Introducing a financial perspective in Supply Chain Management: a literature review on Supply Chain Finance

Luca M. Gelsomino, Riccardo Mangiaracina, Alessandro Perego, Angela Tumino

Department of Management, Economics, and Industrial Engineering, Politecnico di Milano, via Lambroscibini 4/b, Milano – Italy (lucamattia.gelsomino@polimi.it)

Abstract: In the last 10 years new financing opportunities – known as “Supply Chain Finance” or “SCF” – arose, exploiting the strength of the supply chain links to optimise the working capital and create value for the organisations involved. SCF solutions are usually supported by ICTs (Information and Communication Technologies), and can be based on early payments, trade process visibility, supply chain collaboration and enhanced information sharing with financial institutions. In order to gather value from SCF solutions, competences on both Finance and Supply Chain Management are essential. However, many contributions available in the literature take just a ‘partial’ perspective. A holistic framework connecting the ‘finance oriented’ and the ‘supply chain oriented’ perspectives is therefore needed. A basic requirement to develop such a framework is an in-depth analysis of scientific literature published on the subject. This paper aims at illustrating the main evidences emerged from such literature analysis.

Keywords: supply chain management, supply chain finance, supply chain collaboration, literature review

1 Introduction

The recent economic downturn caused a considerable reduction in the granting of new loans, with a significant increase in the cost of corporate borrowing (Ivashina and Scharfstein, 2010). In these difficult times, firms tried to extend trade credit from suppliers in order to supplement other forms of financing, whereas organisations less affected by this credit crunch took the role of liquidity providers, accepting an increase in payment terms (Coulibaly et al., 2013; Garcia-Appendini and Montoriol-Garriga, 2013). These effects contributed considerably to the need for solutions and programmes that optimise the working capital. Among these, one of the most important approaches is Supply Chain Finance (SCF) (Pett et al., 2012). SCF aims to optimise financial flows at an inter-organisational level (Hofmann, 2005) through solutions implemented by financial institutions (Camerinelli, 2009) or technology providers (Lamoureux and Evans, 2011). The ultimate objective is to align financial flows with product and information flows within the supply chain, improving cash flow management from a supply chain perspective (Wuttke et al., 2013b). The benefits of the SCF approach rely on the cooperation among players within the supply chain, which typically results in lower debt costs, new opportunities for obtaining loans (especially for ‘weak’ supply chain players), or reduced working capital within the supply chain. Moreover, the SCF approach often improves trust, commitment, and profitability throughout the chain (Randall and Farris II, 2009).

The level of interest in the topic of SCF among academics and practitioners has increased significantly, as well as the number of scientific articles that gave the concept a more defined identity. However, contrasting definitions, which address the topic from different perspectives, have been found in the literature. This article aims to provide a systematic review of the recent literature and to identify areas for future research.

The paper is organised as follows: the second section describes the methodology adopted to carry out this literature review. The third section shows and discusses the main findings, whereas the fourth section presents the conclusions that have been drawn, and highlights the gaps and potential directions for future research in this field.

2 Methodology

This review examines articles dealing with the general concept of SCF and/or specific SCF solutions (e.g. factoring, reverse factoring and supply chain solutions like VMI – Vendor-Managed Inventory – and CPFR – Collaborative Planning & Forecasting), published between 2000 and 2013. Although some specific solutions were addressed long before 2000, the rise of the SCF concept can reliably be said to have started at the beginning of the 21st century (Hofmann, 2005; Pfohl and Gomm, 2009). Several articles regarding the topics of ‘Financial supply chain management’ and ‘Trade credit’ have also been included in this review. As for the former, contributions dealing with the integration of physical and information flows with financial flows (Wuttke et al., 2013b) were included, whereas articles which address the topic solely from the point of view of automating the trade process were excluded. As for the latter, it is recognised that trade credit partially overlaps with the concept of SCF (Klapper and Randall, 2011) and contributions on trade credit motives, order quantity decisions, factoring economics, credit term decisions, and settlement period decisions have been included in this review.
The search was conducted using library databases (e.g., Science Direct, Scopus, Web of Knowledge) and multiple keywords and strings (e.g. ‘supply chain finance’, ‘financial supply chain’, ‘financial value chain’, ‘working capital optimisation’, ‘VMI’, ‘supply chain AND factoring’, ‘reverse factoring’) that were sought in both the abstract and in the main body of the paper. By using this method, all of the major logistics and supply chain management journals and the top finance and management journals were examined (e.g., International Journal of Physical Distribution and Logistics Management, Supply Chain Management: an international Journal of Business and Finance, Journal of Finance, Management Science, International Journal of Production Economics, European Journal of Operation Research, International Journal of Production Research). In addition to international journals, the search included the proceedings of leading international conferences as well as published books. Articles that mentioned the SCF topic only in the introductory remarks or as a collateral research theme were discarded. Papers were read carefully and thoroughly. In the end, 111 papers published from 2000 to 2014 were selected and examined on the basis of their contents.

3 Findings from the literature

The general Supply Chain Finance literature (not related to specific solutions) was analysed first in order to identify the main topics currently being studied and relevant SCF solutions to be included in the review. Then, articles related to those solutions were examined. All of the papers were grouped according to three main themes:

1. concept and definitions of SCF;
2. expected benefits;
3. SCF initiatives in place.

3.1 Concept and definitions of SCF

This section discusses the definitions of SCF provided by the papers analysed, which are summarised in Appendix A. These definitions are very useful to understand the current state of the art in SCF and the main perspectives taken by different authors in addressing the topic.

In order to classify the definitions of SCF, two main variables were considered:

(a) Role of financial institutions within the SCF framework: some articles suggest that SCF can be considered as a set of short-term solutions provided by financial institutions, focused on accounts payable and/or receivable. In these articles, the direct involvement of a lender, who becomes the solution provider, is an essential component of the SCF scheme.

(b) Scope of SCF:

(i) Indusive of inventory optimisation and/or inventory shifting. The indusion of inventories as well as payables and receivables broadens the scope of SCF to the entire working capital.

(ii) Inclusive of fixed asset financing in addition to working capital.

Two major perspectives emerge from the analysis of the definitions: the ‘finance oriented’ and the ‘supply chain oriented’ perspective.

The ‘finance oriented’ perspective considers SCF a set of (innovative) short-term financial solutions (Camerinelli, 2009; Chen and Hu, 2011). Therefore, financial institutions (or, more generally, lenders) are essential components in the SCF scheme. A second important characteristic of the ‘finance oriented’ perspective is the focus on payables and receivables (but not on inventories). Lamoureux and Evans (2011) state that the triggers of SCF solutions are the most important events in the trade process (e.g. order acceptance, shipment, payable due date). This view is also held by More and Basu (2013), for whom SCF is conceptually divided into three categories: pre-shipment, in-transit, and post-shipment financing solutions.

On the other hand, the ‘supply chain oriented’ perspective extends the framework of working capital optimisation to include inventories. For example, Pfohl and Gomm (2009) tested their conceptual model in a VMI scenario. Moreover, Randall and Farris II (2009) analysed the benefits achieved through a generic shifting of inventory between two supply chain players. They present a descriptive case study that highlights how the different components of the cash-to-cash (C2c) cycle can be managed in a collaborative way by the supply chain players involved (e.g. shifting inventories from a supplier to a customer). Notably, the described benefits might be achieved in the absence of a specific financial solution provided by a lender, which, in fact, is often ancillary. As a general trend, the articles that take this perspective tend to provide holistic analyses of the SCF approach, without describing any specific solutions or practices. A second characteristic of some of the papers that assume the ‘supply chain oriented’ perspective regards the object of the financing. Pfohl and Gomm (2009), and Gomm (2010), specifically state that SCF also applies to fixed assets financing (e.g. through a pay per production solution).

3.2 Expected benefits

From a financial point of view, the benefits of SCF solutions derive mostly from the exploitation of differences in the cost of capital between different players in the supply chain (Pfohl and Gomm, 2009; Randall and Farris II, 2009; Lamoureux and Evans, 2011). However, two additional factors should be taken into account: the duration and volume of the financing required. This three-dimensional framework is known as the ‘Supply Chain Finance cube’, and was proposed by Pfohl and Gomm (2009) and Gomm (2010). The different SCF solutions affect one or more of the three axes that define the cube. As an example, a Vendor-Managed Inventory programme directly affects the volume of capital needed, decreasing
The benefits of SCF solutions, however, are not limited to financial performance. Supply Chain visibility is of paramount importance as well (Caridi et al., 2010). Large companies might be interested in promoting SCF solutions in order to lower the cost of collecting certain information (e.g. customer demand), which is too costly or even impossible to gather otherwise (Pfohl and Gomm, 2009), thus increasing total sales or reducing costs.

Another very important source of benefit for large supply chain players is the reduced risk of bankruptcy throughout the supply chain. This kind of benefit is typical of factoring and reverse factoring solutions, which may allow high-risk suppliers to mitigate their credit risk level with that of their high-quality buyers, thus reducing their cost of debt and increasing their level of access to liquidity (Klapper, 2006).

Several papers approach the analysis of SCF benefits from the point of view of the cash-to-cash cycle, which is also a typical key performance indicator for the management of the entire supply chain (Farris II and Hutchison, 2002). The cash-to-cash cycle can be defined as 'the average days required to turn a dollar invested in raw materials into a dollar collected from a customer' (Stewart, 1995). It consists of three components: days of sales outstanding (accounts receivable collection period) plus days of inventory held (considering both work-in-progress and finished products) minus days of payable outstanding (accounts payable settlement period). As an example, Luo and Zhang (2012) studied the benefits of coordinating the supply chain through trade credit (i.e. operating on the account receivable collection period). Their results show that a low-risk buyer can use trade credit to financially sustain a start-up supplier, to mutual benefit. However, the authors demonstrate that asymmetric information among the parties involved may lead to suboptimal solutions. Along the same line of reasoning, Hofmann and Kortzah (2010) show how a collaborative approach (or, as it is called, a supply chain-oriented approach) to cash-to-cash management leads to optimal solutions, whereas aggressive behaviour (i.e. pressure to shorten receivable collection and extend payable settlement times through the supply chain) might negatively affect the value of the organisations involved.

Other articles highlight the benefits associated with the involvement of financial institutions in SCF programs. In some solutions financial institutions carry the burden of collecting payments, in exchange for an increase in revenues (Palia and Soprnanetti, 2004; Tanrisever et al., 2012). Moreover, they can improve their risk-assessment process, especially regarding SMEs (Hofmann, 2005; Xu and Zhong, 2011).

Finally, some articles state that supply chain links are strengthened through enhanced collaboration, visibility or automation that a SCF solution might entail (Hofmann and Belin, 2011; Lamoureux and Evans, 2011).

3.3 SCF initiatives in place

Several papers describe existing SCF initiatives (e.g. Blackman et al., 2013; More and Basu, 2013; Templar et al., 2012; Wurtke et al., 2013a, 2013b). Overall, these articles can be categorised into two classes, based on their purpose.

(a) Descriptive papers: they highlight successful examples of SCF programmes or practices, either as the main contribution to the paper, or to support insights gathered conceptually. They can have a single- or multi-case focus. An example of the first type is the analysis of the Motorola financial supply chain management strategy, proposed by Blackman et al. (2013). The authors highlight how the introduction of a collaborative approach to managing the financial flows within the supply chain generates cost savings for all of the companies involved.

An example of the multi-case type is presented by John Mathis and Cavinato (2010), in which the Zara and Toyota financial supply chain strategies are described in order to demonstrate that collaboration between the finance and supply chain functions is paramount for an effective financial supply chain management strategy. Other examples are provided by Nienhuis et al. (2013) and Silvestro and Lustrato (2014).

(b) Exploratory papers: they attempt to develop, from multiple SCF initiatives, a series of propositions regarding contextual and/or internal variables that might affect the adoption process and/or the benefits of different SCF solutions. As an example, Wurtke et al. (2013b), who adopted a multi-case methodology, identified patterns related to contextual and internal variables affecting the adoption process and the outcomes of the different SCF solutions. Similarly, Wurtke et al. (2013a) used a number of case studies to develop four propositions involving the adoption process. Specifically, the authors addressed why companies adopt the SCF approach differently, and the role of suppliers in the adoption of SCF solutions. Another analysis based on exploratory case studies is provided by Templar et al. (2012). The contribution of the paper is twofold: the authors highlight the impacts of SCF on both the supply chain and the financial performance of the companies involved, and also point out the current immaturity of SCF practices in business, and the existing gap between theory and practice, which, however, seems to be decreasing.

4 Discussion and Conclusions

The literature review has shown that the topic of SCF has generally been addressed from two main perspectives: the 'finance oriented' and the 'supply chain oriented' perspective. The 'finance oriented' perspective is focused on short-term financial solutions, provided by financial institutions, that address accounts payable and receivable. The 'supply chain oriented' perspective, instead, is more broadly focused on working capital optimisation (in terms of accounts
payable, receivable, and inventories) and potentially even on fixed assets financing. It may or may not be inclusive of financial institutions, also comprising solutions that optimise working capital among the supply chain members. With regard to the benefits of SCF, tangible benefits can be found in the reduction of volume, rate, or duration of the financing, whereas intangible benefits can be achieved by exploiting the value of information and the strength of the supply chain links.

The analysis revealed four main gaps in the extant literature that indicate directions for future research in the area of SCF.

(a) No general taxonomy of SCF schemes and solutions

The reviewed literature lacks of comprehensive and holistic analyses of instruments, practices, and solutions in the field of SCF. Such lack of attention towards the SCF practical tools is coherent with the gap between SCF theory and practice highlighted by Templar et al. (2012). To accomplish this task, it is paramount to select and define those practical instruments or solutions that are part of the SCF landscape. Reviewed literature is not devoid of tentative classifications that have been found among both the ‘finance oriented’ perspective (e.g. Cameniti, 2009; Dykman, 2011; Lamoreux and Evans, 2011) and the ‘supply chain oriented’ perspective papers (e.g. Wuttke et al., 2013b). However, they are still partial, since they usually address just a few practices without attempting to provide a holistic framework, and are either not described in the detail, or used just as examples of possible practices.

(b) Weak empirical-based holistic analyses on the application of SCF

Despite the presence of analyses related to specific SCF solutions like factoring, trade credit and VMI (Claassen et al., 2008; Klapper and Randall, 2011; Klapper, 2006) based on empirical data, a lack of empirical analyses addressing SCF from a more holistic point of view (e.g. state of the art/adoption level of the different SCF solutions) has been found in the literature. Empirical analyses might prove useful in testing existing models and hypotheses, as highlighted by Pfohl and Gommin (2009), as well as providing data for an assessment of the diffusion of the SCF approach and of its different applications, which is still undear. The existing empirical studies do not fully satisfy this need.

Further research works should address more innovative schemes and solutions (e.g. evolved forms of reverse factoring). Moreover, solutions focused on the downstream side of the supply chain should be better investigated, as they have received less attention, especially from the empirical point of view. Future research activities should also focus on analysing the adoption level and the state of the art of the different solutions. Finally, empirical studies should be employed to test hypotheses and the models developed.

(c) Few assessment models consider the impact of SCF programs on Supply Chain financial performance

Although the link between the SCF concept and a financially sustainable supply chain has been already addressed (Templar et al., 2012), there is a general lack of research on the effects of SCF solutions on the financial performance of the entire supply chain (i.e. with supply chain set-ups that are more complex than the single buyer-supplier dyad).

The literature on the ‘finance oriented’ perspective includes a series of SCF solutions that have been recognised to have a positive effect on the financial performance of the supply chain players, even if for some of the more innovative ones (e.g. dynamic discounting and evolved forms of reverse factoring) further research in this sense is required. As a matter of fact, single buyer-supplier set-ups are considered (e.g. Tantisier et al. 2012), whereas results for non-dyadic supply chains are not usually provided (Seifert, 2010).

With regard to solutions that reflect the SCF ‘supply chain oriented’ perspective (e.g. VMI, CPFR), more complex, non-dyadic supply chain set-ups have also been studied (Dawish and Odah, 2010; Mangiaradina et al., 2012), but the impacts on the supply chain financial performance have rarely been addressed. The few contributions available (e.g. Xu et al., 2010) are still rudimentary and the topic could be further studied in greater detail.

(d) Lack of tools to select SCF solutions for different Supply Chains and objectives

This review highlights a lack of practical instruments and tools to support managers in identifying the SCF solutions that best suit their needs. Although some managerial implications have been identified, especially through empirical-based research (e.g. Wuttke et al., 2013a, 2013b), no significant steps have been taken to develop such tools. These tools should be based upon an understanding of the benefits and drawbacks of the different SCF solutions, and at the same time upon the connection between the features of a supply chain and the different SCF solutions. As pointed out by Wuttke et al. (2013b), these features (e.g. captivity, strategic importance, complexity of the market) have an overriding impact on the effective application of different SCF solutions. As an example, a supply base constituted by SMEs or large companies responds in a different way to different SCF solutions, even if their financial performance is similar.

The contribution of this paper is twofold. First, it presents a structured review that provides a guide to both researchers and practitioners on the subject of SCF, highlighting the main perspectives that researchers have taken on this topic, the most important achievable benefits, and the most significant initiatives in place. Second, it identifies some research issues for future investigation.

5 References

# Appendix A: Classification of Supply Chain Finance definitions

<table>
<thead>
<tr>
<th>#</th>
<th>Article</th>
<th>Definition</th>
<th>Role of Financial Institution (a)</th>
<th>Scope: only reverse factoring (b.i)</th>
<th>Scope: inclusive of inventory optimisation (b.ii)</th>
<th>Scope: inclusive of fixed asset financing (b.iii)</th>
<th>Proposed perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hofmann, 2005</td>
<td>SCF is an approach for two or more organisations in a supply chain, including external service providers, to jointly create value through means of planning, steering, and controlling the flow of financial resources on an inter-organisational level</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>2</td>
<td>Camerinelli, 2009</td>
<td>SCF is the set of products and services that a financial institution offers to facilitate the management of the physical and information flows of a supply chain</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Finance</td>
</tr>
<tr>
<td>3</td>
<td>Pföhl and Gomm, 2009</td>
<td>SCF is the inter-company optimisation of financing as well as the integration of financing processes with customers, suppliers, and service providers in order to increase the value of all participating companies</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>4</td>
<td>Gomm, 2010</td>
<td>SCF is the process of optimising the financial structure and the cash-flow within the supply chain</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>5</td>
<td>Chen and Hu, 2011</td>
<td>SCF, as an innovative financial solution, bridges the bank and capital-constrained firms in the supply chain, reduces the mismatch risk of supply and demand in the financial flow, and creates value for supply chain with capital constraints</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Finance</td>
</tr>
<tr>
<td>6</td>
<td>Lamoureux and Evans, 2011</td>
<td>SCF solutions represent a combination of technology solutions and financial services that closely connect global value chain anchors, suppliers, financial institutions and, frequently, technology service providers. They are designed to improve the effectiveness of financial supply chains by preventing detrimental cost shifting and by improving the visibility, availability, delivery and cost of cash for all global value chain participants</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Finance</td>
</tr>
<tr>
<td>7</td>
<td>Grosse-Ruyken et al., 2011(6)</td>
<td>SCF is an integrated approach that provides visibility and control over all cash-related processes within a supply chain</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>8</td>
<td>Wuttke et al. 2013b(3)</td>
<td>We define FSCM as optimised planning, managing, and controlling of supply chain cash flows to facilitate efficient supply chain material flows</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>9</td>
<td>Wuttke et al. 2013b(4)</td>
<td>SCF is an automated solution that enables buying firms to use reverse factoring with their entire supplier base, often providing flexibility and transparency of the payment process</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>Finance</td>
</tr>
<tr>
<td>10</td>
<td>More and Basu, 2013</td>
<td>SCF can be defined as managing, planning and controlling all the transaction activities and processes related to the flow of cash among SC (supply chain) stakeholders in order to improve their working capital</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Finance</td>
</tr>
</tbody>
</table>


(3): Definition of Financial Supply Chain Management.

(4): Definition of Supply Chain Finance.