INTERNATIONAL REVIEW OF ECONOMICS AND MANAGEMENT
ISSN: 2148-3493 IREM
DOI: 10.18825/iremjournal.282112 Volume 5, Number 1, 2017, 34-57.

EFFECT OF SUPPLY CHAIN FINANCE ON VALUE OF FIRMS IN THE SUPPLY CHAIN*

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Abstract

This study aims to determine the effect of supply chain finance on firm value of large buyers with high credit notes. For this purpose, a two-stage application was performed. Firstly, panel data analysis was applied with the data of 2.421 companies from 16 different countries among the G-20 members between 2009 and 2013 and the effect of variables which are affected theoretically by supply chain finance in large companies on firm value is examined. In the second stage of the application, 46 companies which started using supply chain finance between 2006 and 2013 have been identified. Wilcoxon signed-rank test was applied by using the data before and after year which the companies have been started to use supply chain finance and it is determined that whether the variables which is expected to be affected reveal a significant difference between these years. In conclusion, the effect of variables expected to be affected in large companies which make supply chain finance available for their suppliers on firm value differs for each market. Thus, it is concluded that supply chain finance will affect the firm value if the theoretical impacts are realized. However, the second part of the application shows that there is no significant difference in any of the variables before and after supply chain finance using. As a result, although theoretically it is expected that firm value of large companies located within the supply chain finance is affected, there is no effect on firm values in the markets.

Key Words: Trade Finance, Supply Chain Finance, Firm Value

JEL Code: G32, M21

* This study is based on PhD dissertation of Rıfat Karakuş titled "Supply Chain Finance and Its Effect on Firm Value of Firms in the Supply Chain".

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Date of submission: 28.12.2016
Date of acceptance: 18.07.2017

I. INTRODUCTION

The rapid development of globalization and technology has brought a climate of constantly increasing competition for businesses. Enterprises seeking to achieve their objectives within this competitive environment have tried to develop advantageous features that serve the ultimate purpose, such as increasing income, decreasing costs, improving customer satisfaction by providing coordination of internal functions. In order to achieve all these goals, beyond the internal functions, it has become necessary for enterprises to effectively coordinate with their stakeholders and the concept of supply chain has been shaped. Enterprises seeking competitive advantage have been involved in supply chains where the material, information and financial flows from first supplier to the last consumer have been coordinated.

In addition to material and information flows in the supply chain, a financial flow occurs from last customer to first supplier and management of this flow is described as financial supply chain management. One of the most important decisions to be made within the financial supply chain is to identify the financing methods to be used. Commercial financing methods such as commercial loans, factoring, letter of guarantee etc. have been used for a long time in the financing of the exchange of goods and services between the parties in the supply chain.

Especially after the 2008 global crisis, financial difficulties of financial institutions have affected credit markets. The activities of particularly small and medium-sized enterprises with low credit worthiness in the supply chains have come to a halt. Problems experienced in one or several of the stakeholders within the supply chain can affect the performance of the entire chain. For this reason, large enterprises with high credit ratings in the chain have concentrated on new financing methods to sustain the chain's efficiency. Supply chain finance has also gained popularity as a method based on a win-win principle in which large firms with high credit ratings provide low-cost credit to small firms in supply chains. The aim of efforts made by enterprises either individually or in coordination within the supply chains is to maximize the shareholder value. For this reason, the main factor in determining the financing methods used in the financial supply chain should contribute to the shareholder value. Supply chain finance is a method based on a win-win principle and a positive effect on firm value of suppliers, buyers and financial institutions included in the method is expected from supply chain finance. The purpose of this study is to determine the impact of supply chain finance on firm value of large buyers with a high credit rating which makes supply chain finance available for suppliers. In this study, which is aimed to achieve the stated purpose, firstly all aspects of supply chain

financing have been covered and then the effect of supply chain finance on firm value of large buyers with high credit worthiness has been analyzed by empirical implementation.

II. NEED FOR SUPPLY CHAIN FINANCE

Supply chain finance is a method aimed providing low-cost and easily accessible financing to small and medium-sized suppliers. The emergence of this method is based on the support of small and medium-sized enterprises (SMEs) for the sustainability of the supply chain by large buyers. For this reason, before disclosing the supply chain finance, revealing SMEs' priorities for the country's economies and their financial problems is beneficial.

In many developed and developing countries, SMEs are one of the most important actors in the economic system with employment creation, added value creation, investment and export shares (Torlak & Uçkan, 2005). For example, Turkey in 2012, 99.8% of the total number of initiatives, 75.8% of employment, 54.5% of wages and salaries, 63.3% of turnover, 54.2% of value added at factor cost and 53.2% of gross investment in property is created by SMEs (TUIK, 2014).

Although SMEs have importance for their country's economies with characteristics such as more production and products with less investment, encouraging individual savings, minimizing distortions in income distribution, easier adaptation to demand changes and diversity (Bayraktar & Köse, 2004), they face serious problems. Financial problems are one of the most fundamental problems which SMEs encounter in their operational processes. The main financial problems faced by SMEs are concentrated on access to financing and financing costs (Atay, 2012). In a survey conducted among the administrators, for 40% of SMEs in Cyprus, 32% in Greece, 23% in Spain and Croatia, 22% in Slovenia, 20% in Ireland, Italy and the Netherlands, , 9% in Poland, 8% in Germany and 7% in Austria, the most important problem is access to funding sources (Ipsos Mori, 2013). As seen in Figure I, SMEs' share of commercial loans provided by financial institutions is rather low for many countries.

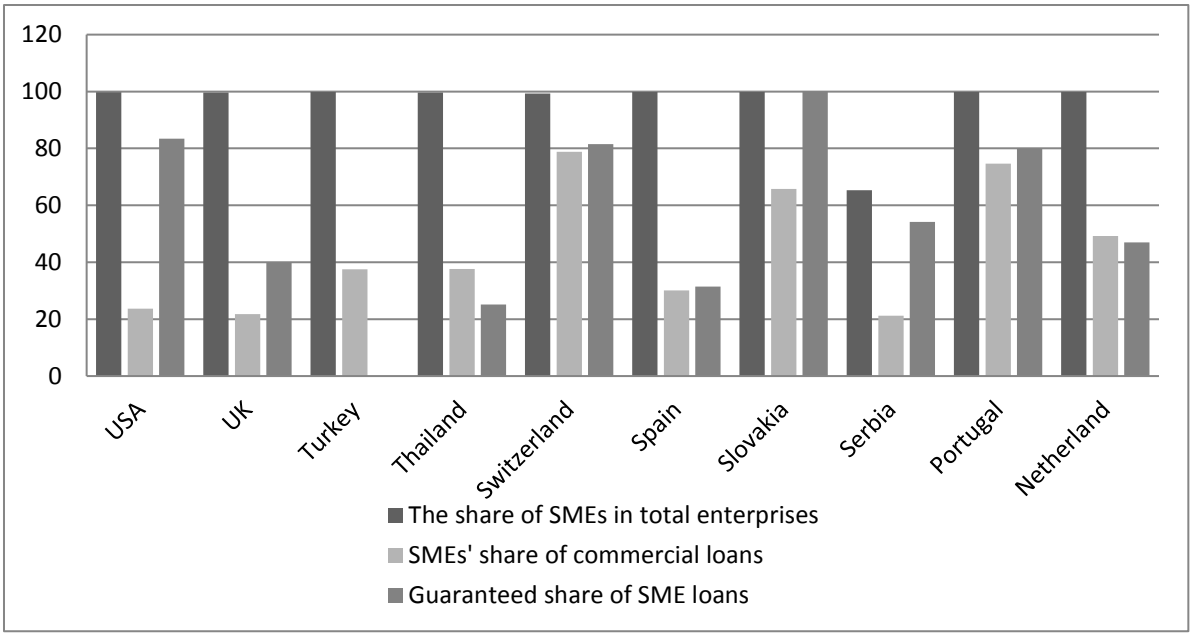

Figure I. SMEs' Share of Commercial Loans and Guarantees

Source: OECD (2014), ***Financing SMEs and Entrepreneurs 2014: An OECD Scoreboard***, Retrieved From http://www.keepeek.com/Digital-Asset-Management/oecd/industry-and-services/ financing-smes-and-entrepreneurs-2014_fin_sme_ent-2014-en#page1, 18.08.2014.

Another alternative fund source for SMEs is capital markets. However, it is seen that SMEs cannot provide sufficient funds from capital markets. The main reasons for this are as follows: SMEs are generally family companies and are worried about losing control, they do not want to bear the cost of opening up to the public and they are very small companies and have insufficient organizational structures, accounting systems and unrecorded transactions (Kutlu & Demirci, 2007).

In addition to the problem of access to finance in SMEs, the high costs of resources are another financial problem. It is inevitable that SMEs will have a higher cost of financing due to their generally higher risk than large enterprises. The investor expectation that expresses the equity cost for the company will be higher in SMEs. Similarly, financial institutions set higher interest rates for SMEs.

The difficulties of SMEs to access financing in terms of equity and foreign resources and the high cost of financing make trade finance more important. For this reason, the classical methods used in trade financing such as factoring, forfaiting, letter of credit and letter of guarantee constitute the alternatives that should be evaluated for SMEs. Although the mentioned methods offer advantages, they bring with them some disadvantages. As a result, supply chain finance as a new and innovative financing method is academically and practically gains importance.

III. SUPPLY CHAIN FINANCE

In traditional factoring transactions, the borrower that is the buyer and will make the payment at the maturity is not a party to the contract. The borrower does not provide any guarantee for the payment to the factor. The party that is the client of the factor is the supplier. For this reason, it is the supplier that determines obtaining of finance and the cost of the transaction. In the case of supply chain finance, which is also expressed as reverse factoring or supplier financing, the initiator of the method becomes the debtor company. Debtor companies agree with one or more financial institutions to discount their debt to suppliers. Bills that are requested by the supplier and approved by the company to be within a certain limit are discounted with the help of a technology platform (Tanrısever, 2015).

On the basis of the supply chain finance is the willingness of buyers with a high credit rating to make these capacities available to their suppliers. Large buyers with strong financial structure and high creditworthiness offer this method as an alternative to their suppliers in order to make it easier to finance them and obtain lower financing costs. The large buyer agrees with one or more financial institutions to discount their debts to suppliers. The supplier carries out the delivery of the goods or services to the big buyer and transmits the bill to the buyer through the technology platform shared by the buyer, supplier and financial institution. After the buyer confirms the invoice, the supplier selects the invoices to be discounted through the system and the financial institution discounts the invoice. The discounted amount is paid by the financial institution to the supplier, and at the maturity, the buyer, in other words the debtor pays the invoice amount to the financial institution (Vervoort, 2012). The process of supply chain finance is shown in Figure II.

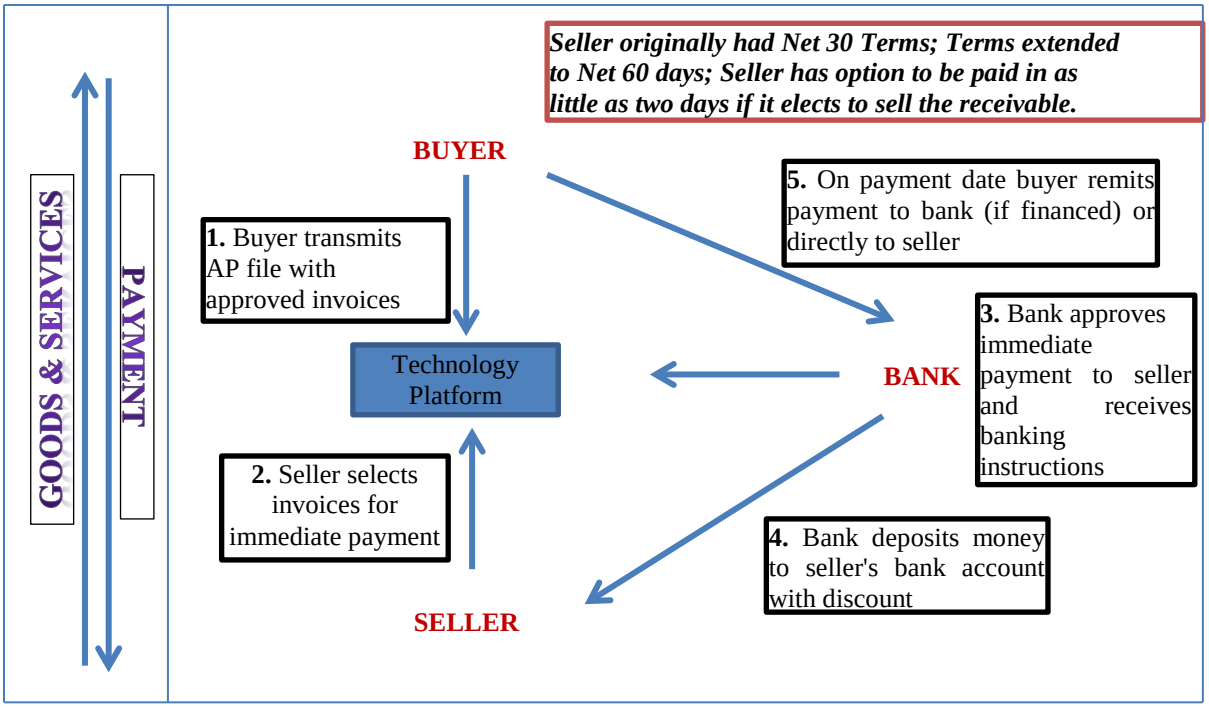

Figure II. The Process of Supply Chain Finance

Source: PwC (2009***), Demystifying supply chain finance***, Retrieved From http://www.pwc.com/us/en/issues/surviving-the-financial-downturn/assets/supply_chain_finance.pdf, 20.05.2015

In factoring, the receivable portfolio of a supplier to be paid by more than one buyer is discounted by a single factor. In fact, the factor is to discount the supplier's receivables from more than one customer in order to diversify the risk of collecting, so that if one does not pay the debts he wants to secure the receivables from other debts. However, this risk diversification requires the question of creditworthiness and the measurement of credit risk for more than one debtor. In supply chain finance, the factor is concentrated on a single borrower. Therefore, the identification of the credit risk becomes easier and more reliable. In addition collateralization is possible if necessary because of the fact that the factor is the creditor of the buyer. In the supply chain finance, the factor concentrates on the debt of a single company with a strong financial structure. Enterprises that are buyers in the supply chain finance are firms with high credit ratings and they give guaranty to the factor. Therefore factors are not willing to undertake any payments from suppliers that are at a higher risk group, namely an irreversible factoring process is carried out. In addition, when the borrower has a high credit rating, the cost of discounting become lower and suppliers with low credit ratings can provide financing at a lower cost by taking advantage of high credit ratings of customers (Klapper, 2006). Supply chain finance which is one of the buyer-centered financing methods and which is expressed in the form of inverse factoring or supplier financing; serve several advantages to suppliers, buyers and financial institutions. Advantages to buyers are discussed below in detail.

III.I. Effect of Supply Chain Finance on Large Buyers with High Credit Worthiness

Supply chain finance is a system based on win-win principle. For this reason, it is expected that the financing-generating (large) and financing-enabled (small) enterprises in this financing process will be positively affected. Also, financial institutions that provide financing should also have positive effects that will enable them to participate in this process.

It is clear that supply chain financing will have a positive effect on the big buyer companies. Otherwise, these companies will not launch such a system. The first of the expected positive effects can be realized as an extension of payment periods. Large firms that work with suppliers with limited financing capabilities will need to make payments in a shorter period of time to meet their suppliers' expectations. However, it is possible that large firms that make supply chain finance available to their suppliers will be able to offer a longer maturity, as they enable suppliers to access finance soon. For this reason, large firms using supply chain finance can expect shortened cash cycle period due to the prolonged average commercial debt repayment period (Lamoureux & Evans, 2011).

The use of supply chain finance will increase the pay-out times of large firms, thus shortening the cash cycle period will limit the need for working capital. So it may be possible to reduce the working capital without increasing the risk of liquidity. Thus, liquidity ratios such as current ratio, acid-test ratio and cash rate can be decreased in these firms and by keeping net working capital at a smaller level net working capital turnover rate can be increased. In a study conducted with the participation of senior executives of 23 large firms using supply chain finance, it was observed that the use of this financing method resulted in an average reduction of 13% in working capital of large firms (Seifert & Seifert, 2009). Another reason why liquidity ratios are affected is the fact that firms' working capital decreases while their short-term debt rises due to the increase in the term. In addition, due to the increasing short-term borrowing, firms' capital structure will be different and short-term debts, which have cheaper cost, will reach a greater weight on the balance sheet.

The use of supply chain finance in payments to be made by large firms has resulted in a decrease in the financing costs of small firms as well as a similar profitability effect for large firms. For example, $ 1 million trade of a large company with a 45-day normal payout period with its supplier can be examined. Three different scenarios were created under the assumption that the financing cost of the large buyer with a 45 day normal payment period is LIBOR + 1% thanks to its higher credit rating, the supplier’s financing cost is LIBOR + 4%, the LIBOR is 0,65%, when the supply chain financing is applied, the supplier discount bills on the 10th day

with LIBOR +%2. In the 45-day payment system the supplier costs $ 5813 financing costs for this period and the bigger firm with a 75 days cash flow cycle bears to $ 1375 financing costs. The bigger company can reduce its own financing costs to $688 by increasing its payment period by 15 days to 60 days, but in this case the financing cost of the supplier increases to $7750. Therefore, it is inevitable that the excess cost of the supplier will be reflected to the bigger company. In the third scenario, when the maturity is extended by using supply chain financing, the cost of the large company will be reduced to 688 USD, also the financing cost of the supplier will be reduced to 4973 USD (Frohling, 2012). As it can be seen in this example, supply chain finance can decrease the financing cost of the large company, which can have a positive impact on profit before tax. In addition, a reduction in administrative expenses related to payments can support this result. Potential increase in profit before tax may lead to an increase in profitability measures such as return on equity and return on assets.

Another advantage of supply chain finance can be seen as a decrease in costs. Small firms using supply chain finance will be able to source with lower financing costs, so they will be able to offer cheaper prices for products or services they will sell (Revathi, 2013). In addition, providing fast and inexpensive access to financing for suppliers will make the firm an attractive market for uncomprehended suppliers and create a competitive environment among suppliers. These conditions will have a positive effect on the cost of sales of large firms and will increase the gross sales profitability.

Big firms working with suppliers with limited financing capabilities may not be able to use these suppliers more with their current maturity policies when they want to increase their operating volume. It may not be possible to increase their activity volumes for suppliers who have difficulty in accessing financing. For example, Caterpillar, the world's leading manufacturer of building equipment, faced that when it wanted to increase its production in 2010, the top 500 suppliers could not respond to this demand due to their financing difficulties (Steeman, 2014). Hence, in this case large firms will have to multiply additional costs to reach new suppliers or limit activity volume. Another alternative would be to provide fast and cheap financing to suppliers. One of the most suitable alternatives for this can be shown as supply chain finance. It is clear that the supply chain finance will help to increase the volume of activity in large firms for the mentioned reason. In addition, since payment periods can be increased when supply chain finance is used, it will be possible for firms to increase their sales volumes by extending their collecting terms (Wohlgeschaffen, 2010).

Large firms that offer supply chain finance to their suppliers will have created different positive effects beyond the financial impacts indicated. In addition to contributions such as a strong electronic payment system, increased transparency in the payment process, strengthening of relations with suppliers, support for small and medium-sized enterprises, which have an important place in the economy for many countries will be considered an important activity in terms of social responsibility. Supplier financing programs developed and supported by governments in the United States and the United Kingdom will illustrate the importance of this social responsibility (Clarissa, 2014).

IV. EMPIRICAL ANALYSIS AND RESULTS

IV.I. Data Set

This research which examines whether large firms that make supply chain finance available to their suppliers contribute to their value by using this method consists of two steps. Firstly, it will be investigated whether the financial indicators of large firms that are expected to be influenced by using supply chain finance have an effect on firm value. For this part of the survey, 16 countries that can be accessed data from 19 countries constituting the G20 countries were included in the data set and an index was selected from stock exchange in each country. When the indices were determined, the number of companies included in the indices became determinants, and the indices covering more companies were taken into the dataset. Companies which includes the relevant index and which can be accessed financial data for the 2009-2013 period and which is not financial companies constitutes the data set. Financial companies do not fall within the scope of the research because they are companies that provide supply chain finance. For this reason they are not included in the data set. Data were obtained from relevant stock exchanges and company official websites, and financial data provider databases. Table I shows the countries included in the study's dataset, selected indices for countries and the number of companies in the selected indices.

Table I. Number of Companies Included in the Data Set

Country	Selected Index	Number of Companies Including Index	Not Included Company Numbers Due to Being a Financial Company	Not Included Companies Number Due to Lacking of Data	Number of Companies Included in the Data Set
USA	S&P 500	505	84	43	378
UK	FTSE 350	353	97	45	211
France	CAC 40	40	5	3	32
İtaly	FTSE ITALIA ALL SHARE	224	47	29	148
Germany	CDAX	467	40	149	278
Japan	NIKKEI 225	225	21	11	193
Canada	S&P TSX COMPOSITE	250	48	36	166
Australia	S&P ASX 300	297	55	70	172
Turkey	XUTUM	346	98	84	164
Argentina	BOLSA GENERAL	66	7	16	43
India	CNX 200	200	46	23	131
South Korea	KRX 100	100	17	4	79
Mexico	IPC COMP MX	60	7	15	38
Russia	BROAD MARKET	100	7	35	58
Brazil	BOVESPA IBOV	71	10	21	40
China	SSE 380	380	0	90	290

In the study, the effect of financial variables which are expected to be influenced by using supply chain finance, on firm value of large buyers was tested at different markets. Later, it was examined whether these variables differed in practice in companies using this funding method. For second part of the study, large firms that started to supply chain finance were searched for 2006-2013, as 31 of them in the USA, 5 in the UK, 1 in France, 2 in Australia, 1 in Mexico, 1 in Singapore, 3 in Turkey, 1 in Taiwan and 1 in China, a total of 46 companies traded on the stock exchanges were identified. The independent variables used in the first part of the research for the relevant companies were calculated for the period prior to the start of supply chain finance (2009) and the following period (2011), and examined whether this method of financing brought about a difference in these variables.

IV. II. Variables

In this research which seeks to determine whether the value of large firms creating supply chain finance is influenced by this financing, the expected effects for the large firms are theoretically explained in Part III.I. In order to determine the expected theoretical effects, the variables which are indicative of these effects are defined. Thus, dependent and independent variables of panel data analysis are determined.

IV.II.I. Dependent Variable

The dependent variable is the annual stock return, which indicates the change in the value of the firm because in the study, it is tried to measure the level of influence on the value

of big companies. For all companies included in the data set, by using share prices, the number of share certificates received during the year, the number of bonus shares received and value of right of priority between the years 2008 and 2013, five-term stock returns between 2009-2013 were calculated. In the survey, annual returns of stocks are calculated as follows (BİST):

$$G_t = \frac{F_t * (BDL + BDZ + 1) - R * BDL + T - F_t - 1}{F_{t-1}}$$

G_t : Return of year "t"

F_t : The latest closing price for the year "t".

BDL : Number of rights issued during the year.

BDZ : Number of bonus share issued during the year.

R : The price of using right of priority

T : Net dividend paid to a share during the year.

F_{t-1} : Latest closing price of the previous year from "t"

IV.II. II. Independent Variables

Large businesses that make supply chain finance available to their suppliers are expected to be influenced by this financing. These effects are described in part III.I of the study. In large firms, by using supply chain finance working capital needs may decrease, short-term borrowing may increase, the average payment period can be extended, return on equity and return on assets may increase, gross margin may increase, financing costs may decrease and the activity volume may be increased. It is possible to monitor these effects with specific financial ratios. Decrease in working capital and increase in short-term borrowing results to decrease in current ratio, acid test ratio and cash ratio and increase in net working capital turnover rate. It is expected that extended payment period by supply chain finance provide longer average payment period and shorter cash conversion cycle for large buyer firms. Increase in activity volume thanks to supply chain finance results to increase in sales and assets. Expected decrease in financing costs and rise in profitability affect gross margin, return on equity, return on assets, earnings before tax and net income positively. Increase in short-term debt also results to change in debt ratios. So, these financial ratios of large firms using supply chain finance is expected to change prognosticatively. For this reason, effect of these financial ratios on firm value is important to predict the effect of supply chain finance on firm value of large firms. Table II shows the independent variables of the study, the way these variables are calculated, the symbol to be expressed in the continuation of the study, and which effect is used to explain. The independent

variables are included in the model by taking the change from the previous term in a similar way with dependent variable.

Table II. Independent Variables of the Study

Independent Variable	Calculation	Symbol	Influence Explained
Current Ratio	Current Assets / Short-term Liabilities	CAOR	● Working capital needs may decrease. ● Short-term borrowing may increase.
Acid Test Ratio	(Current Assets – Inventories) / Short-term Liabilities	ASTOR	
Cash Ratio	Cash and Marketable Securities / Short-term Liabilities	NAKOR	
Net Working Capital Turnover Rate	Net Sales$_T$ / ((Current Assets$_T$ –Short-term Liabilities$_T$ + Current Assets$_{T-1}$ – Short-term Liabilities$_{T-1}$) / 2)	NISDH	
Average payment period	Accounts Payable / Cost of Goods Sold *365	OOS	● The average payment period can be extended.
Cash Conversion Cycle	Inventory conversion period + Receivables conversion period - Payables conversion period	NDS	
Net Sales	Net Sales	NETSAT	● The activity volume may be increased.
Total Assets	Total Assets	AKTOP	
Gross Margin	Gross Profit / Net Sales	BSKAR	● Gross margin may increase.
Return on Equity	Net Income / Shareholders Equity	OZKAR	● Gross margin may increase. ● Financing costs may decrease. ● Return on equity and return on assets may increase.
Return on assets	Net Income / Total Assets	AKKAR	
Earnings Before Tax	Earnings Before Tax	VOK	
Net Income	Net Income	DNK	
Short-term Debt to Total Assets	Short-term Liabilities / Total Assets	KVBPT	● Short-term borrowing may increase.
Long-term Debt to Total Assets	Long-term Liabilities / Total Assets	UVBPT	
Debt Ratio	Total Liabilities / Total Assets	TBPT	

IV.III. Panel Unit Root Tests

As in the analysis of the whole-time series, panel data analysis, which involves both time and horizontal cross-sectional analysis, requires variables to be stationary in order to avoid false associations between variables (Korkmaz, Yıldız & Gökbulut, 2010). The use of non-stationary series may lead to unreliable and economically difficult results. For this reason, before examining the existence of the relationship between the variables in the regression

analyzes made by the time series, it is necessary to examine the time series characteristics of the variables used in the analysis (Altıntaş, 2009).

Panel unit root tests are used to determine whether the data to be used in the panel data analysis are stationary. If the data are not stable, and if the first differences are not still stable, the second difference is taken and the data become stable. In this study, Im, Pesaran and Shin W-stat and ADF-Fisher Chi-square tests which assessed the individual unit root process for each unit, i.e. each company, and Levin, Lin & Chu (LLC) test which investigated the common unit root process, were applied with fixed and fixed trend. According to any method, if the any series are non-stationary, first difference of the series is taken, if not enough, second difference of the series is taken and series become stationary for all series.

IV.IV. Methodology

Panel data analysis and Wilcoxon signed rank test were used in the research. Firstly panel data sets were created for each market separately and panel linear regression was applied to observe the effect of independent variables on firm value. Panel data analysis can be expressed as a combination of regression and time series analysis.

There are different models in analysis to be done with panel data. These are pooled least squares, fixed effects and random effects models (Greene, 2003). In the study, it is necessary to determine which model is more effective before the panel regression analysis is performed. The Breusch-Pagan LM Test which tests the null hypothesis that there is no random effect and F Test which tests the null hypothesis that there is no fixed effect are applied for each market as suggested by Park (2011) and results are summarized in Table III. If null hypotheses are rejected in both test results, Hausman test is applied and if null hypothesis is rejected, fixed effect model; if it cannot be rejected, the random effects model is selected as appropriate model.

Table III. Panel Model Selection

Fixed effect (F test)	**Random effect Breusch-Pagan LM Test**	**Model Selection**
H_0 is not rejected (No fixed effect)	H_0 is not rejected (No random effect)	Pooled OLS
H_0 is rejected (fixed effect)	H_0 is not rejected (No random effect)	Fixed effect model
H_0 is not rejected (No fixed effect)	H_0 is rejected (random effect)	Random effect model
H0 is rejected (fixed effect)	H_0 is rejected (random effect)	Choose a fixed effect model if the null hypothesis of a Hausman test is rejected; otherwise, fit a random effect model

To determine the effective model, each test shown in Table III was applied to the 16 markets forming the data set of the research, and according to these results, the appropriate model for each market was determined and revealed in Table IV.

Table IV. Appropriate Panel Model for Each Market

	F Test		Breusch-Pagan LM Test		Hausman Test		
Country	**Statistic**	**Prob.**	**Statistic**	**Prob.**	**Statistic**	**Prob.**	**Model**
USA	195.415060	0.0000	2880.446	0.0000	46.78567	0.0000	Fixed Effect
UK	126.747134	0.0000	1586.113	0.0000	9.542332	0.0085	Fixed Effect
France	12.964812	0.9982	81.05366	0.0000			Random Effect
İtaly	164.341157	0.0000	2199.738	0.0000	7.968040	0.0928	Fixed Effect
Germany	164.125532	0.0000	2234.390	0.0000	15.21670	0.0551	Fixed Effect
Japan	171.823147	0.0000	1717.311	0.0000	22.78448	0.0190	Fixed Effect
Canada	103.919712	0.0000	826.3677	0.0000	1.943108	0.8570	Random Effect
Australia	30.455051	0.0000	0.388851	0.5329			Fixed Effect
Turkey	365.244782	0.0000	7468.696	0.0000	3.624220	0.3050	Random Effect
Argentina	61.002123	0.0000	281.4644	0.0000	1.368772	0.5044	Random Effect
India	390.259804	0.0000	8146.447	0.0000	4.782487	0.3104	Random Effect
South Korea	88.290303	0.0000	1.451742	0.2282			Fixed Effect
Mexico	12.886975	0.0049	8.741995	0.0031	6.229153	0.1827	Random Effect
Russia	43.591813	0.0000	0.341639	0.5589			Fixed Effect
Brazil	105.567045	0.0000	7.060145	0.0079	0.904369	0.8244	Random Effect
China	1096.792752	0.0000	55.37990	0.0000	1.765664	0.8805	Random Effect

In the first part of the analysis, the influence of expected effects on the firm value because of the involvement of supply chain finance were examined with panel regression analysis, then it will be tested whether these effects are seen in companies that practice this funding method in practice. For this, 46 large firms that provide supply chain finance for their suppliers and the start of this financing has been determined. The indicators that are expected to be affected are calculated separately for the period before and after the beginning of the supply chain finance. These indicators were tested with the Wilcoxon Signed Rank Test to determine whether there was a statistically significant difference. The nonparametric Wilcoxon Signed Rank Test was chosen as the appropriate method for the data set because it does not need the assumptions required for parametric tests. The Wilcoxon Signed Rank Test examines the null hypothesis that there is no difference between two samples.

IV.V. Autocorrelation and Heteroscedasticity

One of the important assumptions in the least squares analysis is that the error terms have a constant variance. In cases where the variance of error terms does not remain constant, the problem of heteroscedasticity is encountered. In the case of heteroscedasticity, the estimates obtained with least squares maintain neutrality and coherence but lose the property known as minimum variance or effectiveness. This can lead to unreliable statistical tests. So the partial t and general F tests of the least squares estimators lose reliability. Moreover, the predictions made with the developed model are not effective (Albayrak, 2008). In this study, heteroscedasticity was analyzed by Wald test for fixed effect models and LR test for random effect models. The common null hypothesis of both tests is that there is no heteroscedasticity.

Another assumption which is as important as the constant variance in the analysis by the least squares method is that there is no relation between the error terms, i.e. autocorrelation. In the case of autocorrelation between error terms, the least squares estimators of the parameters are not effective even though they are unbiased and consistent. In this case, the variance of the parameters will also be deviated because the variance of the error term will deviate. When positive autocorrelation is found, the deviation will be negative and variances will be undercounted. As a result, the t test statistic value will be larger than the actual value. Thus, an insignificant coefficient is likely to be significant and also R^2 will rise. Therefore, since the value of F is greater than it is, T and F tests will lose reliability and give misleading results (Yavuz, 2009). In this study, whether the error term is related or not, i.e. whether there is an autocorrelation problem in the analysis has been tested with the Wooldridge Autocorrelation Test and the null hypothesis that no autocorrelation exists between error terms was tested.

The LR Test or Wald Test results which are used to test heteroscedasticity and Wooldridge Test results which are used to test autocorrelation for each market are summarized in Table V. If the autocorrelation problem is present in the error terms according to the test results, White period standard errors and covariance is used (Sayılgan & Sayman, 2012). White diagonal correction for markets with only heteroscedasticity problems, white cross-section correction for markets with both heteroscedasticity and autocorrelation problem is used (Korkmaz & Karaca, 2014).

Table V. Autocorrelation and Heteroscedasticity Tests Results

	Wooldridge Test		Autocorrelation	LR Test / Wald Test		Heteroscedasticity	Robust Estimator
Country	**F**	**Prob.**		**chi²**	**Prob.**		
USA	15.554	0.0001	YES	3.1e+05	0.0000	YES	White cross-section
UK	4.753	0.0304	YES	2.6e+35	0.0000	YES	White cross-section
France	5.089	0.0313	YES	118.23	0.0000	YES	White cross-section
Italy	0.351	0.5543	NO	14413.98	0.0000	YES	White diagonal
Germany	20.412	0.0000	YES	2.2e+06	0.0000	YES	White cross-section
Japan	28.700	0.0000	YES	11949.71	0.0000	YES	White cross-section
Canada	105.604	0.0000	YES	1248.91	0.0000	YES	White cross-section
Australia	7.538	0.0067	YES	3.4e+05	0.0000	YES	White cross-section
Turkey	16.332	0.0001	YES	486.32	0.0000	YES	White cross-section
Argentina	24.742	0.0000	YES	164.54	0.0000	YES	White cross-section
India	325.440	0.0000	YES	425.47	0.0000	YES	White cross-section
South Korea	26.592	0.0000	YES	11264.80	0.0000	YES	White cross-section
Mexico	0.000	0.9983	NO	190.74	0.0000	YES	White diagonal
Russia	6.454	0.0138	YES	2.0e+05	0.0000	YES	White cross-section
Brazil	71.732	0.0000	YES	111.54	0.0000	YES	White cross-section
China	590.031	0.0000	YES	616.29	0.0000	YES	White cross-section

IV.VI. Results of Panel Data Analysis

Separate panel regression analyzes were conducted for 16 markets to examine the impact of the 16 financial indicators on firm value, which are expected to emerge in large firms by making supply chain finance available to their suppliers. 16 independent variables were searched for each market by a step-wise backward elimination method to create models that are effective in each market. It is seen in the analysis results that the established models are statistically significant for all markets. In addition, in the analysis results, the adjusted R-square which expresses explanatory power of the independent variables on the changes of dependent variable remained at low levels. It can be said that this is normal considering the fact that the factors that can affect the firm value are too much. The panel regression analysis results for each market are summarized in Table VI

Table VI. The Panel Regression Analysis Results for Each Market

	Australia	Turkey	Argentina	Germany	India	İtaly	South Korea	UK	Mexico	Russia	France	USA	Brazil	China	Japan	Canada
CAOR				0.03939 (0.0675)						-0.00887 (0.0246)					-1.01957 (0.0000)	-0.25403 (0.0000)
ASTOR	0.01007 (0.0361)						0.02718 (0.3254)	0.10212 (0.0986)	0.38012 (0.2674)			0.05082 (0.0278)		0.08584 (0.0900)	1.04302 (0.0000)	0.26245 (0.0000)
NAKOR					0.04364 (0.0009)	-0.01042 (0.0000)									-0.06578 (0.0032)	
NISDH										0.00015 (0.0000)						
OOS												-0.01294 (0.5026)			0.46949 (0.0011)	
NDS			0.00496 (0.0000)	8.46E-05 (0.2493)							-0.11906 (0.0000)					-0.07242 (0.0000)
NETSAT		-0.01946 (0.0523)		0.03570 (0.2268)							0.87985 (0.0354)		0.50039 (0.0281)		0.25672 (0.0806)	
AKTOP				0.30804 (0.0000)		-0.00032 (0.9983)	0.13390 (0.4235)	-0.19631 (0.2164)			-1.70194 (0.0007)	0.20069 (0.0000)	-0.13901 (0.0134)	0.07107 (0.0000)	0.17139 (0.0017)	0.12009 (0.0000)
BSKAR									-2.08891 (0.0982)	0.13810 (0.1167)		0.09120 (0.0000)				0.14765 (0.0324)
OZKAR				0.00287 (0.2976)	-0.02930 (0.2438)		0.00749 (0.1128)		0.06571 (0.0406)	-0.06447 (0.0512)						
AKKAR	0.00628 (0.6002)					-0.03654 (0.0048)	0.00349 (0.8952)			0.08381 (0.0018)	0.14495 (0.0003)				-0.02300 (0.0445)	
VOK	0.00372 (0.2679)	0.00205 (0.0451)								0.02840 (0.0005)		0.00220 (0.0103)	0.01005 (0.0050)	0.00593 (0.0072)	-3.86E-05 (0.8024)	
DNK	-0.01002 (0.5472)			-0.00524 (0.2001)	0.03551 (0.2215)	0.04261 (0.0067)	-0.0218 (0.4233)			-0.02729 (0.0000)	-0.17538 (0.0000)				0.02443 (0.0178)	
KVBPT				0.02400 (0.0005)										-0.19952 (0.2722)	-0.08488 (0.2357)	
UVBPT									-0.01434 (0.0001)	0.08251 (0.0000)						
TBPT		-0.17819 (0.0938)	-1.12748 (0.2123)	-0.28226 (0.0000)	-2.83E-05 (0.1463)		-0.0808 (0.4468)			-0.41413 (0.0000)	0.37892 (0.2449)	-0.27166 (0.0000)		0.19457 (0.4258)	-0.43704 (0.0000)	
C	21.8618 (0.0000)	37.7355 (0.0726)	5.62348 (0.8599)	22.0430 (0.0000)	38.5489 (0.0803)	3.61685 (0.0920)	26.9857 (0.0000)	-5.23651 (0.0000)	-11.2828 (0.0014)	7.15334 (0.0000)	0.95154 (0.9262)	22.5831 (0.0000)	22.2519 (0.2065)	24.1830 (0.2714)	12.6329 (0.0000)	26.2488 (0.0229)
F Statistic	4.69475*	5.9051*	3.043***	21.4625*	7.09719*	29.0661*	10.121*	29.7826*	10.6386*	8.97082*	5.72359*	36.7179*	6.08539*	8.55106*	26.9901*	12.1073*
Adjusted R-Square	0.042412	0.02155	0.03477	0.150501	0.035951	0.249489	0.18837	0.147768	0.203396	0.294625	0.182447	0.159513	0.071205	0.025497	0.287958	0.062857

"*" İndicates that the model is statistically significant at the significance level of 1%, and "***" İndicates that the model is statistically significant at level of 10%.

As can be seen in Table VI, the increases in the current ratio (CAOR) have an effect on firm value in 4 markets. The increase of current ratio in Russia, Japan and Canada reduces the firm value. In Germany, the increase in the current ratio has an increasing effect on firm value. When the acid-test ratio (ASTOR), which is another liquidity ratio, is examined, it is seen that the related ratio is used in the models formed for 8 markets. Although the relevant ratio is not statistically significant in 2 of these 8 markets, the coefficients for all markets are found to be positive. In other words, contrary to the current ratio, the increase in the acid-test ratio results increase in the firm value. It is observed that the cash ratios (NAKOR) which is another one of the liquidity ratios are included in the model established for 3 markets, increases in the corresponding variables results the increase in firm value in India market and decrease in Italy and Japan markets. The only market where all three liquidity ratios are included in the model is Japan. While the increases in the current ratio and the cash ratio for the Japanese market have reduced the firm value, there is a positive relationship between acid-test ratio and firm value. This leads to the conclusion that current assets other than stocks and cash and cash equivalents have an increasing effect on the firm value. The net working capital turnover rate (NISDH), which represents the level of activity of the net working capital, is used in the model for the Russian market and has a positive effect on the firm value.

It is seen that the average payout period (OOS) and cash conversion cycle (NDS), which are the most important indicators that are expected to be influenced for large firms that generate supply chain financing, are included in models for 2 and 4 markets, respectively. The result is that the average pay period is not statistically significant for the US market, only the effect on the firm value can be explained at a meaningful level for Japanese market. In this market, there is a positive relationship between average payment time and firm value. In other words, it has been seen that companies extending the payment period for their purchases have a positive effect on the firm value. A statistically significant relationship between cash conversion cycle and firm value is found for 3 markets, the relationship is positive for Argentina and negative for France and Canada. Therefore, the opinion that shortening the cash conversion cycle for French and Canadian markets increases the firm value has been supported.

It is seen that the change in net sales (NETSAT) included in the study's dataset to express the increase in activity volume is included in the model for 5 markets and the change in total assets (AKTOP) is included in the model for 10 markets. As expected, there is a positive relationship between changes in net sales and firm value for France, Brazil and Japan markets. In Turkey, on

the contrary to the expectations, there is a negative relation between net sales and firm value. The effect of change in total assets on firm value is found statistically significant for 7 markets. There is a negative effect for France and Brazil while it is observed that the increase in the total assets also increases the firm value for 5 markets (Germany, USA, China, Japan and Canada).

In order to express the profit expected to be influenced for large firms that generate supply chain finance, both the profitability ratios and the changes in profit amounts are included in the models and their effects on firm value are examined. Theoretically, the increase in profits is expected to increase the value of the company because it is expected to increase future cash flows. The most appropriate variable for this theoretically expected situation is the pre-tax profit (VOK) change. It has been shown that the related variable has a positive effect on the firm value for all of the 5 markets in which the variable is included the model. The same situation is not valid for other profit and profitability indicators. While the gross margin (BSKAR) has statistically significant and positive effect on firm value for the US and Canadian markets, there is an exact opposite situation for the Mexican market. Again, while the increase in the return on equity (OZKAR) has created an increase in firm value for Mexico, it has been seen that it reduces the value of the firm for the Russian market. The effect of return on assets (AKKAR) on firm value was found as statistically significant for 4 markets. There is a positive effect on the firm value for Russia and France markets, while for Italy and Japan markets it is found to be negative. A similar situation exists for change in the net profit (DNK). While accelerating the increase in net profits for the Italian and Japanese markets boosts firm value, there is an adverse effect for the Russian and French markets.

Finally, the effect of financial structure on firm value is examined. It is seen that the short-term debt to total assets (KVBPT) is statistically significant only for the German market and positively affects firm value. It is found that long-term debt to total assets (UVBPT) is significant in 2 markets, a positive relationship for the Russian market and a negative relationship for the Mexican market is valid. The debt ratio (TBPT) affects the firm value negatively for the 5 markets in which it is included the model. In other words as the borrowing rate increases, the value of the firm decreases.

IV.VII. Results of Wilcoxon Signed Rank Test

The effect of the variables expected to be theoretically influenced for large buyers using supply chain finance on firm value is analyzed for each market by panel data analysis. As a result of the analysis it is observed that different variables for each market have an effect on firm value. In the next phase of the study, Wilcoxon Marked Rank Test is applied to test whether the expected effects actually exist. It is examined whether there are any significant differences between previous and the following period data from starting to use this method in 16 variables predicted to be influenced by this financing method and the results are shown in Table VII. With the analysis applied to all 46 firms, the analysis is repeated for only 31 companies operating in the United States and 15 companies operating outside the United States.

Table VII. Wilcoxon Signed Rank Test Results

	For all 46 companies		For 31 companies operating in the United States		For 15 companies operating outside the United States	
Variables	Z value	Probability	Z value	Probability	Z value	Probability
CAOR	-0.410	0.6820	-0.431	0.6664	0.000	1.0000
ASTOR	-0.464	0.6424	-0.568	0.5698	-0.170	0.8647
NAKOR	-1.469	0.1417	-1.862	0.0626	0.057	0.9547
NISDH	-0.879	0.3791	0.000	1.0000	-1.533	0.1252
OOS	-1.273	0.2031	-1.881	0.0599	0.511	0.6092
NDS	1.060	0.2892	1.068	0.2855	0.341	0.7333
NETSAT	0.672	0.5016	0.607	0.5435	0.625	0.5321
AKTOP	1.284	0.1992	1.137	0.2557	0.454	0.6496
BSKAR	0.978	0.3282	1.019	0.3082	0.341	0.7333
OZKAR	0.191	0.8484	0.372	0.7096	-0.057	0.9547
AKKAR	-0.235	0.8143	0.235	0.8141	-0.795	0.4265
VOK	-0.279	0.7806	0.196	0.8446	-0.682	0.4955
DNK	0.093	0.9260	0.333	0.7390	-0.170	0.8647
KVBPT	0.147	0.8827	0.353	0.7243	-0.057	0.9547
UVBPT	0.169	0.8655	-0.216	0.8293	0.795	0.4265
TBPT	0.432	0.6661	-0.118	0.9064	1.079	0.2805

For companies traded in the US and for companies traded in non-US countries as well as for all firms all 16 variables do not vary depending on whether supply chain finance is used or not. Probability values greater than 0.05 as a result of the Wilcoxon Signed Rank Test applied to all variables in all three groups indicate that the variables do not show any significant change.

These results show that the financial variables expected to be influenced for large firms using supply chain finance do not show theoretically expected changes. From this point of view,

it can be argued that supply chain finance has no effect on firm value. In order to strengthen this argument, it is important to examine the non-financial variables related to companies such as "development of supplier relations" which is influenced by supply chain finance in a separate study. In this study, it is tried to foresee that only whether the financial variables differentiate and affect the firm value. As a result, it is observed that such an effect does not exist. However, only financial variables do not affect firm value. For this reason, the consideration of non-financial variables in different studies will provide important contributions to the literature.

V. CONCLUSION

Since the primary financial objective of the business is to maximize the shareholder value, the key factor in determining the financing methods should serve the same purpose. It is expected that all parties participating in the method of supply chain finance, which is claimed to be based on win-win principle, will have a positive impact on the firm value. The purpose of this study is to find out whether supply chain finance shows the expected effect on large firms with high credit ratings.

For the aim of the study, firstly financial indicators that are expected to be influenced for large buyers using supply chain finance were examined by panel data analysis to see whether they had an impact on firm value. The key point reached by panel data analysis is that the effect of the variables on the firm value shows significant differences for the 16 markets involved in the analysis. For example, the increase in the current ratio have a decreasing effect on firm value in Russia, Japan and Canada markets as expected, while there is an increasing effect on the German market. Similarly, effect of changes in net profit growth on firm value is positive for the Italian and Japanese markets, while negative for the French and Russian markets. At the same time, despite the presence in the analysis models for Australian, German, Indian and Korean markets, the corresponding variable did not seem to have any significant effect on the value of the firms in these markets. The results show that it is not possible to mention a common model that affects firm value for all markets. In this case, developing a strategy by evaluating the variables influencing the firm value for the markets will contribute to increase the firm value when companies will use the supply chain finance. For example, a large buyer who will use supply chain financing in Turkey may increase the firm value by using this method to increase profit before tax; on the other hand

large enterprises that will use this method in France and Canada should concentrate on the shortening of the cash conversion cycle.

With the Wilcoxon Signed Rank Test conducted during the second phase of the study, it is analyzed whether the financial variables of large firms are differentiated by using supply chain finance. According to analysis results, for companies traded in the US and for companies traded in non-US countries as well as for all firms, all 16 variables do not vary depending on whether supply chain finance is used or not. The reason for such a consequence may be that the method cannot be used effectively by the suppliers or the use is limited. This can be explained by the fact that small suppliers are lacking in financial information, method is too new, and factors such as hosting technology requirements result lack of interest from suppliers.

In this study, the effect of supply chain financing on firm value of large buyers is evaluated by using financial variables and it is concluded that there is no effect. However, in order to be able to pinpoint that supply chain financing has no effect on firm value, the effect of other non-financial variables (supplier relationships, etc.) besides financial variables needs to be analyzed. For this reason, the consideration of non-financial variables in different studies will provide important contributions to the literature. Also, the studies to be performed by using different financial variables will be important in terms of determining the effect of supply chain finance on firm value. It will also be a significant contribution to the literature with studies focused on determining how supply chain finance affects the value of small suppliers and financial institutions.

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