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Adopting Supply Chain Financial Solutions for the Risk Associated with Supply Chain Financial Flows

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Abstract— **The main aim behind this empirical research is to investigate the impact of the adoption of the supply chain financial solutions on the supply chain financial flows of manufacturing firms listed in Indonesian Stock Exchange. In addition to that the study has also investigated the moderating role of cash conversion cycle in the relationship between supply chain financial solutions and supply chain financial flows. To achieve the objective of the study we have employed the panel data method and have used the linear repression and hierarchical regression techniques. The final sample comprise of 756 firm year observations over the period of 6 years from 2012-2017.teh findings of the study have shown an agreement with the proposed findings of the study. The cash conversion cycle appears as strong moderator. In author knowledge this is among few pioneering studies on this issue and will be helpful for future policy makings.**

Keywords: *supply chain financial flows, Supply chain management, Indonesia*

1.0 Introduction

With the recent financial and economic crisis, a considerable increase is witnessed in the cost of corporate borrowing and reduction in granting new loans [1] Furthermore, the liquidity has dried up from industries as a result of collapsing mortgage and asset backed markets [2],[3]. Couliably [4] and Garcia-Appendini and Garriga [5], mentioned that in such hard situation, firms particularly those with considerably better bargaining power tried to extend trade credit, for increasing other sources of financing from suppliers, thus gave rise to even worse situation towards upstream SC. This has increased the demand for introducing programs and solutions to optimized and perfect working capital. One of the important approaches in this regard is the Supply Chain Finance (SCF), that aims to settle financial flows among organizations [6], using solutions that are designed and applied by the financial institutions or technological service providers [7], [8]. The advantage of this approach depends on the cooperation between players of supply chain. It often results in improvement of commitment, trust and increased profitability along the SC [9], Regardless of its relevance with the practice and research of Supply chain management, only a limited contribution so far has been found, which further claimed to investigate this topic for extended knowledge. However, a general agreement regarding relevance of financial problem in SC, its practice and research provided two perspectives. The first perspective is supply chain oriented which denotes that supply chain finance includes decisions involving working capital in each of its elements of receivable, inventories, accounts payable and fixed asset financing. Thus, focusing the optimization of cash flows throughout the SC, through multiple financial and non-financial solutions [10],[11]. While the second perspective is finance oriented, that focuses on company's financial products in SCs [12],[13]. This perspective often emphasizes on reverse factoring i.e. an agreement through which a financial entity purchases receivable accounts from information-transparent, selected, and qualitative buyer having a lower credit risk as compared with the risk suppliers, thus permitting an access to short term credit on lower cost. [14] thus explains that from both several academic and practitioners' contributions, reverse factoring and SCF are interchangeable.

However, its financial perspective is narrowed and short term oriented, in terms of the tools it employs, which mainly revolves around reverse factoring for financing cash issues in supply chain. The available literature is inadequate in terms of empirical research, providing insufficient evidence to companies for comparing different solutions to SCF. It does not particularly discuss important elements involved in decision making, that leads to the implementation of supply chain finance. With perspective of supply chain finance, it operates on the collaboration between supply chain actors, as a key for better financial flow management, while less importance is given to any implemented financial product. Therefore, this paper aims to investigate a series of case studies through adopting SCF solutions that affect adoption and objectives,

for the purpose of contributing to the development of a framework and for its facilitation in managerial decision making in SCF.

The paper is structured as follows: second section involves literature background; the third section constitutes research question and methodological representation of the model; fourth section involves the discussion of results; fifth section discusses and summarizes the developed framework and the final section includes conclusion and suggestions on the related topic. Therefore, following the agency and stakeholder theory, present study is employed to fill the existing gap in the literature, by identifying relationship among the supply chain financial flow solutions and supply chain financial flows of manufacturing firms in Indonesia.

2.0. Literature Review

2.1 Financial flows in supply chains

[15] and [11], suggested that in literature it is common to observe supply chain as an inter-company information, product, and cash flows among practitioners and in theoretical contributions. In recent past years, significant efforts have been put forward for the alignment of information flow and product delivery [17][16],[18], With respect to coordination of information and product flows, same arguments cannot be stated regarding financial flows as it lags in its journey of alignment and optimization of product and cash flows [11],[19]. However, there is a possibility of discovering theoretical contribution in the form of analytical models, that focus on aligned and joint management of product and financial flows. For instance, Seifert [20], proposed a common topic available in the literature of trade credit i.e. the analysis of trade credit decision and monetary policy, which goes back to the study by [21]. Literature also includes related studies such as analysis of relationship between inventory control and asset-based financing [22], coordination of entire supply chain through financial flow management [23], [24], and joint short-term financing of supplier-buyer dyads [25]. These contributions are purely theoretical, based on unrealistic assumptions, including settled demand or instantaneous or infinite materials, particularly in case of integration between actors involved in a supply chain, that often depends on the availability of information or absence of opportunism [26]. Rather, empirical evidence available on the collaboration exhibits that companies cooperate rarely in a theoretical way, moreover failure in recognizing supply chain partners and trust deficit often results in insurmountable hurdles [27],[28].

2.2. Risks associated with supply chain financial flows

Supply chain financial risk management is considered as the second topic of relevance associated to financial flows in SC. In recent years, its relevance has become increased as companies with limited cash flows, attempted to compensate for decline in bank lending with increased approach to trade credit [29],i.e. improvement of payment terms with suppliers or lowering settlement terms towards customers. As a result of this behavior, probability of financial risk increases having a clear effect on supply chain i.e. lost payments thus spread from company towards its suppliers [30]. According to [31], studies have shown that one fourth of a lost payment or liquidity shock on average is passed towards upstream SC, and it otherwise stops only in a case of cash-rich company. However, this propagation is just one of the consequences arising from liquidity shortage. Some of the studies have also mentioned that trade credit defaults also exhibit downstream propagation effect, because decline in trade credit happens as a result of the induction of liquidity shocks, which causes increase in delayed payments and default risk [32]. The available literature on risk management in supply chain is somehow quietly amalgamated, hence it presents various contributions that mainly focuses on quantitative models for reducing SC disruption risk, including studies by [33], or approaches for the qualitative research on organization configuration for supply chain risk management including [34],[35],and [36]. Despite relevance with the literature, still the aspects of financial flows are overlooked. For instance, Christopher [37],have not considered frameworks for financial supply risk, even after recognizing its necessity to global risk sources. However, [38], acknowledged that along the supply chain, financial flow is one of the potential sources of risk, but did not mention it in his findings.

[32] and [39], have suggested a solution for handling trade credit default chains, by allocating appropriate financial products and policies, liquidity towards companies that are cash rich, in order to permit finances to the cash constrained distributors or supplier, especially SMEs. This approach is consistent with supply chain finance [40].In supply chains, supply chain finance approach, has an ability to represent a step for coalition among theory and its implication on financial flow optimization.

2.3. Different perspectives on supply chain finance

The term supply chain can be defined in different ways. Two major perspectives are identified as a result of a study investigating different conceptual

and definitional contribution on SCF. These are supply chain oriented and financial oriented, that further extends to buyer driven approach [41]. According to financial perspective, supply chain finance is a set of financial or innovative solutions [42], Objectively, a generic leader or financial institution with respect to financial solution, plays a role of compulsory partner in the landscape of SCF. Another characteristic of this perspective is short term financing, i.e. particularly focusing financing solutions on either receivable or payables.

Trigger events are found as the most important ones in Supply chain finance solutions during a trade process, such as acceptance of order, shipment, developing invoices and deciding payable due date [43].,[44], also confirmed this view, they stated that supply chain finance is divided conceptually into further three categories namely; pre-shipment, in-transit, and post shipment financing. However, it is worthy to note that chances are there to identify set of articles in financial perspective, that deals with stricter perspective on SCF, and can be named as buyer-driven view. and suggested that, such kind of articles take SCF as a buyer driven approach, while working capital-oriented cash solutions mostly takes it as analogous to reverse factoring [45], [45]. [46], states that this view has been accepted by the practitioners. While contrarily, the SC perspective within the framework of SCF, includes the optimization of inventories between the supplier and customer or along the supply chain, for reducing working capital and need for shifting working capital to buyer, or further financing for better availability of finances or reducing cost of financing. [11,61,63], to exemplify stated that conceptual model was tested in the scenario of Vendor Managed Inventory (VMI), and the benefits of generic inventory shifting was analyzed by [48],among two players of supply chain. Moreover, another important feature of SC perspective is about collateral or object of financing. SCF can also be applied to financing of fixed assets such as by paying for per production solution or making decisions on joint investment in logistic assets [47],[49], [61-65], Another important feature is bank and financial institutions' role, which is still relevant and is not mandatory in area of SCF solutions.

2.4. Adopting supply chain finance solutions

Several applications of supply chain finance are found through various programs, models and solutions. Some of its schematic programs are named as general consensus, these days. The origin of SCF solutions goes back to the time even before the introduction of its definition. For instance, early examples regarding vendor financing was described by [50], where two companies issued short term loans in 1942, towards the vendors. The solutions get evolved with time. Let's mention a recent example of an Italian stylish named Renzo Rosso, he initiated a setup of advanced IT-based reverse factoring in his company, which aims to share the rating of his vendors with other financial institutions, in this way he rewards best suppliers of companies the benefit of lower financing cost. This evolution has been followed by academic research through numerous analytical/conceptual and empirical contributions focusing mainly on reverse factoring. Such as proposed a framework for analytically assessing the perfect extension of payment terms regarding reverse factoring, focusing majorly on solutions of buyer side, while study aiming the supplier side was done by [51],in which an analytical model was designed to investigate the effect of reverse factoring on suppliers from small and medium enterprises. While on the empirical side, an econometric investigation on the benefits of reverse factoring was done as a means of providing financial flows for SMEs [52], A clearer picture was discussing barriers and objectives on implementing reverse factoring, and finally [14], also provided an analysis based on a case study, in order to discuss the framework for adopting reverse factoring. Nevertheless, market of SCF is wider as compared to reverse factoring. Two new solution groups can be identified in particular from academic view, that falls in SC perspective namely: innovative financing solutions, i.e. two-tier supplier financing and seller based invoice auctions and solution to typical supply chain collaboration (SCC), i.e. VMI and consignment stock [11], However, the problem of supply chain financing can be resolved by reverse factoring, but it is not the ultimate answer to this problem. However, presently, there is an absence of empirical evidence with respect to the consideration of whole SCF within SC perspective.

2.5. Benefits for a company in adopting a supply chain finance solution

For the purpose of present study, supply chain finance solutions are categorized into three groups, as based on the literature. These are: supply chain collaborative solutions, innovative financing solutions, and traditional financing solutions. The first group contains typical SC collaborative solutions that optimize working capital especially inventory with the collaboration of SC partners, the second group involves innovative solutions that generally require comprehensive analysis of SC and high trade process digitalization, while the third group takes into account traditional practices of reverse factoring, that includes trade process digitalization of lower degree.

Generally, the advantages that companies usually get through implementation of SCF solutions are classified into three macro categories namely:

- Declination of Net Operative Working Capital, by increasing accounts payable or reducing accounts receivable, as in similar models of reverse factoring [30], and reduced inventories similar to consignment stock or VMI [54],[55].
- Increase in profits that can be achieved by reduction of cost of sold goods, like the models of Dynamic Discounting, or by reducing financial cost
- Strategic advantages, that are related to risk management in FSCM, that can be achieved by a redistribution of other activities that aims to enhance the access to cash flows for distributors or suppliers, as in SCF's innovative solutions or reverse factoring, or redistributing NOWC [17].

The analysis of literature on optimization of financial flow and SCF shows a gap between theoretical and practical implications. Analytical and theoretical contributions, though insightful and illuminating in terms of understanding of model, but a failure to analyze obstacles for integration among players of supply chain and presentation of unrealistic assumptions. Though focusing by several authors, managerial perspective of SCF adoption, is quite underrepresented. According to researchers, the qualitative studies available in literature are appreciative, but having limited scope for SCF solutions or applicable for few elements regarding adoption process i.e. focusing barriers to adoption or limiting sample to upstream SC[45];and [17]. Hence, the focus of this article is to extend theoretical information of qualitative research for the SCF adoption, providing empirical analysis evidence on application of Supply Chain Finance.

Developing a process of continuous improvement, based on monitoring of closed-loop and managing compliance and spending patterns.

H1: Corporate governance has significant impact on firm supply performance

H2: Corporate governance has significant impact on supply chain governance

H3: supply chain governance has significant impact on firm supply performance

H4: Corporate governance affect the firm supply performance thorough supply chain governance

Figure 1 depicts the theoretical framework of this study. The resource-based theory and agency theory are used to conceptualize the framework shown in figure 1.

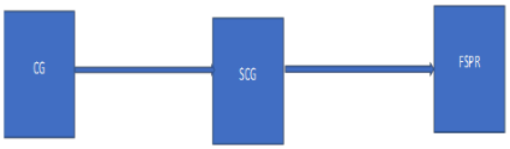

Figure 1: Conceptual framework

3.0. Data source

Data of four fiscal years (2010-2017) is collected from annual reports of the banks . Initially, the entire listed banks in Iraqi Stock Exchange was the target sample. However, later firms with missing data and liability financing more than the total asset value or negative value of equity are excluded from the analysis and the final sample is comprises of 26 banks with 208 firm's year observations.

3.1. Methodology

To achieve the objective the current study has adopted the panel data methodology. The panel data methodology advocates the polling of observation into smaller units of cross-sectional nature over many intervals of time or time periods [3],[53]. One of the advantages of this method is that it provides more detailed, comprehensive authentic findings which are not possible with other simple analysis such as time series or cross-sections. The general form of panel model is as follow .

$$Y_{it} = \alpha_{it} + \beta X'_{it} + \varepsilon_{it} \dots (1)$$

in our case, as our sample is spread of 6 years from 2012 to 2017 and the total number of firms is 100, therefore

i=1,……..…..,126,

t =1,……, 8

The error vector is given by

$$\varepsilon_{it} = v_{it} + u_{it} \quad \dots\dots (2)$$

Where v_{it} the individual is the effect of each of the industrial companies and u_{it} is the error which assumes a normal distribution.

$$SCFF_{it} = \alpha_0 + \alpha_1 ACP_{it} + \alpha_2 APP_{it} + \alpha_3 ITO_{it} + \alpha_4 CCC_{it} + \varepsilon_{it} \ldots\ldots\ldots (3)$$

Hierarchical multiple regression model is a minor extension form of classical linear multiple regression . Hierarchical multiple regressions allow another variable between independent the ent and dependent variable to depend on the level of another independent variable. (i.e. the moderator). It is an appropriate method for detecting the effects of moderating variables. This method improves the attempts of ordinary linear regression estimation by adding a third variable in the model.

The moderator hypothesis is accepted or rejected on the basis if outcome the of the interacting term is significant or insignificant. [58-69] also highlighted that there may be direct as significant ant relationship between path a and path b with outcome variable, but these paths are conically not relevant to test the moderating effect. The linear model of moderated relationship defines by [59] is as follow

$$Y=Y_{it} = \alpha_0 + \alpha_1 X1_{it} + \alpha_2 X2_{it} + \alpha_3 X1_{it} X2_{it} \ldots (4)$$

Where:

α_0=Intercept

α_1X1= Linear effect of X1

α_2X2 = Linear effect of X2

α_3X1 X2= Moderating effect of X2 on X1

Thus, following [58] and [59] the equations Moderating the moderating impact of dividend payout in the relationship between cash flow from operation, capital expenditures, earnings before interest and tax and cash flow moderating model for this study are as follows:

$$SCFF_{it} = \alpha_0 + \alpha_1 CCC_{it} + \alpha_2 (ACP * CCC)_{it} + \varepsilon_{it} \ldots\ldots\ldots (5)$$

$$SCFF_{it} = \alpha_0 + \alpha_1 CCC_{it} + \alpha_2 (APP * CCC)_{it} + \varepsilon_{it} \ldots\ldots\ldots (6)$$

$$SCFF_{it} = \alpha_0 + \alpha_1 CCC_{it} + \alpha_2 (ITO * CCC)_{it} + \varepsilon_{it} \ldots\ldots\ldots (7)$$

Where, for each company (i) and each year (t); SCFF is a proxy of supply chain financial flow, ACP is average collection period, APP is average payment period , ITO is inventory turnover and CCC is cash conversion cycle is a proxy of economic growth and alternatively of financial crisis.SUSINDEX is sustaiabity index Table 1: Correlation Analysis

developed by the factor analysis of three key factors namely profitibity, efficency, and liquidity, INV is the ratio of investmnet to total asset , NII, is the ratio of non intrest income to total assets, and LOAN is the ratio of total advances to total aset.$ACP * CCC, APP * CCC, and\ ITO * CCC$ are intrection terms. $\alpha_1 - 3$ are coefficients of concerned variables and ε_{it} is random error term for the i[th] firm of time t .

3.3 Pre-test specifications

To decide between the panel data fixed effect random effect or pooled OLS we have used are-test specification tool known as Breusch and Pegan Lagrangian multiplier (LM) test. This is a test which is used for the purpose of selecting the most fitting model between random effect and pooled *OLS*.The results of the test var (u)=0, Chaibar2(01)=0.00 and Probability>

	1	2	3	4	5
SCFF	1				
APP	0.5379*	1			
ACP	-0.3242**	0.1353*	1		
ITO	-0.2027	-0.2322	0.186	1	
CCC	0.3210**	0.2359**	-0.0117*	-0.2914*	1

Chaibar2=1.00. The results of *Breusch and Pegan Lagrangian multiplier (LM) test* shows that, the probability value of Breusch and Pegan lagrangian multiplier test(1.0000) is not significant. This leads to non-rejection of the null hypothesis, which means that there is no entithe ty effect in the model. Thus, the test perfectly suggests that pooled OLS is the most efficient and appropriate.

4.0 Analysis and Discussion

4.1 Correlation Analysis

The result of the correlation analysis is discussed in table 2. The results indicate that the APP and CCC are positively related to SCFF. Whereas the ACP and ITO are in negative relation to audit budget.

Table 1: Correlation Analysis

4.2. Direct Results

The prime objective of the current study is to investigate the impact of supply chain financial solutions such as APP, ACP, and ITO on the SCFF.

In addition to that the currents study is also interested in finding the relationship between CCC and SCFF. Finally, the study has also investigated the moderating role of CCC in the relationship between ACP, APP, ITO, and SCFF. The finding of the study is discussed in table 2.

The results of the current study show that all the supply chain solutions are in significant relations with the supply chain financial flows, all factors except ITO appears in positive relation with SCFF. The results are in line with the proposed hypothesis, however, interestingly the ITO have shown deviation from the projected results. The findings indicate that if ITO goes down the SCFF will go up

Table2: Linear regression Analysis

Dependent Variable:*SCFF*	**(3)**
APP	0.723***
	(0.139)
ACP	0.732***
	(0.121)
ITO	-0.437**
	(0.052)
CCC	0.527**
	(0.137)
R^2	0.812
Adjusted R^2	0.824
***F*-statistic**	20.247
Prob.(F – Statistics)	0.000
S.E of Regression.	0.099
Number of firms	126

*,**,*** denote statistical significance the 0.10, 0.05 and 0.01 level respectively

4.3. Results of the Hierarchical Multiple Regression Model

The results of the hierarchical multiple regression Model are shown in table 3. The direct results have shown consistency with the finding of direct results presented in table 3. The cash conversion cycle appears as a strong moderator in all models.

Table 3: Results of the Hierarchical Multiple Regression Model

Dependent Variable:$GDPG$	(5)	(6)	(7)
SCFF	0.241***		
	(0.029)		
APP		0.342***	
		(0.012)	
ACP			-0.351**
			(0.023)
ITO			
$ACP * CCC$	0.388**		
	(0.126)		
$APP * CCC$		-0.676*	
		(0.177)	
$ITO * CCC$			0.258***
			(0.018)
Number of firms	126	126	126

*,**,*** denote statistical significance the 0.10, 0.05 and 0.01 level respectively

The direct results hierarchical multiple regression model of the current study has shown a great deal of agreement with the OLS results. The indirect results of ACP*CCC, and ITO*CCC are positive and significant. Whereas the relationship between APP*CCC, and SCFF is negative and significant. The results of results hierarchical multiple regression model have shown a great deal of agreement with our hypothesized results.

5.0. Conclusion

For the purpose of present study, supply chain finance solutions are categorized into three groups, as based on the literature. These are: supply chain collaborative solutions, innovative financing solutions, and traditional financing solutions. The first group contains typical SC collaborative solutions that optimize working capital especially inventory with the collaboration of SC partners, the second group involves innovative solutions that generally require comprehensive analysis of SC and high trade process digitalization, while the third group takes into account traditional practices of reverse factoring, that includes trade process digitalization of lower degree. The main aim behind this empirical research is to investigate the impact of the adoption of the supply chain financial solutions on the supply chain financial flows of manufacturing firms listed in Indonesian Stock Exchange. In addition to that the study has also investigated the moderating role of cash conversion cycle in the relationship between supply chain

financial solutions and supply chain financial flows. To achieve the objective of the study we have employed the panel data method and have used the linear repression and hierarchical regression techniques. The final sample comprise of 756 firm year observations over the period of 6 years from 2012-2017.teh findings of the study have shown an agreement with the proposed findings of the study. The cash conversion cycle appears as strong moderator. In author knowledge this is among few pioneering studies on this issue and will be helpful for future policy makings.

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