*|. |	7	-0.127	-0.100	6.5031	0.482
.|. |	.|* |	8	0.045	0.077	6.7732	0.561
.|. |	.|. |	9	-0.058	-0.064	7.2375	0.612
.|. |	.|. |	10	0.032	0.054	7.3830	0.689
.|. |	.|. |	11	-0.014	-0.022	7.4100	0.765
.|. |	.|. |	12	-0.040	-0.031	7.6393	0.813
.|. |	.|. |	13	0.003	-0.023	7.6405	0.866
.|. |	.|. |	14	-0.038	-0.029	7.8464	0.897
.|. |	.|. |	15	0.025	0.038	7.9355	0.926
*|. |	*|. |	16	-0.146	-0.173	11.044	0.807
*|. |	.|. |	17	-0.113	-0.051	12.926	0.741

.|. |	.|. |	18	0.054	0.064	13.355	0.770
.|* |	.|* |	19	0.096	0.103	14.735	0.739
.|. |	.|. |	20	-0.009	-0.049	14.746	0.791
.|. |	.|* |	21	0.060	0.076	15.293	0.808
.|. |	.|. |	22	0.025	-0.004	15.392	0.845
.|* |	.|. |	23	0.085	0.014	16.513	0.832
.|. |	.|. |	24	-0.033	-0.051	16.680	0.862

Table A.II. Corrected Autocorrelation in the New Long-Term Model

Sample: 2003M01 2014M01

Included observations: 125

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|* |	.|* |	1	0.136	0.136	2.3607	0.124
.|. |	.|. |	2	0.026	0.008	2.4499	0.294
.|. |	.|. |	3	0.042	0.038	2.6819	0.443
.|. |	.|. |	4	-0.005	-0.017	2.6856	0.612
.|. |	.|. |	5	0.045	0.048	2.9514	0.707
*|. |	*|. |	6	-0.102	-0.118	4.3433	0.630
*|. |	*|. |	7	-0.127	-0.100	6.5031	0.482
.|. |	.|* |	8	0.045	0.077	6.7732	0.561
.|. |	.|. |	9	-0.058	-0.064	7.2375	0.612
.|. |	.|. |	10	0.032	0.054	7.3830	0.689

.|.	|	.|.	|	11	-0.014 -0.022	7.4100 0.765
.|.	|	.|.	|	12	-0.040 -0.031	7.6393 0.813
.|.	|	.|.	|	13	0.003 -0.023	7.6405 0.866
.|.	|	.|.	|	14	-0.038 -0.029	7.8464 0.897
.|.	|	.|.	|	15	0.025 0.038	7.9355 0.926
*|.	|	*|.	|	16	-0.146 -0.173	11.044 0.807
*|.	|	.|.	|	17	-0.113 -0.051	12.926 0.741
.|.	|	.|.	|	18	0.054 0.064	13.355 0.770
.|*	|	.|*	|	19	0.096 0.103	14.735 0.739
.|.	|	.|.	|	20	-0.009 -0.049	14.746 0.791
.|.	|	.|*	|	21	0.060 0.076	15.293 0.808
.|.	|	.|.	|	22	0.025 -0.004	15.392 0.845
.|*	|	.|.	|	23	0.085 0.014	16.513 0.832
.|.	|	.|.	|	24	-0.033 -0.051	16.680 0.862

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FARKLI GELİR GRUPLARINDAKİ ÜLKELERDE FİNANSAL GELİŞME VE EKONOMİK BÜYÜME İLİŞKİSİNİN ANALİZİ

Dilek ŞAHİN*

Özet

Finansal gelişme, finansal araçların daha yaygın kullanılır hale gelmesi olarak tanımlanmaktadır. 1980'li yıllardan itibaren, finansal gelişmenin ekonomik büyümedeki rolü literatürde önemli araştırma konusu haline gelmiştir. Bu çalışmanın amacı finansal gelişme ve ekonomik büyüme arasındaki ilişkiyi analiz etmektir. Bu kapsamda yüksek gelirli ve üst-orta gelirli ülkeler ele alınmış ve 2005-2015 dönemleri arası panel veri analiz yöntemi kullanılarak analiz edilmiştir.

Anahtar Kelimeler: Finansal Gelişme, Ekonomik Büyüme, Farklı Gelir Grupları, Panel Veri Analizi.

Jel Kodları: F00, F21, O1.

ANALYSIS OF THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN COUNTRIES OF DIFFERENT INCOME GROUPS

Abstract

Financial development is defined as the use of financial instruments more widely. The role of financial development in ensuring economic growth has become an important research topic in the literature since the 1980s. The purpose of this study is to analyze the relationship between financial development and economic growth. In this context, hig-income and upper-middle income countries were considered and between 2005 and 2015 was analyzed using panel data analysis method.

Keywords: Financial Development, Economic Growth, Different Income Groups, Panel Data Analysis.

JEL Classification: F00, F21, O1.

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I. GİRİŞ

Bütün ülkelerin ulaşmak istedikleri en önemli amaçlardan biri milli gelir seviyesindeki artışı sağlayarak ekonomik büyümeyi gerçekleştirmektir. Bu bağlamda finansal gelişmenin ekonomik büyümenin sağlanmasında belirleyici olup olmadığı literatürde önemli araştırma konusu haline gelmiştir. 1980 sonrası dönemde küreselleşme eğiliminin hızlanmasıyla birlikte finansal piyasaların önemi artmış ve finansal piyasaların ekonomik büyümenin önemli sürükleyicilerinden biri olduğu kanaati hızla yaygınlaşmıştır.

Finansal gelişme, bir ülkede finansal piyasaların gelişmesi neticesinde finansal araçların artması ve bu araçların daha yaygın kullanılır hale gelmesi olarak tanımlanmaktadır (Mercan ve Peker, 2013: 93). Finansal gelişme sayesinde tasarruf sahipleri portföy çeşitlendirmesi imkanı bulmakta; finansal sistemin tam ve etkin işlemesi ise kıt kaynakların doğru ve etkin yatırım projelerine dönüşmesini sağlamaktadır. Böylelikle finansal sistem tasarrufların ekonomiye kanalize olmasını sağlayarak ekonomik büyümeyi tetiklemektedir.

Finansal gelişme ve ekonomik büyüme arasındaki ilişkinin açıklamasında dört temel görüşün olduğu görülmektedir. Birinci görüşe göre, ekonomik büyüme finansal gelişmeye öncülük etmektedir. Buna göre önce ekonomik büyüme gerçekleşmekte ardından finansal sistem büyümektedir. İkinci görüşe göre ise, önce finansal gelişme sağlanmakta ardından ekonomi büyümektedir. Böylelikle finansal sistemin desteği ile gerçekleşen bir ekonomik büyüme ortaya çıkmaktadır. Üçüncü görüşe göre ise, finansal gelişme ve ekonomik büyüme arasında karşılıklı bir etkileşim söz konusu iken; dördüncü görüşe göre ise, finansal gelişme ve ekonomik büyüme arasında önemli bir ilişki bulunmamaktadır (Kandır vd., 2007: 312).

Finansal gelişme ve ekonomik büyüme arasındaki ilişki bir ülkenin ekonomik gelişmişlik düzeyine göre farklı seviyelerde gerçekleşebilir. Gelişmiş ülkelerde finansal aracılığın yapısı ve verimliliği ekonomik büyüme ile daha fazla ilgili olabilirken; finansal aracılığın düzeyi gelişme sürecinin ilk dönemlerindeki ekonomiler için çok daha önemli olabilir. Bununla birlikte finansal gelişme ve ekonomik büyüme ilişkisi değişkenlerin seçimi ve kullanılan yönteme göre de farklılık gösterebilir (Güneş, 2013:76). Levine göre (1997), finansal sistem finansal aracılar vasıtasıyla bir yandan tasarrufları yönlendirirken; diğer yandan kaynak tahsisini ve risk yönetimini kolaylaştırmakta ve böylelikle sermaye oluşumunu ve teknolojik yeniliği sağlayarak ekonomik büyümenin gerçekleşmesini kolaylaştırmaktadır (Levine, 1997: 691).

Bu çalışmanın esas amacı, farklı gelir gruplarındaki ülkelerde finansal gelişme ve ekonomik büyüme arasındaki ilişkiyi analiz etmektir. Analize dâhil edilen ülkeler, yüksek gelirli ülkeler ve üst-orta gelirli ülkeler olarak sınıflandırılmıştır. Çalışmada bağımlı değişken olarak ekonomik büyümeyi

temsilen kişi başına düşen GSYH % artış, bağımsız değişken olarak özel sektöre verilen kredilerinin GSYH % payı, finansal sektör tarafından sağlanan kredilerin GSYH % payı, para arzının GSYH % payı ve borsada işlem gören şirketlerin değerinin GSYH % payı kullanılmıştır. Çalışmada panel veri analizi yöntemi uygulanarak 2005-2015 dönemleri arası analiz edilmiştir. Çalışmanın devam eden bölümleri şu şekilde organize edilmiştir. İkinci bölümde konu ile ilgili literatür taramasına yer verilmiştir. Veri setinin ve modelin tanıtıldığı üçüncü bölümün ardından çalışmanın yöntem ve analiz sonuçlarının sunulduğu dördüncü bölüme yer verilmiştir. Son olarak sonuç kısmı ele alınmıştır.

II. LİTERATÜR TARAMASI

Literatürde finansal gelişme ve ekonomik büyüme ilişkisi çok sayıda araştırmaya konu olmakla birlikte bu araştırmalardan bazılarını aşağıdaki gibi sıralamak mümkündür:

Kandır vd., (2007), Türkiye'de finansal gelişme ve ekonomik büyüme arasındaki ilişki 1988-2004 dönemleri arasında incelenmiştir. Çalışmada bağımlı değişken olarak kişi başına reel milli gelir, bağımsız değişken olarak da İMKB işlem hacminin milli gelire oranı, İMKB piyasa değerinin milli gelire oranı, İMKB işlem görme oranı ve özel sektöre verilen banka kredilerinin milli gelire oranı kullanılmıştır. Yöntem olarak Johansen eş bütünleşme testi, hata düzeltme modeli ve nedensellik analizinin kullanıldığı çalışmada finansal gelişmenin ekonomik büyümeyi desteklemediği buna karşılık ekonomik büyümenin finansal gelişmeyi desteklediği sonucuna ulaşılmıştır.

Kenourgios ve Samitas (2007), Polonya'da finansal gelişme ve ekonomik büyüme arasındaki ilişki 1994-2004 dönemleri arasında çeyreklik veriler kullanılarak koentegrasyon analiz yöntemi kullanılarak incelenmiştir. Sonuç olarak uzun dönemde özel sektöre kullandırılan kredilerin ekonomik büyümenin en önemli sürükleyicisi olduğu görülmüştür.

Rachdi ve Mbarek (2011), 1990-2006 dönemleri arasında 10 OECD ve 6 MENA ülkesi ele alınarak finansal gelişme ve ekonomik büyüme ilişkisi analiz edilmiştir. Çalışmada panel veri analizi yöntemi kullanılmıştır. Sonuç olarak ele alınan ülkelerde, panel eş bütünleşme analizi finansal gelişme ve ekonomik büyüme arasında uzun dönemli ilişki olduğunu göstermiştir. Genelleştirilmiş moment analizinde ise, finansal gelişme ve ekonomik büyüme arasında pozitif bir ilişki olduğu görülmüştür. Nedensellik analizinde, OECD ülkelerinde çift yönlü nedensellik ilişkisi; MENA ülkelerinde ise, ekonomik büyümeden finansal gelişmeye doğru tek yönlü nedensellik ilişkisi olduğu görülmüştür.

Sanusi vd., (2012), 2004-2008 dönemleri arasında, 10 ASEAN ülkesinde finansal gelişme ve ekonomik büyüme arasındaki ilişki statik panel veri analizi yöntemi kullanılarak incelenmiştir. Sonuç olarak finansal gelişme ve ekonomik büyüme arasında ilişki olduğu görülmüştür.

Adusei (2013), 1971-2010 dönemleri arasında Gana'da finansal gelişme ve ekonomik büyüme arasındaki ilişki analiz edilmiştir. Çalışmada hata düzeltme modeli ve genelleştirilmiş moment modeli kullanılmıştır. Sonuç olarak finansal gelişmenin ekonomik büyümeyi engellediği görülmüştür.

Güneş (2013), 1988-2009 dönemleri arasında Türkiye'de finansal gelişme ve ekonomik büyüme arasındaki ilişki analiz edilmiştir. Finansal gelişmişlik düzeyini temsilen para arzının milli gelire oranı ve finansal piyasalarda çalışanların toplam işgücü içerisindeki payı kullanılmıştır. Ekonomik büyüme, finansal istihdam ve para arzı değişkenleri arasındaki eş bütünleşme analizinde Pesaran vd. (2001) sınır testi yöntemi kullanılmıştır. Yapılan analizler sonucunda, ekonomik büyümenin finansal piyasalarda çalışanların toplam işgücü içerisindeki payını artırdığını buna karşılık para arzı oranını etkilemediği sonucuna ulaşılmıştır.

Mercan ve Peker (2013), 1992-2010 dönemleri arasında finansal gelişmenin ekonomik büyüme üzerindeki etkisi aylık verilerle Türkiye için araştırılmıştır. Çalışmada Pesaran vd., tarafından geliştirilen sınır testi yöntemi kullanılmış ve sonuç olarak değişkenler arasında uzun dönemli ilişki olduğu ayrıca uzun dönemde finansal gelişmenin ekonomik büyümeyi pozitif ve istatistiksel olarak anlamlı etkilediği görülmüştür. Yapılan analiz sonucunda, kısa dönemde değişkenler arasında ortaya çıkan sapmaların uzun dönem denge düzeyine yakınsadığı görülmüştür.

Onuonga (2014), 1980-2011 dönemleri arasında Kenya'da finansal gelişme ve ekonomik büyüme arasındaki ilişki analiz edilmiştir. Çalışmada ARDL sınır testi yöntemi kullanılmıştır. Analiz sonuçları, finansal gelişmenin ekonomik büyümeyi pozitif yönde etkilediğini göstermiştir. Ayrıca Granger nedensellik analizi, finansal gelişme ve ekonomik büyüme arasında çift yönlü nedensellik ilişkisinin olduğunu göstermiştir.

Agbelenko (2015), 1981-2010 dönemleri arasında Togo'da finansal gelişme ve ekonomik büyüme arasında ilişki analiz edilmiştir. Çalışmada Johansen eş bütünleşme testi, Granger nedensellik analizi ve vektör hata düzeltme modeli kullanılmıştır. Sonuç olarak, Togo'da finansal gelişmenin ekonomik büyüme üzerinde pozitif ve istatistiksel olarak anlamlı etkisinin olduğu görülmüştür. Granger nedensellik testi, ekonomik büyümeden finansal gelişmeye doğru gerçekleştiği sonucuna ulaşılmıştır.

Siddique ve Majeed (2015), 1980-2010 dönemleri arasında 5 Güney Asya ülkeleri arasında enerji tüketimi, ticaret ve finansal gelişmenin ekonomik büyüme üzerindeki etkisi analiz edilmiştir. Değişkenler arasında uzun dönem ilişkinin belirlenmesinde panel eş bütünleşme analizi; nedenselliğin yönünün tespitinde ise Granger nedensellik analizi yöntemi kullanılmıştır. Çalışmada sonuç olarak, finansal gelişme, enerji ve ticaretin ekonomik büyümeyi pozitif etkilediği görülmüştür.

Uzun dönemde, büyüme ve enerji tüketimi arasında çift yönlü nedensellik ilişkisinin olduğu; ticaretten ve finansal gelişmeden ekonomik büyümeye doğru tek yönlü nedensellik ilişkisinin olduğu görülmüştür.

III. VERİ SETİ ve MODEL

Bu çalışmada, finansal gelişme ve ekonomik büyüme arasındaki ilişki 2005-2015 dönemleri arasında yüksek gelirli ülkeler ve üst-orta gelirli ülkeler için analiz edilmiştir. Bu bağlamda çalışmada; 7 yüksek gelirli ülke (Avustralya, İsrail, Japonya, Kore, Polonya, Singapur, Şili) ve 10 üst-orta gelirli ülke (Arjantin, Brezilya, Çin, Kolombiya, Macaristan, Malezya, Meksika, Peru, Tayland, Türkiye) değerlendirmeye alınmıştır. Çalışmada bağımlı değişken olarak ekonomik büyümeyi temsilen kişi başına düşen milli gelirdeki % artış, bağımsız değişken olarak özel sektöre verilen kredilerin GSYH % payı, finansal sektör tarafından sağlanan kredilerin GSYH % payı, para arzının GSYH % payı, borsada işlem gören şirketlerin değerinin GSYH % payı değişkenleri kullanılmıştır. Çalışmada panel veri analizi yöntemi uygulanmıştır.

Çalışmada kullanılan ampirik model (1) nolu Eşitlikte gösterilmiştir:

$$PGDP_{it} = \alpha + \beta_1 DCPS_{it} + \beta_2 DCPF_{it} + \beta_3 BM_{it} + \beta_4 MCC_{it} + \mu_{it} \quad (1)$$

Çalışmada kullanılan verilere ve verilerin alındığı kaynaklara tablo 1'de yer verilmiştir.

Tablo I. Veri Seti ve Tanımlamalar

Değişken	Açıklama	Kaynak
PGDP	Kişi Başına Düşen Gayri Safi Yurt İçi Hâsıla Artışı (%)	Dünya Bankası
DCPS	Özel Sektöre Verilen Kredilerinin GSYH % Payı	
DCPF	Finansal Sektör Tarafından Sağlanan Kredilerin GSYH % Payı	
BM	Para Arzının GSYH % Payı	
MCC	Borsada İşlem Gören Şirketlerin Değerinin GSYH % Payı	

IV. YÖNTEM VE UYGULAMA SONUÇLARI

Yüksek gelirli ülkeler ve üst-orta gelirli ülkeler için analizde kullanılan değişkenlere ait temel tanımlayıcı istatistikler tablo 2'de sunulmuştur. Tablo 2'de modellerde kullanılan değişkenlerin 2005-2015 yılları arasındaki maksimum ve minimum değerleri ile ortalama ve standart sapmalarına yer verilmiştir.

Yüksek gelirli ülkelerde ekonomik büyümeyi temsil eden kişi başına milli gelirin ortalama olarak 2.34 olarak gerçekleşmiş olduğu, en düşük ve en yüksek % -5.51 ve % 13.2 düzeyinde gerçekleştiği görülmektedir. Yüksek gelirli ülkelerde finansal gelişmenin göstergesi olarak kullanılan özel sektöre verilen yurt içi kredilerin GSYH içindeki payının 2005-2015 yılları arasında ortalama 109.08 düzeyinde gerçekleşmiş olup en düşük ve en yüksek değerleri ise sırasıyla % 27.27 ve % 196.78 olarak gerçekleşmiştir. Finansal sektörün gelişmesinin göstergesi olarak kullanılan bir diğer gösterge ise finansal sektörün özel sektöre sağladığı yurt içi kredilerin GSYH'ya oranı değişkeni 2005-2015 yılları arasında ortalama olarak 139.81 düzeyinde gerçekleşmiş olup en düşük ve en yüksek değerleri ise sırasıyla % 38.64 ve % 376.95 olarak gerçekleşmiştir. Bir diğer gösterge olan para arzının GSYH % payının ele alınan yıllarda ortalama 121.17 düzeyinde gerçekleşirken; en düşük ve en yüksek değeri % 43.36 ve % 251.92 olarak gerçekleştiği görülmektedir. Borsada işlem gören şirketlerin değerinin GSYH % payının ele alınan yıllarda ortalama olarak 105.89 olarak gerçekleşmiş olup en düşük ve en yüksek %17.12 ve % 299.57 olarak gerçekleşmiştir.

Üst-orta gelirli ülkelerde ekonomik büyümeyi temsil eden kişi başına milli gelirin ortalama olarak 3.3 olarak gerçekleşmiş olduğu, en düşük ve en yüksek % -6.97 ve % 13.6 düzeyinde gerçekleştiği görülmektedir. Üst-orta gelirli ülkelerde finansal gelişmenin göstergesi olarak kullanılan özel sektöre verilen yurt içi kredilerin GSYH içindeki payının 2005-2015 yılları arasında ortalama 61.47 düzeyinde gerçekleşmiş olup en düşük ve en yüksek değerleri ise sırasıyla % 10.61 ve % 155.33 olarak gerçekleşmiştir. Finansal sektörün gelişmesinin göstergesi olarak kullanılan bir diğer gösterge ise finansal sektörün özel sektöre sağladığı yurt içi kredilerin GSYH'ya oranı değişkeni 2005-2015 yılları arasında ortalama olarak 79.64 düzeyinde gerçekleşmiş olup en düşük ve en yüksek değerleri ise sırasıyla % 15.3 ve % 196.93 olarak gerçekleşmiştir. Bir diğer gösterge olan para arzının GSYH % payının ele alınan yıllarda 75.50 düzeyinde gerçekleşirken; en düşük ve en yüksek değeri % 23.39 ve % 205.74 olarak gerçekleştiği görülmektedir. Borsada işlem gören şirketlerin değerinin GSYH % payının ele alınan yıllarda ortalama olarak 52.35 olarak gerçekleşmiş olup en düşük ve en yüksek % 6.24 ve % 168.06 olarak gerçekleşmiştir.

Tablo II. Tanımlayıcı İstatistikler

	Değişken	Ortalama	Standart Sapma	Minimum	Maksimum
Yüksek Gelirli Ülkeler	**PGDP**	2.34	2.56	-5.51	13.21
	DCPS	109.08	44.14	27.27	196.78
	DCPF	139.81	88.97	38.64	376.95
	BM	121.17	54.01	43.36	251.92
	MCC	105.89	63.94	17.12	299.57
Üst-Orta Gelirli Ülkeler	**PGDP**	3.3	3.71	-6.97	13.6
	DCPS	61.47	41.35	10.61	155.33
	DCPF	79.64	44.91	15.3	196.93
	BM	75.50	47.19	23.39	205.74
	MCC	52.35	37.41	6.24	168.06

Çalışmada panel veri analizi yüksek gelirli ülkeler ve üst-orta gelirli ülkeler için yapılarak sonuçlar yorumlanmıştır.

IV.I.Yüksek Gelirli Ülkeler İçin Tahmin Sonuçları

Panel veri modellerinde, klasik modelin geçerliliği diğer bir ifadeyle birim ve/veya zaman etkilerinin olup olmadığının tespitinde kullanılan testlerden biri "Olabilirlik Oranı Testi" (LR)'dir. Bu teste H_0 hipotezi "klasik model doğrudur" şeklinde kurulmaktadır. H_0 hipotezi reddedilirse, birim, zaman veya hem birim hem de zaman etkilerinin olduğuna diğer bir ifadeyle klasik modelin uygun olmadığına karar verilmektedir. Tablo 3'de görüldüğü üzere, LR testi sonucunda sadece zaman etkisinin olduğu görülmektedir. Bu nedenle model tek yönlüdür.

Tablo III. LR Testi

LR Testi		
	Birim Etki	**Zaman Etki**
X^2	0.76	19.18
Prob.	0.1919	0.000

Yapılan LR testi sonucunda birim ve/veya zaman etkilerinin olduğu anlaşıldıktan sonra, bu etkilerin sabit mi yoksa tesadüfi mi olduğuna karar verilmesi gerekir. Bu bağlamda karar aşamasında Hausman testi tahminciler arasında seçim yapmak amacıyla kullanılmaktadır. Sabit ve tesadüfi etkiler modelleri arasındaki en önemli farklardan biri, birim etkilerin bağımsız değişkenlerle korelasyonlu olup olmadığı hususudur. Eğer aralarında korelasyon söz konusu değilse, tesadüfi etkiler modeli daha etkin ve geçerlidir.

Hausman testinde; H_0= Açıklayıcı değişkenler ve birim etki arasında korelasyon yoktur şeklindedir. Bu nedenle tesadüfi etkiler tahmincisi daha etkin olduğundan kullanımı uygun olacaktır. H_A=Açıklayıcı değişkenler ile birim etki arasında korelasyon vardır şeklindedir. Bu nedenle sabit etkiler modeli tutarlı olduğundan tercih edilmelidir.

Tablo 4'de görüldüğü üzere, tesadüfi etkiler tahmincisinin tutarlı ve etkin olduğu, ancak sabit etkiler tahmincisinin tutarsız olduğu sonucuna ulaşılmıştır. Diğer bir anlatımla, Hausman testi zaman etkisinin tesadüfi olduğunu göstermektedir. Yapılan bu analiz tek yönlü tesadüfi etki modelidir.

Tablo IV. Hausman Testi

Hausman Testi	
X^2	6.43
Prob.	0.1990

Tesadüfi etkiler modelinde, kalıntılardaki birimlere göre heteroskedasitenin varlığının Değiştirilmiş Wald testinin sınandığı tablo 5'de $\varphi^2_i = \varphi^2$ şeklinde kurulan H_0 hipotezi reddedilmekte, varyansın birimlere göre değiştiği anlaşılmakta ($\varphi^2_i \neq \varphi^2$) ve dolayısıyla birimlere göre heteroskedasite olduğu sonucuna ulaşılmaktadır.

Tablo 5'de modelde otokorelasyonun olup olmadığı sınanmıştır. Otokorelasyonun olup olmadığının tespitinde Bhargava, Franzini ve Narendranathan tarafından önerilen Durbin Watson testi ve Baltagi-Wu tarafından önerilen yerel en iyi değişmez testi kullanılmıştır. Testlerin her ikisinde de otokorelasyon katsayısının sıfıra eşit olduğu (p=0) H_0 hipotezi test edilmektedir. Literatürde test istatistiklerinin 2'den küçükse otokorelasyonun önemli olduğu yorumu yapılmaktadır. Tabloda görüldüğü üzere, her iki test içinde değerler 2'den büyüktür. Bu nedenle tesadüfi etkiler modeli için otokorelasyon sorunun önemli olmadığı şeklinde yorum yapılmaktadır. Tesadüfi etkiler modelinde birimler arası korelasyonun varlığını sınamak için Pesaran'ın testi kullanılmaktadır. Tablo 5'de

görüldüğü üzere, H_0 hipotezi reddedilmekte ve dolayısıyla birimler arası korelasyonun olduğu sonucuna ulaşılmaktadır.

Tablo V. Varsayımların Testi

	Modified Wald Testi	**Modified Bhargava et al. Durbin-Watson Test**	**Baltagi-Wu LBI Testi**	**Pesaran Test**
X^2	65.69	2.168	2.219	Birimler arası korelasyon (7.513)
Prob.	0.000			0.000

Yapılan analizler sonucunda çalışmada; heterokedasite'nin ve birimler arası korelasyonun olduğunu buna rağmen otokorelasyonun olmadığı görülmüştür. Mevcut olan heterokedasite'nin ve birimler arası korelasyonun giderilmesinde ise, Beck-Katz Tahmincisi kullanılmıştır.

Bu doğrultuda elde edilen sonuçlar tablo 6'da gösterilmiştir. Bulguların yer aldığı tablo 6 incelendiğinde, bağımlı değişken kişi başına düşen gelirdeki % artış üzerinde finansal sektör tarafından sağlanan kredilerin GSYH % payı ve borsada işlem gören şirketlerin değerinin GSYH % payının pozitif olarak etkin oldukları görülmektedir. Buna karşılık, özel sektöre verilen kredilerin GSYH % payı ve para arzının GSYH % payının negatif etkiye sahip olduğu görülmektedir.

Katsayılar yorumlandığında özel sektör kredilerinde ortaya çıkan %1 birimlik artışı ekonomik büyümeyi % 0.02 düzeyinde azaltmaktadır. Finansal sektör tarafından sağlanan kredilerin GSYH içindeki % payında %1 birimlik artış ekonomik büyümeyi % 0.01 düzeyinde artırmaktadır. Para arzında ortaya çıkan %1 birimlik artışın ise ekonomik büyümeyi % 0.01 düzeyinde azalttığı ve borsada işlem gören şirketlerin değerinin GSYH % payında ortaya çıkan %1 birimlik artışın ise ekonomik büyümeyi % 0.01 düzeyinde arttığı görülmektedir. Ayrıca, özel sektör kredilerinin GSYH % payı ve para arzının GSYH % payı katsayılarının ekonomik büyüme üzerinde istatistiksel olarak anlamlı oldukları görülmektedir.

Tablo VI. Analiz Sonuçları

Değişkenler	Katsayılar	Z istatistik	P-değer
DCPS	-0.026492	-1.82	0.069**
DCPF	0.010007	1.06	0.290
BM	-0.013895	-1.93	0.054**
MCC	0.010054	1.36	0.173
Sabit	4.450811	6.28	0.000*

Not: *, %5 **, %10 seviyesinde anlamlılık düzeyini göstermektedir.

IV.II. Üst-Orta Gelirli Ülkeler İçin Tahmin Sonuçları

Üst-orta gelirli ülkeler için yapılan LR testi sonucu tablo 7'de gösterilmiştir. Tablo 7'de görüldüğü üzere, LR testi sonucunda sadece zaman etkinin olduğu görülmektedir. Bu nedenle model tek yönlüdür.

Tablo VII. LR Testi

LR Testi		
	Birim Etki	**Zaman Etki**
X^2	4.04	36.72
Prob.	0.062	0.000

Tablo 8'de Hausman testi sonuçları yer almaktadır. Tablo 8'de görüldüğü üzere, sabit etkiler tahmincisinin tutarlı ve etkin olduğu; tesadüfi etkiler tahmincisinin ise tutarsız olduğu görülmektedir. Diğer bir ifadeyle Hausman testi zaman etkisinin sabit olduğunu göstermektedir. Yapılan bu analiz tek yönlü sabit etki modelidir.

Tablo VIII. Hausman Testi

Hausman Testi	
X^2	22.79
Prob.	0.000

Tablo 9'da görüldüğü üzere, Wald testi analizinde H_0 hipotezi reddedilmekte, varyansın birimlere göre değiştiği anlaşılmakta ($\varphi^2_i \neq \varphi^2$) ve dolayısıyla birimlere göre heteroskedasite olduğu sonucuna ulaşılmaktadır.

Otokorelasyonun olup olmadığının tespitinde Bhargava, Franzini ve Narendranathan tarafından önerilen Durbin Watson testi ve Baltagi-Wu tarafından önerilen yerel en iyi değişmez testi kullanılmıştır. Testlerin her ikisinde de otokorelasyon katsayısının sıfıra eşit olduğu (p=0) H_0 hipotezi test edilmektedir. Literatürde test istatistiklerinin 2'den küçükse otokorelasyonun önemli olduğu yorumu yapılmaktadır. Tabloda görüldüğü üzere, her iki test içinde değerler 2'den büyüktür dolayısıyla sabit etkiler modeli için otokorelasyon sorunun önemli olmadığı şeklinde yorum yapılmaktadır. Birimler arası korelasyonun varlığının testinde kullanılan Pesaran testi sonucunda H_0 hipotezi reddedilmekte ve birimler arası korelasyonun olduğu anlaşılmaktadır.

Tablo IX. Varsayımların Testi

	Modified Wald Testi	**Modified Bhargava et al. Durbin-Watson Test**	**Baltagi-Wu LBI Testi**	**Pesaran Test**
$\mathbf{X^2}$	176.25	2.041	2.128	Birimler arası korelasyon (10.730)
Prob.	0.000			0.000

Yapılan analizler sonucunda çalışmada; heterokedasite'nin ve birimler arası korelasyonun olduğu buna karşılık otokorelasyonun olmadığı görülmektedir. Mevcut olan, heterokedasite ve birimler arası korelasyon sorunun giderilmesinde ise, Beck-Katz Tahmincisi kullanılmıştır. Bu doğrultuda elde edilen sonuçlar tablo 10'da gösterilmiştir.

Bulguların yer aldığı tablo 10 incelendiğinde, bağımlı değişken ekonomik büyüme üzerinde özel sektöre verilen kredilerinin GSYH % payının, para arzının GSYH % payının ve borsada işlem gören şirketlerin değerinin GSYH % payının pozitif olarak etkin oldukları görülmektedir. Buna karşılık, finansal sektör tarafından sağlanan kredilerin GSYH % payının ekonomik büyüme üzerinde negatif etkisinin olduğu görülmektedir. Katsayılar yorumlandığında özel sektör kredilerinin GSYH % payında ortaya çıkan % 1 birimlik artış ekonomik büyümeyi % 0.03 düzeyinde artırmaktadır. Finansal sektör tarafından sağlanan kredilerin GSYH % payında ortaya çıkan % 1 birimlik artışın ekonomik büyümeyi % 0.86 düzeyinde azalttığı görülmektedir. Bununla birlikte para arzının GSYH % payında ortaya çıkan % 1 birimlik artışın ekonomik büyümeyi % 0.07 düzeyinde artırdığı; borsada işlem gören şirketlerin değerinin GSYH % payında ortaya çıkan % 1 birimlik artışın ise ekonomik büyümeyi % 0.006 düzeyinde artırdığı sonucuna ulaşılmıştır. Ayrıca, özel sektöre verilen kredilerin

GSYH % payı, finansal sektör tarafından sağlanan kredilerin GSYH % payı ve para arzının GSYH % payının ekonomik büyüme üzerinde istatistiksel olarak anlamlı etkiye sahip olduğu görülmektedir. Borsada işlem gören şirketlerin değerinin GSYH % payının ise, ekonomik büyüme üzerinde istatistiksel olarak anlamsız etkiye sahip olduğu görülmektedir.

Tablo X. Analiz Sonuçları

Değişkenler	Katsayılar	Z istatistiği	P değeri
DCPS	0.030406	0.96	0.336
DCPF	-0.869435	-4.66	0.000*
BM	0.0762369	4.54	0.000*
MCC	0.0066905	0.05	0.960
Sabit	2.574933	2.04	0.042*

Not: *, %5 seviyesinde anlamlılık düzeyini göstermektedir.

V.SONUÇ

2005-2015 dönemleri arasında yüksek gelirli ülkeler ve üst-orta gelirli ülkeler için finansal gelişme ve ekonomik büyüme arasındaki ilişkinin analiz edildiği bu çalışmada panel veri analizi yöntemi kullanılmıştır. Çalışmada bağımlı değişken olarak ekonomik büyümeyi temsilen kişi başına düşen GSYH % artış, bağımsız değişken olarak özel sektöre verilen kredilerinin GSYH % payı, finansal sektör tarafından sağlanan kredilerin GSYH % payı, para arzının GSYH % payı ve borsada işlem gören şirketlerin değerinin GSYH % payı kullanılmıştır.

Yüksek gelirli ülkeler için elde edilen sonuçlar değerlendirildiğinde, ekonomik büyüme üzerinde finansal sektör tarafından sağlanan kredilerin GSYH % payı ve borsada işlem gören şirketlerin değerinin GSYH % payının pozitif olarak etkin oldukları görülmektedir. Buna karşılık, özel sektöre verilen kredilerin GSYH % payı ve para arzının GSYH % payının negatif etkiye sahip olduğu görülmektedir. Üst-orta gelirli ülkeler için elde edilen sonuçlar değerlendirildiğinde ise, ekonomik büyüme üzerinde özel sektöre verilen kredilerinin GSYH % payının, para arzının GSYH % payının ve borsada işlem gören şirketlerin değerinin GSYH % payının pozitif olarak etkin oldukları görülmektedir. Buna karşılık, finansal sektör tarafından sağlanan kredilerin GSYH % payının ekonomik büyüme üzerinde negatif etkisinin olduğu görülmektedir.

Sonuç olarak, finansal gelişmişliğin ekonomik büyümeyi hızlandırdığını söylenebilir. Ayrıca, finansal sistemin ekonomik büyümeye önemli bir katkısının olabilmesi için ülkelerin gelişmişlik

düzeyinin belirli bir seviyede olması gerekir. Yine ekonomik büyümenin istikrarlı bir şekilde sürdürülebilmesi için iyi işleyen ve gelişmiş bir finansal sisteme ihtiyaç duyulmaktadır.

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