Systematic literature review on supply chain finance based on the evolution of the research themes

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Abstract

Supply chain finance (SCF) deals with the management of financial flows throughout the supply chain. In order to improve the collaborative cash cycle and working capital, SCF aims to facilitate the reduction of financial risks in a supply chain. To do this, SCF involves the coordination of supply chain actors, SCF instruments and supply chain processes. Within this framework, this paper systematically reviews the literature on the SCF with the aim of clarifying its evolution and contribution to the SCF, in order to give a global vision, able to answer questions concerning, supply chain finance concept, types, the research evolution and research topics that can be open for us at supply chain finance.

Keywords: supply chain finance, reverse factoring, dynamic discounting, financial inventory

1. Introduction

In a financial crisis, companies struggling to achieve sufficient profitability or those with unstable cash flows are particularly vulnerable. Indeed, the credit crisis of 2008, which particularly affected small and medium-sized enterprises (smes), resulted in the bankruptcy of many suppliers and disrupted their stability (Hofmann and Belin 2011). To this end, companies resort to optimizing their cash flows by building collaborative relationships with supply chain partners and financial institutions. These institutions are developing new financing methods such as supply chain finance.

The concept of supply chain finance, which has evolved in recent years (Gelsomino et al 2016), aims at optimizing the working capital requirements in a supply chain. The major challenge is to be able to synchronise all flows and related information while improving the company's cash flow (camerinelli 2009 lamoureux and evans 2011).

Banks, through their SCF solutions, offer a portfolio of financial, technological instruments to optimize the management of their customers' working capital and facilitate supply chain transactions (Baft et al., 2016; Caniato et al., 2016).

Companies consider three pillars of supply chain working capital: accounts payable, accounts receivable and inventories. While buyers prefer extended payment terms, suppliers are interested to accelerate payment for products sold. In this case, SCF practices can be used to resolve financial conflicts between actors in the supply chain. This will allow the buyer to extend the payment date, while suppliers can be paid rapidly at lower cost.

Research published in the literature on the subject of SCF provides insight into a wide range of management tools and practices (Caniato et al., 2016). For that, the objective of this paper is to study the evolution of the SCF based on the research themes.
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We recall the first part of this article to the presentation of the operating principles of the SCF solutions and the financial stakes related to their implementation. We will devote the rest of the article to a systematic review of the literature (SLR) which aims to characterize the evolution of supply chain finance over the period 2000-2020.

Supply chain finance concept:

. Definitions:

Since the economic crisis of 2009, the SCF has been offering solutions to finance an organisation's supply chain.

<table>
<thead>
<tr>
<th>Sources</th>
<th>years</th>
<th>Definitions</th>
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<tr>
<td>(Hofmann, 2005)[15]</td>
<td>2005</td>
<td>“SCF is a financing solution that enables two or more companies in a supply chain to jointly create value by planning, managing and controlling the flow of financial resources at an inter-organisational level”.</td>
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<td>(PWC, 2015)[17]</td>
<td>2015</td>
<td>“SCF is an approach that allows the company to improve the working capital of buyers and sellers in a transaction - using an intermediary tool to link buyers, sellers and third party financing entities to minimise supply chain risks/costs and strengthen business relationships.”</td>
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<td>(Seifert &amp; Seifert, 2009)[18]</td>
<td>2009</td>
<td>“Supply Chain Finance (SCF) is an innovative opportunity aims to reduce working capital. Its mechanism is reverse factoring, which makes the technique buyer-centric rather than supplier-centric.</td>
</tr>
<tr>
<td>(Pfohl&amp;Gomm, 2009)</td>
<td>2009</td>
<td>&quot;Supply Chain Finance (SCF) is the business-to-business optimization 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&quot;.</td>
</tr>
<tr>
<td>Camerinelli (2011)</td>
<td>2011</td>
<td>“SCF can focus on the collection of products and services that financial institutions offer to facilitate the physical and information flow of a supply chain&quot;.</td>
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Table 1: Most cited definitions of supply chain concept.

Supply chain finance instruments.

SCF is the use of financing and risk mitigation practices and techniques, incurred by supply chain through collaboration between relevant actors. It aims at optimizing the flow and allocation of financial resources and enables the management of working capital and liquidity invested in Supply Chain processes and transactions to be optimized. (Hofmann and Belin, 2011). An SCF operation is structured around three main players: the company that buys the goods (the Buyer), the company that supplies the goods (the Supplier) and the Bank. There are several SCF practices and instruments. In the literature, we find, among others, Factoring, Reverse
Reverse factoring

Reverse factoring is another form of financing, which offsets the disadvantages of factoring. It is an asset financing solution that allows a client company and its supplier to enter into a three-way financing agreement with a financial partner. Both parties (customer and supplier) make it known that they want to participate in the construction of the financial solution, unlike in the case of factoring where the transaction is initiated solely by the supplier.

In reverse factoring, the supplier risk is not taken into account in the factoring company’s decision making, but rather the creditworthiness of the customer. Moreover, the factor only applies reverse factoring to invoices already approved by the customer. The risk of non-payment is thus considerably reduced, so that the costs are also lower for the supplier.
Inventory financing

Hofmann (2009) first addressed this innovative form of financing inventories, providing a conceptual explanation of the relevance and implications of the topic.

Inventory financing can be defined as a line of credit or a short-term loan given to a company so it can purchase products for sale. These products, or inventories, constitute a guarantee for the loan if the company does not sell its products and cannot repay the loan. Inventory financing is particularly useful for businesses that need to pay suppliers in a shorter period of time than it takes to sell inventory to customers.

Dynamic Discounting

Dynamic discount programs allow buyers to pay their suppliers earlier using their own funds. They thus benefit from an early payment discount based on a financing rate agreed in advance between the partners. The earlier the payment is made, the greater the discount achieved by the buyer, if the supplier accepts the advance payment. (Templar et al., 2016).

The discount by early payment is calculated automatically by the collaborative platform provided by the bank. This type of programme is best suited to companies with excess cash and liquidity. It is designed for companies looking for an alternative to short-term investments with low returns.

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Definitions</th>
<th>References</th>
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<tr>
<td>Warehouse financing</td>
<td>Warehouse financing is a form of inventory financing. It is a loan from a financial institution to a company, manufacturer or processor. Existing inventory, goods or products are used as collateral for the loan</td>
<td>Jiang et al. (2016)</td>
</tr>
<tr>
<td>Factoring</td>
<td>“It is a financing solution that allows companies to benefit from early payment of their receivables before the</td>
<td>Klapper (2006)</td>
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due date. To do this, the receivables are transferred to a financial organisation (called a Factor) which manages the company's receivables under a factoring contract”

<table>
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<tr>
<th>Buyer Direct Financing</th>
<th>the buyer (manufacturer) gives supply contracts and loans directly to suppliers.</th>
<th>Babich and Kouvelis (2018)</th>
</tr>
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<tr>
<td>Vendor-Managed Inventory</td>
<td>“lorsque les niveaux de service convenus avec le client sont atteints, Le fournisseur pourrait planifier sa propre production et décider du calendrier de réapprovisionnement. Cela permet aux fournisseurs de stabiliser leur production et d'optimiser les coûts de transport ”.</td>
<td>Waller et al. (1999);</td>
</tr>
<tr>
<td>Raw Material Financing</td>
<td>It is a part of inventory financing whereby the funds are given to finance raw materials.</td>
<td>Basu and Nair (2012);</td>
</tr>
<tr>
<td>Invoice discounting</td>
<td>Invoice discounting is a mechanism of financing invoices that allows businesses to take advantage of the value of sales. A portion of the total amount becomes available from the lender when you send an invoice to your customer, providing an invaluable source of working capital throughout the month.</td>
<td>Hofmann (2005); Bryant and Camerinelli (2014)</td>
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<td>Consignment stock</td>
<td>Consignment stock is stock that legally belongs to one party, but is held by another party. This means that the benefits and risks relating to the stock remain with the first party, while the second party is responsible for the distribution or operation of the stock.</td>
<td>Caniato et al. (2016); Templar et al. (2016)</td>
</tr>
<tr>
<td>Purchase order financing</td>
<td>A purchase order is an order form, given by a buyer to a seller. It is an agreement between the buyer and the seller on the prices and quantities of a product or service, when accepted by the seller.</td>
<td>camerinelli (2009); Lamoureux and Evans (2011); Li et al. (2011); Basu and Nair (2012); de Meijer and de Bruijn (2013); More and Basu (2013); Bryant and Camerinelli (2014); de Boer et al. (2015); BAFT et al., 2016; Yan et al. (2016)</td>
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Table 2: Other supply chain finance instruments

An overview of supply chain finance challenges

The challenges of SCF can in general be classified into six categories based on organizational focus areas:

<table>
<thead>
<tr>
<th>Supply chain finance challenges</th>
<th>Signification</th>
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<td>humanresource (HR)</td>
<td>Some SC managers lack knowledge and information on the use of SCF programmes (Hofmann and Belin, 2011). Business professionals are generally unaware of CFS plans. This lack is the main challenge to be overcome in optimizing a company's working capital.</td>
</tr>
<tr>
<td>IT and technology related challenges</td>
<td>Technology has become an indispensable part of modern CS. However, when it comes to processing financial transactions, most companies use manual processes (Aberdeen, 2006b). These processes increase delays in payment receipts and increase the number of days sales outstanding (DSO) for suppliers, resulting in additional working capital requirements.</td>
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<tr>
<th>Finance related challenges</th>
<th>Today, the company recognises the value of a collaborative approach that can meet the needs of two business partners at once (Silveira and Arkader, 2007). Without a shared vision, SC cannot realize its potential value. (Krause, 1997)</th>
</tr>
</thead>
</table>

| Inter as well as intra-firm coordination, collaboration and alliance-oriented challenges | It is difficult for SCF suppliers to establish working capital and third party financing plans. The main impact of all these factors is the unreliability and unpredictability of SC's overall cash flows. The main cause of additional working capital requirements is Delays in invoice reconciliation, which causes delays in receiving payments and increases the time it takes to collect receivables (Hausman, 2005; Lindeen, 2010). |

Table1: The most significant supply chain finance challenges

Systematic literature review

A systematic review consists of a synthesis of the scientific literature in response to a specific question. It uses explicit methods of data search, selection and analysis. Statistical methods may or may not be used to synthesize the results of the studies.

**Formulation of questions**

The constant changes in supply chains and their environments have a strong impact on companies' financial balances. The multiplication of flows and the internationalization of exchanges push companies to take a close interest in the financial part of their activities. The supply chain and finance functions must however work together to manage the profitability of the company. These subjects have been the subject of several studies. Through this review, we wish to identify the issues addressed by the authors and the reasons behind the emergence of such issues. We wish to highlight the problems addressed by the authors, particularly the optimization topics highlighted and the way they were addressed.

**Define the keywords**

When the research question has been defined, the relevant articles to be included in the literature review are identified. For this, it is necessary to define a list of keywords to query article databases, such as ScienceDirect, ABI/INFORM Global, EBSCOHostScopus. The key words selected are: "Supply Chain Finance", "Financial Supply Chain", "Reverse Factoring", "Trade Finance", "Trade Credit", "Dynamic discounting" and "Inventory financing". The choice of these keywords is justified by the fact that "Supply Chain Finance" includes the management of the supply chain and the associated financial issues. The other terms refer to a set of tools and solutions for supply chain finance such as trade credit, reverse factoring, dynamic discounting, and inventory financing.

**Selection and first evaluation of articles**

A first research, led us to about 1000 articles. In order to better filter and identify the most relevant articles for our study, we used inclusion, exclusion and quality assessment criteria. A two-step inclusion and exclusion process was adopted.
The first step in the process is to first filter the articles based on their title review and abstract.

Then, during a second stage, an in-depth review is conducted based on three evaluation criteria. First, the documents must contain the terms of the list of selected keywords, second, the documents must relate to subjects related to supply chain. The quality of the contributions is first judged on the basis of the evaluations of the journal guide of the Association of Business Schools (ABS). Selected articles should have a score of 2 to 4. 255 articles are selected at this stage. They finally pass the last filter which consists of a detailed reading and the quality assessment based on contribution, the theoretical framework, the methodological approach and the analysis conducted (Wong et al., 2012). This step makes it possible to reduce the list of articles to be analyzed to 119.

Supply chain finance work continues to find its place in top ranked ABS journals. Two reports and a conference paper relevant to our research and were added to our selection. As a result, a total of 119 publications are selected for the subject of this systematic review.

Analysis and synthesis

After extraction, a descriptive and thematic content analysis will be performed on each selected publication. The ACCEPTED MANUSCRIPT focuses on the categorization of articles by year, country of publication, institution, discipline and research methods.

On the other hand, the thematic analysis could be divided into two parts: thematic findings and thematic synthesis. In the process of thematic synthesis, evidence from the literature was explored, cross-referenced and analyzed (while explaining constructs, archetypes and their relationships) to provide rigorous reflections on the literature.

Description of the work and characterization of the contributions

The main objective of this descriptive analysis is to understand the trends in this corpus of literature addressing research questions related to the financialization of supply chains.

Figure 5 shows that supply chain finance is attracting increasing interest from researchers. 82% of publications were published between 2008 and 2019. This particularly indicates the emergence of the subject and the increased interest in local issues with the financial challenges of the supply chain after the 2008 global economic crisis.

![Figure 5: Evolution of the number of SCF publications between 2000 and 2019.](image)
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Figure 6: Breakdown of SCF publications in major scientific journals

The 118 articles studied within the framework of this review were published in some fifty renowned journals (of which 40 journals are rated by the ABS). Figure 6 illustrates the journals that most received this type of work: International Journal of Production Economics (25 articles), European Journal of Operational Research (15 article) Applied Mathematical Modelling (9 articles).

Thematic analysis and categorization of research work.

The analysis of the contributions reveals 7 major themes that were addressed in the various works. These themes concern, as part of the commercial credit policy, inventory management on the one hand and supply chain coordination on the other hand. Financial interdependence between partners, Capital constrained and financial risks and The financialization of capital. There is also the themes refer to financial in the supply chain. Finally, sustainability and the role of electronic platforms in the development of logistics chain financing is an important subject.

<table>
<thead>
<tr>
<th>the themes</th>
<th>Supporting references</th>
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<tbody>
<tr>
<td>Capital constrained and</td>
<td>N.YAN et al 2018; N.YAN et al 2016; L.Zhao et al 2018; E. Cao et</td>
</tr>
</tbody>
</table>
The financialization of capital


SUSTAINABILITY


The role of electronic platforms in the development of supply chains


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as shown in figure 9, the majority of articles cover two major topics: inventory management and the financialization of the supply chain. This is explained by the importance of the relationship between inventory management and supply chain finance. In addition, financialization monopolizes the second large segment in research. This is explained by the permanent changes experienced by the supply chains, which have a strong impact on the financial balances of companies. The multiplication of flows and the internationalization of trade are pushing companies to take a close interest in the financial part of their activities. This has taken on a very large scale, especially after the 2008 financial crisis.

Recently, the SCF also deals with topical issues such as sustainability, and the role of platforms in the development of supply chains. This shows that the supply chain finance concept has an important place in scientific research.
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Figure 8: Evolution of papers number on supply chain finance theme over time.

Figure 8 shows the evolution of articles on the concept of supply chain finance over time and their domain of study. We notice that the first theme, namely inventory management, progressed over time but decreased after 2016. On the other hand, the number of articles that touch the financialization aspect increased in a remarkable way, which could be explained by changing the research angle of vision and the place occupied by the finance supply chain in research.

The main reason behind this development is that at first, the concept was ambiguous and unknown. But over time, the importance of the supply chain finance became more interesting for the researchers. What revealed other themes of research, like capital constrained and financial risks which has known a certain evolution especially after 2008, the year of the financial crisis when companies suffered from the shortage of funding. This pushes several researchers to study the capital constraint and its relationship with the finance supply chain. This new concept has proposed financial solutions that will solve the financing problem. In addition, after 2011, new themes are emerging, such as financial interdependence between partners, sustainability and the role of electronic platforms in the development of supply chains.

Figure 9: Methods used in each topic.

A cross between the sets of methods and the topics/themes has been realized to get a clear vision on the methods used in each topic (Figure 9), which gave us a great combination in each topic/theme.
For example, in the topic of inventory management, we found that the first set of methods used is modeling and simulation followed by the literature review method. While the theme financialization of capital, we notice that the researchers use all the methods. This can be explained by the importance and the degree of topicality of the theme.

Concerning the themes of capital constraints and supply chain coordination, the researchers use the following methods: statistical method, simulation and modeling and literature review.

Discussion

We have outlined seven lines of research for SCF.

First, almost all of the articles assume that credit term extension is allowed under certain quantity conditions without paying penalties (Chung et al 2006, Huang 2007). We see that this is not applied in reality because almost all late payments are subject to penalties. In group two, author Chung study how to determine the economic quantity of the order under conditions of permissible late payment. Late payment depends on the quantity ordered. The payment of the article must be made immediately. When the quantity ordered is less than the quantity for which late payment is permitted. (Chung et al 2005)

Regarding future research, studies could include the penalty rate in their models.

Second, a thorough reading of some articles shows that the classical EOQ and EPQ models assume that demand is certain, whereas these assumptions do not correspond to reality.

In the future, we propose studies of more flexible forms of demand or fluctuating demand information should be considered for a wider field of application.

Third, several articles study coordination only through commercial credit, while the supply chain finance could also be a mechanism for coordinating the supply chain (through these financing instruments such, reverse factoring, dynamic discounting, financial inventory...). There are a few researchers studying this point (A. Arkan et al 2012; K. Shang et al 2012; C. H. Lee et al 2010).

In the future, in order to coordinate the supply chain, several research projects can be carried out by combining different contracts with trade credit.

Fourth, to the extent that globalization continues, economies (but also financial markets) combined with the precariousness of prices and the volatility of interest rates, has resulted in a considerable increase in the number (but also in the nature) of financial sources and risks. In other words, the financial environment is regularly enriched by new techniques and technologies, automatically creating new risks. Despite their impact on the economy, there are few articles that study financial risks and their influence on the mechanisms of the SCF. Hence the need to research financial risks while analyzing their impact on SCF.

Fifth, Today's supply chains have become increasingly complex and global, making companies at different stages of the supply chain increasingly vulnerable to a variety of risk factors. Understanding and managing these risks, as well as their impact on supply chain operations and profitability, has become an imperative issue for many companies. Fluctuations in the value of currencies can result in significant losses for companies engaged in global transactions. For example, in January 2015, the CEO of Procter & Gamble warned that a stronger dollar would result in a 5% reduction in the company's sales in 2015 and a 12% reduction in profits. Another example, in 2016, British companies rushed to hedge their currency risk to protect themselves from the growing risk of "Brexit". According to a study of more than 7,000 non-financial companies from 50 countries, around 60 of the companies surveyed have put in place some form of hedging using financial derivatives. Despite the importance of this topic, there are few articles that study this subject and link it to the SCF, so researchers could study the coverage of risks by financial products while analyzing their impact on the mechanisms of the SCF.

Conclusion

The concept of supply chain finance (SCF) is used for different representations of supply chain finance. However, it can be applied at two different levels. The first level, which could be described as technical, concerns the management of money flows and financial processes in the supply chain as defined by Wuttke et al 2013. This management is often associated with a platform or an information system developed by one or more banks that take care of the coordination of the participants in the supply chain and the financing.

The second, strategic, level concerns all financial instruments and technologies that enhance the efficiency of cash flows in the supply chain, allowing optimization of working capital, liquidity and risk.
Supply chain finance (SCF) is an area of research that focuses on managing the supply chain in the right way. Using different methods of systematic review, our study provides contributions that help SCF researchers to establish their studies.

References


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[127].


