



Supply Chain Finance: a literature review

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Review

Supply Chain Finance: a literature review

Abstract

Purpose The purpose of this paper is twofold: to classify the research to-date on Supply Chain Finance (SCF) according to the main themes and methods, and to propose directions for future research.

Design/methodology/approach The review is based on 119 papers mainly published from 2000 to 2014 in international peer-reviewed journals and in the proceedings of international conferences.

Findings The articles that provide a definition of SCF reflect two major perspectives: the '*finance oriented*' perspective - focused on short-term solutions provided by financial institutions, addressing accounts payable and receivable - and the '*supply chain oriented*' perspective - which might not involve a financial institution, and is focused on working capital optimisation in terms of accounts payable, receivable, inventories, and sometimes even on fixed asset financing.

Research limitations/implications While efforts were made to be all-inclusive, significant research efforts may have been inadvertently omitted. However, the authors believe that this review is an accurate representation of the body of research on SCF published during the specified timeframe, and feel that confidence may be placed on the resulting assessments.

Originality/value The paper presents a comprehensive summary of previous research on this topic and identifies the most important issues that need to be addressed in future research. On the basis of the identified gaps in the literature, four key issues have been highlighted which should be addressed in future research.

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

Paper type: literature review

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). Moreover, the collapse of the asset and mortgage-backed markets dried up liquidity from industries (Cornett *et al.*, 2011). In these difficult times, firms (especially the most vulnerable ones) tried to extend trade credit from suppliers in order

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3 to supplement other forms of financing, while organisations less affected by this credit
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5 crunch took the role of liquidity providers, accepting an increase in payment terms
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7 (Coulibaly *et al.*, 2013; Garcia-Appendini and Montoriol-Garriga, 2013). These effects
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9 contributed considerably to the need for solutions and programs that optimise working
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11 capital. Among these, one of the most important approaches is Supply Chain Finance
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13 (SCF) (Polak *et al.*, 2012). SCF aims to optimise financial flows at an inter-
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15 organisational level (Hofmann, 2005) through solutions implemented by financial
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17 institutions (Camerinelli, 2009) or technology providers (Lamoureux and Evans, 2011).
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19 The ultimate objective is to align financial flows with product and information flows
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21 within the supply chain, improving cash flow management from a supply chain
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23 perspective (Wuttke *et al.*, 2013b). The benefits of the SCF approach rely on
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25 cooperation among players within the supply chain, which typically results in lower
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27 debt costs, new opportunities for obtaining loans (especially for ‘weak’ supply chain
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29 players), or reduced working capital within the supply chain. Moreover, the SCF
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31 approach often improves trust, commitment, and profitability throughout the chain
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33 (Randall and Farris II, 2009).
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38 The level of interest in the topic of SCF among practitioners has increased significantly.
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40 An example that illustrates this is the ‘Supply Chain Finance scheme’ developed by the
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42 UK government [i]. This scheme is an agreement between the UK government and 37
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44 of the biggest companies in the UK. The companies agree to notify a financial
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46 institution when an invoice is approved for payment; the bank is then able to offer a 100
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48 per cent immediate advance to the supplier at a lower interest rate, knowing that the
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50 invoice will ultimately be paid by the large company.
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53 Along with the expansion of the SCF market, interest in SCF is also growing among
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55 academics. The number of scientific articles focusing on SCF has increased in the last
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3 decade, giving the concept a more defined identity and leading to the development of a
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5 more precise framework to describe the SCF solutions landscape. However, contrasting
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7 definitions, which address the topic from different perspectives, have been found in the
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9 literature. More specifically, the literature review highlights the existence of the *finance*
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11 *oriented* and the *supply chain oriented* perspectives (cf. section 3). The former is
12
13 focused on financial aspects and considers the SCF approach as a set of financial
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15 solutions, very often provided by financial institutions (Camerinelli, 2009). The latter
16
17 emphasises the role of collaboration amongst supply chain members, with a particular
18
19 focus on inventory optimisation. This perspective extends the boundaries of SCF
20
21 beyond simply financial solutions, taking into consideration inventories, supply chain
22
23 processes, and even collaborative solutions for fixed asset financing, such as pay-on-
24
25 production schemes (Pfohl and Gomm, 2009). The differences between the two
26
27 perspectives result in conflicting frameworks and definitions, and consequently it is still
28
29 very difficult to derive a clear picture of SCF from the existing literature. As a matter of
30
31 fact, a general framework describing the SCF concept and SCF solutions, in which the
32
33 two main perspectives (*finance oriented* and *supply chain oriented*) are both considered,
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35 is still lacking. The authors believe that the integration of these two existing
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37 perspectives is critical if the benefits of the SCF approach are to be more fully realised.
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39 This article aims to provide a systematic review of the recent literature and to identify
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41 areas for future research. The paper is organised as follows: the second section
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43 describes the methodology used to carry out this literature review; the third section
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45 presents and discusses the main findings; the fourth section highlights the gaps and
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47 suggests potential directions for future research in this field; and the final section
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49 presents the conclusions that have been drawn.
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Methodology

Scope of the analysis

This review examines articles dealing with the general concept of SCF and/or specific SCF solutions (e.g. factoring, reverse factoring, supplier finance, VMI – Vendor-Managed Inventory), mainly published between 2000 and 2014. As a matter of fact, 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). Together with the aforementioned solutions, the trade credit literature was also reviewed, considering the same time frame. This literature could not be neglected in the present review, because it is recognised that trade credit partially overlaps with the concept of SCF (Klapper and Randall, 2011). Contributions focused on trade credit are plentiful within this time frame (Chang *et al.*, 2008; Seifert *et al.*, 2013; Soni *et al.*, 2010). Specifically, they can be divided into seven groups: monetary policy implications, credit risk models, trade credit motives, order quantity decisions, factoring economics, credit term decisions, and settlement period decisions (Seifert *et al.*, 2013). The first two groups in the list are unrelated to the matter at hand, and were therefore excluded from this review. The other categories might include contributions with clear links to the concept of SCF (e.g. Klapper *et al.*, 2011; Klapper and Randall, 2011), and, therefore, were included in this review.

It should be noted that several articles that address the topic of ‘Financial supply chain management’ have also been included in this review, based on the fact that, at least in these particular contributions, the distinction between SCF and Financial supply chain management seems to be negligible. Specifically, 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.

Selection process

The selection process can be divided into two macro-steps. In the first step, 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', 'supply chain financing', 'financial supply chain', 'financial value chain', 'working capital optimisation', 'working capital management', 'VMI', 'supply chain AND factoring', 'reverse factoring'), which 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, Journal of Business and Finance, Journal of Finance, Management Science, International Journal of Production Economics, Journal of Business Logistics, Journal of Supply Chain Management, Journal of Operations Management). 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 (e.g. articles focusing on e-invoicing, which only mention SCF, were considered to be out of scope).

Papers were read carefully and thoroughly. In the end, 106 papers published from 2000 to 2014 were selected for in-depth examination.

In the second step, coherently with Cooper (2009), the entire body of work referenced in the initial sample of 106 papers was gathered and examined, in order to identify relevant papers that: (i) eluded the keyword search carried out in step one, or (ii) were

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3 published prior to the time limit set (i.e. 2000). This step led to the identification of a
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5 total of 2016 articles, most of which could immediately be discarded based solely on the
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7 title (i.e. methodological, contextual, or other articles clearly unrelated to the topic at
8
9 hand) or because they were already included in the initial sample of 106 articles. The
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11 result was a sample of 226 articles. From these, 50 additional contributions were
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13 discarded because they were found to be non-scientific articles (e.g. reports, white
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15 papers), leaving 176 articles to be reviewed. In order to select which articles deserved
16
17 an in-depth analysis, two criteria were used: (i) papers published in a top journal (i.e.
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19 the top finance, logistics or supply chain management journals based on the SCImago
20
21 Journal Ranking index), or (ii) if not published in a top journal (as defined above),
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23 papers that were cited in at least 4 of the original sample of 106 articles. The first
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25 criterion produced 20 articles, while the second produced 18. Each of these articles was
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27 then carefully examined to determine whether it should be included. Ultimately, 9
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29 articles from the first group and 4 from the second were added to the review, bringing
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31 the total number of articles to 119.

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36 Summarizing, 119 papers were selected. Among these, 5 were published before 2000,
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38 while the others were published in the 2000-2014 timeframe; 102 were published in
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40 journals, and 16 in international conference proceedings, while the remainder are books,
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42 book chapters and working papers. In general, the papers found on this topic were
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44 published in journals of logistics and supply chain management (22), business and
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46 management (14), economics (14), finance and treasury (11), production management
47
48 (11), operations research (10), and engineering and technologies (7).

51 52 53 ***Review method***

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55 A number of methods used in previous reviews were examined (Meixell and Norbis,
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57 2008; Natarajathinam *et al.*, 2009; Perego *et al.*, 2011). For the purposes of our
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1
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3 review, and consistently with Perego *et al.* (2011), the articles were classified using a
4
5 two-pronged approach. The papers were classified on the basis of the research
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7 method(s) adopted and were also examined on the basis of their contents. The general
8
9 Supply Chain Finance literature (not related to specific solutions) was analysed first in
10
11 order to identify the main topics currently being studied and relevant SCF solutions to
12
13 be included in the review. Then, articles related to those solutions were examined. All
14
15 of the papers were grouped according to three main themes:

- 16
17 (1) concept and definitions of SCF;
- 18
19 (2) expected benefits;
- 20
21 (3) SCF initiatives in place.

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27 The articles were summarised using the established review criteria in order to facilitate
28
29 the identification of patterns that describe research themes as well as revealing possible
30
31 gaps. Coherently with Carter and Easton (2011) and Jarvis *et al.* (2003), data coding
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33 was conducted by the corresponding author and by one of the other authors, based on
34
35 the coding scheme depicted in Table 1. An initial measure of reliability, based on the
36
37 proportion of total pairwise agreements between the coders, was (overall) over 80
38
39 percent, suggesting a very high level of reliability and thus replicability of the data
40
41 coding (Carter and Easton, 2011). Disagreements between coders were examined, and
42
43 the other authors were involved as needed, until consensus was reached (Jarvis *et al.*,
44
45 2003; Pilbeam *et al.*, 2012).

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50 =====Please insert table 1 here =====

51
52 Table 1: Categories used to extract and analyse the data

53 54 **Supply Chain Finance: findings from the literature**

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56 This section is organised as follows: following a brief introduction, the articles are
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58 discussed from the point of view of the research method in the first subsection, while
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1
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3 the subsequent subsections address the key topics listed in the previous section. A table
4
5 summarising the content and features of each of the 119 papers analysed is available
6
7 upon request.
8
9

10 11 **Research method**

12 The analysis presented in this paper replicates the categorisation proposed by Meixell
13 and Norbis (2008), in which the papers were classified according to seven research
14
15 methods, i.e. analytical models, conceptual models or frameworks, case studies,
16
17 interviews, surveys, simulation and others. Please note that the total number of papers
18
19 listed in Table 2 does not add up to 119 as multiple methodologies were used in some
20
21 papers. Overall, about half of the articles reviewed are based on analytical models or
22
23 simulations, while the other half are almost equally split between conceptual and
24
25 empirical studies (e.g. case study, surveys).
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31 =====Please insert table 2 here =====

32
33 Table 2: Research method summary
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36 Analytical modelling has been used with a general scope by some authors, such as Pfohl
37 and Gomm (2009), who modelled a generic SCF solution in order to identify the
38
39 variables driving the benefits. Similarly, Srinivasa Raghavan and Mishra, (2011),
40
41 developed an analytical model to demonstrate that, under the right hypotheses, the joint
42
43 financing of a buyer-supplier dyad is more profitable than two separate financing
44
45 operations for both of the two organisations and for the lender. The analytical approach
46
47 has, of course, also been used extensively to model specific SCF solutions. In this
48
49 respect, the solution most commonly addressed is Vendor-Managed Inventory. Dong
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51 and Xu (2002), approached the solution from the supply chain perspective, and
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53 compared the benefits of the VMI solution to those that can be achieved through so-
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3 called full channel coordination (i.e. an ideal state in which the supply chain players
4
5 concur to maximise the profit of the entire supply chain). Yao (2008), on the other hand,
6
7 compared the benefit of Information Sharing, Continuous Replenishment, and VMI in
8
9 terms of stock reduction with respect to a more traditional stock management policy.
10
11 With regard to other solutions, Palia and Sopranzetti (2004) proposed a model to assess
12
13 the benefits of a solution for the securitisation of accounts receivable (such as the
14
15 factoring option), while Lee and Rhee (2011) demonstrated how trade credit, used
16
17 according to a supply chain perspective, could be a valuable supply chain coordination
18
19 tool.
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23 The conceptual articles reviewed usually present general frameworks or concepts
24
25 regarding SCF, focused on defining the scope of application, the objectives, the actors
26
27 involved, or the levers that can be exploited (Camerinelli, 2009; Gomm, 2010;
28
29 Hofmann, 2005; Hofmann and Belin, 2011; Pfohl and Gomm, 2009). Hofmann (2005)
30
31 provided an analysis of the players involved in the SCF process as well as some insights
32
33 about how SCF solutions affect the way financial and supply chain processes are
34
35 managed. Although conceptual papers dealing with the SCF concept are much more
36
37 prevalent than those involving specific SCF solutions, some valuable examples of the
38
39 latter were found, e.g. Soufani (2001) addressed the role of factoring for SMEs in the
40
41 UK.
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44
45 With regard to empirical research methodologies, the literature reviewed highlights the
46
47 use of surveys (Borade and Bansod, 2010; Dong *et al.*, 2007; Klapper, 2006; Soufani,
48
49 2002), as well as statistical analyses of empirical data from previous datasets
50
51 (Atanasova, 2012; Fisman and Love, 2003; Klapper, 2006). As an example, More and
52
53 Basu (2013) conducted a survey of Indian firms, whose purpose was to identify the
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55 most important challenges in the implementation of SCF solutions. In addition, the case
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3 study methodology has recently been used in several articles, in a descriptive
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5 (Blackman *et al.*, 2013; Randall and Farris II, 2009) or in an exploratory manner
6
7 (Wuttke *et al.*, 2013a, 2013b). These articles usually examine the resulting benefits and,
8
9 in some cases, present interpretative SCF frameworks. Notably, (Wuttke *et al.*, 2013a),
10
11 used case studies to develop a six-proposition framework linking the contextual
12
13 variables and the internal supply chain characteristics that most affect the application of
14
15 SCF solutions.
16
17

18 19 20 ***Concept and definitions***

21 This section discusses the definitions of SCF presented in the papers analysed, which
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23 are summarised in Table 3. These definitions help clarify the current state of the art in
24
25 SCF and the main perspectives from which different authors have approached this topic.
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29 =====Please insert Table 3 here =====

30 Table 3: Supply Chain Finance definitions
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35 In order to classify the definitions of SCF, two main factors were considered:
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- 38 (a) The role of financial institutions
39
40 (b) The scope of SCF
41
42 (i) Only (an evolved form of) Reverse Factoring
43
44 (ii) Inclusive of inventory optimisation and/or inventory shifting
45
46 (iii) Inclusive of fixed asset financing
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50 Variable (a) deals with the role of financial institutions within the SCF framework.

51 Some articles suggest that SCF can be considered as a set of short-term solutions
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53 provided by financial institutions, focused on accounts payable and/or receivable. In
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3 these articles, the direct involvement of a lender, who becomes the solution provider, is
4
5 an essential component of the SCF scheme.

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7 Variable (b) reflects the scope of SCF covered in the selected articles. Some of these
8
9 papers not only consider SCF as a set of short-term financial solutions, but also limit the
10
11 possible financial solutions to Reverse Factoring only, assuming a specific buyer-driven
12
13 orientation (typical of Reverse Factoring).
14

15
16 Other papers include collaborative inventory management or inventory shifting among
17
18 supply chain players within SCF. The inclusion of inventories as well as payables and
19
20 receivables broadens the scope of SCF to include working capital in its entirety.
21

22
23 Finally, some articles further expand the scope of SCF. These, in fact, not only consider
24
25 all of the working capital components as the main target of SCF practices, but expand
26
27 the scope to include the financing of fixed assets among supply chain players (Gomm,
28
29 2010; Hofmann, 2005; Pfohl and Gomm, 2009).
30

31
32 Two major perspectives emerge from the analysis of the articles that provide definitions
33
34 of SCF: the '*finance oriented*' (from which it is possible to identify a further '*buyer-*
35
36 '*driven*' perspective) and the '*supply chain oriented*' perspective (cf. Table 4).
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42 ===Please insert table 4 here===

43 Table 4: The SCF perspectives identified.
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47 The '*finance oriented*' perspective interprets SCF as a set of (innovative) short-term
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49 financial solutions, as shown by Camerinelli (2009) and Chen and Hu (2011), who
50
51 explicitly mentioned this point in their definitions. Therefore, financial institutions (or,
52
53 more generally, lenders) are essential components in the SCF scheme. A second
54
55 important characteristic of the '*finance oriented*' perspective is the focus on payables
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57 and receivables (but not on inventories). Lamoureux and Evans (2011) opine that the
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3 events that trigger SCF solutions are the most important events in the trade process (e.g.
4 order acceptance, shipment, payable due date). This view is also held by More and Basu
5 (2013), for whom SCF is conceptually divided into three categories: pre-shipment, in-
6 transit, and post-shipment financing solutions. It is worth noting that, within the
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11
12 *'finance oriented'* perspective, there is also a subset of articles that address SCF from an
13 even stricter perspective, which could be called the *'buyer-driven'* perspective. In these
14 articles, SCF is viewed as a set of buyer-driven financial solutions, often modelled as an
15 evolved form of Reverse Factoring (Seifert, 2010; Wuttke *et al.*, 2013b). The evolution,
16 with respect to traditional Reverse Factoring, lies mainly in the technological
17
18 improvement of the solution that makes it possible to: (i) provide capital to a higher
19 number of suppliers at a lower rate, (ii) increase transparency and flexibility, and (iii)
20 involve new players – such as logistics service providers (Chen and Hu, 2011; Wuttke
21
22 *et al.*, 2013b). Although this perspective is taken into account in only a limited number
23 of articles, it is quite well-established among practitioners (PWC, 2009).

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34 On the other hand, the *'supply chain oriented'* perspective extends the framework of
35 working capital optimisation to include inventories. For example, Pfohl and Gomm
36 (2009) tested their conceptual model in a VMI scenario, while Randall and Farris II
37 (2009) analysed the benefits achieved through a generic shifting of inventory between
38 two supply chain players. In the latter case, a descriptive case study highlights how all
39 of the different components of the cash-to-cash (C2c) cycle can be managed in a
40 collaborative way by the supply chain players involved (e.g.: shifting inventories from a
41 supplier to a customer). Notably, the described benefits might be achieved in the
42 absence of a specific financial solution provided by a lender, which, in fact, is often
43 ancillary. As a general trend, the articles that take this perspective tend to provide
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60 holistic analyses of the SCF approach, without describing any specific solutions or

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3 practices. A second characteristic of some of the papers that assume the 'supply chain
4
5 oriented' perspective regards the object of the financing. Pfohl and Gomm (2009), and
6
7 Gomm (2010), specifically state that SCF also applies to fixed asset financing (e.g.:
8
9 through a *pay per production* solution). This is also confirmed by Hofmann (2005), who
10
11 illustrates, as an example of an SCF operation, a joint investment in a fixed asset by two
12
13 organisations that are part of the same supply chain.
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15

16 17 18 ***Expected benefits***

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20 From a strictly financial point of view, the benefits of SCF solutions derive mostly from
21
22 the exploitation of differences in the cost of capital between different players in the
23
24 supply chain (Lamoureux and Evans, 2011). This is a well-known fact, which was
25
26 identified even in early contributions on specific SCF models (such as Reverse
27
28 Factoring), published well before the 2000s, already underline it (Brennan *et al.*, 1988).
29
30 Player 'A', whose cost of capital is k_A , might exploit the cost of capital k_B ($k_B < k_A$) of
31
32 player 'B' in order to lower its capital rate (Pfohl and Gomm, 2009; Randall and Farris
33
34 II, 2009). However, this is not the only source of benefit and, in order to better
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36 conceptualise the value derived from a SCF program, two additional factors should be
37
38 taken into account: the duration and volume of the financing required. This three-
39
40 dimensional framework is known as the 'Supply Chain Finance cube', and was
41
42 proposed by Pfohl and Gomm (2009) and Gomm (2010). The different SCF solutions
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44 affect one or more of the three axes that define the cube. For example, a Vendor-
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46 Managed Inventory program directly affects the volume of capital needed, decreasing
47
48 inventories through improved accuracy (Dong *et al.*, 2007; Sari, 2007); an invoice
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50 discounting solution directly affects the duration of the financing, decreasing the cash-
51
52 to-cash cycle for the supplier and/or the buyer involved in the transaction (Farris II and
53
54 Hutchison, 2002; Grosse-Ruyken *et al.*, 2011); a Reverse Factoring solution, or in
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3 general a program that combines the shortening of the cash-to-cash cycle with the
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5 exploitation of the leading player's risk rating, affects both the duration and the rate
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7 axes (Wuttke *et al.*, 2013a).
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10 The benefits of SCF solutions, however, are not limited to financial performance.
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12 Supply chain visibility is of paramount importance as well (Caridi *et al.*, 2010). Large
13
14 companies (such as player 'B' in the previous example) might be interested in
15
16 promoting SCF solutions in order to lower the cost of gathering certain information (e.g.
17
18 customer demand), which is too costly or even impossible to gather otherwise (Pfohl
19
20 and Gomm, 2009), thus increasing its total sales or reducing its costs.
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24 Another very important source of benefit for large supply chain players is the reduced
25
26 risk of bankruptcy throughout the supply chain. This kind of benefit is typical of
27
28 factoring and Reverse Factoring solutions. Specifically, Klapper (2006) points out that
29
30 factoring (and, moreover, Reverse Factoring) may allow high-risk suppliers to mitigate
31
32 their credit risk level with that of their high-quality buyers, thus reducing their cost of
33
34 debt and increasing their level of access to liquidity. The Reverse Factoring solution
35
36 could provide additional benefits related to the reduced need for information: collecting
37
38 credit information for selected high-quality buyers is - generally speaking - easier and
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40 reduces the risk of the financial operation, with a further decrease in cost of debt and
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42 access to liquidity for high-risk suppliers (Berger and Udell, 2006; Klapper, 2006;
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47 Tanrisever *et al.*, 2012).
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50 Several papers approach the analysis of SCF benefits from the point of view of the cash-
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52 to-cash cycle, which is also typically a key performance indicator for the management
53
54 of the entire supply chain (Farris II and Hutchison, 2002). The cash-to-cash cycle can
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56 be defined as '*the average days required to turn a dollar invested in raw materials into*
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3 *a dollar collected from a customer*' (Stewart, 1995) and it consists of three components:
4
5 days of sales outstanding (accounts receivable collection period) plus days of inventory
6
7 held (considering both work-in-progress and finished products) minus days of payable
8
9 outstanding (accounts payable settlement period). As an example, Luo and Zhang
10
11 (2012) studied the benefits of coordinating the supply chain through trade credit (i.e.
12
13 operating on the accounts receivable collection period). Their results show that
14
15 managing trade credit periods might be a source of substantial benefits for the supply
16
17 chain. For example, a low-risk buyer can use trade credit to financially sustain a start-up
18
19 supplier, to mutual benefit. However, the authors also demonstrated that such benefits
20
21 depend on the information available throughout the chain: asymmetric information
22
23 among the parties involved may lead to suboptimal solutions. Along the same line of
24
25 reasoning, Hofmann and Kotzab (2010) showed how a collaborative approach (or, as it
26
27 is called, a supply chain-oriented approach) to cash-to-cash management leads to
28
29 optimal solutions, whereas aggressive behaviour (i.e. pressure to shorten receivable
30
31 collection and extend payable settlement times through the supply chain) might
32
33 negatively affect the value of the organisations involved. Such conceptual insights also
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35 find support among practitioners, as some organisations have adopted the role of
36
37 liquidity providers, accepting an increase in their cash-to-cash cycle, providing an
38
39 alternative means of financing to supply chain partners in distress. The positive effects
40
41 of an SCF approach to cash-to-cash cycle management are also confirmed by
42
43 Lamoureux and Evans (2011), and by Randall and Farris II (2009).
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51 Other articles highlight the benefits associated with the involvement of financial
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53 institutions in SCF programs. In some solutions, such as factoring or those focused on
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55 securitising assets receivable, financial institutions usually carry the burden of
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57 collecting payments, in exchange for an increase in revenues (Palia and Sopranzetti,
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3 2004; Tanrisever *et al.*, 2012). Moreover, financial institutions can improve their risk-
4
5 assessment process, especially regarding SMEs. This assessment is often characterised
6
7 by high levels of uncertainty due to asymmetric information, and constitutes a source of
8
9 major concern for financial institutions (Deakins and Hussain, 1994). The SCF
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11 approach might increase the availability and accuracy of information, thus supporting
12
13 financial institutions in estimating a default probability tailored to the specific SMEs
14
15 (Hofmann, 2005).
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19 Finally, some articles state that supply chain links are strengthened through enhanced
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21 collaboration, visibility or automation that a SCF solution might entail (Hofmann and
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23 Belin, 2011; Lamoureux and Evans, 2011).
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26 27 ***Supply Chain Finance projects*** 28

29 Several papers describe existing SCF initiatives (Blackman *et al.*, 2013; More and Basu,
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31 2013; Templar *et al.*, 2012; Wuttke *et al.*, 2013a, 2013b). Overall, these articles can be
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33 categorised into two classes, based on their purpose. Some of them are descriptive in
34
35 nature, and present one or more cases of interest, highlighting significant aspects; others
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37 are exploratory and present a set of propositions related to SCF about the adoption
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39 process, the outcome of the SCF program or the role of inter- or intra-company
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41 collaboration.
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46 (i) *Descriptive*: the purpose of these articles is usually to highlight successful
47
48 examples of SCF programs or practices. The paper can have a single- or multi-case
49
50 focus. The papers analysed present the descriptive case studies either as the main
51
52 contribution to the paper, or to support insights gathered conceptually.
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55 An example of the first type, with a single-case focus, is the analysis of the Motorola
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57 financial supply chain management strategy, described by (Blackman *et al.*, 2013). The
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3 authors highlight how the introduction of a collaborative approach to managing the
4 financial flows within the supply chain generates cost savings for all of the companies
5 involved.
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9 An example of the multi-case type is presented by (John Mathis and Cavinato, 2010),
10 in which the Zara and Toyota financial supply chain strategies are described in order to
11 demonstrate that collaboration between the finance and supply chain functions is
12 paramount for an effective financial supply chain management strategy. A second
13 example is represented by (Nienhuis *et al.*, 2013), who analysed the opportunities
14 presented by SCF in terms of real-time financing of SMEs. They discussed two
15 descriptive case studies focused on innovative SCF services, which support the
16 conclusion that e-invoicing service providers and financial institutions are moving
17 towards real-time financing. A further example is represented by (Silvestro and
18 Lustrato, 2014), who analysed the role of banks in the integration of financial and
19 physical flows, and supported their conceptual conclusions with two in-depth case
20 studies.
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37 (ii) *Exploratory*: the purpose of these articles is to develop, from multiple SCF
38 initiatives, a series of propositions regarding contextual and/or internal variables that
39 might affect the adoption process and/or the benefits of different SCF solutions. As an
40 example, Wuttke *et al.* (2013b), who adopted a multi-case methodology, identified
41 patterns related to contextual and internal variables affecting the adoption process and
42 the outcomes of the different SCF solutions. They developed a five-proposition
43 framework with the objective of supporting managerial decisions related to the
44 implementation of SCF programs. Similarly, Wuttke *et al.* (2013a) used a number of
45 case studies to develop four propositions involving the adoption process. Specifically,
46 the authors addressed why companies take different approaches to SCF, and the role of
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3 suppliers in the adoption of SCF solutions.

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5 Another analysis that is based on exploratory case studies is provided by Templar *et al.*
6
7 (2012). The authors collected empirical evidence from different industries for the
8
9 purpose of analysing motivations, strategies, enablers and inhibitors of different SCF
10
11 applications. The paper provides a twofold contribution: the authors highlight how SCF
12
13 impacts on both the supply chain and the financial performance of the companies
14
15 involved, and they also point out the current level of immaturity of SCF practices in
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17 business, and the existing gap between SCF theory and practice which does, however,
18
19 seem to be decreasing.
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24 **Gaps and directions for future research**

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26 Four main gaps have been identified in the literature reviewed. Consequently,
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28 recommendations for future research have been provided to fill in these gaps.
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31 *(i) No general theory of SCF*

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34 The most important gap in the current SCF literature is the lack of a general '*theory of*
35
36 *SCF*'. This seems to be the cause of the disparity between SCF theory and practice,
37
38 which has previously been noted by Templar *et al.* (2012). This is hardly surprising. On
39
40 the one hand, SCF is a complex and relatively new concept, but on the other hand, the
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42 division of this topic into two different perspectives has led to the publication of
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44 disconnected ideas, which has had a negative impact on the usefulness of the results. The
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46 research on this topic should therefore move from a conceptual determination of the
47
48 validity and importance of SCF (which has been achieved) on to addressing and
49
50 generalising the building blocks of this approach (e.g. schemes and solutions, issues,
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52 enablers), starting with a comprehensive definition of those practical instruments or
53
54 solutions that make up the SCF landscape. A better general theory of SCF can be
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3 developed if it is based on a solid foundation of broadly applicable SCF building blocks.
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5 The reviewed literature is not devoid of attempts to develop generalised visions of SCF
6
7 that have been found among both the *'finance oriented'* perspective (More and Basu,
8
9 2013) and the *'supply chain oriented'* perspective papers (Wuttke *et al.*, 2013a, 2013a).
10
11 However, they are relatively scarce and the ideas presented have not been fully
12
13 developed, since they usually address just a few practices without providing a holistic
14
15 framework. Moreover, they still fail to bridge the two main perspectives, producing
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17 efforts and publications that are not fully coherent among each other.
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20 Further research works should focus on providing a comprehensive classification of
21
22 SCF solutions that takes into consideration the key features of SCF practices and takes a
23
24 more practical view of the SCF concept. These definitions will be the building blocks
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26 for the creation of a general SCF theory following a theory generation process similar to
27
28 the one observed within the field of supply chain management (Carter *et al.*, 2015;
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30 Cooper *et al.*, 1997; Croxton *et al.*, 2001).
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35 *(ii) Weak empirical-based holistic analyses on the application of SCF*
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38 Although analyses of specific SCF solutions (e.g. factoring, trade credit and VMI,
39
40 Claassen *et al.*, 2008; Klapper and Randall, 2011; Klapper, 2006) based on empirical
41
42 data have been found in the literature, there is a lack of empirical analyses addressing
43
44 SCF from a more holistic point of view (e.g. state of the art/adoption level of the
45
46 different SCF solutions). Empirical analyses might prove useful for testing existing
47
48 models and hypotheses, as highlighted by Pfohl and Gomm (2009), as well as providing
49
50 data for an assessment of the diffusion of the SCF approach and of its different
51
52 applications, which is still unclear. The existing empirical studies do not fully satisfy
53
54 this need. Among the most significant empirical studies, More and Basu (2013) based
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56 their work on a survey, which was limited to financial solutions – a limitation shared
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3 also by Wuttke *et al.*, 2013a – and, geographically, to Indian firms only. Wuttke *et al.*
4
5 (2013b), considered a more comprehensive set of practices (such as evolved forms of
6
7 Reverse Factoring, inventory financing, and financing based on letters of credit), but
8
9 limited the study to the application of SCF solutions focused on the upstream side of the
10
11 supply chain.

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14 Further research should address more innovative schemes and solutions (such as
15
16 Dynamic Discounting, or evolved forms of Reverse Factoring) and also tackle the
17
18 application of SCF solutions that focus on the downstream side of the supply chain, as
19
20 these have received less attention, especially from the empirical point of view. Future
21
22 research should also focus on analysing the adoption level and the state of the art of the
23
24 different solutions. Finally, empirical studies should be employed to test hypotheses and
25
26 the models developed.
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30 *(iii) Few assessment models consider the impact of SCF programs on Supply Chain*
31
32 *financial performance*
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36 Although the link between the SCF concept and a financially sustainable supply chain
37
38 has already been addressed (Templar *et al.*, 2012), there is a general lack of research on
39
40 the effects of SCF solutions on the financial performance of the entire supply chain (i.e.
41
42 with supply chain set-ups that are more complex than the single buyer-supplier dyad).
43
44 The literature on the '*finance oriented*' perspective includes a series of SCF solutions
45
46 that have been recognised to have a positive effect on the financial performance of the
47
48 supply chain players, although further research is still needed to better assess some of
49
50 the more innovative solutions (e.g. Dynamic Discounting and evolved form of Reverse
51
52 Factoring). One example is the Reverse Factoring solution, which positively influences
53
54 the financial performance of the supply base involved (Klapper, 2006). However,
55
56 quantitative assessments of the benefits achievable through Reverse Factoring solutions
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3 are still rare and are based on the single buyer-supplier set up (e.g. Tanrisever *et al.*
4
5 2012). A second example is the management of trade credit, which has been considered
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7 by a number of authors who focused on the impact on the financial variables - such as
8
9 the cost of capital - of the supply chain players involved. Although the management of
10
11 trade credit has been addressed for a range of scenarios, which generally involve typical
12
13 supply chain or logistics decisions (e.g. joint inventory policies and trade credit
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15 decisions, trade credit for the supply chain coordination), non-dyadic supply chain set-
16
17 ups have scarcely been addressed and have been identified as an area for future research
18
19 (Seifert, 2010).
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22
23 With regard to the SCF '*supply chain oriented*' perspective, joint inventory
24
25 management policies have been extensively analysed, even in complex networks, over a
26
27 long period of time (Clark and Scarf, 1960). Specific '*supply chain oriented*' SCF
28
29 solutions (e.g. VMI) involving complex, non-dyadic supply chain set-ups have also
30
31 been studied (Darwish and Odah, 2010; Mangiaracina *et al.*, 2012). However, the
32
33 impacts on the financial performance of the supply chain have rarely been addressed. A
34
35 rare example is Xu *et al.* (2010), who analysed how VMI might reduce the probability
36
37 of bankruptcy among supply chain players. The contributions that do consider financial
38
39 performance are rudimentary and this topic could be further studied and developed in
40
41 greater detail.
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45 Future research should extend the focus of the assessment models either to include more
46
47 complex supply chain set-ups (especially for solutions of a more financial nature), or to
48
49 conduct a more comprehensive analysis of the impact on financial performance
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51 (especially with respect to solutions of a more supply chain management nature).
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55 *(iv) Lack of tools for choosing SCF solutions for different Supply Chains and*
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57 *objectives*
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3 This review highlights a lack of practical guidance and tools to help managers identify
4 the SCF solution that best suits their needs. This area has generally been neglected in
5 the literature. Although some managerial implications have been identified, especially
6 through empirically-based research such as that presented by Wuttke *et al.* (2013a,
7 2013b), no significant steps have been taken to develop such tools. These tools should
8 be based upon an understanding of the benefits and drawbacks of the different SCF
9 solutions, and at the same time upon the connection between the features of a supply
10 chain and the different SCF solutions. As pointed out by Wuttke *et al.* (2013b), such
11 variables (e.g. captivity, strategic importance, complexity of the market) have, in fact,
12 an overriding effect on the effective application of different SCF solutions. As an
13 example, a supply base consisting of SMEs responds in a different way to different SCF
14 solutions than does a supply base made up of large companies, even if their financial
15 performance is similar.

32 **Conclusions**

33 In this paper, 119 research contributions on the topic of Supply Chain Finance, mainly
34 published between 2000 and 2014, were examined. The papers were analysed using a
35 two-pronged approach – i.e. analysis of the research method(s) adopted and of the
36 specific contents.

37 The contribution of this paper is twofold. First, it presents a structured review that
38 provides a guide to both researchers and practitioners on the subject of SCF,
39 highlighting the main perspectives that researchers have taken on this topic, the most
40 important achievable benefits, and the methodologies used to conduct the studies.

41 Second, it identifies some research issues for future investigation.

42 In general, the literature review has shown that the topic of SCF has been addressed
43 from two main perspectives. The *'finance oriented'* perspective is focused on short-term

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3 financial solutions, provided by financial institutions, which involve accounts payable
4 and receivable. An even more restrictive perspective, the so-called buyer-driven
5 perspective, focuses only on evolved forms of Reverse Factoring. The '*supply chain*
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financial solutions, provided by financial institutions, which involve accounts payable and receivable. An even more restrictive perspective, the so-called buyer-driven perspective, focuses only on evolved forms of Reverse Factoring. 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 asset financing. It may or may not include financial institutions, as it also comprises solutions that optimise working capital among the supply chain members. With regard to the benefits of SCF, the literature review has shown that 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. In terms of methodology, the review shows that studies focusing on the general scope of SCF are mainly conceptual, whereas those focusing on specific solutions use analytical modelling and simulation.

The analysis revealed several gaps in the extant literature that indicate directions for future research in the area of SCF. First, it shows that there is a need for the development of a '*general theory of SCF*'. Second, the empirical results on the application of many SCF solutions are weak. Third, there is lack of analysis focused on the link between SCF and supply chain financial performance. Finally, there are too few practical instruments available to support managerial decisions in the field.

This study has one potential limitation. While considerable effort was made to ensure that the review would be all-inclusive, it is possible that some relevant research studies may have inadvertently been omitted. However, the authors believe that this review is an accurate representation of the body of research on SCF published during the specific time frame.

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Table 1. Categories used to extract and analyse the data

Area	Category	Information
Descriptive	Country	Country of corresponding author's affiliation
	Source	Journal, conference proceedings, or book title, in which it was published
	Title	Complete title of the paper
Methods	Methodologies	Primary methodology of the paper (cf. Table 2 for admissible values); if a single primary methodology cannot be identified, multiple codes may apply
	Scope	It Identifies if the paper addresses the general SCF approach or a specific solution
Themes	Definition and concept	Coded as "Core" if the article provides a definition of SCF, "Ancillary" if it contributes to conceptually clarify the concept without formally attempting to define it, "None" otherwise
	Quantitative benefits	Coded as "Core" if the article presents a quantification of the benefit of SCF or SCF solutions (through analytical models, simulation or quantitative-based analysis of empirical data), "None" otherwise
	Qualitative benefits	Coded as "Core" if the article is focused on the definition of intangible or qualitatively describe tangible benefits of SCF or single SCF solutions, "Ancillary" if the description of the benefits is used to support the core content of the paper, "None" otherwise
	SCF projects	Coded as "Core" if SCF projects are the focus of the article (e.g. case study), "Ancillary" if they are presented and comprehensively described, but are not the core content, "None" if projects are merely mentioned or are not present

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Table 2. Research method summary

Methodology	Number
Analytical	57
Conceptual	30
Survey	12
Case study	13
Simulation	11
Interviews	0
Others	9

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Table 3. Supply Chain Finance definitions

#	Article	Definition	(a) Role of Financial Institution	(b.i) Scope: only RF	(b.ii) Scope: inclusive of inventory optimization	(b.iii) Scope: inclusive of fixed asset financing	<i>Proposed perspective</i>
1	Hofmann (2005)	<i>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</i>				Yes	<i>Supply Chain</i>
2	Camerinelli (2009)	<i>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</i>	Yes				<i>Finance</i>
3	Pfohl and Gomm (2009)	<i>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</i>			Yes	Yes	<i>Supply Chain</i>
4	Gomm (2010)	<i>[SCF is the process of] optimising the financial structure and the cash-flow within the supply chain</i>			Yes	Yes	<i>Supply Chain</i>
5	X. Chen and Hu (2011)	<i>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</i>	Yes				<i>Finance</i>
6	Lamoureux and Evans (2011)	<i>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</i>	Yes				<i>Finance</i>
7	Grosse-Ruyken et al. (2011)	<i>[SCF] is an integrated approach that provides visibility and control over all cash-related processes within a supply chain^(a)</i>			Yes		<i>Supply Chain</i>
8	Wuttke et al. (2013a)	<i>we define [FSCM] as optimised planning, managing, and controlling of supply chain cash flows to facilitate efficient supply chain material flows^(b)</i>			Yes		<i>Supply Chain</i>
9	Wuttke et al. (2013b)	<i>[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^(c)</i>	Yes	Yes			<i>Buyer-driven</i>
10	More and Basu (2013)	<i>[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</i>	Yes				<i>Finance</i>

^(a): Based on Camerinelli (2009) and Pfohl and Gomm (2009).

^(b): Definition of Financial Supply Chain Management

^(c): Definition of Supply Chain Finance

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Table 4. The SCF perspectives identified

Perspective	(a) Role of financial Institution	(b.i) Scope: only RF	(b.ii) Scope: inclusive of inventory optimization	(b.iii) Scope: inclusive of fixed asset financing
Financial oriented	Mandatory	No	No	No
<i>buyer-driven</i>	Mandatory	Yes	No	No
Supply Chain Oriented	Non-mandatory	No	Yes	Sometimes

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