# Can supply chain finance help mitigate the financial disruption brought on by the COVID-19 pandemic?

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**Abstract**
The COVID-19 pandemic created a financial disruption within supply chains, destabilizing especially small and medium enterprises (SMEs) and devastating the global economy. Supply chain finance (SCF) answered the 2008 financial crisis and could help face the new challenge, but new paradigms are necessary to become an effective mitigation strategy. Thanks to empirical data collected through a focus group with industry experts, this note presents new research directions in the SCF domain, based on Contingency Theory and Resource Orchestration Theory, including new solutions, actors, collaborations, technologies, regulations, and performance.

**Keywords**
Supply Chain Finance, COVID-19, Digital Technologies

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## The outbreak of Covid on supply chains and the role Supply Chain Finance

The outbreak of the COVID-19 pandemic impacted the health of the world population and economic activities dramatically in all countries, with significant effects on supply chains all over the planet. Lockdowns have disrupted the demand and supply of many goods in terms of physical flows; at the same time, financial flows have been affected, with dramatic consequences spreading across supply chains. This financial distress brought back memories of the financial crisis of 2007/2008 when the economic downturn and the credit crunch caused a reduction of cash that affected, in particular, SMEs.

The two phenomena were very similar: the analysis of the largest 800 manufacturing firms in Europe and the US over between 2004 and 2017 showed how they systematically extended their payment terms (Caniato et al., 2020), forcing suppliers to look for additional sources of funding. An immediate extension of payment terms also happened in 2020, but this situation was exacerbated by a simultaneous decline in demand during the pandemic, with consequently reduced payments.

In the years following the financial crisis of 2007/2008, the central banks poured significant amounts of liquidity into the system. However, this did not reach all companies equally, with SMEs still struggling to access credit. In those years, a new approach was developed to cope with such a situation under the name Supply Chain Finance (SCF) to cope with such a situation. It aimed at improving access to funding and the management of financial flows for the entire supply chain, supporting, in particular, weaker actors such as SMEs (Gelsomino et al., 2016). SCF is based on a collaborative approach involving both companies along the supply chain and financial and technology providers.

During those years, SCF was emerging and appearing for the first time; indeed, after the outbreak of COVID-19, SCF received additional attention from companies as a potential solution to mitigate the pandemic's adverse financial effects to avoid repeating the mistakes and damages of the previous decade. For example, fashion companies such as Gucci and Luxottica, which suffered a dramatic slowdown in sales during the spring of 2020, had their suppliers ready to deliver goods that were not needed anymore in the short term (Caniato et al., 2020). To avoid the risk of suppliers going out of business, they decided to renew and extend their SCF programs, allowing them to deliver and cash their invoices. This is just an example of a widespread situation, with SME suppliers in many industries, from automotive to food (during lockdowns, bars and restaurants could not work), experiencing severe financial problems. This resulted in increased use of the existing solutions and demonstrated the need for further evolution to match the unprecedented challenges faced by supply chains.

Some anecdotal examples suggest a potential role of SCF in facing the current situation. Still, the topic requires further investigation, hence our first research question: *Which is the contribution that Supply Chain Finance could offer to mitigate the COVID-19 financial distress?*

Given the relevance of the problem for supply chains worldwide and the limited research available, this paper aims to identify relevant directions for future research that could help fill in the knowledge gap and support buyers, suppliers, financial, information and technology providers to develop innovative solutions and approaches to addressing the current and future challenges. Still, the focus on contribution of theories and the identification of new topics requires attention, hence our second research question: *What theoretical perspectives and topics should Supply Chain Finance research focus on in a post-Covid-19 era?"*

**Empirical and theoretical limitations in the current literature**

SCF literature has grown significantly over the last few years, but some gaps are emerging, especially considering the current situation.

The first stream of literature pertains to SCF solutions. SCF was initially considered a synonym of reverse factoring, a specific financial solution. A large, creditworthy buyer agrees with a financial institution to buy in advance the approved receivables of selected suppliers (Klapper, 2006). In this way, the suppliers can obtain liquidity faster at a favorable interest rate based on the customer's rating. This solution is still the most popular and has seen a considerable increase over the years, including recently during the pandemic, e.g., by food retailers who have extended their programs, thus allowing their suppliers to be paid faster, to compensate the lost revenues from bars and restaurants. In the last decade, the scope of SCF has broadened significantly, including multiple solutions (e.g., dynamic discounting, inventory financing, purchase order finance). While reverse factoring has been extensively investigated in the literature, and mainly from the buyer's perspective, other solutions are still under-researched despite their relevance in the current situation. The supplier perspective is seldom considered (Martin & Hofmann, 2019). Covid-19 showed the importance to exploit additional solutions or to combine different solutions to mitigate the financial distress along the supply chain and so additional research is necessary in this direction.

A second literature stream focuses on the supply chain actors considered. Given the complexity of today's supply chains, consisting of several tiers, often the actors who are more in need of financial support are far from the focal firm. However, standard SCF solutions are mainly dyadic, i.e., they involve a buyer and tier-1 suppliers only, thus failing to reach further upstream and leaving a significant part of the problem unsolved. This issue is also under-investigated in the literature, with very few contributions available (van Bergen et al., 2019). The worse distress provided by Covid-19 concerned especially the deepest tiers of the supply chain and research in how to incorporate these actors in SCF is missing, but fundamental.
Similarly, supporting actors should also be considered. Another relevant evolution in the SCF domain has been the birth of innovative players, typically "Fintech" companies, i.e., providing financial services exploiting digital technologies' potential. During the pandemic, e-commerce has further

accelerated its growth rate, making platforms such as Amazon relevant for SCF. But this topic is also under-investigated in the existing literature. If a proper management, along the overall supply chain, of the financial flows is necessary, all the potential actors should be involved, but how to achieve this is still an open issue, exacerbated by Covid-19 distress.

Furthermore, SCF benefits extensively from adopting digital technologies to make processes faster and cheaper and enable innovative solutions that can involve more companies at lower costs (Caniato et al., 2016). Several technologies can be considered, such as Electronic Invoicing, Artificial Intelligence (Moretto et al., 2018), or the Internet of Things (Abbasi et al., 2019). However, all these opportunities are still under-investigated (Caniato et al., 2019). They are highly in need in the current scenario when traditional credit risk assessment models are less reliable real-time monitoring of supply chains is even more relevant than before. Indeed, the pandemic made historical financial data at the base of traditional credit risk assessment methods not representative of companies' current condition since 2020 has been radically different from previous years. Also, the unpredictability of supply chain flows resulting from lockdowns, slowdowns, requisitions at borders, Brexit, etc., increased the need for real-time tracking of shipments to react and adjust promptly to disruptions. In this direction, the missing element is to identify the enabling factors, necessary to cope with a stronger and more extensive need of financial support along the chain.

Based on both the literature and the empirical evidence reported above, we have identified the boundaries of SCF and the main elements part of these boundaries. Anyhow, Covid-19, with its upmost critical distress, has strongly blurred these boundaries, making existing solutions less valuable and effective or past tools not more able to satisfy the requirements of the supply chains. In the same way, actors are modifying their roles and new resources are necessary. In this domain, additional research is necessary, to assure that SCF could actually contribute to alleviate the new financial distress.

## The voice from the field: the focus group as a suitable methodology

A focus group with SCF experts was organized to collect empirical evidence to answer our research question. The focus group's goal was to discuss the expected impact of the COVID-19 pandemic on SCF in the short- and medium-term. Indeed, several novelty elements appeared in the last few months, but it is unclear whether these represent a long-lasting change or are limited to the current situation.
The focus group aims to create a collaborative and creative atmosphere (Barbour, 1999). It has proved to be an appropriate methodology for acquiring direct feedback and insights from experts (Andic et al., 2012). The focus group meetings were conducted in such a way as to generate a natural, unrestricted discussion on the subject, which was observed and guided by the facilitators (Andic et al., 2012).
The choice of the focus group was driven by the willingness to adopt a co-production research approach, engaging both practitioners and scholars in the research and jointly analyzing the current phenomenon, and identifying future directions for SCF.

Data were collected in December 2020, 10 months after the first impacts of COVID-19, between the second and the third wave of the pandemic. We believe this is an appropriate timeframe to discuss a phenomenon, which is still occurring and collect proper evidence of its impacts.
The sample of the focus group included 56 people, all experts in the field, representing the broad range of actors involved in SCF, including industrial companies (i.e., buyers and suppliers), financial providers, technology providers, and information providers, etc.

The focus group was designed around four variables, to allow an open collection of insights while guiding the discussion to avoid dispersion. In particular, the four main variables are the following:

- Contextual factors: three main macro factors were identified – ecosystem and models (i.e., new emerging solutions, new actors, etc.), regulations affecting SCF, and digital technologies enabling innovative SCF solutions.
- Role of COVID-19 pandemic: for each contextual factor, we aimed to understand COVID's influence, i.e., if the factor was accelerated or generated by the COVID-19 pandemic.
- Time horizon: for each contextual factor, we aimed to understand if the impact is expected in the short term (next six months) or the medium term (next two years). A description of the type of impact in the short and medium-term is presented.
- Actors: for each contextual factor, we aimed to understand the SCF actors affected.

Additional details about the sample and the method for data collection are reported in Annex A.

**The perspectives of the experts: the influence of Covid on SCF**

The focus group discussion highlighted the most relevant contextual factors affecting SCF and their expected impact, as summarized in Table 1.

| Contextual factors | | Description | Role of COVID-19 pandemic | Time horizon | | Actors |
|---|---|---|---|---|---|---|
| Factor | Sub-factor | | | Short-term impact | Long-term impact | |
| Ecosystem | Platform economy | The emergence of new business models developed around digital platforms to foster the match between demand and supply and streamline it. | Significant boost: topics discussed for some years are now accelerating and acquiring a new meaning | - Stronger process automation<br>- Support to decision-making<br>- A new source of financing for SMEs<br>- Growing adoption of existing solutions, not yet fully adopted (e.g., purchase order finance, inventory finance)<br>- Increasing collaboration between banks and fintechs<br>- Stronger collaboration in the ecosystem<br>- Involvement of new actors (e.g., e-Commerce platforms)<br>- The emergence of new solutions oriented to support actors not fully covered by existing solutions (e.g., retailers and distributors) | - Boost the use of innovative technologies<br>- Involvement of new actors (e.g., regtech)<br>- The more decisive role of the customer, who becomes more aware and able to find information and perform autonomously activities traditionally done by consultants<br>- Boost the involvement of the overall supply chain in the use of SCF solutions<br>- Revolution of the roles: are large firms becoming fintechs?<br>- Growing attention to cyber risk | - Financial Providers<br>- Technology Providers<br>- Large firms<br>- SMEs<br>- Fintech & Startup<br>- Trade credit insurer |
| | Sustainability and circular economy | New SCF business model oriented to improve environmental and social performance of the overall supply chain. | Growing attention stimulated by COVID: topics discussed for some years are now a priority | - SCF as a tool to invest in sustainability<br>- More substantial attention to green investments<br>- Stronger support to SMEs<br>- SCF solutions to support specific industries or projects<br>- Use of some existing solutions now including a clear sustainability goal (e.g., Dynamic discounting) | - More attention to business continuity, beyond the first tier of suppliers or customers<br>- Sharing data along the supply chain to assess the real sustainability impact of the supply chain<br>- Change in the rating models to give higher relevance to sustainability KPIs<br>- Need of cultural support for SMEs<br>- The stronger focus of trade credit insurer on sustainability parameters | - Large firms<br>- SMEs<br>- Rating agencies<br>- Trade credit insurer |
| Regulation | The new European definition | The new European definition of default of companies is | Higher attention created by COVID: rules defined before | - Increasing the attention of SMEs towards financial parameters, pushing a cultural and technological change<br>- If too strict, possible adverse effects on how SMEs are evaluated and so | - Possibility to have new solutions to support the restructuring of firms (e.g., restructuring factoring) | - SMEs<br>- Financial providers<br>- Large firms |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | stricter than before; the new Italian rule defines strict parameters for the identification of companies in crisis | now become more urgent | about their possibility to get access to credit<br>- A boost of cultural change in managers, with stronger attention to financial parameters in a perspective view<br>- Need of new competencies and stronger relevance of actors, such as information providers | | - Information providers |
| | Expansive monetary policies | Actions of central banks to increase the availability of liquidity at lower costs to sustain the current crisis due to COVID-19 | Created by COVID | - Boost in the use of scenario planning solutions for large companies<br>- Increase in the knowledge about new financial solutions for SMEs, thanks to the support of legal and accounting advisors | - More awareness about financial solutions and the importance of healthy financial management along the supply chain<br>- Risk for SMEs of not being able to pay the debt connected with these new monetary policies<br>- More substantial use of SCF solutions to keep a similar level of liquidity | - SMEs<br>- Large firms<br>- Financial providers<br>- Fintech |
| | Accounting treatment of SCF solutions | Revision by IFRS of IAS rules for SCF solutions | The attention created by COVID: rules defined before now become urgent | | - Reducing the cultural barriers towards SCF solutions<br>- Increasing information sharing and transparency along the supply chain<br>- Reduction in the use of some SCF solutions, if accounted as financial debt?<br>- The emergence of new SCF solutions, less focused on financial tools and more oriented to exploit liquidity existing within the supply chain<br>- More robust monitoring on SCF solutions to ensure they keep their focus on short-term financing | - Rating agencies<br>- Large firms<br>- Financial providers<br>- Information providers |
| | Payment terms to SMEs | In the EU in general and in some countries in particular (e.g., Italy), new rules are imposing | The attention created by COVID: rules defined before now become urgent | - Change in the negotiation process, as payment terms were considered part of the negotiation | - Spotlight on the needs of SMEs, with large companies required to consider more the need of smaller actors of the supply chain | - SMEs<br>- Large firms<br>- Trade credit insurers<br>- Financial providers |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | maximum payment terms to SMEs (60 days) | | | - The increasing relevance of new actors, such as trade credit insurers, to mitigate the risk<br>- Introduction of cultural attention to cash management also for SMEs, that are generally more focused on costs and revenues<br>- Stronger relevance of solutions to allow consistency in payment terms: SCF allows to minimize the effect of these policies | - Fintech |
| Technologies | Electronic Invoicing | European obligation in the use of electronic invoicing | The attention created by COVID: rules defined before now become urgent | - Higher digitization to allow an expansion in the use of SCF solutions also for SMEs and at the international level<br>- Streamline the process to make it easier and faster<br>- The emergence of new roles, such as advisors, especially for supporting SMEs | - Unified standards facilitate the expansion of SCF solutions | - SMEs<br>- Large firms<br>- Technology providers<br>- Financial providers |
| | Artificial Intelligence | Use of artificial intelligence algorithms to support the use of SCF solutions | Greater attention created by COVID: topics discussed for some years are now a priority | - Improving and speeding up the matching between solutions and actors<br>- SCF becomes a more strategic tool, also supported through scenario analysis and prediction of potential risks<br>- The stronger focus of large firms on the balance of economic and financial resources<br>- Data are available in real-time, so allowing a better reaction to external phenomena<br>- Possibility to expand SCF solutions deeper along the supply chain | - Disruptive impact allows new actors to enter the market and change some existing actors' roles (e.g., some large firms are modifying their role towards a more fintech-oriented one).<br>- New models of financing, more decentralized models are emerging<br>- Better assessment of the risk of actors involved, expanding the financing opportunities and reducing the cost of financing | - Large firms<br>- SMEs<br>- Fintech<br>- Technology providers<br>- Financial providers |

*Table 1: The perspectives of the experts, involved in the focus group*

*SCF ecosystem*

The focus group highlighted that SCF is increasingly benefiting from the so-called "platform economy." This trend was discussed in the industry for some years that received a real boost due to COVID. Adopting a platform economy approach in the SCF ecosystem means expanding the SCF opportunities to improve the matching between demand and supply, thanks to proper digitization of processes and the emergence of new solutions and new actors. Participants of the focus group highlighted especially some impacts in the short-term, such as increased collaboration between incumbents (such as financial providers) and new entrants (such as fintechs or e-commerce platforms) and broader adoption of innovative SCF solutions (such as purchase order finance and inventory finance). This trend of new solutions, new actors, and new collaborations is also expanded in the medium term when digitization is presented as a fundamental enabler to boost the use of SCF along the entire supply chain. Quite extreme is, in this sense, the view presented by a financial provider: *"In the medium term, thanks to the use of technologies and the development of a real platform of SCF solutions, we could see a change in the roles: large firms, with available liquidity, might change their roles and become fintechs, to finance the actors of the supply chain that need more support."*

Simultaneously, the focus group highlighted that the COVID-19 pandemic boosted the relevance of sustainability and circular economy for the entire supply chain. This trend became relevant also for the SCF domain, more than it was in the past. According to the focus group's point of view, in the short term, this means considering the impact on environmental and social performance when SCF solutions are evaluated. For example, a startup illustrated a change they implemented in their business model to accommodate this new requirement: *"We offer dynamic discounting for some years. COVID-19 showed us the importance of supporting the environmental sustainability of our supply chains. With that purpose, we reshaped our dynamic discounting solution to pursue sustainability goals."* The expected impacts in the medium term still keep this focus in mind, broadening the scope of SCF solutions to ensure business continuity and supply chain resilience. Achieving this goal will require offering SCF solutions beyond the first tier, thereby exploring new solutions such as the so-called "deep tier" finance and changing the rating models used by financial providers and credit insurers, giving higher relevance to sustainability KPIs.

*Regulation*

The focus group highlighted that the COVID-19 pandemic gave growing relevance to some regulations existing for some time, such as the new European definition of default or the accounting treatment of SCF solutions. For the former, focus group participants highlighted that the more substantial impact could be cultural. The regulation appears as an enabling factor to foster attention on financial indicators, especially for SMEs. This could impact large firms – that start understanding the impact of their choices on their SME suppliers – and information providers – that acquire a more strategic role. A large firm participating in the focus group provided an interesting view: *"The regulation is not changing anything in reality but is creating a spotlight on the importance of considering how financial parameters are considered towards the SMEs. If these companies are not treated properly, they will suffer big damages, with potential negative side effects for the big customers too. We must be ready for this change and start revising our approaches today."* For some actors, this change could also determine some critical changes in the SCF ecosystem, such as the emergence of new solutions like the "restructuring factoring," as called by one of the focus group actors.

Concerning the accounting treatment of SCF solutions, the discussion was tricky: the focus group participants believe that impacts will not occur in the short term but the medium term. The COVID emergency, as mentioned in the introduction, gave a boost to the use of SCF solutions, thereby attracting the attention of rating agencies. The keywords that emerged in the discussion were two: transparency and the need for new solutions. Transparency means that *"SCF should not be used* *secretly but in an open and managerial way, to avoid potential negative effects along the supply chain. We need to be transparent in how SCF solutions are used, to give support and not hide problems."* Also, new solutions are needed since SCF ecosystem has the principal goal to optimize the existing liquidity in the supply chain. Without relying excessively on financial actors, the SCF ecosystem should learn how to exploit existing liquidity.

The focus group also highlights the influence of expansive monetary policies, emerged due to the COVID-19 crisis and the consequent need for liquidity. The discussion is quite doubtful about the impact that these policies could have on the SCF domain. According to some actors, this policy could reduce the use of SCF solutions in the short term, despite increasing the knowledge about new financial solutions for SMEs. The real doubt is about the medium term's impact, as SMEs might struggle to pay back this debt, so a more robust use of SCF solutions would be necessary to keep a similar liquidity level.

*Technologies*

In terms of technologies, two technologies are discussed as enabling factors for using SCF solutions in the COVID-19 era: electronic invoicing and artificial intelligence. Other technologies mentioned in the literature as potentially relevant, such as the Internet of Things and Blockchain, did not emerge as important.

About electronic invoicing, the discussion focused on the European obligation. The topic is not new, but the COVID-19 crisis has increased its relevance. A technology provider summarized the importance of electronic invoicing: *"We experimented the impact of electronic invoicing in Italy. Initially, it was a real mess, but the benefits are tangible when we overcame the technological problems. This technology gave a real boost to streamline the internal processes, which provided a benefit to SCF tools. This technology facilitated the emergence of some solutions such as dynamic discounting. The dream now is to be able to do the same also at the European level. What do we need to have a real expansion? Support for SMEs that are suffering more the transition towards a real digital economy, and unified standards at the European level."*

Artificial intelligence is presented as the most promising technology for SCF. Also, in this case, the role of COVID was to be the actual trigger to move from theory to practice, from discussing to actual adoption. Different impacts are expected in the short and medium term. In the short term, according to the focus group participants, the efficiency and effectiveness in the use of SCF solutions can be improved. Efficiency, since artificial intelligence allows automating some activities; effectiveness, since artificial intelligence allows to better scout the supply chain, share data, and analyze and offer solutions beyond the first tier. In the long term, expectations are also more disruptive. A technology provider summarized his view with these words: *"Thanks to the artificial intelligence and in line with the platform ecosystem we discussed before, the SCF world could radically change. New financial models are emerging, and new actors are entering the market. Large companies could also play a more financial role. I am expecting a real disruption in the roles and the profiles of the SCF ecosystem, thanks to more shared intelligence."*

**How will Supply Chain Finance research look like in a post Covid-19 era?**

The literature review and the focus group results allowed us to identify some relevant research directions for the future, summarized in the following paragraphs.

These directions have been identified leveraging both the Contingency Theory and the Resource Orchestration Theory. These directions are summarized in Table 2.

| Research question | SCF macro factor | SCF variable | Theoretical lens | Component of the theoretical lens |
|---|---|---|---|---|
| RQ1: How are the SCF solutions changing to optimize all the cash-to-cash cycle components and streamline cash flow management along the supply chain? | SCF ecosystem – platform economy | **SCF solutions**<br>- Adoption of innovative solutions<br>- New ways of using existing solutions<br>- New solutions emerging | Contingency theory | Response variable |
| RQ2: What objectives drive the adoption of SCF solutions under the light of the new emerging regulations? | Regulation | **SCF benefits**<br><br>New objectives brought by new regulations | Contingency theory | Contingent variable |
| RQ3: How may SCF support companies in improving supply chain performance with a Triple Bottom Line approach? | SCF ecosystem - Sustainability and circular economy | **SCF benefits**<br><br>- Environmental performance<br>- Social performance | Contingency theory | Performance variable |
| RQ4: How could the different resources brought by new actors be structured to foster the adoption of innovative SCF solutions towards a platform economy? | SCF ecosystem – platform economy<br><br>Technologies | **SCF actors**<br><br>- New SCF actors<br>- New SCF resources<br>- New SCF platforms | Resource Orchestration Theory | Resource structuring |
| RQ5a: Which are the new forms of collaborations among SCF providers emerging to exploit resource bundling? | SCF ecosystem – platform economy | **SCF actors**<br><br>New collaborations among providers | Resource Orchestration Theory | Resource bundling |
| RQ5b: How is the role of actors of the SCF ecosystem changing to exploit resource bundling? | SCF ecosystem – platform economy | **SCF actors**<br><br>New roles of SCF actors | Resource Orchestration Theory | Resource bundling |
| RQ6: How does SCF resource leveraging modify metrics and solutions for creditworthiness assessment? | Technology | **SCF benefits**<br><br>New metrics for risk assessment | Resource Orchestration Theory | Resource leveraging |

*Table 2: The new SCF research directions after the Covid-19 era*

*Supply Chain Finance shaped within the contingent context*

According to the classic Contingency Theory model (Sousa & Voss, 2008), the COVID-19 pandemic introduced new contingent variables, new response variables, and new performance variables.
This is summarized in Figure 1.

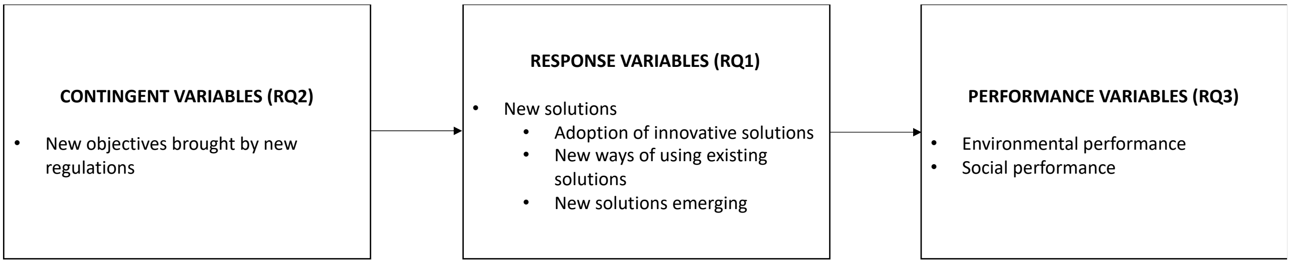


*Figure 1: The support of Contingency Theory to the new avenue of SCF research*

*Innovative SCF solutions toward a platform economy*

Currently, literature about SCF is strongly focused on reverse factoring and solutions that have the invoice as collateral (e.g., Lekkakos & Serrano, 2016; More & Basu, 2013). Other authors started expanding the view of SCF beyond reverse factoring, analyzing new innovative solutions, such as dynamic discounting, trade finance, or asset-based lending (e.g., Gelsomino et al., 2016). Current literature shows some gaps, such as a limitation of empirical research investigating innovative SCF solutions. The focus is on a single solution and some specific domains.

First of all, considering response variables, a broadening of the portfolio of available solutions is emerging. In particular, the SCF ecosystem perspective highlights a growing adoption of new innovative SCF solutions, such as inventory finance and purchase order finance. According to the new SCF business model oriented to improve sustainability, we found new ways of using existing solutions, such as dynamic discounting, to improve sustainability performance. We also identified the potential birth of new SCF solutions, such as restructuring finance, to support critical situations. An extension of the SCF domain beyond invoice-related solutions is crucial empirical evidence to extend the use of SCF solutions to support all working capital components. Finally, the extension beyond the first tier requires the development of deep-tier SCF solutions. Some of these solutions are already existing in the market, while others are still under development. Whether they will become a reality and expand research boundaries at the intersection of supply chain management and finance is still an open question.
Based on this preliminary insight, research question 1 was formulated.

This insight could guide the SCF ecosystem companies in expanding their portfolio of solutions, exploiting the liquidity in the supply chain, and not limited to invoice-based solutions. For the providers, the preliminary insights of this study suggest that it is time to offer some innovative solutions and revise existing solutions to incorporate the new trends (e.g., sustainability); for the users, these insights offer a broader perspective of SCF solutions, suggesting to combine different solutions for different moments of the year or different actors of the supply chain.

*New SCF objectives related to new regulations*

Literature has investigated the objectives pursued by using SCF solutions, which are essentially linked to the optimization of working capital and financial resources along the supply chain. Current elements of novelty at the regulation level are driving some changes in the reasons behind the use of SCF solutions. More financial resources are available through expansive monetary policies, new regulations are revising the European definition of default, and the accounting treatment of SCF solutions is being revised. These regulations could lead to new objectives and new opportunities for SCF that are still to be investigated, but they may also introduce some new limitations. Based on this preliminary insight, research question 2 was formulated.

This insight is also relevant for managers because the regulation could change the competitive arena in the market. The users could benefit from this paper's insights, as they need to understand how the new regulations will impact both them and their supply chain in general. Moreover, new regulations are bringing new objectives driving the adoption of SCF solutions. As discussed in previous sections, the impact of the regulation could be variegated, and so managers need to understand the impact in both the short and the medium term. Results also highlight that regulations stimulate a new culture into the ecosystem and modify how decisions are taken. Providers should investigate this influence to better support their customers in selecting the most appropriate solutions and adequately balancing the impact of regulations.

*Performance variables need to include sustainability*

Considering performance variables, new areas of evaluation are emerging. Current literature on SCF has deeply investigated the impact in terms of financial costs and benefits (e.g., Gelsomino et al., 2016; Lamoureux & Evans, 2011), although some additional benefits related to economic performance (Hofmann, 2009), efficiency, and effectiveness are also mentioned (Bonzani et al., 2018). Most of the current literature relies on transaction cost economics indications to assess the value of SCF solutions adopted along the supply chain (Wuttke et al., 2013; Martin, 2017; Martin & Hofmann, 2019; Dekkers et al., 2020; Jia et al., 2020).

The COVID-19 crisis confirms these performance metrics and reveals the importance of SCF as a tool to boost sustainability with a Triple Bottom Line approach. In terms of economic performance, empirical insights reported the value of SCF solutions to optimize economic and financial performance, not only at the company level but also at the supply chain level, particularly for SMEs. In terms of social sustainability, COVID-19 generated an economic and financial crisis that raised attention to the need to preserve competencies along the supply chain and defend employment in the community of suppliers, both local and global, which is a form of social sustainability. These insights are consistent with the motivations behind the use of SCF solutions in the last decade, when the first examples of this kind emerged, such as Gucci, PUMA, and OTB (Caniato et al., 2020).

Nevertheless, during this crisis, companies also reported using SCF solutions to improve environmental sustainability along the supply chain, provide suppliers with the financial resources necessary to invest in sustainability or expand the attention to sustainability in the upstream tiers of the supply chain. These preliminary insights need to be investigated in the long term to understand whether SCF may improve sustainability performance. Based on this preliminary insight, research question 3 was formulated.

This result is relevant for managers, considering both providers and users. Providers may have new opportunities to revise their solutions to assure support to their customers' sustainability performance. At the same time, they need to revise their value assessment method to support the users in understanding not only the financial and economic impacts but also the sustainability ones. For users, sustainability is becoming a priority, and innovative tools to support these strategic goals are necessary. This paper highlights how SCF could become an additional lever to optimize sustainability performance.

*The orchestration of Supply Chain Finance resources*

The insights that emerged through the focus group suggest some further research directions emphasizing the importance of orchestrating available resources and adopting the theoretical lens of the Resource Orchestration Theory (Sirmon et al., 2011), which is based on resource structuring, bundling, and leveraging.

Participants in the focus group deeply discussed the broad number of actors increasingly involved in applying SCF solutions. The traditional model presented by Pfohl and Gomm (2009) is still valid but not wholly representative of the situation faced by companies today because the distinction between primary and secondary actors of SCF is blurring. Today's challenge is integrating the different resources provided by the various actors and orchestrate them consistently to exploit the opportunities offered by SCF solutions.

This is summarized in Figure 2.

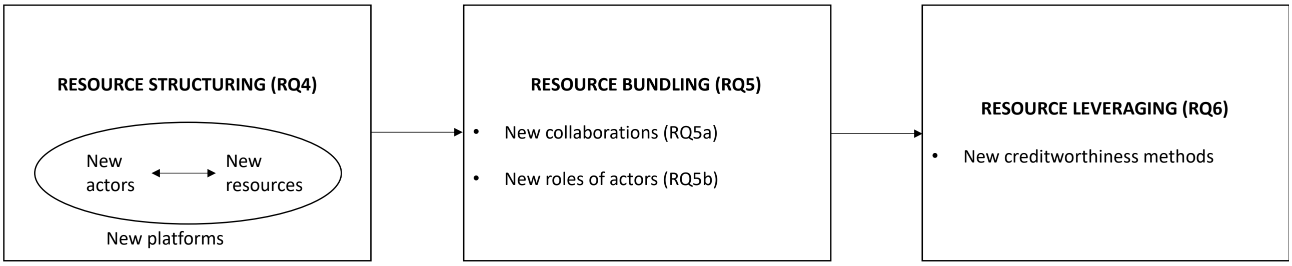


*Figure 2: The main research directions under the light of Resource Orchestration Theory*

*Multiple actors for SCF resource structuring in a platform economy based on digital technologies*
SCF research so far mainly focused on the role of buyers and suppliers. So far as the providers are concerned, the literature mainly investigated the perspective of financial providers or, more recently, information providers (Moretto et al., 2018) and logistics service providers (Elliot et al., 2020). These providers' contribution is focused on exploiting the resources necessary to use SCF solutions: financial resources, information flows, and transportation and warehousing.

While these resources are still essential, the actors that could provide these resources in the SCF ecosystem have profoundly changed. For example, technological resources have become more and more relevant over the years, as digital technologies are a fundamental resource for the advanced use of innovative SCF solutions, expanding technology providers' role. New regulations, such as the standardization of electronic invoicing at the European level, further boost this phenomenon. Actors also require a combination of financial and technological resources, increasing the importance of fintech actors. The willingness to mitigate the risk of the supply chain actors has expanded the need for risk mitigators, expanding the role of trade credit insurers for the implementation of SCF solutions. The need to extend the availability of advanced technologies for small-size firms has also expanded the opportunities to use technological capabilities from budding startups. Finally, e-commerce platforms are also entering the SCF ecosystem, leveraging their unique position as intermediaries between demand and supply. They are extensively using digital technologies to improve the availability of rich and timely information.

This combination of different actors has brought the platform economy concept to the SCF domain. The participants of the focus group confirm this phenomenon. One financial provider stated: *"Platform economy is an enabler of SCF because when we talk about SCF, we are talking about collaborative ecosystems in which multiple actors exist. The development of platform economy ecosystems is a strong condition for the development and success of SCF in the short term."* This point is also reinforced by a large firm participating in the discussion: *"In the medium term, the development of platform economy also allows the progressive integration of all the players involved in the value chain. This inclusion aims at involving the customer and allows the inclusion of other processes (logistics, finance, etc.) and other actors, often neglected in previous years."*

This discussion brought in the understanding that new resources need to be structured in the SCF domain, and this could be done through the involvement of new actors not considered in the past. Who will be the actors to consider, what roles they will play, and which resources they will bring are still to be investigated. Based on this preliminary insight, research question 4 was formulated.

This result also highlights an essential contribution to the SCF ecosystem. It broadens the SCF ecosystem to include new players, new roles, and new opportunities. Managers need to understand that new competitors could emerge, but also new potential partners. Companies part of the ecosystem should be aware of the evolution to identify potential opportunities or threats.

*New forms of collaboration in the SCF ecosystem for resource bundling*

A second research direction emerged from the focus group. Since new actors and resources are emerging, innovative methods for bundling resources are required to integrate the contribution of different actors in a unique combination of capabilities. Indeed, a financial provider stated during the focus group: *"When we talk about SCF, we are talking about collaborative ecosystems on which there are multiple players. The development of platform economy ecosystems is a strong condition for the development and success of SCF in the short term. Platforms are the enablers of an environment for the development of structured and immediate dialogue of all actors."* This sentence highlights the importance of developing collaborations among actors of the ecosystem to integrate different resources effectively. There are several examples of collaborations between financial providers and fintech companies, which were initially perceived as competitors. They have different competencies and different resources. They can work together to combine their resources to offer support to a broad range of actors of the ecosystem, e.g., allowing smaller firms' participation in SCF solutions. The panorama of possible collaborations has only been partially explored so far. The existence of standard paradigms exploiting specific bundling of resources is still not evident, thus requiring additional research. Based on this preliminary insight, research question 5a was formulated.

The focus group also highlighted a more radical change in bundling resources, not among actors but for every actor. Some managers participating in the focus group reported this consideration: *"The introduction of new regulations, the possibility to exploit financial resources by some actors, the contribution of innovative technologies, are enabling companies to become fintech, thereby also modifying the roles of existing actors and consequently also business models."*

Perhaps this could appear too radical and maybe more oriented to the long term rather than the short term, but the expansion of SCF solutions and the understanding of the value of exploiting all the available resources have already changed the roles of some companies. For example, several consumer goods retailers developed their financial providers internally to offer SCF solutions to their suppliers, combining their financial resources with the information resources they have about their supply chains. Over the last few years, some e-commerce providers started doing the same, thanks to their availability of financial resources combined with complete visibility about their customers and suppliers' flows. Whether these changes will remain in the long term, bringing new hybrid companies combining internally different resources, is still unclear, and additional research is necessary. Based on this preliminary insight, research question 5b was formulated.

This result could be relevant for both providers and users. For the providers, collaborations to expand the offering in the SCF ecosystem emerge as a critical driver of change for the future. Providers can use this lever at their disposal, evaluating potential collaborations to exploit as an element of differentiation. At the same time, new collaborations offer new opportunities for the users, such as broadening the scope of SCF solutions to include SMEs. Managers of cash-rich firms should also consider revising the business model of their firms, asking themselves if SCF could also become part of their offering.

*Assessing creditworthiness for resource leveraging thanks to the use of technology*
Existing resources need to be leveraged to improve creditworthiness assessment by adopting a supply chain perspective to generate value within the SCF ecosystem. This move is necessary not only for the appropriate adoption of SCF solutions but, in broader terms, also for a better financial evaluation of the actors. The relevance of this topic is not completely new; literature have been discussing for some years the importance of including supply chain relationships in the analysis of creditworthiness to perform a better assessment, especially of SME companies, and obtain a more timely measure (e.g., Moretto et al., 2018). However, the COVID-19 pandemic has dramatically increased the urgency of this change. All the focus group participants, especially financial providers and rating agencies, remarked that the financial evaluation of non-listed companies at the end of 2020 was still performed based on 2019 financial reports, which were entirely unreliable. The same will also be true for most of the data related to 2020 since, hopefully, they will not represent the situation of the companies in 2021. In a situation where the traditional measures are not simply myopic but wholly disconnected from the current reality, there is the need for new data, new metrics, and new methods. In this domain, the supply chain is an incredible source of information. The combination of data available to different actors is necessary, together with a tool to incorporate and combine these data. For this purpose, digital technologies can play a crucial role. For example, electronic invoicing is an effective tool to collect real-time information about companies' trade flows; artificial intelligence is valuable for using structured and unstructured data with both assessment and predictive purposes. While the need is clear, how these resources will improve creditworthiness metrics needs additional research. Based on this preliminary insight, research question 6 was formulated.

This insight is especially relevant for rating agencies and financial providers, which should investigate innovative ways to assess creditworthiness, incorporating new metrics and new solutions, going beyond the traditional financial indicators, as these appear not only myopic but sometimes also distant from reality of the company. Financial providers and rating agencies urgently need to explore new ways to assess companies' risk and their supply chains, incorporating operational information and other non-financial sources. This is also relevant for industrial managers, who may obtain significant benefits by sharing data with financial and information providers, to receive more accurate and timely assessments.

**PSM learning from the pandemic**
The COVID-19 pandemic generated dramatic effects not only from a sanitary and health perspective but also from an economic perspective. In particular, supply chains worldwide suffered from disruptions and struggled to maintain their continuity due to lockdowns. These restrictive measures generated adverse effects from several perspectives, among which financial ones are particularly relevant. SMEs, in particular, are suffering from the difficulty of getting access to credit and sustaining their financial flows. After the 2008 financial crisis, SCF solutions emerged as an answer to these problems, and some preliminary insights demonstrate that this may be valuable also now. The situation generated by the COVID-19 pandemic is different from those previously faced, and the existing models are not always appropriate or sufficient to resolve the newly emerged problems. In this domain, managers and academics could learn a lot from the pandemic.

In the area of SCF, the pandemic impacted mainly in two directions, that could determine the lesson learned for the future. First of all, the uncertainty has grown, blurring the boundaries and changing the definitions of the elements of SCF. This evolution was driven by the second element, which is the complexity to manage: the pandemic made clearer than ever that coping with the financial performance of a single firm, without considering the supply chain, is myopic; furthermore, that simply considering the financial impact on direct suppliers is, nevertheless, limited, and a stronger contribution along the whole supply chain is required.

The combination of uncertainty and complexity generated some effects that should be taken into consideration in the future, by both academics and practitioners.

The first contribution is simply a reinforcement of what it is known since several years in the PSM literature: "*one size does not fit all".* If the recipe was clear, the ingredients were not. The pandemic has changed these ingredients and a stronger awareness is necessary.
The second contribution is that companies should exploit their resources, both internal and external, to be able to face the level of uncertainty and complexity mentioned above.

The solutions emerged through the discussion with experts move mainly in three directions. First of all, a single variable analysis such as a single solution or a single actor or a single performance to optimize, as performed in the past, is simply ineffective. Companies need to learn how to implement a holistic approach, to support also the weakest nodes of the supply chain. Holistic approach entails the need to consider simultaneously multiple solutions, multiple stakeholders, multiple actors, multiple roles. PSM research should support managers not only in shaping these new variables but also in understanding the influence among variables and the existing connections.

Second, the traditional models of analysis could be ineffective too. Just to make a few final examples, assessing the risk of a company based only on financial reports is not enough; or assessing the impact of SCF solutions only in terms of financial performance is incomplete. Researchers should provide managers with new models and methods, and managers should be able to use them.

Third, to overcome a crisis, innovation is fundamental, and SCF too should innovate. Until this moment, technology was often adopted to make traditional solutions more effective. Covid-19 forced and accelerated the digitization of the supply chain and, in a similar way, technology can not only boost the use of SCF tools, but also enable radically new solutions, to cope with the new level of complexity and uncertainty already mentioned. In the same way, until this moment, collaboration in the SCF ecosystem was mainly the exception, indeed in the future this should become the must have. Companies need to understand the point and learn how to do it; researchers should offer schemes and approaches to make these new technologies as well as these new forms of collaborations effective.

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## Annex A – Data collection

*The sample*
We included in the sample representatives of 16 industrial companies (both large and small firms), 15 financial providers, 15 technology providers, and 10 other providers (i.e., consultants, information providers, trade credit insurers). The roles involved in the focus group are mainly managers or heads of a unit, who possessed the seniority and the expertise necessary to read the current phenomenon and understand its impact on their business in the long term. At the same time, they have a high level of experience in the domain, working in SCF for several years. The sample was purposefully heterogeneous to represent these different actors and collect their views. The focus group was organized within the activities of the SCF Observatory, a permanent participatory research initiative launched by the School of Management of Politecnico di Milano in close collaboration with industry representatives, aimed at monitoring the evolution of the SCF ecosystem, to investigate open issues and opportunities and develop innovative knowledge and solutions.

Secondary sources were used to analyze the context and understand the phenomenon’s main directions while preparing for the focus group. As secondary sources, we relied on the news about the use of SCFs, discussion with some companies presenting to us their problems and their solutions, webinars run to present the problems and the solutions offered, websites of providers offering new solutions, laws, and regulations emerged to offer new liquidity in the supply chains.

*Data collection*
Due to COVID-19 restrictions, the focus group was conducted online in two rounds COVID(one in the morning and one in the afternoon of December 3rd, 2020), splitting the sample into two cohorts. Each round consisted of three phases, for a total duration of three hours:

Phase 1: Plenary presentation of the initiative. In this phase, participants to the focus group were provided with a summary of the main evolution of SCF from 2013 to 2020 to recap the prominent trends that occurred so far and with a description of the variables used to conduct the focus group. Besides, the goal and the methodology of the focus group were shared with all the participants.

Phase 2: Discussion in small groups. The participants were divided into seven groups of eight people each (four in the morning round, four in the afternoon round)to foster the discussion and allow each person to present their ideas in depth. Each group was adequately designed to include representatives of the four categories reported above to enable different perspectives. Two researchers moderated each group: one mainly facilitated the discussion, whereas the second took notes to avoid missing information (sessions were also recorded). The discussion was organized in two steps: first, each participant was requested to reflect individually on the topic to collect unique ideas. Then, each participant shared the ideas in the group to start a discussion with the other participants. Different ideas were collected in a shared document in real-time, visible by everyone, to ensure that every actor’s perspective was collected correctly. This phase's goal was not necessary to reach an agreement but to collect different views on the potential impacts of the factors on SCF. People were asked to discuss each factor’s impact, the time horizon, and actor involvement.

Phase 3: Wrap-up session. After the group discussion, a closing plenary session was conducted where each group presented the synthesis of the ideas that emerged. The evidence emerged by the plenary sessions of both rounds was collected and subsequently shared with all the participants to collect comments and feedback.