

CRANFIELD UNIVERSITY

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Supply Chain Activities and SMEs' Financial Performance:
Moderating Effects of Firm Size and Supply Chain Position

School of Management

Doctor of Philosophy
Academic Year: 2016 - 2020

Supervisor: Professor Michael Bourlakis
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the degree of Doctor of Philosophy

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ABSTRACT

Although good supply chain management can drive large companies' financial performance, its effectiveness in improving financial performance of small and medium-sized enterprises (SMEs) is still inconclusive, which results from the heterogeneity of SMEs compared to large companies. The objective of this thesis is to test the relationship between supply chain activities and SMEs' financial performance and examine the moderating effects of firm size and supply chain position on this relationship. This thesis consists of three independent but interconnected papers, which fulfil the research objective collectively.

Paper One titled "A conceptual framework of supply chain activities for SMEs' financial performance" aims to identify supply chain activities that can drive the financial performance of SMEs based on a systematic literature review. Based on the 110 papers identified, a conceptual framework is established with nine supply chain activities that contribute to SMEs' financial performance: purchasing, production, transport, inventory management, supplier partnership, customer partnership, supply chain strategy, quality management, and information sharing. Firm size and supply chain position are found to moderate the impact of supply chain activities on SMEs' financial performance.

To empirically test the conceptual framework, Paper Two titled "Supply chain activities and SMEs' financial performance: The moderating effect of supply chain position" focuses on the performance of four internal supply chain activities (purchasing, production, transport, and inventory performance) and examines their relationships with SMEs' financial performance along with the moderating effect of supply chain position. Based on survey data collected from 318 SMEs in the UK upstream food supply chain, partial least squares structural equation modelling results indicate that superior production and inventory performance can significantly improve the financial performance of SMEs, while purchasing and transport performance do not have significant effects. Multigroup analysis results suggest that supply chain position can moderate the impact of purchasing performance on profitability and liquidity and the impact of production and inventory performance on liquidity. Follow-up interviews were conducted with

seven executives from UK food SMEs to triangulate the quantitative results obtained.

Paper Three titled “Working capital management and SMEs’ financial performance: Moderating effects of firm size and supply chain position” empirically investigates the impact of working capital management and its three components (inventory holding days, accounts receivable days, and accounts payable days) on SMEs’ financial performance (profitability and liquidity) incorporating the moderating effects of firm size and supply chain position. Panel data regression results based on financial data of 325 SMEs in the UK upstream food supply chain from 2012 to 2018 suggest that cash conversion cycle, as a proxy of working capital management, is negatively associated with both profitability and liquidity of SMEs. All three working capital components have significantly negative relationships with SMEs’ profitability. Firm size and supply chain position significantly moderate some of those relationships. Those quantitative results were also triangulated by interviews with seven executives from UK food SMEs.

This thesis empirically identifies that, the same as large companies, SMEs can also financially benefit from supply chain management. However, not all supply chain activities contribute to SMEs’ financial performance. The impact of supply chain activities on financial performance also varies with SMEs’ supply chain position and firm size. The results of this thesis can assist owner-managers of food SMEs with different sizes and supply chain positions to make informed decisions on the priority of supply chain activities in improving their companies’ financial performance.

Keywords:

Supply chain management, Supply chain activity, Performance measurement, Financial performance, Working capital management, Supply chain finance, SME

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最后但最重要的是，我想向我的父母发自内心地说声感谢。我博士生涯的开端可以部分归功于五年前我父亲的一个不成熟的想法，当时他和一群博士生交流并且“感受到了他们的智慧”，所以他便想让我也运用并且展现一下自己的智慧（你能相信这就是原因吗！）。尽管非常的不成熟，但是这个想法看上去很可能会改变我的人生。我的母亲是个善解人意的人，所以她总能在我失落的时候给我安慰，在我有压力的时候为我减轻焦虑。谢谢你们为我提供了一个良好的成长环境，也谢谢你们为我提供了出国留学的机会。你们的支持与爱永远是我人生中最大的动力。

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LIST OF ABBREVIATIONS

APD	Accounts payable day
ARD	Accounts receivable day
AVE	Average variance extracted
CABS	Chartered Association of Business School
CB-SEM	Covariance-based structural equation modelling
CIMA	Chartered Institute of Management Accountants
CIPS	Chartered Institute of Procurement and Supply
CR	Current ratio
DEFRA	Department for Environment, Food and Rural Affairs
EOQ	Economic order quantity
FPM	Financial performance measurement
GDPR	General data protection regulation
HCM	Hierarchical component model
HOC	Higher-order construct
HTMT	Heterotrait-monotrait ratio
IHD	Inventory holding days
IT	Information technology
JIT	Just-in-time
KPI	Key performance indicator
LOC	Lower-order construct
MICOM	Measurement invariance of composite models
OEM	Original equipment manufacturer
PLS-SEM	Partial least squares structural equation modelling
QR	Quick ratio
RBV	Resource-based view
ROA	Return on assets
ROE	Return in equity
ROI	Return on investment
ROS	Return on sales
SALSA	Safe and Local Supplier Approval
SCM	Supply chain management
SCOR model	Supply chain operations reference model

SLR	Systematic literature review
SME	Small and medium-sized enterprise
TQM	Total quality management
VIF	Variance inflation factor
VMI	Vendor managed inventory
WCM	Working capital management
WIP	Work-in-process

1 INTRODUCTION

1.1 Research Rationale

1.1.1 Importance and Necessity

Supply chain management (SCM) has risen to prominence in the past decades due to its potential to improve companies' competitiveness and financial performance (Gunasekaran et al., 2004). Supply chain activities have been widely used to improve the financial performance of large companies and almost no company can succeed without managing its supply chain successfully. However, the effectiveness of SCM in SMEs is still controversial. Although some researchers support the positive effect of SCM in SMEs (e.g. Hamister, 2012; Thakkar et al., 2013; Williams, 2006), others find no or even negative impact (e.g. Arend and Wisner, 2005; Vaaland and Heide, 2007).

This inconclusive thinking for the role of SCM in SMEs can be explained by their unique characteristics in comparison with their large counterparts. Comparatively, SMEs have higher management visibility and less bureaucracy (Sousa and Aspinwall, 2010), tend to develop specific core competencies (Hong and Jeong, 2006), have shorter decision-making processes (Yusof and Aspinwall, 2000), understand customer needs better (Bhutta et al., 2007), and are more flexible in operations (Thakkar et al., 2013). Those characteristics potentially provide SMEs with more advantages in being responsive to SCM over large companies.

However, some characteristics of SMEs put them at a disadvantage in SCM. Kull et al. (2018) contend that SMEs are different from large companies in three aspects: strategic goals, governance structures, and resources, and the heterogeneity in those three aspects has great implications for SCM in SMEs. First, in terms of strategic goals, since SMEs are normally owned and managed by a founder or a founding family, SME owner-managers lay great emphasis on preserving the control of their companies. Therefore, they are less willing to engage with other members in the supply chain (Kumar and Singh, 2017). Second, because of the centralised management and flat governance structure, SME owner-managers tend to make supply chain related decisions intuitively (Ellegaard, 2006), which negatively influences the effectiveness of SCM in

improving SMEs' financial performance. Last, SMEs have fewer resources by nature, including financial resources, management professionals, and technologies, so they cannot invest into SCM sufficiently and lack the capability to take advantage of SCM to improve their financial performance (Jayaram et al., 2014).

Contemporary SCM theories and activities mainly focus on and are designed for large companies, which neglect the heterogeneity of SMEs. Compared to large companies, SMEs tend to implement SCM differently (Arend and Wisner, 2005; Hong and Jeong, 2006; Thakkar et al., 2013), lack the ability to adapt to SCM effectively (Quayle, 2003), and are less concerned with methods supporting SCM (Vaaland and Heide, 2007). Therefore, it is problematic for SMEs to use the SCM concepts that have their origins in large-firm concerns. Although large firms take supply chain activities as an opportunity to improve their financial performance (Gorane and Kant, 2017), those activities would be irrelevant to SMEs or even pose a threat to them (Kull et al., 2018). As a result, the causal relationship between supply chain activities and SMEs' financial performance should be tested.

Despite there is a trend that companies make more use of non-financial measures with increase in firm size, SMEs still place greater emphasis on financial measures than non-financial measures (Ismail, 2007; Perera and Baker, 2007; Toledo-López et al., 2012), which can be explained from three perspectives. First, SMEs do not face the same degree of pressure as large companies to fulfil the expectation of different stakeholder groups, so the primary objective of SMEs is to achieve their internal financial target. Second, the limited resources and expertise constrain SMEs' capability to take advantage of advanced performance measurement systems which include both financial and non-financial measures. Last, financial measures have the advantage of being precise, objective, and reliable (Parker, 2000), and they are available at a minimum cost and effort (Perera and Baker, 2007). Meanwhile, although non-financial performance is usually considered as a driver of value creation, the ultimate objective of evaluating non-financial performance is to improve financial

performance (Bahri et al., 2017; Ittner and Larcker, 2003). Consequently, this thesis focuses on SMEs' financial performance only.

1.1.2 Research Gaps

Although some studies examine the impact of supply chain activities on SMEs' financial performance, many of them obtain contradictory findings due to different contexts or other contingency factors, such as country and industry (e.g. Arend and Wisner, 2005; Hamister, 2012). Most of those studies focus on a limited number of supply chain activities, so their findings are fragmented, which impedes a holistic view with multiple supply chain activities being considered. An overview of supply chain activities enables SME owner-managers to identify the most effective ones in improving their companies' financial performance and make informed supply chain decisions efficiently. However, there is a lack of studies summarising the existing findings and providing a conclusive overview of the relationship between supply chain activities and SMEs' financial performance.

Additionally, most studies investigating SMEs' financial performance focus on profitability only, lacking the multiplicity of financial goals (Töyli et al., 2008). While the level of the use of multi-dimensional indicators is significantly low in SMEs (Ismail, 2007), many SME owner-managers complain that their financial indicators generate an overload of data which is too complex to inform decision-making (Hudson et al., 2001), so it is necessary to identify a small number of financial key performance indicators (KPIs) that capture the essence of SMEs' financial performance.

Mentzer et al. (2001) propose two scopes of SCM: internal SCM, which is the management of supply chain activities that are within and can be directly controlled by a company, and external SCM, which is the management of supply chain activities that are related to the supply chain members of a company. A high degree of the utilisation and exploitation of internal supply chain activities is a prerequisite for the effectiveness of external supply chain activities (Huo, 2012). Nevertheless, it is found that SMEs have not fully taken advantage of internal supply chain activities to improve their financial performance (Kumar and Singh, 2017; Singh et al., 2010). Hence, it is not surprising that many studies find that

SCM has no or even negative impact on SMEs' financial performance, since most of them address external supply chain activities (e.g. Kumar et al., 2016; Sukwadi et al., 2013), while few empirical studies investigate the relationship between internal supply chain activities and companies' financial performance in the context of SMEs.

It is also argued that firm size and supply chain position moderate the relationship between supply chain activities and financial performance. The amount of resources held by a company is positively associated with its size (Bourlakis et al., 2014), so larger firms have more resources than smaller ones to effectively manage supply chain activities and yield financial benefits from them. Supply chain position is the location of a company along the supply chain. The examined food supply chain can be divided into four positions: primary producers, processors, wholesalers, and retailers (Jie and Gengatharen, 2019). The importance of supply chain activities is different for companies at different supply chain positions (Li et al., 2006), and supply chain position influences the adoption of certain supply chain activities and their extent of being successfully implemented (de Abreu et al., 2012). Companies at different supply chain positions have different supply chain power (Maglaras et al., 2015), which influences their capability to capitalise on supply chain activities to improve financial performance. However, the existing research on firm size difference almost exclusively focuses on SMEs versus large companies, and few studies investigate the difference within SMEs (Bourlakis et al., 2014). There is a scarcity of research examining the moderating effect of firm size on the relationship between supply chain activities and SMEs' financial performance. According to the best of the author's knowledge, no paper specifically takes supply chain position as a moderator and explores its effect on the relationship between supply chain activities and the financial performance of companies, let alone SMEs.

1.2 Research Aim and Objectives

Given the importance and necessity of this research and to close the mentioned research gaps, the aim of this research is to test the relationship between supply chain activities and SMEs' financial performance and examine the moderating effects of firm size and supply chain position on this relationship. This aim is further split into five objectives as below:

- 1) To identify supply chain activities that can influence SMEs' financial performance from the extant literature.
- 2) To identify financial dimensions and indicators that are critical in measuring SMEs' financial performance from the extant literature.
- 3) To empirically investigate the relationship between internal supply chain activities and SMEs' financial performance.
- 4) To empirically investigate the moderating effects of firm size and supply chain position on the relationship between internal supply chain activities and SMEs' financial performance.
- 5) To explore reasons for the significant or insignificant relationship between internal supply chain activities and SMEs' financial performance and the moderating effects of firm size and supply chain position.

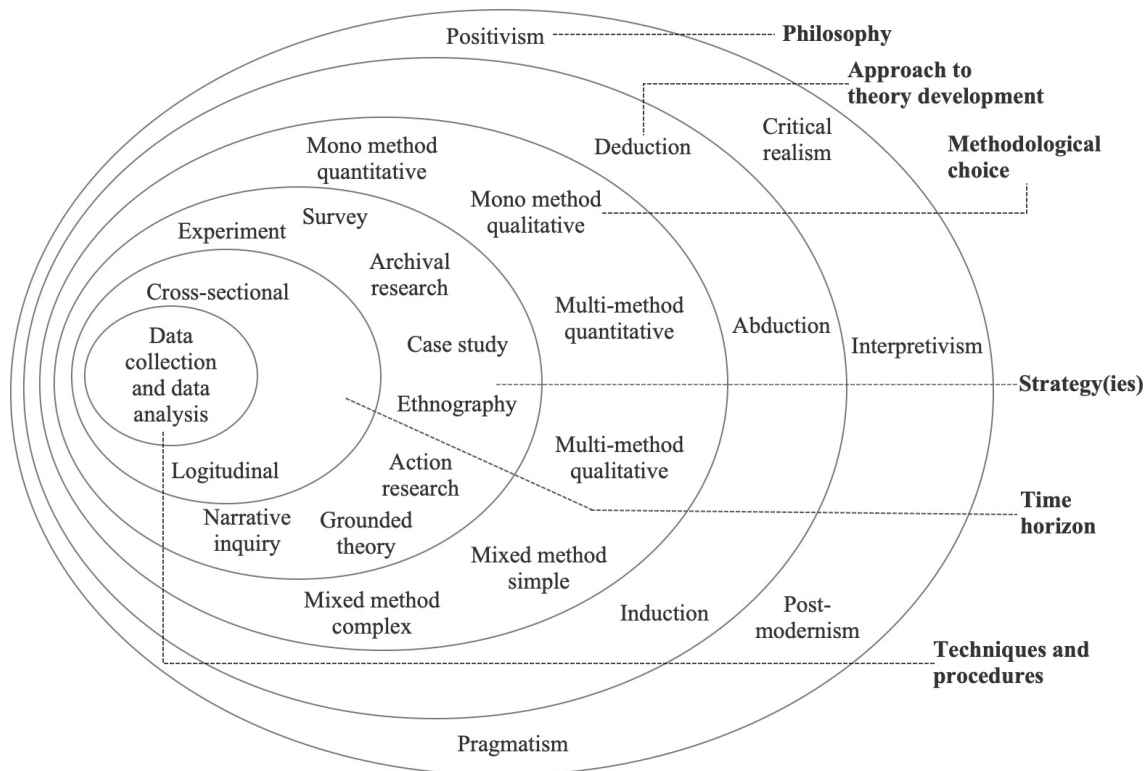
1.3 Overview of Research Design

1.3.1 Research Design

Research design is a general plan of how to fulfil the pre-defined research aim and objectives. To provide foundation of knowledge on the relationship between supply chain activities and SMEs' financial performance and to formulate a theoretical framework for the empirical research, a systematic literature review (SLR) is first conducted and presented in Paper One. Compared to the traditional or narrative literature review, which often lacks thoroughness and has not been regarded as a real investigative science in many cases, SLR can minimise deviations and bias by exhaustively searching literature, be reproduced following a sequence of transparent procedures, and provide more reliable and objective conclusions based on a set of rigorous literature selection criteria (Tranfield et al.,

2003). It also provides a reliable basis for practitioners and decision-makers to generate decisions and take actions by enhancing the legitimacy and authority of the evidence obtained (Tranfield et al., 2003). This SLR aims to achieve Research Objective 1 and 2 by identifying supply chain activities that can influence SMEs' financial performance. In line with Mentzer et al. (2001), this paper finds that supply chain activities can be categorised into internal and external. Besides, supply chain activities that directly involve or influence multiple internal and/or external supply chain activities and impact the financial performance of SMEs are categorised into what is termed as "spanning supply chain activities". It is also found that firm size and supply chain position can moderate the relationship between supply chain activities and SMEs' financial performance.

Upon the establishment of the theoretical framework, the next step is to validate it and empirically examine if the identified supply chain activities can drive the financial performance of SMEs and if firm size and supply chain position moderate this relationship. In line with Research Objective 3, 4 and 5, the empirical research focuses on internal supply chain activities only, including purchasing, production, transport, and inventory management. The research onion (Saunders et al., 2016, p.124) in Figure 1-1 is adopted to introduce the design of the empirical research, which includes sequential procedures of research philosophy, approach to theory development, methodological choice, strategy, time horizon, and techniques and procedures.



Source: Saunders et al. (2016, p.124)

Figure 1-1 Research onion

In terms of research philosophy, this research adopts a critical realist stance. Unlike positivism focusing on observations and experiences only, the philosophy of critical realism focuses on explaining what we see and experience and claims there are two steps to understand the world. First, there are observations and events we experience. Second, there is the mental processing that goes on after the experience, when we “reason backwards” from our experiences to the underlying reality that might have caused them (Saunders et al., 2016, p.139). Objective 3 and 4 address the observed relationship between internal supply chain activities and SMEs’ financial performance and the moderating effects of firm size and supply chain position, while Objective 5 focuses on explaining those observations.

The abductive approach combining both deductive and inductive approaches is adopted in theory development. Abductive approach is appropriate when data are collected to explore a phenomenon and further generate a new or modify an existing theory. In this research, existing theories mainly focusing on large

companies are used to propose hypotheses, which are tested in the context of SMEs (Objective 3 and 4). Factors leading to the difference between SMEs and large companies (difference between results and hypotheses) are identified to accommodate current theories to SMEs (Objective 5).

Accordingly, the mixed method is adopted, which combines the use of quantitative and qualitative data collection techniques and analytical procedures. The mixed method is well suited with the philosophy of critical realism and abductive approach. In this research, the quantitative method is used to test theoretical hypotheses, followed by the qualitative method to develop a richer theoretical understanding, so a sequential explanatory research design is adopted (Saunders et al., 2016, p.171).

The empirical research consists of Paper Two and Three, aiming to achieve Research Objectives 3, 4 and 5 collectively. Since most supply chain data needed are not available in existing studies or databases, the survey strategy is employed to collect quantitative cross-sectional data from SMEs by a questionnaire. As a research strategy in social science, survey has derived considerable credibility from its widespread acceptance and use in academic research, which allows researchers to generalise about a large population by studying only a small portion of that population (Rea and Parker, 2014, p.2). Partial least squares structural equation modelling (PLS-SEM) is applied to test the relationships between supply chain activities and SMEs' financial performance, and multigroup analysis is used to analyse the moderating effect of supply chain position. Following the sequential explanatory research design, follow-up semi-structured interviews with a sample of survey respondents are conducted to interpret the quantitative results obtained and deepen our understanding of the relationship between supply chain activities and SMEs' financial performance. Interview is a valuable source of research evidence and provides richness of explanations of various phenomena (Eisenhardt, 1989).

In addition, among the four investigated supply chain activities, the data of inventory and financial data of SMEs are available in financial databases. Therefore, Paper Three triangulates and complements part of the findings of

Paper One and Two by adopting the archive research strategy. It examines the relationship between inventory management along with accounts receivable and payable management, which are three components of working capital management (WCM), and SMEs' financial performance. The balanced panel data set is required because it reduces the noise introduced by unit heterogeneity by allowing for equal observations for every unit in each time period (Tauringana and Afrifa, 2013). Panel data regression analysis is performed to examine the relationship between WCM and SMEs' financial performance. Similarly, qualitative interviews are conducted with SME owner-managers to interpret the quantitative results obtained. It is worth noting that despite different interview questions, the interviews for Paper Two and Three are based on the same group of SME owner-managers who participate in the survey in Paper Two, so their companies are not included in the sample for the quantitative research in Paper Three. However, since both papers focus on the same context (refer to Section 1.3.2), the interview results are still valid and reliable for Paper Three.

To summarise, three independent but interrelated papers fulfil the research aim and objectives collectively, which are summarised in Table 1-1.

Table 1-1 Summary of papers in this thesis

Paper	Chapter	Objective	Type	Title	Journal	CABS ranking	Status
1	2	1, 2	Conceptual	A conceptual framework of supply chain activities for SMEs' financial performance	International Journal of Physical Distribution and Logistics Management	2	To be submitted
2	3	3, 4, 5	Empirical	Supply chain activities and SMEs' financial performance: The moderating effect of supply chain position	International Journal of Production Economics	3	To be submitted
3	4	3, 4, 5	Empirical	Working capital management and SMEs' financial performance: Moderating effects of firm size and supply chain position	International Journal of Production Research	3	To be submitted

Notes: The journal ranking is based on the Academic Journal Guide 2018 published by Chartered Association of Business Schools (CABS, <https://charteredabs.org/academic-journal-guide-2018/>) and from high to low is 4*, 4, 3, 2, 1.

1.3.2 Empirical Research Context

The empirical research adopts the UK upstream food supply chain as the research context. Since the food supply chain is complicated, dynamic, and fragile (Eksoz et al., 2019), a clear causal relationship between supply chain activities and financial performance can help increase the resource efficiency and competitiveness of the whole supply chain. Since UK does not produce enough food and imports about twice the amount of food it exports (Peters, 2018), this resource efficiency improvement is particularly necessary for the UK food supply chain. Moreover, because the UK food supply chain is characterised by the dominance of a few large retailers (Zissis et al., 2018), upstream SMEs' supply chain activities can be largely influenced by powerful retailers, so it is necessary and important for those SME owner-managers to understand the relationship between supply chain activities and their companies' financial performance and further make efficient SCM strategies. The UK food industry consists of a large number of SMEs, accounting for 97 per cent of the whole sector (DEFRA, 2018), so it is a typical context for SME-focused research.

In the food supply chain, while the upstream primary producers and food processors produce food only, the downstream food wholesalers and retailers normally engage in other industries and sell other products apart from food, so their financial performance is affected by non-food products. Since this research examines the impact of supply chain activities on food SMEs' financial performance, it is important to control the products they sell. Therefore, the empirical research concentrates on the upstream food supply chain only, including primary producers, consisting of crop growers and animal raisers, and food processors, consisting of food and beverage manufacturers.

1.4 Thesis Structure and Key Contributions to Knowledge

This thesis consists of five chapters and is structured as shown in Figure 1-2. Chapter 1 discusses the research rationale, defines the aim and objectives of this research, and provides an overview of the research design.

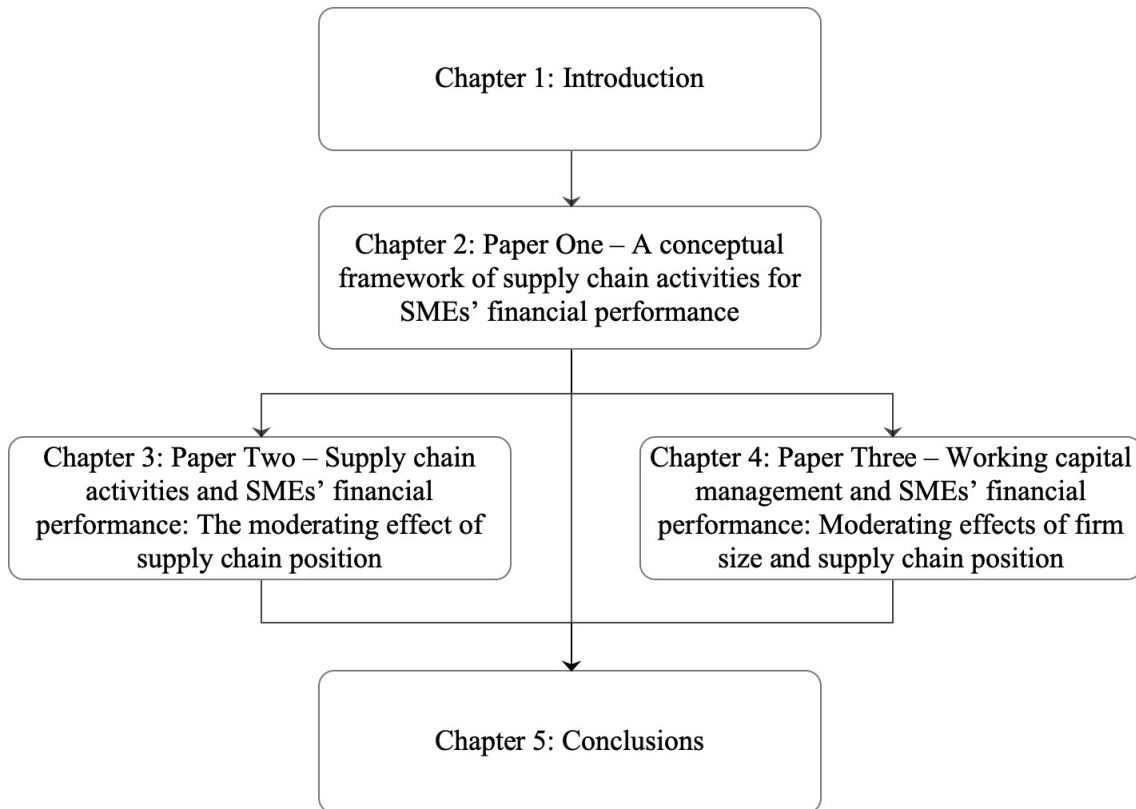


Figure 1-2 Thesis structure

To pave the way for empirical investigation, Paper One titled “A conceptual framework of supply chain activities for SMEs’ financial performance” establishes a conceptual framework of supply chain activities that influence SMEs’ financial performance based on a systematic review of 110 papers, which is provided in Chapter 2. This framework consists of nine supply chain activities that contribute to financial performance of SMEs and are classified into three categories: internal supply chain activities, including purchasing, production, transport, and inventory management; external supply chain activities, including supplier partnership and customer partnership; and spanning supply chain activities, including supply chain strategy, quality management, and information sharing. Additionally, two supply chain activities, outsourcing and sustainable SCM, which are applicable to large companies, are found ineffective for SMEs in terms of financial performance because of the associated hidden costs of these activities. A framework of financial KPIs is also established to evaluate the financial performance of SMEs. By identifying supply chain activities relevant to SMEs’ financial performance, this paper provides invaluable insights on SCM and

financial performance measurement in the SME context. SME owner-managers can understand how to take advantage of supply chain activities to enhance their firms' financial performance based on the conceptual framework developed.

Based on the survey data of 318 SMEs from the UK upstream food supply chain, Paper Two titled "Supply chain activities and SMEs' financial performance: The moderating effect of supply chain position" empirically examines part of the conceptual framework established in Paper One by investigating the impact of internal supply chain activities on SMEs' financial performance and is presented in Chapter 3. PLS-SEM results indicate that superior production and inventory performance can significantly improve the financial performance of SMEs, while purchasing and transport performance do not have significant effects. Multigroup analysis results suggest that supply chain position can moderate the impact of purchasing performance on profitability and liquidity and the impact of production and inventory performance on liquidity. The author also separately examines SMEs at different supply chain positions and prioritises sub-constructs of the four internal supply chain activities in improving their financial performance. Follow-up interviews were conducted with seven executives from UK food SMEs to triangulate the quantitative results obtained. This paper contributes to SCM and finance of SMEs by revealing the difference between SMEs at different supply chain positions in taking advantage of supply chain activities to improve their financial performance. The results can support owner-managers of food SMEs at different supply chain positions when making informed decisions regarding resource allocation on supply chain activities.

To further empirically examine the conceptual framework and to triangulate and complement the findings of Paper One and Two, Paper Three titled "Working capital management and SMEs' financial performance: Moderating effects of firm size and supply chain position" adopts the secondary financial data of 325 SMEs in the UK upstream food supply chain from 2012 to 2018 and investigates the relationship between WCM and SMEs' financial performance, which is presented in Chapter 4. Panel data regression results show that cash conversion cycle, as a proxy of WCM, is negatively associated with both profitability and liquidity of

SMEs. All three working capital components (inventory holding days, accounts receivable days, and accounts payable days) have significantly negative relationships with SMEs' profitability. Firm size significantly moderates the relationships between inventory holding days and profitability and between cash conversion cycle and liquidity. Supply chain position significantly moderates the impact of inventory holding days and accounts receivable days on SMEs' profitability. Those quantitative results were also triangulated by interviews with seven executives from UK food SMEs. This paper contributes to both financial management and SCM in the SME context by empirically identifying and interpreting the moderating effects of firm size and supply chain position on the relationship between WCM and SMEs' financial performance. SME owner-managers should prioritise and allocate more resources on inventory management to improve financial performance, followed by accounts receivable and payable management. SMEs with different sizes and supply chain positions have different priority sequence of working capital components in improving financial performance.

Finally, conclusions are drawn in Chapter 5, integrating the findings of three papers, highlighting contributions to knowledge and limitations, and providing directions for future research.

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**2 PAPER ONE – A
CONCEPTUAL FRAMEWORK
OF SUPPLY CHAIN
ACTIVITIES FOR SMES’
FINANCIAL PERFORMANCE**

2.1 Introduction

Over the past decades, supply chain management (SCM) has risen to prominence owing to its potential to improve companies' competitiveness and financial performance (Gunasekaran et al., 2004). Supply chain activities have been widely used to improve the financial performance of large companies and almost no company can succeed without managing its supply chain successfully. However, the effectiveness of SCM in small and medium-sized enterprises (SMEs) is still controversial. Although some researchers support the positive effect of SCM in SMEs (e.g. Hamister, 2012; Thakkar et al., 2013; Williams, 2006), others find no or even negative impact (e.g. Arend and Wisner, 2005; Vaaland and Heide, 2007). Despite SCM can help SMEs to streamline their internal functions, speed up delivery process, and further improve their competitiveness, more quantifiable benefits can be obtained by SMEs if adequate support is received internally and externally from large supply chain partners (Thakkar et al., 2013).

Some characteristics of SMEs such as resource scarcity, risk appetite, and professional management can constrain their SCM capability (Jayaram et al., 2014). Kull et al. (2018) argue that SMEs are different from their larger counterparts in three aspects: strategic goals, governance structures, and resources. Consequently, the heterogeneity in those three dimensions has great implications for the antecedents and the structure of SCM in SMEs. For example, the emphasis on preserving the control of companies can influence SMEs' willingness to engage with other members in the supply chain (Gómez-Mejía et al., 2007); supply chain integration might be of little benefit to SMEs since they normally do not have specialised functions and sufficient resources (Vaaland and Heide, 2007).

On the other hand, contemporary SCM theories and activities mainly focus on and are designed for large companies, which neglect the heterogeneity of SMEs. SMEs tend to implement SCM differently compared to large companies (Arend and Wisner, 2005; Hong and Jeong, 2006; Thakkar et al., 2013); they lack the ability to adapt to SCM effectively (Quayle, 2003), and are less concerned with

methods supporting SCM (Vaaland and Heide, 2007). Therefore, it is problematic for SMEs to use the SCM concepts that have their origins in large-firm concerns. Although large firms take supply chain activities as an opportunity to improve their financial performance (Gorane and Kant, 2017), those activities would be irrelevant to SMEs or even pose a threat to them (Kull et al., 2018). As a result, the causality between supply chain activities and SMEs' financial performance should be examined.

With regard to performance measurement, despite there is a trend that companies make more use of non-financial measures with increase in firm size, SMEs still place greater emphasis on financial measures than non-financial measures (Ismail, 2007; Perera and Baker, 2007; Toledo-López et al., 2012), which can be explained from three perspectives. First, SMEs do not face the same degree of pressure as large companies to fulfil the expectation of different stakeholder groups, so the primary objective of SMEs is to achieve their internal financial target. Second, the limited resources and expertise constrain SMEs' capability to take advantage of advanced performance measurement systems which include both financial and non-financial indicators. Last, financial measures have the advantage of being precise, objective, and reliable (Parker, 2000), and they are available at a minimum cost and effort (Perera and Baker, 2007). Considering that many SMEs complain that their financial indicators generate an overload of data which is too complex to inform decision-making (Hudson et al., 2001) and the level of the use of multi-dimensional indicators is significantly low in SMEs (Ismail, 2007), it is necessary to identify a small number of financial key performance indicators (KPIs) that capture the essence of SMEs' performance.

Although there are several studies examining the impact of supply chain activities on SMEs' financial performance, some of them obtain contradictory findings due to different contexts or other contingency factors (e.g. Arend and Wisner, 2005; Hamister, 2012). In addition, those studies normally focus on a limited number of supply chain activities, so their findings are too fragmented, which impedes a comprehensive decision-making with multiple supply chain activities being considered. An overview of supply chain activities enables SME owner-managers

to identify the most effective ones in improving the financial performance and allocate their resources efficiently. However, to the best of the author's knowledge, there is no study with a conclusive overview of this topic in the context of SMEs. Therefore, the objective of this study is to address this gap among SCM, Financial Performance Measurement, and SMEs by summarising the extant literature and developing a conceptual framework that specifies the causal relationship between supply chain activities and financial KPIs of SMEs through a systematic literature review (SLR). The definition of SMEs by the European Commission (2015) is adopted in this study, which defines SMEs as firms that have fewer than 250 employees and annual turnover no more than €50 million or annual balance sheet no more than €43 million. The objective is broken down into three research questions:

- 1) Which supply chain activities influence the financial performance of SMEs?
- 2) In what way do supply chain activities influence the financial performance of SMEs, positively or negatively?
- 3) What financial dimensions and indicators are critical in measuring the financial performance of SMEs?

The remainder of the paper is structured as follows. Section 2.2 provides a description of the methodology adopted, followed by descriptive findings in Section 2.3 and thematic findings in Section 2.4. Section 2.5 discusses the findings of the review, and the conclusions are drawn in Section 2.6.

2.2 Methodology

To achieve the research objective, the author adopted the SLR methodology suggested by Tranfield et al. (2003). The traditional or narrative literature review is often biased and lacks thoroughness, while SLR can minimise deviations and bias by exhaustively searching literature, be reproduced following a sequence of transparent procedures, and provide more reliable and objective conclusions based on a set of rigorous literature selection criteria. According to Tranfield et al. (2003), three stages are involved in implementing an SLR, which are review planning, review conducting, and reporting and dissemination in sequence.

At the review planning stage, a scoping study was conducted by exploring and synthesising relevant seminal papers, which delimited research areas to the following: SCM, Financial Performance, and SME. It also generated an overview of debates surrounding the fields of study and identified search strings for each area (Table 2-1). The SCM-related search string aims at identifying supply chain activities while the search string of Financial Performance focuses on financial KPIs and the SME focused string addresses the SME context of this study. Two search string combinations were used to identify relevant papers: 1) SCM and SME and 2) Financial Performance and SME. Both combinations included the SME-related search string, ensuring the SME focus of this study and its generalisability to SMEs.

Table 2-1 Search strings adopted

Academic areas	Search strings
SCM	("supply chain*" OR "logistics" OR "value chain*" OR "demand chain*" OR "supply network*")
Financial Performance	("financial performance" OR "financial measure*" OR "financial management" OR "financial indicator*" OR "financial metric*" OR "financial ratio*" OR "ratio analysis" OR "financial KPI*")
SME	("firm size" OR "SME*" OR "small and medium size* enterprise*" OR "small and medium enterprise*" OR "small compan*" OR "small firm*" OR "small enterprise*" OR "small business*" OR "micro compan*" OR "micro firm*" OR "micro enterprise*" OR "micro business*" OR "medium size* compan*" OR "medium size* firm*" OR "medium size* enterprise*" OR "medium size* business*")

Regarding review conducting, the literature search was conducted in June 2020 by employing three databases (EBSCO, ABI/INFORM, and Scopus). These databases have been widely used in literature review studies (e.g. Bititci et al., 2012; Choong, 2013; Eksoz et al., 2014) and cover key disciplines such as Business, Management, and Finance. Search fields included the title, abstract, keywords, and subject of the study. Two exclusion criteria were defined in advance (Table 2-2): only peer-reviewed English papers were eligible for further analysis considering the quality of papers and capabilities of the author. The criteria for papers that can be included in the final literature pool (inclusion criteria) are defined in the second panel of Table 2-2.

Table 2-2 Exclusion/Inclusion criteria and rationale

Exclusion/Inclusion criteria	Rationale
<i>Exclusion criteria</i>	
Papers that are not peer-reviewed	Peer-reviewed papers are likely to be of higher quality than conference papers and working papers
Non-English language papers	The constraint of language capabilities of the author
<i>Inclusion criteria</i>	
Supply chain practices or supply chain activities	The focus of this study is on supply chain activities
Identifiable financial dimensions and/or financial KPIs	Financial performance is another focus of this study
Identifiable relationships between supply chain activities and financial performance	This study aims to identify supply chain activities that can drive SMEs' financial performance

Based on the search of search strings in the selected databases and after applying the exclusion criteria and removing duplicates, 8,608 papers qualified for title and abstract screening. Afterwards, the title and the abstract of those studies were screened against the pre-defined inclusion criteria (Table 2-2) and, subsequently, 216 papers were eligible for full-text screening. The full-text screening was still based on the same inclusion criteria. During the process, a snow-balling search was conducted to identify relevant papers by screening reference lists of included papers to ensure the comprehensiveness of the literature search. Papers identified were subject to full-text screening as well and the qualified papers (130) followed a quality appraisal process (Pittaway et al., 2004) where each paper was rated on a Likert scale from zero to three in terms of theoretical background, methodology, findings, and contribution (Appendix A.1). Finally, 110 papers that had an average quality score of at least 1.5 or had high relevance with the research topic were included in the final literature pool. Figure 2-1 summarises the literature selection process.

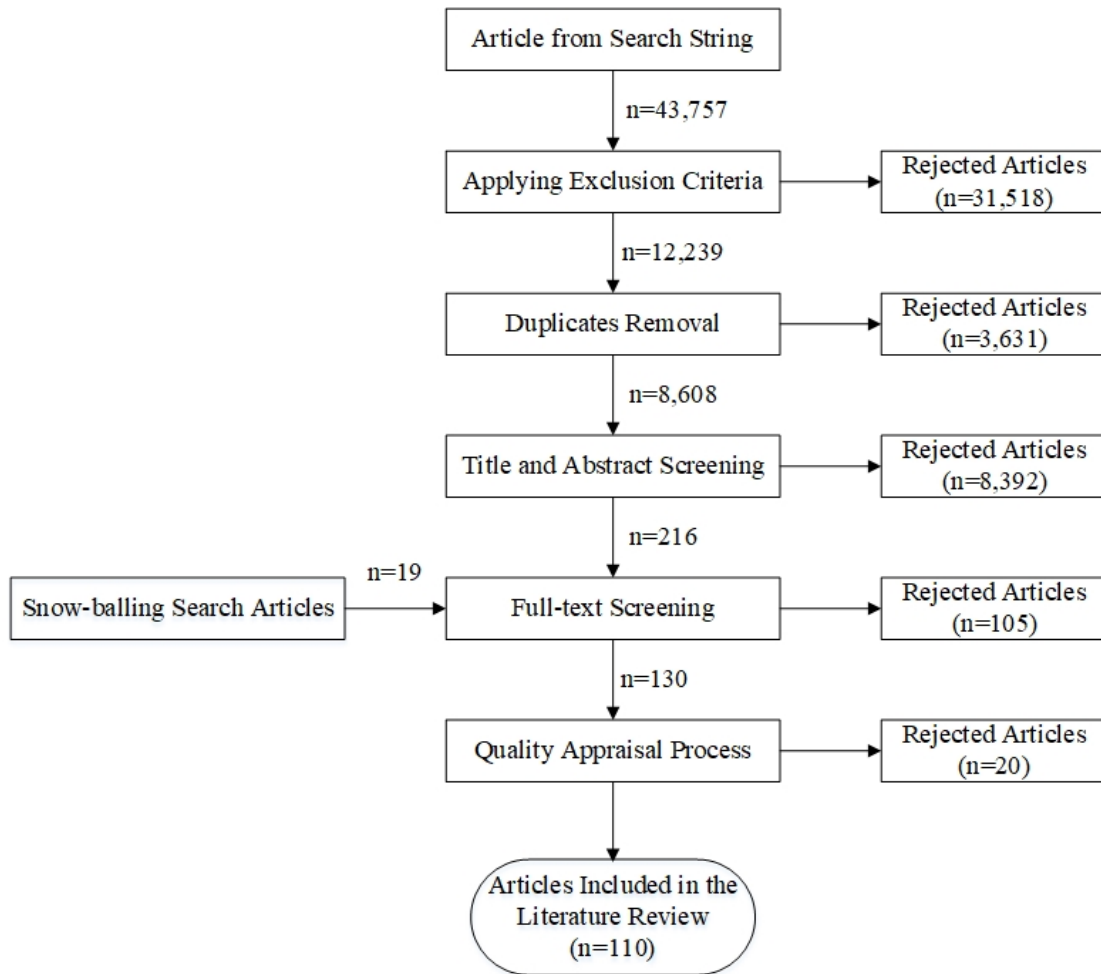


Figure 2-1 Building the literature pool

At the stage of reporting and dissemination, content analysis, which is a research technique for an objective and systematic description of the literature (Gold et al., 2010) was adopted to analyse and synthesise the reviewed studies. The content of each included paper was extracted and recorded on a spreadsheet. Analytic categories, which are the primary components of content analysis, can be derived deductively by being confirmed before the analysis of the literature or inductively by being developed from the reviewed literature (Seuring and Müller, 2008). Since this study is exploratory and there is no formative framework of supply chain activities that can be referred to, the analytic categories which are supply chain activities in this study were therefore obtained inductively by summarising the included studies and form the structure of the paper.

2.3 Descriptive Findings

Table 2-3 shows the number of papers allocated to different descriptive categories. The framework adopted to classify study types has two categories: analytical and empirical, which are divided into seven subcategories: conceptual, mathematical, and statistical (analytical); experimental design, statistical sampling, mixed method, and case studies (empirical) (Habib et al., 2015; Taticchi et al., 2015).

There is an increasing trend of the number of papers published under this topic, suggesting the impact of SCM on SMEs' financial performance is of great research potential and has attracted researchers' attention. The included papers are a mixture of analytical and empirical studies, within which empirical studies account for a larger proportion (104 out of 110) while only six papers are analytical. Statistical sampling is the dominant study type (88) and the quantitative method is the dominant research methodology (91), while few studies adopt a qualitative approach or mixed method. Since most studies focus on developed countries (Europe and North America) and the manufacturing industry, their generalisability to developing countries and the service industry is constrained.

The author also provides the number of papers for each supply chain activity where each paper could be allocated to more than one supply chain activity due to its multiple focuses. Supply chain activities are classified into three categories based on their scope, which are internal, external, and spanning. Internal supply chain activities are business functions or management processes that can be directly controlled by a company and influence its financial performance, while external supply chain activities are activities that are related to the supply chain members of a company and can influence its financial performance. Spanning supply chain activities are activities that directly involve or influence multiple internal and/or external supply chain activities and also impact the financial performance of the business.

Table 2-3 Papers allocated to each descriptive category

Descriptive category	Sub-category	Number of papers
Paper type	<i>Analytical</i>	
	Conceptual	4
	Mathematical	–
	Statistical	2
	<i>Empirical</i>	
	Experimental design	–
	Statistical sampling	88
	Mixed method	5
Studies over time	Case studies	11
	Before 1995	3
	From 1995 till 1999	3
	From 2000 till 2004	8
	From 2005 till 2009	20
	From 2010 till 2014	34
	From 2015 till 2020	42
Methodology	Quantitative	91
	Qualitative	14
	Mixed methods	5
Geographical location	Europe	36
	North America	18
	India	11
	China	8
	Africa	6
	Australia and New Zealand	5
	Multiple	5
	Other	15
Industry sector	N/A	6
	Manufacturing	69
	Service	12
	Both	23
Analytic category	N/A	6
	<i>Internal supply chain activities</i>	
	Purchasing	15
	Production	14
	Transport	12
	Inventory management	16
	<i>External supply chain activities</i>	
	Supplier partnership	26
	Customer partnership	25
	<i>Spanning supply chain activities</i>	
	Supply chain strategy	14
	Quality management	15
	Information sharing	26
	Outsourcing	10
Sustainable SCM	19	

Note: Analytical papers that do not have specific geographical and/or industrial contexts are allocated to N/A.

Table 2-4 presents the top ten journals based on the number of publications in the final literature pool. According to the Chartered Association of Business Schools (CABS, <https://charteredabs.org/academic-journal-guide-2018/>), most top ten journals are classified into the Operations and Technology Management area, which underscores that this topic is still operations oriented.

Table 2-4 Ranking of journals by number of publications

Journal title	Publications	CABS ranking	Impact factor
Supply Chain Management: An International Journal	11	3	4.296
International Journal of Production Economics	8	3	4.998
International Journal of Production Research	7	3	3.199
Industrial Management and Data Systems	6	2	3.727
Production Planning and Control	4	3	3.340
International Journal of Physical Distribution and Logistics Management	4	2	5.212
Journal of Cleaner Production	4	2	6.395
Benchmarking: An International Journal	4	1	N/A
Journal of Operations Management	3	4*	7.776
Journal of Small Business Management	3	3	3.120

Notes: 1. The CABS ranking is based on the Academic Journal Guide 2018 published by CABS (<https://charteredabs.org/academic-journal-guide-2018/>) and from high to low is 4*, 4, 3, 2, 1.
2. The impact factor is based on the 2018 Journal Citation Reports published by Clarivate Analytics and was obtained from the journals' websites.

2.4 Thematic Findings

Table 2-5 presents a matrix highlighting supply chain activities and financial dimensions for each paper. Eleven supply chain activities are identified from the reviewed papers: purchasing, production, transport, inventory management, supplier partnership, customer partnership, supply chain strategy, quality management, information sharing, outsourcing, and sustainable SCM. Five key financial dimensions which are prevalently used to measure SMEs' financial performance are presented, including profitability, growth, market share, asset utilisation, and liquidity. Table 2-5 also presents the frequency of two moderators, firm size and supply chain position, which influence the relationship between supply chain activities and SMEs' financial performance and are discussed in detail in the following sections.

Table 2-5 Papers included in the review and corresponding focus on supply chain activities and financial dimensions

No.	Author(s)	Supply chain activities											Moderators/ Control variables		Financial dimensions				
		1	2	3	4	5	6	7	8	9	10	11	FS	SCP	Profitability	Growth	Market share	Asset utilisation	Liquidity
1	Agan et al. (2013)											x	x		x		x		
2	Agburu et al. (2017)										x				x				
3	Ali, Bentley, et al., (2017)											x			x				
4	Ali, Nagalingam, et al. (2017)			x				x						x			x		
5	Amedofu et al. (2019)					x	x			x				x		x			
6	Ates et al. (2013)					x	x	x						x				x	
7	Atnafu and Balda (2018)				x									x			x		
8	Bagur-Femenías et al. (2015)								x							x			
9	Bahri et al. (2017)		x		x				x	x				x				x	
10	Banomyong and Supatn (2011)	x		x	x									x					
11	Barba-Sánchez et al. (2018)								x					x					
12	Bayraktar et al. (2009)					x	x			x	x			x					
13	Bhutta et al. (2007)													x		x			
14	Blackburn et al. (2013)							x						x		x			
15	Bordonaba-Juste and Cambra-Fierro (2009)					x				x				x					
16	Bourlakis et al. (2014)											x	x		x				
17	Bretherton and Chaston (2005)					x	x	x						x					
18	Cantele and Zardini (2018)											x			x				
19	Cao and Zhang (2011)					x	x						x		x				
20	Carr and Pearson (1999)	x				x								x					
21	Carr and Smeltzer (2000)	x												x			x		
22	Carter et al. (2000)											x			x				
23	Chalmeta et al. (2012)	x	x	x	x				x	x				x		x	x		
24	Chalotra (2013)				x									x			x		
25	Choi et al. (2017)											x	x		x		x		
26	Chrisman and Bhandari (1982)													x					
27	Christopher and Ryals (1999)		x	x		x	x			x	x			x				x	
28	de Abreu et al. (2012)											x	x		x				
29	de Haan et al. (2007)	x	x	x	x					x				x					
30	Demirbag et al. (2006)								x						x		x		
31	Dollinger and Kolchin (1986)	x													x				
32	Duh et al. (2012)								x					x					
33	Eng (2016)			x										x					
34	Evangelista et al. (2013)									x			x		x				
35	Evangelista et al. (2012)									x						x		x	
36	Fantazy et al. (2009)	x		x				x						x		x			
37	Fantazy and Salem (2016)							x						x		x			
38	Federici (2009)									x					x				

Table 2-5 Continue

No.	Author(s)	Supply chain activities											Moderators/ Control variables		Financial dimensions				
		1	2	3	4	5	6	7	8	9	10	11	FS	SCP	Profitability	Growth	Market share	Asset utilisation	Liquidity
39	Geng et al. (2017)											x	x		x	x	x		
40	Gokarn and Kuthambalayan (2019)		x			x	x			x					x	x			
41	Golicic and Smith (2013)													x					
42	Gunasekaran and Ngai (2003)			x	x		x	x	x	x					x	x			
43	Gunasekaran et al. (2011)							x	x						x				
44	Hafeez et al. (2010)							x	x							x			
45	Hanna and Jackson (2015)	x													x				x
46	Hendricks and Singhal (2001)								x				x		x				
47	Herzallah et al. (2014)														x	x			
48	Hilmola et al. (2015)							x	x						x				
49	Holter et al. (2008)			x							x			x					
50	Hsu et al. (2011)					x	x	x							x	x		x	
51	Jain et al. (2016)											x			x				
52	Jie and Gengatharen (2019)		x			x	x			x					x				
53	Jin (2006)													x		x			
54	Jin and Kang (2013)	x												x		x			
55	Johnson and Templar (2011)				x		x				x				x			x	x
56	Johnston (2014)				x									x				x	
57	Karadağ (2018)				x										x	x		x	x
58	Kazan et al. (2006)		x											x				x	
59	Kim (2006)					x	x							x		x			x
60	Kim et al. (2015)	x												x		x			
61	Koh et al. (2007)					x	x				x				x	x			
62	Kossai and Piget (2014)														x				
63	Koumanakos (2008)				x										x			x	
64	Kumar et al. (2019)											x			x				
65	Kumar et al. (2014)														x	x			
66	Kumar et al. (2016)					x	x								x	x		x	
67	Laitinen (2002)														x	x			x
68	Lambert and Cooper (2000)					x	x								x				
69	Lau et al. (2004)														x				
70	Lee (1998)														x				
71	Lee et al. (2012)														x				x
72	Lucato et al. (2017)														x				
73	Marodin et al. (2016)		x												x				
74	Mothilal et al. (2012)			x			x								x				
75	Namagembe et al. (2019)														x				
76	Nsimbila and Jurriëns (2012)	x				x									x				

Table 2-5 Continue

No.	Author(s)	Supply chain activities											Moderators/ Control variables		Financial dimensions				
		1	2	3	4	5	6	7	8	9	10	11	FS	SCP	Profitability	Growth	Market share	Asset utilisation	Liquidity
77	O'Neill et al. (2016)							x							x		x	x	
78	Paik (2011)	x				x							x		x				
79	Palomero and Chalmeta (2014)					x	x								x				
80	Pavlis et al. (2018)	x							x										x
81	Power (2005)					x	x								x				
82	Pressey et al. (2009)	x													x				
83	Rajeev (2008)				x										x				
84	Raman and Ahmad (2013)									x						x			
85	Rezaei et al. (2015)					x	x								x	x	x		
86	Rezaei et al. (2018)					x	x								x	x			
87	Sahoo and Yadav (2018)		x												x				
88	Shashi et al. (2019)		x		x										x	x			
89	Shashi et al. (2018)					x	x					x			x				
90	Sinha et al. (2016)							x							x			x	
91	Söderberg and Bengtsson (2010)	x	x	x											x	x		x	x
92	Solakivi et al. (2011)									x					x				
93	Steinker et al. (2016)				x										x			x	x
94	Stoian and Gilman (2017)							x				x	x	x		x			
95	Sueyoshi and Goto (2010)											x	x		x				
96	Sukwadi et al. (2013)					x		x							x	x			
97	Sundram et al. (2016)					x	x			x					x				
98	Susanty et al. (2018)									x					x			x	
99	Tan et al. (2010)									x			x		x				
100	Tasdemir and Hiziroglu (2019)				x										x				
101	Tatoglu et al. (2016)		x			x	x	x		x					x				
102	Tipu and Fantasy (2014)							x							x	x			
103	Töyli et al. (2008)		x	x	x									x	x	x			x
104	Tunälv (1992)							x							x				
105	Valsamakis and Sprague (2001)							x							x			x	
106	Wang et al. (2008)									x					x	x	x		
107	Wu (2017)											x			x			x	
108	Wynarczyk and Watson (2005)					x	x									x			
109	Yadav et al. (2019)		x												x				
110	Yang et al. (2020)											x				x			

Notes: 1. "x" means the item is examined in the corresponding paper.

2. Moderators/Control variables: FS – Firm size; SCP – Supply chain position.

3. Supply chain activities: 1 – Purchasing; 2 – Production; 3 – Transport; 4 – Inventory management; 5 – Supplier partnership; 6 – Customer partnership; 7 – Supply chain strategy; 8 – Quality management; 9 – Information sharing; 10 – Outsourcing; 11 – Sustainable SCM.

2.4.1 Internal Supply Chain Activities

The literature concentrates on four internal supply chain activities to improve SMEs' financial performance: purchasing, production, transport, and inventory management.

2.4.1.1 Purchasing

Purchasing is a business function which significantly influences the bottom line of an organisation (Pressey et al., 2009). Normally, purchases account for approximately 60 per cent of a company's revenue so it is particularly important for SMEs, who lack financial resources by nature. According to the research by Dollinger and Kolchin (1986), SME owner-managers indicate the importance of purchasing for not only acquiring materials but also generating strategic information and competitive advantages.

It is found that purchasing can contribute to SMEs' financial performance. Effective purchasing management offers great potential for profit improvement as it lowers the cost of goods sold (Dollinger and Kolchin, 1986; Söderberg and Bengtsson, 2010). The quality of purchased products positively influences SMEs' sales, growth (Nsimbila and Jurriëns, 2012), and liquidity (Pavlis et al., 2018). Purchasing flexibility is positively associated with SMEs' net profit (Fantazy et al., 2009), and the purchasing skills required by owner-managers are positively related to SMEs' financial performance (Carr and Smeltzer, 2000; Paik, 2011). Despite the potential benefit of the improved purchasing performance, purchasing is still informal in SMEs and they have not fully taken advantage of purchasing to improve their financial performance (Pressey et al., 2009).

Some studies focus on the effect of strategic purchasing, which is defined as the degree that purchasing is aligned with supply chain and corporate strategies (Carr and Pearson, 1999) and note that firm size moderates the positive relationship between strategic purchasing and financial performance (e.g. Carr and Pearson, 1999; Carr and Smeltzer, 2000; Kim et al., 2015). In other words, as the firm size increases, the positive impact of strategic purchasing is stronger on companies' financial performance. On the other hand, global sourcing is found

insignificant in decreasing SMEs' costs, but larger companies with higher capabilities can benefit from it (Hanna and Jackson, 2015). As a result, SME owner-managers should effectively manage their purchasing activities and improve purchasing performance by lowering the purchase cost, improving the quality of purchased products, shortening the purchasing cycle time, and strengthening the relationship with suppliers to enhance their companies' financial performance. With the expansion of firm size, they can consider more strategy-oriented purchasing practices, like strategic purchasing and global sourcing. This leads to the first hypothesis:

H1. Purchasing performance positively affects SMEs' financial performance.

2.4.1.2 Production

To improve financial performance, companies should compress the end-to-end pipeline time, because the shorter the pipeline, the less working capital tied up (Christopher and Ryals, 1999). Production can help SMEs shorten the supply chain cycle time by reducing production lead time, which reduces operating costs and promotes sales by enhancing customer services (Christopher and Ryals, 1999).

A cause-and-effect relationship exists between production and SMEs' financial performance (Chalmeta et al., 2012). Kazan et al. (2006) adopt four dimensions to measure production performance and identify that despite the insignificance of the time dimension, production quality, cost, and flexibility are significantly and positively associated with the financial performance of SMEs. Production performance is also positively correlated with SMEs' quality and productivity performance, which further impact their financial performance (Söderberg and Bengtsson, 2010). Gokarn and Kuthambalayan (2019) argue that SMEs' production capability positively influences their supply chain performance and financial performance.

The adoption of advanced production techniques also contributes to SMEs' financial performance, such as the flexible production system (Bahri et al., 2017), just-in-time (JIT) production (Tatoglu et al., 2016), and lean production (Sahoo

and Yadav, 2018; Shashi et al., 2019; Yadav et al., 2019). It is worth noting that implementing these techniques requires large investments and compatible infrastructure, which is unaffordable by most micro and small firms (Sahoo and Yadav, 2018). Therefore, SME owner-managers should emphasise their production management and performance first and then consider their current situation and comprehensively evaluate the feasibility before investing in advanced production techniques. Accordingly, the hypothesis is formulated:

H2. Production performance positively affects SMEs' financial performance.

2.4.1.3 Transport

Transport constitutes a vital and strategic component of the supply chain (Eng, 2016; Holter et al., 2008), and transport risks are a potential cause of disruptions for SMEs (Ali, Nagalingam, et al., 2017). In contrast, carefully managed transport can improve SMEs' financial performance. In addition to production, transport is another function that has the potential to shorten the supply chain cycle time, so a transport lead-time compression helps enhance SMEs' financial performance by reducing operating costs, improving cash flows, and increasing sales (Christopher and Ryals, 1999). Transport cost is a critical aspect in assessing the supply chain performance of SMEs (Banomyong and Supatn, 2011).

The study by Söderberg and Bengtsson (2010) shows that transport performance has a positive relationship with SMEs' quality and productivity performance. Transport flexibility, which is the ability of a company's transport to accommodate customers' urgent or special needs, is found to increase SMEs' sales growth (Fantazy et al., 2009). Based on the data from small and medium-sized grocery retailers, Eng (2016) asserts there is a positive relationship between SMEs' transport capability and their financial performance. Although transport can contribute to SMEs' financial performance, many SMEs cannot manage transport effectively due to lack of resources, such as skills and information systems (Holter et al., 2008), which constrains their potential to financially benefit from it. Thus, the following hypothesis is proposed:

H3. Transport performance positively affects SMEs' financial performance.

2.4.1.4 Inventory Management

Inventory management is at the core of SCM (Gunasekaran and Ngai 2003), which aims to reduce inventory levels without interrupting daily production and customer service (Koumanakos, 2008). Given the resource-constraint feature of SMEs, inventory management, as an integral part of working capital management, is crucial for their financial performance, since inventory reduction liberates the cash tied up and decreases inventory holding costs (Karadağ, 2018).

Empirical evidence shows that the implementation of inventory management has a positive effect on the financial performance of SMEs (e.g. Atnafu and Balda, 2018; Chalotra, 2013; Karadağ, 2018; Tasdemir and Hiziroglu, 2019). Thus, inventory optimisation is widely adopted by financially distressed SMEs as a turnaround strategy to prevent bankruptcy (Steinker et al., 2016). Proper inventory management can result in efficiency improvement, competitive ability increase, and cost reduction (Chalotra, 2013). Koumanakos (2008) highlights that inventory holding days have a negative association with SMEs' profitability, which is verified by Johnston (2014), implying the current inventory level of SMEs is too high to be efficient.

Indeed, the use of formal inventory management practices in SMEs is still inadequate and SMEs have not fully exploited the potential of inventory management to drive their financial performance (Rajeev, 2008). Consequently, SME owner-managers are advised to implement appropriate inventory management practices such as ABC analysis, economic order quantity (EOQ), and vendor managed inventory (VMI) to keep their inventory at an optimal level (Rajeev, 2008). Those arguments suggest the following hypothesis:

H4. Inventory performance positively affects SMEs' financial performance.

2.4.2 External Supply Chain Activities

The external supply chain activities include supplier partnership and customer partnership, and most research examines them as a whole called external partnership. A partnership will facilitate the knowledge and technology transfer between companies, especially when they are in the development phase

(Gunasekaran and Ngai 2003). Based on the resource-based view (RBV), since SMEs suffer from a lack of resources, establishing partnership externally can provide SMEs with essential resources, which lead to enhanced competitive advantage and financial performance (Bretherton and Chaston, 2005; Gokarn and Kuthambalayan, 2019; Hsu et al., 2011; Palomero and Chalmeta, 2014).

Wynarczyk and Watson (2005) identify that compared to non-partnership SMEs, partnership counterparts have significantly higher rate of growth. SMEs' partnership capability is also found to positively influence their financial performance through improved supply chain performance (Gokarn and Kuthambalayan, 2019). Rezaei et al. (2018) investigate the partnership in functions and contend that the partnership in research and development positively impacts SMEs' financial performance, which is consistent with the findings of Rezaei et al. (2015).

Partnership with critical suppliers is crucial for a responsive supply chain (Christopher and Ryals, 1999; Power, 2005). An effective supplier partnership provides buying firms with opportunities for mutual planning and joint problem solving with suppliers (Sundram et al., 2016), making inventory and cost reduction possible. It allows suppliers to know buyers' needs, permits buyers to identify suppliers' capabilities, and enables both to match their business philosophies (Bordonaba-Juste and Cambra-Fierro, 2009), which result in a better quality of goods and further higher sales (Nsimbila and Jurriëns, 2012). Many studies also empirically support the positive relationship between supplier partnership and the financial performance of SMEs (e.g. Koh et al., 2007; Kumar et al., 2016; Sukwadi et al., 2013; Sundram et al., 2016).

Customer partnership can help companies plan and schedule capacity better (Christopher and Ryals, 1999) and differentiate their products from competitors, improving customer satisfaction and loyalty (Jie and Gengatharen, 2019). As a part of SCM practices, customer partnership can positively influence SMEs' financial performance (Tatoglu et al., 2016). Involving key customers in decision-making is found to benefit the financial performance of SMEs (Kumar et al., 2016). Moreover, an effective customer partnership is positively associated with SMEs'

sales, inventory turnover (Valsamakis and Sprague, 2001), cost reduction (Bayraktar et al., 2009), and profit growth (Mothilal et al., 2012).

However, developing a partnership is not cost free; it requires resources that are normally not possessed by SMEs (Rezaei et al., 2015). In practice, SMEs seem to be more internally focused while spending less effort in establishing long-term external partnerships (Ates et al., 2013), so SME owner-managers need to strike the balance between internal activities and external partnerships and find an optimal level of partnership efforts for their firms (Cao and Zhang, 2011). Based on those arguments, the following hypotheses are proposed:

H5. Supplier partnership positively affects SMEs' financial performance.

H6. Customer partnership positively affects SMEs' financial performance.

2.4.3 Spanning Supply Chain Activities

The literature emphasises five spanning supply chain activities: supply chain strategy, quality management, information sharing, outsourcing, and sustainable SCM.

2.4.3.1 Supply Chain Strategy

Supply chain strategy is a critical construct of SCM (Tatoglu et al., 2016), encompassing decisions related to both internal and external supply chain activities. The financial performance of SMEs relies on the implementation of an appropriate supply chain strategy (Fantazy and Salem 2016; Hsu et al. 2011). A clearly defined strategy can help SMEs gain competitive advantage (Bretherton and Chaston, 2005) and can facilitate business growth (Blackburn et al., 2013). Companies that have a supply chain strategy are more profitable than those which do not have one (Tunälv, 1992).

Sukwadi et al. (2013) assert that both lean and agile supply chain strategies contribute to SMEs' financial performance through improved supply chain performance. Hafeez et al. (2010) categorise the supply chain strategy into three dimensions, i.e. technology, organisation, and people and identify its positive relationship with SMEs' financial performance. Fantazy et al. (2009) reveal three

types of supply chain strategy, which are innovative strategy, customer-oriented strategy, and follower strategy. After analysing the data of Canadian manufacturing SMEs, they find that innovative strategy and customer-oriented strategy have a positive association with SMEs' financial performance, while the follower strategy is insignificant. However, a replicate study conducted within Pakistani manufacturing SMEs shows that SMEs need to adopt the follower strategy to improve financial performance (Tipu and Fantasy, 2014), suggesting the formulation of supply chain strategy should consider contingency factors, such as country, industry, and firm size.

Despite the benefit of supply chain strategy, SMEs are found to have difficulties in developing mission, vision, and values, and most of them have no formal strategies (Ates et al., 2013). Therefore, SME owner-managers are encouraged to formulate a supply chain strategy for their companies and think about how to achieve their long-term development and prosperity (Gunasekaran and Ngai 2003). It is then hypothesised that:

H7. Implementing supply chain strategy positively affects SMEs' financial performance.

2.4.3.2 Quality Management

Quality management is pertinent to various supply chain activities and particularly important for some industries, such as the food industry (Ali, Nagalingam, et al., 2017). Kumar et al. (2014) examine the impact of different quality management practices and conclude that quality management can positively influence the financial performance of manufacturing SMEs. This positive effect also holds in service SMEs (Bagur-Femenías et al., 2015). A high quality of products and services is essential for the long-term survival and prosperity of SMEs (Gunasekaran and Ngai 2003). Hilmola et al. (2015) suggest that superior quality is at the centre for achieving high revenues and profits in SMEs. SMEs' quality orientation (O'Neill et al., 2016) and quality-enhancing capability (Lau et al., 2004) also positively influence their financial performance.

Total quality management (TQM) is a widely adopted quality management practice (O'Neill et al., 2016), which is found to contribute to SMEs' financial performance (e.g. Demirbag et al., 2006; Duh et al., 2012; Sinha et al., 2016). In the SME context, Lee (1998) observes that TQM adopters have greater sales than non-TQM adopters. Hendricks and Singhal (2001) empirically claim that SMEs tend to financially benefit more from TQM when compared to large firms, indicating TQM is effective in driving the financial performance of SMEs. Thus, the author proposes the following hypothesis:

H8. Quality management positively affects SMEs' financial performance.

2.4.3.3 Information Sharing

Information sharing is the degree to which important information can be communicated within firms and between supply chain members, which helps reduce uncertainty in the supply chain (Susanty et al., 2018). Sharing information along the supply chain facilitates cost savings, inventory management, and supply chain partnerships (Pavlis et al., 2018). It is demonstrated that information sharing can improve SMEs' profitability (Susanty et al., 2018), liquidity (Pavlis et al., 2018), and sales growth (Sundram et al., 2016).

A well-recognised approach to facilitate information sharing is to adopt information technology (IT) (Kumar et al., 2016). A frequently cited benefit of IT is cost reduction (Bayraktar et al., 2009; Federici, 2009; Tan et al., 2010), and many SME owner-managers attribute their improved financial performance to the adoption of IT (Gunasekaran et al., 2011). Empirical studies also support that SMEs can obtain financial benefits from IT investments (e.g. Barba-Sánchez et al., 2018; Evangelista et al., 2012; Kossai and Piget, 2014). Gokarn and Kuthambalayan (2019) note that SMEs' IT capability is important in driving their financial performance.

High investment is one of the barriers to IT adoption (Evangelista et al., 2013), and it is argued that IT investment alone cannot guarantee benefits, which will be magnified only when information is effectively utilised (Jin, 2006). As a result, SMEs are recommended to actively engage in information sharing in the supply

chain while ensuring information quality (Jie and Gengatharen, 2019). Before investing in IT, SME owner-managers need to consider their firms' financial situation and the feasibility to be aligned with their supply chain strategy (Hafeez et al., 2010; Wang et al., 2008). The hypothesis is then formulated as follows:

H9. Information sharing positively affects SMEs' financial performance.

2.4.3.4 Outsourcing

Outsourcing offers companies opportunities to concentrate on their core businesses (Agburu et al., 2017). Since SMEs are resource-constrained, outsourcing is extensively adopted by them to acquire essential and specialised resources (Gunasekaran and Ngai 2003). One of the main drivers behind the prevalence of outsourcing is the reduction of fixed asset investment (Christopher and Ryals, 1999; Johnson and Templar, 2011), so it is believed outsourcing can improve firms' financial performance. However, whether SMEs can yield financial benefits from outsourcing is still controversial.

Some studies support a positive relationship between outsourcing and SMEs' financial performance, but they treat outsourcing as a part of SCM while failing to examine the impact of outsourcing separately (e.g. Bayraktar et al., 2009; Koh et al., 2007). Based on a sample of 74 SMEs, Raman and Ahmad (2013) compare the financial performance between outsourcing firms and the non-outsourcing counterparts and observe that outsourcing SMEs are the out-performer. Nonetheless, they do not indicate any causality and the sample size is too small to be representative. Agburu et al. (2017) investigate the outsourcing of different business activities and find that although outsourcing accounting activities is insignificant, the outsourcing of back office activities, primary activities, and supporting activities significantly improves SMEs' profitability.

Solakivi et al. (2011) note that transport is the most extensively outsourced function in SMEs, but no significant relationship is found between logistics outsourcing and SMEs' financial performance. This insignificance can be explained by the hidden costs associated with outsourcing, including additional transport costs, communication charges, risk costs, and costs arising from

incompatible organisational cultures and systems, which tend to be overlooked by owner-managers (Solakivi et al., 2011). Many SMEs lack competence in outsourcing (Holter et al., 2008), and it does not necessarily lead to a better financial performance, so SME owner-managers should consider the total costs associated with outsourcing before making relevant decisions.

2.4.3.5 Sustainable SCM

Sustainable SCM has been a major topic in SMEs during recent years, and the majority of relevant studies in the literature pool (16 out of 19) were published in or after 2012. The objective of sustainable SCM is to achieve a balance among firms' economic, environmental and social performance (Bourlakis et al., 2014), which has been identified to improve the financial performance of large companies (e.g. Carter et al., 2000; Geng et al., 2017; Golicic and Smith, 2013), but this impact is controversial among SME focused literature.

Stoian and Gilman (2017) investigate both social and environmental dimensions of sustainability and note that social practices have a positive impact on SMEs' growth, while environmental practices are insignificant, which is verified by Cantele and Zardini (2018). Most other research only investigates the environmental aspect of sustainable SCM. Focusing on UK food SMEs, Ali, Bentley, et al. (2017) argue that environmental SCM is positively associated with firms' profitability, but the specific industry focus and small sample size limit the generalisability of their findings. Lee et al. (2012) contend that environmental SCM cannot directly improve SMEs' financial performance but does so through increased efficiency. Environmental purchasing (Namagembe et al., 2019) and socially responsible supplier development (Wu, 2017) are also positively related to SMEs' financial performance.

By contrast, some studies support no relationship between sustainable SCM and SMEs' financial performance (e.g. Choi et al., 2017; Lucato et al., 2017; Shashi et al., 2018). Sueyoshi and Goto (2010) identify a positive link between environmental performance and financial performance in large firms while not in SMEs. The insignificance can be partially explained by the fact that sustainable practices in SMEs are normally informal and have not been successfully

implemented (Jain et al., 2016), but the primary reason is SMEs lack essential knowledge and ability to integrate sustainable practices to improve performance (Kumar et al. 2019). At present, SMEs are concerned with more pressing issues such as survival rather than environmental or social sustainability (Agan et al., 2013).

2.4.4 Firm Size and Supply Chain Position

In light of the reviewed articles, it is found that firm size and supply chain position moderate the relationship between supply chain activities and SMEs' financial performance. Since firm size is usually considered as a control variable in many quantitative studies, it is useful to distinguish between moderator and control variable. Control variable is a variable that can largely influence the dependent variable and cannot be ignored so is included in the model, while moderator is a variable that can influence the direction and/or strength of the relationship between an independent variable and a dependent variable. Although some included papers consider firm size as a control variable, they also indicate and discuss its moderating effect on the relationship between supply chain activities and SMEs' financial performance so were included in the reviewed articles as well as argued below (e.g. de Abreu et al., 2012).

Firm size is a critical moderator in SCM because companies use different mechanisms when they grow in size (de Haan et al., 2007; Kim, 2006). Firm size has a positive relationship with global sourcing and IT adoption and influences their impact on firm financial performance (Evangelista et al., 2013; Jin and Kang, 2013). Large companies tend to yield more financial benefits from strategic purchasing than SMEs (Carr and Pearson, 1999; Carr and Smeltzer, 2000; Kim et al., 2015), while the skills of purchasing employees are more important for SMEs (Carr and Smeltzer, 2000). Compared to SMEs, large firms have greater capabilities to harness SCM (Bourlakis et al., 2014), so they have better operational performance (Holter et al., 2008; Johnston, 2014; Marodin et al., 2016) and can financially benefit more from improved production performance (Kazan et al., 2006). Moreover, firm size moderates the impact of external partnership (Cao and Zhang, 2011), supply chain strategy (Stoian and Gilman,

2017), and IT (Jin 2006) on firms' financial performance. Although large firms are more inclined to implement TQM (Duh et al., 2012), SMEs can gain more financial benefits from it (Hendricks and Singhal, 2001). Finally, firm size is a crucial factor to be considered in sustainable SCM, because large firms adopt more sustainable practices (de Abreu et al., 2012) and the effect of sustainable SCM is stronger in large firms than in SMEs (Geng et al., 2017; Sueyoshi and Goto, 2010).

With respect to supply chain position, on one hand, it influences the degree of implementation and risks of supply chain activities. Firms that are positioned nearer to the original equipment manufacturers (OEMs) in the supply chain have a higher degree of lean production (Marodin et al., 2016). Ali, Nagalingam, et al. (2017) propose that exporters like packers and wholesalers are more vulnerable to transport risks than other parties in the supply chain. On the other hand, supply chain position moderate the impact of supply chain activities on SMEs' financial performance. Dollinger and Kolchin (1986) observe that the correlation between SME owner-managers' effort in purchasing and corporate financial performance is stronger in retailers than in manufacturers. The empirical research of Karadağ (2018) shows the correlation between inventory management and SMEs' financial performance is stronger in the manufacturing industry compared to the service sector, because inventory plays a more critical role in the manufacturing industry than in the service industry. Furthermore, it is found that the relationship between logistics performance and the financial performance of SMEs is significant in both wholesalers and retailers while insignificant in manufacturers (Töyli et al., 2008). Supply chain position also influences firms' adoption of sustainable practices (de Abreu et al., 2012), sustainable performance (Bourlakis et al., 2014), and the extent that they can financially benefit from sustainability (Stoian and Gilman, 2017). Despite the moderating effects of firm size and supply chain position, there is a distinctive research gap in understanding the role and importance of moderators when investigating the impact of supply chain activities on SMEs' financial performance, which is addressed by this study. The arguments suggest the following hypotheses:

H10. Firm size moderates the relationship between supply chain activities and SMEs' financial performance.

H11. Supply chain position moderates the relationship between supply chain activities and SMEs' financial performance.

2.4.5 Financial KPIs for SMEs

Various financial dimensions are used to evaluate the financial performance as well as the supply chain performance of SMEs. Table 2-5 shows the financial dimensions adopted in each paper and a summary is provided in Table 2-6.

Table 2-6 Financial dimensions used to evaluate SMEs' performance

Financial dimensions	No. of papers	Representative financial indicators	No. of papers
Profitability	98	Return on sales (ROS)	28
		Return on investment (ROI)	22
		Net profit	13
		Return on asset (ROA)	13
Growth	43	Sales growth	36
		Profit growth	9
		Market share growth	7
Market share	21	Market share	21
Asset utilisation	14	Inventory turnover	10
		Asset turnover	3
Liquidity	13	Quick ratio	7
		Current ratio	5
		Cash conversion cycle	4

Profitability, liquidity, and asset utilisation are widely recognised as three financial objectives for SMEs (Christopher, 2011, p.58). Profitability is the most widely used financial dimension in the reviewed literature and 98 papers adopt it to measure SMEs' financial performance, simply because the goal of most businesses is to make profits. In practice, profitability indicators are the most commonly used financial measures in SMEs (Kossai and Piget, 2014), and two representative indicators are return on sales (ROS) and return on investment (ROI). Nevertheless, it is argued that few SMEs have the notion of the total amount invested, and it is difficult to make a proper measurement of ROI (Lucato et al., 2017). Instead, Chrisman and Bhandari (1982) assert that return on equity (ROE) is the most meaningful profitability indicator for SMEs because it represents the primary or even the sole source of income for SMEs.

However, O'Neill et al. (2016) point out that it is probably problematic if focusing on SMEs' profitability only, because SMEs are typically young and may not reach profitability for an extended period (O'Neill et al., 2016). Under this circumstance, liquidity which measures firms' ability to pay off the debts when they become due has become increasingly important, and two representative indicators are the quick ratio and current ratio (Karadağ, 2018). Liquidity is closely relevant with the survival of SMEs since no firm can survive without a continuous cash flow and SMEs have insufficient cash by nature (Karadağ, 2018). In addition, liquidity is vital in measuring SMEs' supply chain performance because they have weak supply chain power and are vulnerable to commercial requests from their large supply chain partners (Maglaras et al., 2015). Despite the importance of liquidity for SMEs, this study shows that SMEs' liquidity performance has not been sufficiently addressed and only 13 papers adopt this financial dimension.

Asset utilisation is also a financial objective for SMEs, because high asset utilisation indicates the high efficiency of firms, which finally contributes to the bottom line (Steinker et al., 2016). SMEs can improve asset utilisation by generating additional sales with the current level of assets or by maintaining the same level of sales with fewer assets employed (Johnson and Templar, 2011), so the higher the asset turnover, the better the assets are utilised. In addition to asset turnover, SMEs need to pay specific attention to inventory turnover in asset utilisation, because inventory is usually one of the largest asset investments in SMEs (Johnston, 2014).

With the development and expansion of SMEs and for large SMEs, like medium-sized firms, they need to focus more on their competitiveness to ensure the sustainable development. Growth and market share are widely used to assess the competitiveness of companies. While market share evaluates the relative competitiveness, growth is a reliable measure of absolute competitiveness, and three typical growth indicators are sales growth, profit growth, and market share growth (Laitinen, 2002). It is noted that despite the significance of market share for most medium-sized firms, it is not the focus for micro firms, as their competitive priority is to protect the specialised niche market through which they generate

profits, regardless of the size of their market share (Lambert and Cooper, 2000). SMEs can pursue competitiveness only after achieving and being able to sustain their financial objectives.

It is therefore concluded that the current literature lacks comprehensiveness and pertinence in measuring SMEs' financial performance. As a result, based on the discussion above, a framework of financial KPIs for SMEs is established in Figure 2-2, and the corresponding calculation formulae are provided in Appendix A.2. Those KPIs reflect five financial dimensions: profitability, liquidity, asset utilisation, growth, and market share, classified into two sequential business objectives: financial objective and competitiveness. To measure SMEs' performance from the financial perspective, owner-managers need to ensure the achievement of their financial objectives in terms of liquidity indicating survival, asset utilisation focusing on efficiency, and profitability suggesting the bottom line. With the development and expansion of the business, SMEs should increasingly emphasise competitiveness constructed by market share and growth.

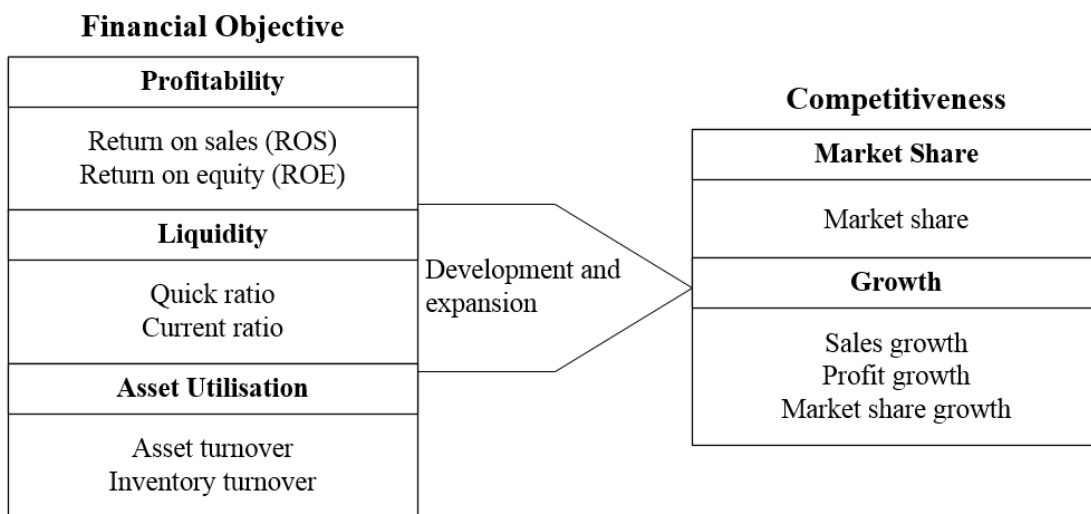


Figure 2-2 Framework of financial KPIs for SMEs

2.5 Discussion

Based on thematic findings, a framework summarising the proposed hypotheses is established in Figure 2-3. In general, SMEs can capitalise on the internal functions and management processes to improve their financial performance,

including purchasing, production, transport, and inventory management. The enhanced capability and performance of those activities directly contribute to SMEs' financial performance. It is argued that to survive in the current competitive market, SMEs should develop unique capabilities and performance that are inimitable by competitors (Hsu et al., 2011). Despite the positive impact of internal supply chain activities on the financial performance, the relevant management in SMEs is still ineffective and they have not fully taken advantage of internal supply chain activities to improve their financial performance (Holter et al., 2008; Pressey et al., 2009; Rajeev, 2008). Given that those activities are internal and can be directly controlled by companies, owner-managers should focus on effectively managing and improving the performance of internal supply chain activities.

SMEs can improve the performance of their internal supply chain activities from four aspects, which are quality, time, flexibility, and cost (Christopher, 2011, p.129). For example, owner-managers can improve SMEs' purchasing performance by improving the quality of purchased products, shortening the purchasing cycle time, strengthening the relationship with suppliers to obtain greater flexibility in supply, and lowering the purchase cost. On the other hand, SME owner-managers can enhance the production performance by decreasing the defect rate, shortening the production cycle time, improving the flexibility in adapting the production schedule to urgent orders, and improving the utilisation of production capacity.

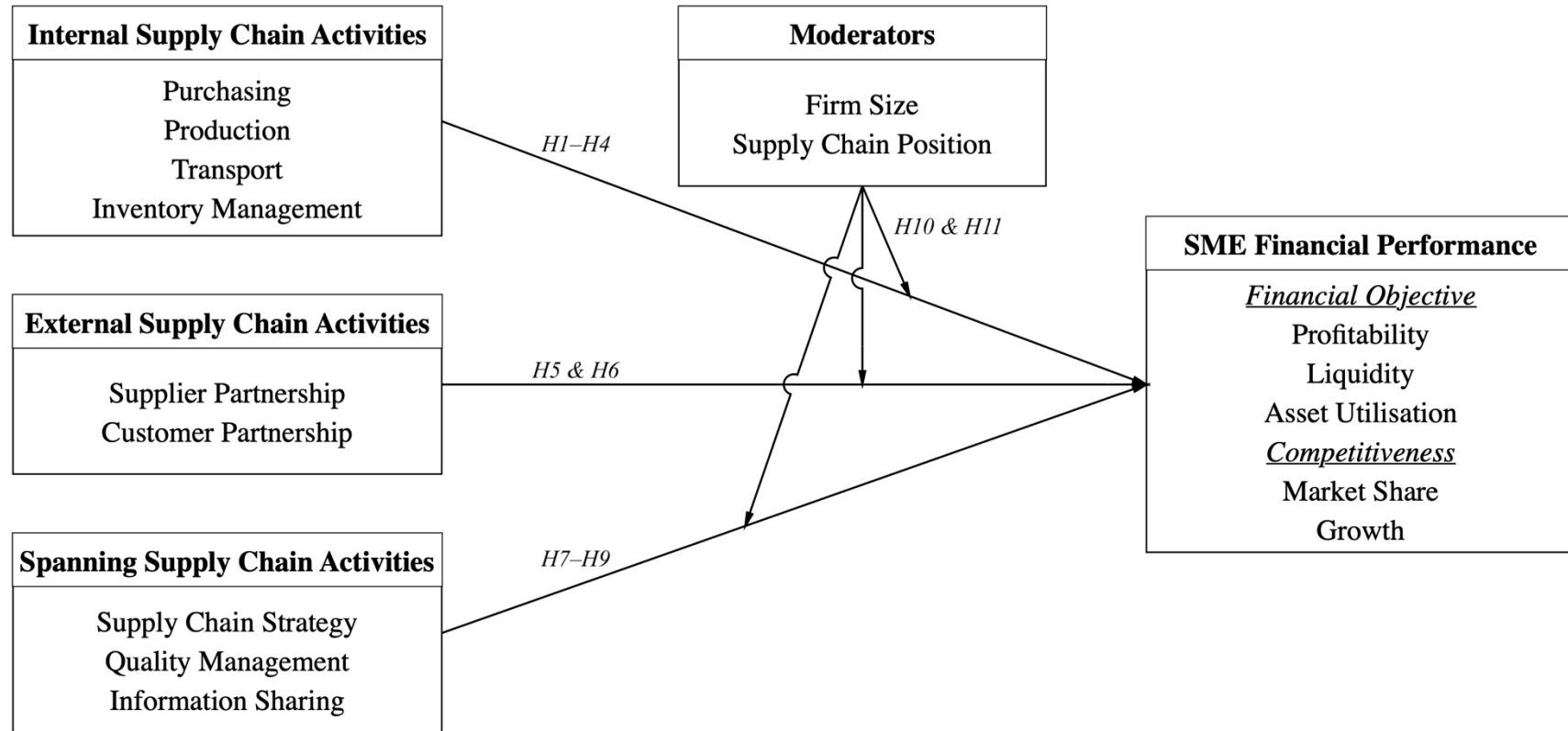


Figure 2-3 Framework of supply chain activities for SMEs' financial performance

SMEs can also get financial benefits externally by establishing partnerships with suppliers and customers. From the perspective of RBV, external partnerships can provide SMEs which are naturally resource-constrained with essential resources, further leading to improved competitive advantage and financial performance (Gokarn and Kuthambalayan, 2019). However, developing a partnership is costly and requires a high level of internal communication and collaboration capabilities (Huo, 2012). It is also contended that a prerequisite for a successful SCM is to coordinate the internal supply chain activities (Lambert and Cooper, 2000). Therefore, SMEs need to prioritise the internal supply chain activities and achieve a high level of internal supply chain performance before relying on their supply chain partners to improve their financial performance.

Some spanning supply chain activities can benefit SMEs' financial performance as well. Supply chain strategy provides directions for all supply chain activities and the successful implementation of a supply chain strategy is beneficial for SMEs' financial performance. In practice, most SMEs do not have formal strategies (Ates et al., 2013), so owner-managers are recommended to formulate a supply chain strategy for their companies with the consideration of business and supply chain environments. Quality management is vital for companies because the quality of products and services can influence not only firms' financial performance through customer satisfaction but also public health, especially in the food industry. SMEs can adopt TQM to continuously improve their quality management and it is never too late to invest in it (Hendricks and Singhal, 2001). Sharing information internally and externally along the supply chain can facilitate the efficiency of various supply chain activities, such as inventory management and supply chain partnerships (Pavlis et al., 2018) and improve the financial performance of SMEs. Consequently, SMEs are encouraged to share essential and high-quality information along the supply chain without negatively influencing confidentiality. For those SMEs with financial slacks, they can adopt IT to facilitate information sharing. In addition, the current research cannot achieve a consensus on the impact of outsourcing and sustainable SCM on SMEs' financial performance, so owner-managers are

recommended to balance the total costs and benefits before making outsourcing- and sustainable SCM-related decisions. No hypothesis is proposed for outsourcing and sustainable SCM because the existing evidence does not sufficiently support their positive impact on SMEs' financial performance and the impact will not be empirically tested in the following research.

It is also found that firm size and supply chain position moderate the relationship between supply chain activities and the financial performance of SMEs. Specifically, SMEs with different sizes and/or supply chain positions can yield different degrees of financial benefits from supply chain activities, so SME owner-managers should consider their firm sizes and supply chain positions when utilising supply chain activities to improve their companies' financial performance.

To comprehensively measure the financial performance of SMEs, owner-managers should carefully manage a set of financial KPIs in five dimensions, which are profitability, liquidity, asset utilisation, market share, and growth. SMEs at the introduction stage should focus on achieving the following financial objectives: profitability, liquidity, and asset utilisation; and later on, they should increasingly emphasise the competitiveness measured by growth and market share.

2.6 Conclusion

To exert the effect of supply chain activities on SMEs, it is essential to increase our understanding of the role of specific supply chain activities towards SMEs' financial performance. The extant literature has not achieved a consensus on what supply chain activities can be adopted by SMEs to enhance their financial performance and what financial KPIs can be employed to comprehensively measure SMEs' performance (Bititci et al., 2012). This study is the first attempt to close the mentioned gaps by synthesising existing findings.

2.6.1 Theoretical Implications

This study has made two major contributions to SCM and performance measurement in relation to SMEs. First, due to the heterogeneity of SMEs compared to large companies and the large-firm focus of contemporary SCM

theories and activities, the effectiveness of SCM in SMEs is still controversial (e.g. Arend and Wisner, 2005; Hamister, 2012; Jayaram et al., 2014; Thakkar et al., 2013; Vaaland and Heide, 2007; Williams, 2006). By identifying nine effective and two ineffective supply chain activities for SMEs and articulating their impact on SMEs' financial performance, this study addresses Research Questions One and Two in relation to what and how supply chain activities influence the financial performance of SMEs. To the best of the author's knowledge, there is no study with a conclusive overview of the impact of supply chain activities on the financial performance of SMEs, so this study contributes to SCM in the SME context. Moreover, it is widely argued that as a part of supply chain performance measurement, the causal relationship between supply chain activities and financial outcome measures should be established (Ittner and Larcker, 2003), so this paper also fills the gap in supply chain performance measurement of SMEs.

Furthermore, most studies examine firms' financial performance based on profitability while lacking the multiplicity of financial goals highlighted by Töyli et al. (2008). Although financial performance measurement is a common theme for businesses, most KPI frameworks are designed for large companies instead of SMEs. This study addresses under a clear manner Research Question Three by establishing a framework of financial KPIs which is applicable for SMEs at different development stages. Therefore, this study contributes to the performance measurement of SMEs.

2.6.2 Managerial Implications

This paper contains significant practical implications for SME owner-managers. Based on the framework of supply chain activities, owner-managers can understand which initiatives are appropriate for their companies and take advantage of them to enhance their firms' financial performance. They can avoid financial losses by carefully scrutinising decisions regarding unfavourable supply chain activities, including outsourcing and sustainable SCM. By tracking the causality between supply chain activities and financial outcome measures, they will become capable of evaluating their companies' supply chain performance. Furthermore, the situation that SME owner-managers are overloaded with

performance measurement data can be alleviated by adopting the framework of financial KPIs. Hence, these owner-managers can adopt a limited number of financial KPIs to evaluate their firms' performance.

2.6.3 Limitations and Agenda for Future Research

This study is not without limitations, and the principal one is the non-exhaustiveness of the literature search. The adoption of keywords in literature search might omit some relevant papers which do not use those specific keywords, and some relevant papers may not be indexed by the adopted databases. Another limitation of this paper is that it ignores the potential difference within SMEs, i.e. between micro, small, and medium-sized firms (European Commission, 2015), because almost all reviewed articles take SMEs as a whole without distinguishing them. However, by including firm size as a moderator in the conceptual framework, the author allows for a difference in the impact of supply chain activities on SMEs with different firm sizes, but future research is needed to provide empirical evidence on this.

This study also provides a plethora of future research avenues. First, the proposed model of supply chain activities requires further empirical examination. This model consists of a variety of supply chain activities but not all of them are widely adopted by SMEs due to resource constraints. Future research can refine the model through case studies or qualitative interviews to identify which supply chain activities are mostly relevant, suitable, and appropriate for SMEs to improve financial performance. The relationship between supply chain activities and SMEs' financial performance needs to be empirically and quantitatively investigated, which is partially fulfilled by the next two papers (Paper Two and Three) in this thesis. Second, the role of firm size and supply chain position in the proposed framework has significant research potential. The moderating effects of firm size and supply chain position on the relationship between supply chain activities and SMEs' financial performance require empirical evidence, which is also provided by the next two papers. Since firm size and supply chain position influence the effectiveness of supply chain activities, further research is recommended to compare the effect of supply chain activities on the financial

performance between SMEs with different firm sizes and/or supply chain positions. Third, it is observed that very few studies empirically investigate the effect of outsourcing on the financial performance of SMEs. Considering the prevalence and importance of outsourcing in SMEs, future research is recommended to address this gap. Last, most existing papers in this academic field focus on the manufacturing industry and developed countries, so further work is urgently required for the service industry and developing countries.

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**3 PAPER TWO – SUPPLY
CHAIN ACTIVITIES AND
SMES’ FINANCIAL
PERFORMANCE: THE
MODERATING EFFECT OF
SUPPLY CHAIN POSITION**

3.1 Introduction

Despite the significance of supply chain management (SCM) in business management and financial performance for large companies (Shi and Yu, 2013), its effectiveness in small and medium-sized enterprises (SMEs) is still inconclusive. Although some researchers support the positive impact of SCM on SMEs' financial performance (e.g. Hamister, 2012; Tipu and Fantasy, 2014), others identify no or even negative impact (e.g. Arend and Wisner, 2005; Rezaei et al., 2015).

This inconclusive thinking for the role of SCM in SMEs can be explained by their unique characteristics in comparison with their large counterparts. Kull et al. (2018) contend that SMEs are different from large companies in three aspects: strategic goals, governance structures, and resources. The heterogeneity in those three aspects has great implications for SCM in SMEs. First, in terms of strategic goals, since SMEs are normally owned and managed by a founder or a founding family, SME owner-managers lay great emphasis on preserving the control of their companies. Therefore, they are less willing to engage with other members in the supply chain (Kumar and Singh, 2017). Second, because of the centralised management and flat governance structure, SME owner-managers tend to make supply chain related decisions intuitively (Ellegaard, 2006), which negatively influences the effectiveness of SCM in improving SMEs' financial performance. Last, SMEs have fewer resources by nature, including financial resources, management professionals, and technologies, so they cannot invest into SCM sufficiently and lack the capability to take advantage of SCM to improve their financial performance (Jayaram et al., 2014). As a result, SMEs tend to implement SCM differently compared to large companies, lack the ability to adapt to SCM effectively, and are less concerned with methods supporting SCM (Tanco et al., 2015).

However, it does not mean that SMEs cannot benefit from SCM. Mentzer et al. (2001) propose two scopes of SCM: internal SCM, which is the management of business functions or processes that are within and can be directly controlled by a company, and external SCM, which is the management of supply chain

activities that are related to the supply chain members of a company. A high degree of the utilisation and exploitation of internal supply chain activities is a prerequisite for the effectiveness of external supply chain activities (Huo, 2012). Nevertheless, it is found that SMEs have not fully taken advantage of internal supply chain activities to improve their financial performance (Kumar and Singh, 2017; Singh et al., 2010). Hence, it is not surprising that many studies note that SCM has no or even negative impact on SMEs' financial performance, since most of them address external supply chain activities (e.g. Kumar et al., 2016; Sukwadi et al., 2013), while few empirical studies investigate the relationship between internal supply chain activities and companies' financial performance in the context of SMEs.

Supply chain position plays a moderating role in this relationship between supply chain activities and companies' financial performance. The importance of supply chain activities is different for companies at different supply chain positions (Li et al., 2006). Additionally, supply chain position also influences the adoption of certain supply chain activities and their extent of being successfully implemented (de Abreu et al., 2012). However, according to the best of the author's knowledge, no empirical paper specifically takes supply chain position as a moderator and explores its effect on the relationship between supply chain activities and the financial performance of companies, especially SMEs. Given those research gaps and the fact that contemporary SCM theories mainly focus on and are designed for large companies (Kull et al., 2018), this study aims to bridge those gaps by empirically investigating the relationship between the performance of four internal supply chain activities: purchasing, production, transport, and inventory performance, and SMEs' financial performance and the moderating effect of supply chain position on this relationship. The examined four supply chain activities are in line with many SCM frameworks such as the supply chain operations reference (SCOR) model and comprehensively reflect the internal supply chain of a company.

The focus on financial performance is determined by SMEs' greater emphasis on financial than non-financial measures in performance measurement (Toledo-

López et al., 2012), which can be explained from three perspectives. First, SMEs do not face the same degree of pressure as large companies to fulfil the expectation of different stakeholder groups, so their priority is to achieve the internal financial target. Second, the limited resources and expertise constrain SMEs' capability to adopt advanced performance measurement systems consisting of both financial and non-financial measures. Third, financial measures have the advantages of being precise, objective, and reliable, and they are available at a minimum cost and effort (Perera and Baker, 2007).

This paper focuses on SMEs from the UK upstream food supply chain. Since the food supply chain is complicated, dynamic, and fragile (Eksoz et al., 2019), a clear causal relationship between supply chain activities and financial performance can help increase the resource efficiency and competitiveness of the whole supply chain. The UK does not produce enough food and imports about twice the amount of food it exports (Peters, 2018), so this resource efficiency improvement is particularly necessary for the UK food supply chain. Furthermore, since food industry in the UK is typical with a large number of SMEs, which account for 97 per cent of the whole sector (DEFRA, 2018), UK is selected as the research context. Normally, a food supply chain can be divided into four positions: primary producers, processors, wholesalers, and retailers (Jie and Gengatharen, 2019). While the upstream primary producers and food processors produce food only, the downstream food wholesalers and retailers normally engage in other industries and sell other products apart from food, so their financial performance is affected by non-food products. Since this study investigates the impact of supply chain activities on SMEs' financial performance, it is important to control the products they sell. Therefore, this research concentrates on the upstream food supply chain only, including primary producers, consisting of crop growers and animal raisers, and food processors, consisting of food and beverage manufacturers.

The contribution of this study is threefold. First, it expands the body of literature of SCM and finance in SMEs by empirically articulating the impact of internal supply chain activities on SMEs' financial performance. Second, this study

identifies a moderating effect of supply chain position on the relationship between supply chain activities and SMEs' financial performance, providing a novel perspective for SCM research. Third, it interprets the impact of supply chain activities on SMEs' financial performance and the moderating effect of supply chain position based on empirical evidence. SMEs at different supply chain positions have different priorities in supply chain activities to improve their financial performance, so this research helps owner-managers of food SMEs at different supply chain positions make informed decisions regarding prioritising their supply chain activities.

The remainder of this paper is structured as follows. Section 3.2 provides an overview of the literature, sets out the hypotheses, and proposes a conceptual framework. The methodology adopted is outlined in Section 3.3. Section 3.4 presents the results of data analysis, followed by discussions in Section 3.5. In Section 3.6, the paper concludes by highlighting the implications and limitations of the study and offering suggestions for future research.

3.2 Literature Review and Hypothesis Development

Most studies investigating SMEs' financial performance focus on profitability only, lacking the multiplicity of financial goals (Töyli et al., 2008). In addition to profitability, liquidity is another critical financial dimension as it determines the survival of SMEs, measuring firms' ability to pay off the debts (Karadağ, 2018). According to Christopher (2016, p.70), profitability and liquidity are also two important dimensions in measuring SMEs' supply chain performance. Moreover, SMEs are recommended to monitor their growth performance, which reflects their competitiveness (Laitinen, 2002). Since these three financial dimensions have different focuses, this study examines them separately.

3.2.1 Purchasing Performance

Purchasing is a key supply chain activity within a company, which is also an integrator that interfaces intensively with other supply chain activities. Because of differences in supply chain power and purchasing practices, SMEs and large companies are not recommended to be examined as a homogeneous group in

purchasing analysis (Morrissey and Pittaway, 2004). For example, in comparison with large companies, SMEs tend to purchase locally and nationally rather than internationally to reduce risks (Ellegaard, 2008). Although purchasing is still informal in SMEs, it is important for SMEs in not only securing materials but also acquiring strategic information and competitive advantages (Pressey et al., 2009). Therefore, improved purchasing performance is expected to enhance the financial performance of SMEs.

Purchasing performance is typically measured by four aspects: cost, quality, time, and flexibility (Rodríguez-Escobar and González-Benito, 2017). Purchasing costs account for approximately 60 per cent of companies' revenues, so a superior purchasing performance offers great potential for profit improvement as it lowers the cost of goods sold (Saranga and Moser, 2010). However, purchasing is not a cost reduction activity only, because it can promote customer loyalty and further sales by improving material quality, reducing production downtime, and shortening the time to markets (Nsimbila and Jurriëns, 2012). The improved quality of purchased materials can also help reduce SMEs' inventory levels (Kaynak and Hartley, 2008), thus contributing to their liquidity. Purchasing flexibility is the ability of companies to ensure raw material supply when there are unexpected changes in demand (Kumar et al., 2006). Fantasy et al. (2009) find that strong purchasing flexibility increases SMEs' net profits due to the increased robustness of raw material supply. These arguments suggest the following hypotheses:

H1. Purchasing performance positively affects SMEs' financial performance.

H1a. Purchasing performance positively affects SMEs' profitability.

H1b. Purchasing performance positively affects SMEs' liquidity.

H1c. Purchasing performance positively affects SMEs' revenue growth.

3.2.2 Production Performance

Production is one of the key sources of competitiveness, so many companies seek to acquire competitive advantages and yield financial benefits by improving

their production performance (Alves and Alves, 2015). To increase and sustain competitiveness, companies should produce high quality and low cost products with shorter lead times and quickly respond to changes in demand, so production performance also consists of four aspects: cost, quality, time, and flexibility (Kazan et al., 2006). Compared to large companies, SMEs may have difficulties in improving production performance because of their few resources and weak supply chain power (Grando and Belvedere, 2006), but a strong production performance can still improve SMEs' financial performance.

Reducing production costs can not only promote profitability but also build market share by offering competitive prices (Chavez et al., 2017). The high quality of final products is essential for the long-term survival and prosperity of SMEs (Gunasekaran and Ngai, 2003). Hilmola et al. (2015) suggest that superior product quality is at the centre for achieving high revenues and profits in SMEs. In addition, to improve financial performance, companies with any size should compress the total end-to-end pipeline time, which is also called supply chain cycle time (Christopher and Ryals, 1999). The shorter the pipeline time, the less working capital tied-up and the higher liquidity (Christopher and Ryals, 1999). The pipeline time can be shortened by eliminating non-value-adding activities in production, which reduces operating costs and promotes sales by enhancing customer services. In comparison with large companies, the key strength of SMEs is flexibility (Grando and Belvedere, 2006). High production flexibility enables SMEs to respond to customers' special requirements quickly, which positively impacts customer satisfaction and further revenues and profits (Chavez et al., 2017). Thus, the following hypotheses are proposed:

H2. Production performance positively affects SMEs' financial performance.

H2a. Production performance positively affects SMEs' profitability.

H2b. Production performance positively affects SMEs' liquidity.

H2c. Production performance positively affects SMEs' revenue growth.

3.2.3 Transport Performance

Transport is a critical and strategic component of the supply chain, which interacts directly with customers and influences customer satisfaction. It is argued that any performance improvement in transport will be ultimately reflected on companies' financial performance (Abushaikha et al., 2018). However, the number of studies empirically examining the relationship between transport performance and the financial performance of companies is very limited, let alone SMEs (Abushaikha et al., 2018). Although SMEs lack resources, such as skills and information systems, to effectively improve their transport performance (Holter et al., 2008), transport risk, like the risk of product damage and deterioration during transport, is a potential cause of disruptions for SMEs (Ali et al., 2017), so they are encouraged to carefully manage and improve transport performance.

The same as purchasing and production, transport performance is also measured by the aspects of cost, quality, time, and flexibility (Christopher, 2016, p.143). Transport cost is a critical aspect in assessing the supply chain performance of SMEs (Banomyong and Supatn, 2011), which influences their profitability. Superior transport performance in terms of quality and responsiveness strengthens the likelihood that customers remain loyal to a company, benefiting its revenues and profits (Ralston et al., 2015). In addition to production, transport is another function that has the potential to shorten the pipeline time, which reduces operating costs, improves cash flows, and increases sales (Christopher and Ryals, 1999). Transport flexibility, which is the ability of a company's transport to accommodate customers' urgent or special needs, is found to increase SMEs' revenue growth (Fantazy et al., 2009). Eng (2016) notes that SMEs can improve their financial performance by increasing their transport capability. Therefore, the hypotheses are formulated as follows:

H3. Transport performance positively affects SMEs' financial performance.

H3a. Transport performance positively affects SMEs' profitability.

H3b. Transport performance positively affects SMEs' liquidity.

H3c. Transport performance positively affects SMEs' revenue growth.

3.2.4 Inventory Performance

There are two distinct views on the relationship between inventory and firm financial performance. While some researchers treat inventory as a fundamental driver of costs, others treat inventory as only an option to balance capacity with demand and advocate no relationship between inventory and firm financial performance (Cannon, 2008). Considering that inventory is an asset that requires capital investments and administrations, it is reasonable to propose that inventory reduction can contribute to financial performance improvement. A good inventory performance is determined by low inventory levels and/or high inventory turnovers, but the prerequisite is that lowering the inventory level cannot interrupt the production schedule and product supply (Koumanakos, 2008).

Given the resource-constraint feature of SMEs, inventory performance is particularly important for them, despite the current inventory level of SMEs is too high to be efficient (Johnston, 2014; Koumanakos, 2008). Since holding inventory is associated with various costs, including costs of materials, space, labour, deterioration, theft, and capital (Slack and Brandon-Jones, 2019, p.455), inventory reduction can result in cost reduction and profit increase. A superior inventory performance improves production efficiency and satisfies customer demands, improving the revenue growth and profitability of companies (Chalotra, 2013). Capkun et al. (2009) investigate three inventory types (raw materials, work-in-process, and final products) separately and note that they are all negatively associated with SMEs' profitability. Additionally, inventory management is an integral part of working capital management, which is widely adopted by SMEs to improve cash flows. A reduction in inventory can liberate the cash tied-up, contributing to companies' liquidity (Johnson and Templar, 2011). Therefore, inventory optimisation has been prevalently used by financially distressed SMEs as a turnaround strategy to prevent bankruptcy (Steinker et al., 2016). Based on these findings, the following hypotheses are formulated:

H4. Inventory performance positively affects SMEs' financial performance.

H4a. Inventory performance positively affects SMEs' profitability.

H4b. Inventory performance positively affects SMEs' liquidity.

H4c. Inventory performance positively affects SMEs' revenue growth.

3.2.5 Supply Chain Position

Supply chain position is the location of a company along the supply chain. It is argued that supply chain position can influence the degree of implementation and risks of supply chain activities. Firms that are positioned nearer to the original equipment manufacturers in the supply chain are found to have a higher degree of lean production (Marodin et al., 2016). Companies in the downstream supply chain like packers and wholesalers are more vulnerable to transport risks than other parties in the supply chain because of their longer transport distance, which is associated with more risks such as damage (Ali et al., 2017). In addition, supply chain position affects the importance and performance of supply chain activities. Schmidt et al. (2017) note that environmental purchasing is more important for companies in the downstream supply chain as they face more pressure from final customers. Shah and Shin (2007) stress that the inventory level has a significant improvement in manufacturers over time but increases in wholesalers and retailers. Therefore, it is reasonable to propose that supply chain position can moderate the relationship between supply chain activities and the financial performance of companies, including SMEs.

However, there is a lack of research focusing on the moderating effect of supply chain position and to the best of the author's knowledge, no empirical paper examines supply chain position explicitly as a moderator in the relationship between supply chain activities and SMEs' financial performance. Meanwhile, some studies can shed light on the moderating effect of supply chain position on SCM. For example, Blankley (2008) points out that firms' position in the supply chain influences their ability to acquire financial benefits from SCM technologies. In regard to purchasing performance, Dollinger and Kolchin (1986) observe that the correlation between purchasing performance and SMEs' financial performance is stronger for retailers than for manufacturers. In the food supply chain, primary producers tend to establish and join agricultural cooperatives to increase their bargaining power in purchasing and to share production resources,

which are not commonly adopted by food processors (Grashuis, 2018; Montefrio and Dressler, 2019); thus, primary producers are expected to have more capabilities than food processors to obtain financial benefits from improved purchasing and production performance.

There is a tendency that logistics performance is positively associated with profitability and growth of wholesalers and retailers, while this relationship is indistinct in manufacturers (Töyli et al., 2008). The empirical study of Karadağ (2018) shows the correlation between inventory performance and SMEs' financial performance is stronger for manufacturers compared to retailers. By contrast, Lambert and Pohlen (2001) argue that inventory reduction initiatives have stronger influences on the financial performance of downstream supply chain members than upstream parties, because the value of inventory is increasing as it moves closer to the point of consumption. Given the lack of relevant and specific literature, the author explores and tests the moderating effect of supply chain position on the relationship between the performance of the examined internal supply chain activities and SMEs' financial performance and proposes the following hypotheses based on the arguments above:

H5. Supply chain position moderates the relationship between the performance of internal supply chain activities and SMEs' financial performance.

H5a. Supply chain position moderates the relationship between purchasing performance and SMEs' financial performance.

H5b. Supply chain position moderates the relationship between production performance and SMEs' financial performance.

H5c. Supply chain position moderates the relationship between transport performance and SMEs' financial performance.

H5d. Supply chain position moderates the relationship between inventory performance and SMEs' financial performance.

Figure 3-1 unifies the aforementioned hypotheses in a conceptual framework, consisting of all constructs and the hypothesised relationships between them.

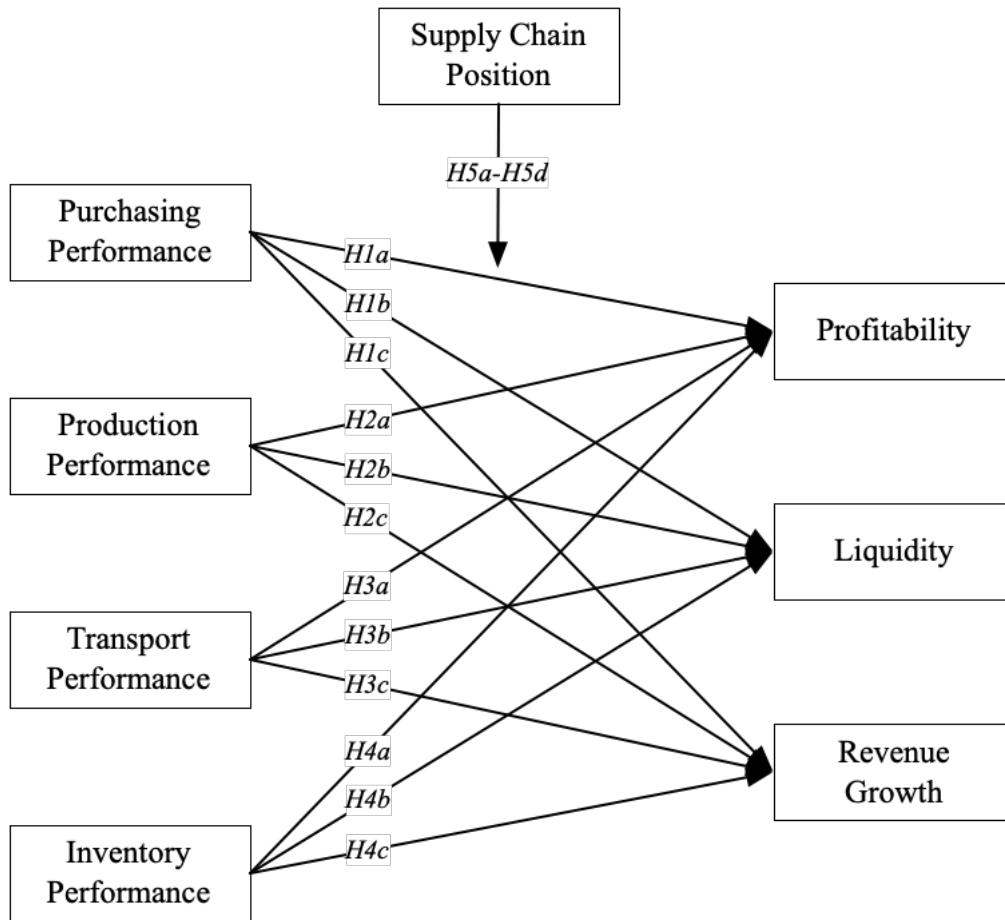


Figure 3-1 Conceptual framework

3.3 Methodology

3.3.1 Measurement Items and Survey Development

The data for this study were collected by a structured survey and a single respondent was needed from each sample. Single respondent survey is still dominant and valid in the supply chain research (Montabon et al., 2018). The survey questionnaire consists of two sections and the first section collects the demographic information of the respondents and their companies, including job title, working years in the current company and current industry, firm location, number of employees, revenue, total asset, industry, and firm age. The SME definition by the European Commission (2015) was adopted, which defines SMEs as firms that have fewer than 250 employees and annual turnover no more than €50 million or total asset no more than €43 million. This definition further categorises SMEs into three sizes based on the number of employees, annual

turnover, and total assets (Figure 3-2). Due to the sensitivity of financial data, instead of providing exact financial figures, respondents were only asked to select the categories that their companies fall into regarding the turnover and total asset. Since this study focuses on the UK only, to better fit with this definition, the average conversion rate 1:1.14 between GBP and EUR during 2017 – 2018 was adopted.

SME Category	Number of Employees	Annual Turnover	or	Total Asset
Medium-sized	< 250	≤ €50 million	or	≤ €43 million
Small	< 50	≤ €10 million	or	≤ €10 million
Micro	< 10	≤ €2 million	or	≤ €2 million

Source: European Commission (2015)

Figure 3-2 Classification of SMEs

The second section of the questionnaire contains the measurement items for each construct, which were developed through an extensive review of the similar constructs investigated in previous studies. Purchasing, production, and transport performance are respectively measured by four sub-constructs: cost, quality, time, and flexibility (Christopher, 2016, p.143). Each sub-construct is further measured by one or more items adapted from previous relevant studies. Inventory performance can be comprehensively measured by its three components: raw materials, work-in-process (WIP), and final products (Capkun et al., 2009). However, WIP inventory does not make sense to farmers (primary producers) (Aramyan et al., 2007), so to make data comparable across the sample, it was excluded from the measurement items. As a result, inventory performance is measured by two items “raw material inventory level” and “final product inventory level”. To facilitate the redundancy analysis, a global item

“overall inventory level” was added to the questionnaire, which is further discussed in measurement model evaluation. Finally, financial performance consists of profitability, liquidity, and revenue growth. Table 3-1 shows the adopted measurement items and their corresponding indicators used in data analysis.

Respondents were asked to compare their firms’ performance regarding each measurement item with their main competitor relying on a five-point Likert scale from 1 = “far worse” to 5 = “far better”, which enables performance data from different respondents to be comparable (Bititci et al., 2013) and is commonly adopted in relevant studies (e.g. Foerstl et al., 2013; Schoenherr and Narasimhan, 2012). The questionnaire with measurement items in Table 3-1 targets food processors, including food and beverage manufacturers. In addition, two versions of the questionnaire with wording being adapted to specific contexts were respectively designed for crop growers and animal raisers to help increase their understanding. For instance, to measure production quality, one item “quality of final products” for food processors was adapted to “quality of harvested crops” for crop growers and “quality of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.)” for animal raisers.

The questionnaire was first tested through semi-structured interviews with seven academic experts whose research interest covers one or more academic areas involved in this study, including SCM, performance measurement, SME, and food industry. The author ensured that each of those four areas was covered by at least two academic experts. Furthermore, the questionnaire was pilot tested with six executives from UK food SMEs, including both primary producers and food processors. These six firms were excluded from the final data set to avoid potential bias. The results of the pilot test helped us to refine the survey questionnaire and improve its wording. Detailed pilot test process and results are provided in Appendix B along with the initial and refined questionnaires. Given that each measurement item is well supported by the literature and verified by both academic experts and practitioners, the content validity of the constructs is established.

3.3.2 Data Collection

The revised questionnaire was uploaded to Qualtrics, an online survey platform. The link to the survey, along with a cover letter introducing the purpose of the research, was sent to 4,957 executives of SMEs in the UK food industry by email, including crop growers and animal raisers for food consumption and food and beverage manufacturers. Among them, 1,330 were retrieved from the online directory of Safe and Local Supplier Approval (SALSA), which provides food safety accreditation for UK food SMEs, and the rest were purchased from three General Data Protection Regulation (GDPR) compliant data companies. Out of the 4,957 emails sent, 623 bounced back due to invalid email addresses, resulting in 4,334 questionnaires delivered to the recipients. In an effort to increase the response rate, a modified methodology of Dillman (2007) was followed. A reminder email was sent to all valid email addresses three weeks after the initial email, and the second reminder was sent after another three weeks. As a result, a total of 336 responses were received. After removing the invalid responses, including responses from ineligible industries and large companies and responses containing more than 10 per cent missing data, 318 responses were usable for data analysis, generating an effective response rate of 7.34%. Similar response rates were reported in previous SME-oriented supply chain studies (e.g. Evangelista et al., 2012; Kim et al., 2015; Rezaei et al., 2015).

This study adopts a mixed method combining both quantitative and qualitative methods, which offers a more nuanced understanding of a given phenomenon (Johnson et al., 2007). Follow-up semi-structured interviews were then conducted with seven survey respondents to enrich and deepen our understanding of the relationship between supply chain activities and SMEs' financial performance. Interview is a valuable source of research evidence and provides richness of explanations of various phenomena (Eisenhardt, 1989). The interview guide was developed based on the quantitative results obtained with an aim to interpret them, which is provided in Appendix C.1. The interviews were taken over the phone or Skype and lasted between 30 and 45 minutes. With the permission of participants, all interviews were audio recorded, transcribed verbatim (see

Appendix D), and analysed using content analysis (Gold et al., 2010) in NVivo 12.

3.3.3 Analysis Methodology

Partial least squares structural equation modelling (PLS-SEM) was adopted to test relationships between constructs, which was performed by SmartPLS 3. Compared to covariance-based SEM (CB-SEM), PLS-SEM is more efficient in estimating complex models comprising five or more constructs (Sarstedt et al., 2014), and the model in this study consists of seven constructs and twelve sub-constructs. PLS-SEM can handle formatively measured constructs better than CB-SEM (Hair et al., 2017, p.18), which are incorporated in this model. Moreover, PLS-SEM has a strong advantage of being able to work with non-normally distributed data and has greater statistical power than CB-SEM (Sarstedt et al., 2014). Since supply chain position is a categorical rather than continuous indicator, multigroup analysis was used to analyse the moderating effect of supply chain position.

In light of the rule of thumb that the minimum sample size required by PLS-SEM is 10 times the maximum number of arrowheads pointing at a construct in the model and because the relevant number is 10 in this model (the construct *Production Performance* has 10 indicators), the minimum sample size required is 100 (Barclay et al., 1995). Alternatively, following Cohen's (1992) recommendations for minimum sample size requirement based on the power analysis, 129 samples are needed to detect R^2 values of 0.10, assuming a significance level of 10% and a statistical power of 80%. Therefore, the sample size of 318 in this study can be considered sufficiently large for analysis.

3.3.4 Model Specification

Since *Purchasing Performance*, *Production Performance*, and *Transport Performance* are measured by four sub-constructs respectively, those three higher-order constructs (HOCs) are formatively measured by their corresponding four lower-order constructs (LOCs). For instance, the HOC *Purchasing Performance* is formatively measured by its four LOCs *Purchasing Cost*,

Purchasing Quality, Purchasing Time, and Purchasing Flexibility. Furthermore, each LOC is reflectively formed by relevant indicators. Therefore, a reflective-formative hierarchical component model (HCM) using the repeated indicators approach (Lohmöller, 1989) for specification was established, and the factor weighting scheme was used for parameter estimation (Becker et al., 2012). As *Inv_Raw* and *Inv_Fin* focus on different facets of inventory performance and are not mutually interchangeable, they are treated as formative indicators of *Inventory Performance*. Finally, *Profitability, Liquidity, and Revenue Growth* are single-item constructs measured by *Fin_Pro, Fin_Liq, and Fin_Rev* respectively.

3.4 Data Analysis and Results

3.4.1 Demographic Analysis

Table 3-2 shows that the survey respondents are largely composed of “Founder/Owner/CEO/Director/Partner/General Manager” (83%), followed by “Operations Director” (9%), “Finance Director” (2%), “Marketing Director” (1.5%), and “Others” (3%). Five respondents did not provide their job titles. Most respondents were high level decision-makers and their job titles were closely relevant with this study, highlighting the reliability of the data obtained. The average years that the respondents had been working in the current company and industry were 19 (Median = 15; SD = 15) and 24 (Median = 23; SD = 14) respectively, further strengthening the reliability of the data set.

Table 3-2 Demographic information of survey respondents and interview participants

Characteristics	Survey respondents		Interview participants	
	Frequency	%	Frequency	%
<i>Job title</i>				
Founder/Owner/CEO/Director/Partner /General Manager	263	83%	7	100%
Operations Director	30	9%	-	-
Finance Director	7	2%	-	-
Marketing Director	5	1.5%	-	-
Others (including Technical Director, Warehouse Manager, Regulatory Manager, and Strategic Advisor)	8	3%	-	-
Unknown	5	1.5%	-	-
<i>Location</i>				
England	279	88%	5	71%
Scotland	21	6.5%	2	29%
Wales	9	3%	-	-
Northern Ireland	7	2%	-	-
Unknown	2	0.5%	-	-
<i>Industry</i>				
Crop growing	116	36%	2	29%
Animal raising	41	13%	1	13%
Food manufacturing	118	37%	2	29%
Beverage manufacturing	43	14%	2	29%
<i>Supply chain position</i>				
Primary producers	157	49%	3	43%
Food processors	161	51%	4	57%
<i>Firm size</i>				
Micro	159	50%	4	57%
Small	112	35%	3	43%
Medium	44	14%	-	-
Unknown	3	1%	-	-

88% of the sample SMEs were operating in England, followed by Scotland (6.5%), Wales (3%), and Northern Ireland (2%). This location distribution is consistent with the profile of SMEs in the UK (Rhodes, 2018). Almost half of the SMEs in the sample were primary producers (49%), including crop growers (36%) and animal raisers (13%), while the rest were food processors (51%), consisting of food manufacturers (37%) and beverage manufacturers (14%). Micro firms accounted for half of the sample, and 35% of the sample were small firms. Only 14% of the samples were classified as medium-sized firms. The distribution of firm size shows a similar pattern with surveys conducted by Bourlakis et al. (2014)

and Chowdhury et al. (2019) in SMEs, suggesting the representativeness of the collected sample. The average age of the sample companies was 40 years (Median = 30; SD = 35). The last two columns in Table 3-2 show the demographic information of the interview participants.

3.4.2 Non-response Bias

The possibility exists that the firms who did not respond to the survey were different from the respondents, and the sample of this study did not represent the non-respondents, so non-response bias needs to be examined (Rezaei et al., 2015). The most widely adopted method for checking non-response bias is based on the assumption that the opinions of late respondents are representative of non-respondents (Armstrong and Overton, 1977). Following this approach, the first 25 per cent of responses received by this study ($n = 80$, early respondent group) were compared to the last 25 per cent of responses received ($n = 80$, late respondent group) by t-test (Chowdhury et al., 2019; Yacob et al., 2019). The results revealed no statistically significant difference between the two groups in regard to company demographic characteristics (Ou et al., 2010), such as the revenue ($p = 0.639$), total asset ($p = 0.870$), and the number of employees ($p = 0.975$). Thus, it is concluded that non-response bias is not an issue in this study.

3.4.3 Common Method Variance

Since the data were collected using a self-administered questionnaire which was completed by single respondents once, it is necessary to ensure the common method variance is not an issue, which was examined by Harman's single factor (Podsakoff et al., 2003). If there is a substantial amount of common method variance, a single factor should emerge from the analysis accounting for the majority of the variance (Acar et al., 2019). Based on the varimax rotation of the principal component analysis conducted by SPSS 26, there were eight factors explaining in total 69.95% of the variance, and the first factor explained only 13.53% of the variance in the data set. When only one factor was forced to be extracted, it accounted for only 29.04% of the variance. As a result, no single factor can explain the majority of the variance, concluding that common method variance is of no concern in this study.

3.4.4 Measurement Model Evaluation

Evaluating PLS-SEM results involves two stages: measurement model evaluation and structural model evaluation, and the structural model can only be evaluated when measurement model evaluation provides satisfactory results (Sarstedt et al., 2014). Since the model in this study involves both reflective and formative measures, the measurement model evaluation includes the following steps.

- **Indicator reliability.** To check the indicator reliability, the **outer loading** of the indicators for reflectively measured constructs should be examined. Outer loadings above 0.70 suggest that the construct explains over 50% of the indicator's variance (Sarstedt et al., 2014). It can be observed from Table 3-3 that all outer loadings of the reflective indicators are well above the threshold value of 0.70, indicating sufficient levels of indicator reliability.
- **Internal consistency reliability**, which is applicable to reflective constructs only. The traditional criterion for internal consistency is **Cronbach's alpha**. However, due to the limitations of this approach, such as the sensitivity to the number of indicators and the underestimation of internal consistency reliability, it is suggested to employ Jöreskog's (1971) **composite reliability** at the same time. While taking Cronbach's alpha as the lower bound, the composite reliability is considered as the upper bound of internal consistency reliability, and the threshold value is 0.70 (Hair et al., 2017, p.112). According to Table 3-3, all reflective constructs' Cronbach's alpha and composite reliability values are above 0.70 except the Cronbach's alpha of *Production Time* (0.650). Given that Cronbach's alpha generally tends to underestimate the internal consistency reliability and the composite reliability of *Production Time* is well above the threshold value of 0.70 (0.850), there is no problem with its internal consistency reliability. Thus, it is concluded that the indicators of reflectively measured constructs have internal consistency reliability.

Table 3-3 Outer loading, Cronbach's alpha, composite reliability and AVE

Reflective constructs and indicators	Outer loading	Cronbach's alpha	Composite reliability	AVE
Purchasing Quality		0.843	0.906	0.764
Pur_Qual_1	0.783			
Pur_Qual_2	0.907			
Pur_Qual_3	0.924			
Purchasing Time		0.793	0.906	0.829
Pur_Time_1	0.909			
Pur_Time_2	0.911			
Purchasing Flexibility		0.849	0.930	0.869
Pur_Flex_1	0.939			
Pur_Flex_2	0.925			
Production Cost		0.789	0.904	0.826
Pro_Cost_1	0.905			
Pro_Cost_2	0.913			
Production Quality		0.793	0.879	0.708
Pro_Qual_1	0.854			
Pro_Qual_2	0.773			
Pro_Qual_3	0.894			
Production Time		0.650	0.850	0.739
Pro_Time_1	0.833			
Pro_Time_2	0.886			
Production Flexibility		0.820	0.893	0.735
Pro_Flex_1	0.858			
Pro_Flex_2	0.851			
Pro_Flex_3	0.863			
Transport Cost		0.736	0.883	0.791
Tra_Cost_1	0.881			
Tra_Cost_2	0.897			
Transport Quality		0.812	0.914	0.841
Tra_Qual_1	0.911			
Tra_Qual_2	0.923			
Transport Time		0.838	0.925	0.860
Tra_Time_1	0.927			
Tra_Time_2	0.928			
Transport Flexibility		0.896	0.951	0.906
Tra_Flex_1	0.951			
Tra_Flex_2	0.952			

Notes: Since *Purchasing Cost* is a single-item construct, it was excluded from the measurement model assessment (Hair et al., 2017, p.109).

- **Convergent validity**, which is the extent to which an indicator correlates positively with alternative indicators of the same construct (Hair et al., 2017, p.112). For a reflectively measured construct, a common measure

to assess its convergent validity is the **average variance extracted (AVE)**. The AVE value is the mean of squared outer loadings for all indicators associated with a construct, and an acceptable AVE should be 0.50 or higher, indicating the construct explains over 50% of its indicator's variance (Sarstedt et al., 2014). As can be seen in the last column of Table 3-3, all reflectively measured constructs have AVE values of 0.708 or higher, providing evidence that the reflectively measured constructs have high levels of convergent validity.

On the other hand, to examine the convergent validity of formatively measured constructs, the **redundancy analysis** should be conducted to test whether the formatively measured construct is highly correlated with a reflectively measured construct that has the same meaning as the formative construct (Sarstedt et al., 2014). Normally, a global indicator that summarises the essence of the formatively measured construct can be used as the single measure for the reflectively measured construct (Sarstedt et al., 2013). The strength of the path coefficient linking the two constructs indicates the convergent validity of the formative indicators and a magnitude of at least 0.70 is acceptable (Hair et al., 2017, p.140). To assess the convergent validity of the formatively measured construct *Inventory Performance*, the global indicator *Inv_Ove* was adopted as the single measure for the reflectively measured construct in the redundancy analysis. The redundancy analysis yields a path coefficient of 0.917, which is above the recommended threshold of 0.70, thus providing support for the convergent validity of *Inventory Performance*.

- **Discriminant validity**, which is applicable to reflective constructs only. Discriminant validity determines the extent to which a construct is empirically distinct from other constructs (Sarstedt et al., 2014). To evaluate discriminant validity, the **heterotrait-monotrait ratio (HTMT)** of correlations was employed, which is an estimate of what the true correlation between two constructs would be, if they were perfectly measured (Henseler et al., 2015). An HTMT value below 0.90 indicates an acceptable discriminant validity (Henseler et al., 2015). Table 3-4 shows

that all HTMT values of reflective constructs are lower than the threshold value of 0.90. Furthermore, through running the bootstrapping procedure with 5,000 samples, the confidence intervals of all HTMT values were obtained (the values in the brackets in Table 3-4) to test the null hypothesis that $H_0: HTMT \geq 1$, where a confidence interval including the value 1 (Henseler et al., 2015) fails to reject the null hypothesis. None of the confidence intervals built through bootstrapping has the value 1, hence the discriminant validity holds. As complementary, two traditional discriminant validity examination methods **Fornell and Larcker (1981) criterion** and **cross-loadings** were conducted, which also verified the establishment of discriminant validity (see Appendix E).

- **Collinearity of formative indicators.** Collinearity, which refers to the high correlation between formative indicators or predictor constructs, may severely bias the model estimation and the statistical significance, and thus should be addressed. The **variance inflation factor (VIF)** values of two formative indicators *Inv_Raw* and *Inv_Fin* are both 1.708, below the threshold value of 5 (Hair et al., 2014), implying that collinearity is not an issue for the measurement model.
- **Significance and relevance of formative indicators.** If the **outer weight** of a formative indicator is significantly different from zero, the indicator truly contributes to forming the construct, and thus can be retained (Sarstedt et al., 2014). The outer weights of *Inv_Raw* and *Inv_Fin* are respectively 0.451 and 0.649 and significant at a 5% level, so they are retained in the formative construct *Inventory Performance*.

Table 3-4 Heterotrait-monotrait ratio (HTMT) of reflective construct

	Production Cost	Production Flexibility	Production Quality	Production Time	Purchasing Cost	Purchasing Flexibility	Purchasing Quality	Purchasing Time	Transport Cost	Transport Flexibility	Transport Quality	Transport Time
Production Cost												
Production Flexibility	0.108 (0.039, 0.221)											
Production Quality	0.418 (0.288, 0.533)	0.410 (0.281, 0.532)										
Production Time	0.576 (0.437, 0.717)	0.645 (0.498, 0.733)	0.663 (0.553, 0.775)									
Purchasing Cost	0.490 (0.367, 0.595)	0.051 (0.000, 0.076)	0.152 (0.055, 0.274)	0.228 (0.093, 0.376)								
Purchasing Flexibility	0.246 (0.108, 0.382)	0.264 (0.140, 0.388)	0.196 (0.094, 0.313)	0.386 (0.229, 0.539)	0.423 (0.292, 0.540)							
Purchasing Quality	0.103 (0.037, 0.187)	0.209 (0.086, 0.341)	0.323 (0.216, 0.430)	0.341 (0.186, 0.496)	0.346 (0.204, 0.469)	0.547 (0.431, 0.648)						
Purchasing Time	0.267 (0.128, 0.401)	0.181 (0.063, 0.322)	0.232 (0.123, 0.350)	0.435 (0.286, 0.582)	0.472 (0.333, 0.582)	0.671 (0.565, 0.770)	0.619 (0.508, 0.709)					
Transport Cost	0.516 (0.358, 0.648)	0.197 (0.091, 0.308)	0.334 (0.201, 0.463)	0.450 (0.300, 0.589)	0.425 (0.268, 0.559)	0.384 (0.240, 0.515)	0.239 (0.095, 0.382)	0.326 (0.185, 0.459)				
Transport Flexibility	0.088 (0.021, 0.181)	0.423 (0.298, 0.534)	0.335 (0.202, 0.460)	0.324 (0.176, 0.459)	0.083 (0.018, 0.210)	0.369 (0.256, 0.476)	0.252 (0.117, 0.383)	0.313 (0.187, 0.429)	0.389 (0.239, 0.516)			
Transport Quality	0.245 (0.089, 0.394)	0.328 (0.188, 0.467)	0.483 (0.354, 0.602)	0.459 (0.297, 0.613)	0.197 (0.055, 0.338)	0.356 (0.219, 0.483)	0.361 (0.215, 0.496)	0.358 (0.215, 0.499)	0.598 (0.436, 0.718)	0.651 (0.537, 0.747)		
Transport Time	0.318 (0.180, 0.447)	0.340 (0.193, 0.462)	0.407 (0.282, 0.524)	0.462 (0.299, 0.609)	0.213 (0.077, 0.345)	0.375 (0.248, 0.501)	0.332 (0.183, 0.473)	0.356 (0.222, 0.482)	0.615 (0.478, 0.733)	0.721 (0.584, 0.817)	0.872 (0.802, 0.936)	

Notes: The values in brackets represent the 95% bias-corrected and accelerated confidence interval of the HTMT values obtained by running the bootstrapping routine with 5,000 samples in SmartPLS 3.

3.4.5 Structural Model Evaluation

Given that the measurement model evaluation indicates a satisfactory quality of the measurement model, the author proceeds to evaluate the structural model, including the collinearity of predictor constructs, coefficient of determination, and predictive relevance.

- **Collinearity of predictor constructs.** In addition to the collinearity of formative indicators, the collinearity of predictor constructs in the structural model should be examined as well. Table 3-5 shows that the **VIF** values of all predictor constructs are well below the threshold value of 5 (Hair et al., 2014), so collinearity does not pose a threat to the structural model.

Table 3-5 VIF of predictor constructs

Predictor constructs	Purchasing Performance	Production Performance	Transport Performance	Profitability/ Liquidity/ Revenue Growth
Purchasing Cost	1.281			
Purchasing Quality	1.458			
Purchasing Time	1.718			
Purchasing Flexibility	1.594			
Production Cost		1.265		
Production Quality		1.384		
Production Time		1.737		
Production Flexibility		1.357		
Transport Cost			1.355	
Transport Quality			2.245	
Transport Time			2.586	
Transport Flexibility			1.706	
Purchasing Performance				1.301
Production Performance				1.765
Transport Performance				1.445
Inventory Performance				1.555

- **Coefficient of determination (R^2),** which manifests the in-sample predictive power of a model. As a result, the R^2 values for *Profitability*, *Liquidity*, and *Revenue Growth* are respectively 0.276, 0.197, and 0.209. Relevant studies investigating the impact of supply chain activities on SMEs' financial performance obtain similar or even lower R^2 values (e.g. Bayraktar et al., 2009; Hilmola et al., 2015; Jin, 2006). Considering the

multitude of potential antecedents of SMEs' financial performance, it is concluded that those R^2 are satisfactory.

- **Predictive relevance (Q^2)**, which evaluates a model's out-of-sample predictive power. Q^2 values greater than zero are acceptable for endogenous constructs (Sarstedt et al., 2014). Following the blindfolding procedure, Q^2 values of 0.243, 0.169, and 0.177 were obtained for *Profitability*, *Liquidity*, and *Revenue Growth*, suggesting a satisfactory out-of-sample predictive power of the model.

3.4.6 Structural Model Results

Based on the results of the structural model obtained by running bootstrapping procedures with 5,000 samples at a significance level of 5% in SmartPLS 3 (Chung and Lee, 2001), the author evaluates the statistical significance of the hypothetical relationships. Table 3-6 presents the path coefficients and their significance levels between the four predictor constructs and three financial dimensions. Despite the positive path coefficients of *Purchasing Performance*, they are insignificant on all three financial dimensions; thus, *H1* (*H1a*: $\beta = 0.093$, $p = 0.117$; *H1b*: $\beta = 0.030$, $p = 0.627$; *H1c*: $\beta = 0.032$, $p = 0.615$) is not supported. *H2* (*H2a*: $\beta = 0.234$, $p < 0.01$; *H2b*: $\beta = 0.155$, $p < 0.05$; *H2c*: $\beta = 0.341$, $p < 0.01$), which postulates that production performance has a positive impact on SMEs' financial performance, is supported. However, the path coefficients from *Transport Performance* to the three financial dimensions are insignificant, so *H3* (*H3a*: $\beta = -0.072$, $p = 0.273$; *H3b*: $\beta = -0.014$, $p = 0.842$; *H3c*: $\beta = 0.009$, $p = 0.895$) is not supported. The results also show that SMEs' inventory performance positively and significantly influences their profitability, liquidity, and revenue growth, supporting *H4* (*H4a*: $\beta = 0.341$, $p < 0.01$; *H4b*: $\beta = 0.328$, $p < 0.01$; *H4c*: $\beta = 0.142$, $p < 0.10$).

Table 3-6 Path coefficients between predictor constructs and financial performance

Predictor constructs	Profitability	Liquidity	Revenue Growth
Purchasing Performance	0.093	0.030	0.032
Production Performance	0.234***	0.155**	0.341***
Transport Performance	-0.072	-0.014	0.009
Inventory Performance	0.341***	0.328***	0.142*

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

3.4.7 Moderating Effect of Supply Chain Position

Multigroup analysis was employed to investigate the moderating effect of supply chain position, which aims to identify the significant difference between primary producers and food processors in the relationship between the examined supply chain activities and financial performance. The primary producer data set contains 157 samples SMEs and the food processor one consists of 161 samples. The sample sizes for both groups meet the minimum sample size requirements advised by the 10 times rule of thumb (Barclay et al., 1995) and Cohen's (1992) power analysis, which are 100 and 129 respectively.

Prior to multigroup analysis, it is essential to ensure that the group differences in model estimates do not result from the distinctive content and/or meanings of the constructs across groups by establishing measurement invariance (Hair et al., 2018, p.139). To achieve that, the measurement invariance of composite models (MICOM) procedure developed by Henseler et al. (2016) was conducted, including configural invariance and compositional invariance. Because the path model and data treatment used for both primary producers and food processors are identical and the group-specific model estimations are based on the same algorithm settings, the configural invariance is established. Compositional invariance exists when the composite scores are the same across groups, which draws on the permutation approach. The permutation results (Table 3-7) show that the p -values of all constructs are higher than 5%, indicating the correlation between two composite scores is not significantly lower than 1, so the compositional invariance holds as well (Henseler et al., 2016). Given the establishment of both configural invariance and compositional invariance, the

partial measurement invariance is supported, so the data sets are eligible for multigroup analysis.

Table 3-7 Permutation p -values of constructs

Constructs	Permutation p -values
Purchasing Cost	0.263
Purchasing Quality	0.158
Purchasing Time	0.940
Purchasing Flexibility	0.605
Production Cost	0.066
Production Quality	0.493
Production Time	0.914
Production Flexibility	0.944
Transport Cost	0.309
Transport Quality	0.335
Transport Time	0.142
Transport Flexibility	0.825
Purchasing Performance	0.072
Production Performance	0.614
Transport Performance	0.430
Inventory Performance	0.090
Profitability	0.405
Liquidity	0.510
Revenue Growth	0.399

Notes: The p -values are obtained by running 1,000 permutations at a significance level of 5% in SmartPLS 3.

The author further analysed the two groups separately and statistically compared their path coefficients (total effects) from the four HOCs to financial performance based on permutation. Both models were assessed against the measurement and structural model quality criteria in Section 3.4.4 and 3.4.5 and yielded satisfactory results. Multigroup analysis results (Table 3-8) show that *Purchasing Performance* has significantly positive impacts on primary producers' *Profitability*, *Liquidity*, and *Revenue Growth* while no significant influence on food processors' financial performance. *Production Performance* has significantly positive relationships with all financial dimensions of primary producers and food processors, except *Liquidity* for food processors. Consistent with the main model, *Transport Performance* has no significant influence on any financial dimension of primary producers and food processors. *Inventory Performance* significantly and

positively influences all financial dimensions of primary producers and food processors, except *Revenue Growth* for food processors.

The permutation *p*-values suggest that the path coefficients from *Purchasing Performance* to *Profitability* and *Liquidity* for primary producers are significantly different from those for food processors (*Profitability*: $p < 0.10$, Figure 3-3a; *Liquidity*: $p < 0.01$, Figure 3-3b), indicating that supply chain position significantly moderates the relationship between purchasing performance and SMEs' profitability and liquidity, so *H5a* is supported. Supply chain position also significantly moderates the impacts of production and inventory performance on SMEs' liquidity (*Production Performance*: $p < 0.10$, Figure 3-3c; *Inventory Performance*: $p < 0.10$, Figure 3-3d), so *H5b* and *H5d* are supported. However, no moderating effect of supply chain position is found in other relationships and *H5c* is not supported. Thus, *H5* is partially supported.

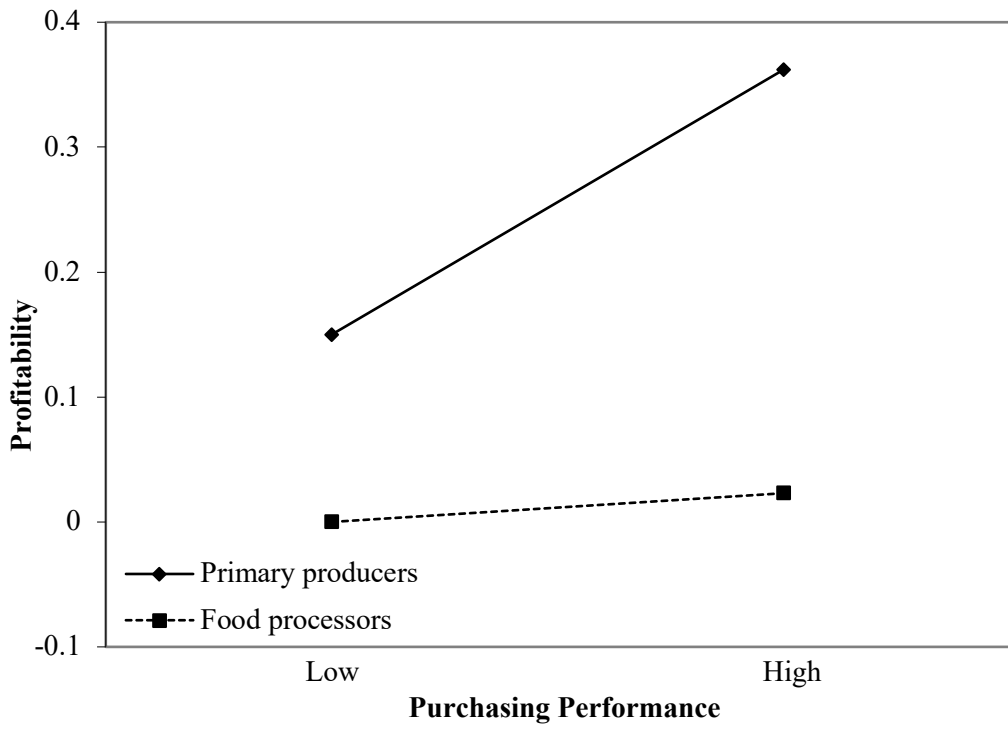
The total effects of LOCs on three financial dimensions were also computed for both models. The significance of LOCs in influencing SMEs' financial performance is consistent with their corresponding HOCs. According to the outer weights of the two formative indicators *Inv_Raw* and *Inv_Fin*, despite the insignificance of raw material inventory, final products inventory has a significant impact on primary producers' inventory performance and further financial performance. Both raw material and final product inventories have significant impacts on food processors' inventory and financial performance, but the impact of raw material inventory is higher than that of final product inventory.

Table 3-8 Total effects of predictor constructs on different financial dimensions by supply chain position

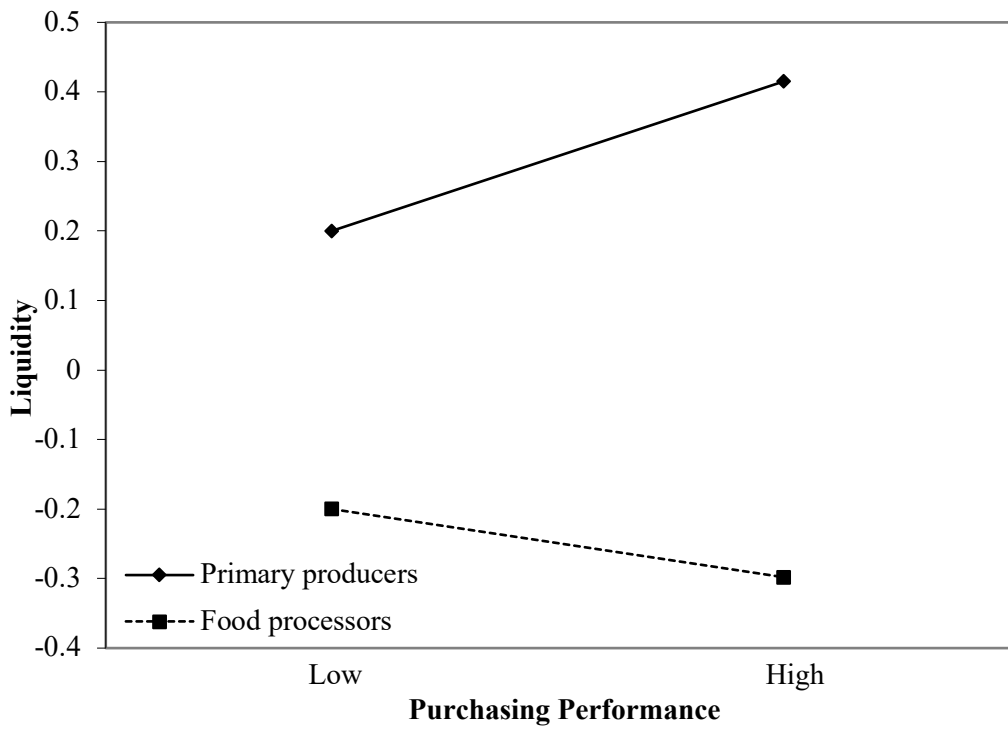
Predictor constructs	Profitability			Liquidity			Revenue Growth		
	Primary producers	Food processors	Permutation <i>p</i> -values	Primary producers	Food processors	Permutation <i>p</i> -values	Primary producers	Food processors	Permutation <i>p</i> -values
<i>HOCs</i>									
Purchasing Performance	0.212***	0.023	0.092*	0.215**	-0.098	0.008***	0.145*	-0.052	0.121
Production Performance	0.292***	0.199**	0.621	0.310***	0.039	0.062*	0.342***	0.348***	0.880
Transport Performance	-0.005	-0.119	0.427	0.017	-0.038	0.689	0.057	-0.025	0.586
Inventory Performance	0.310***	0.366***	0.764	0.187*	0.450***	0.094*	0.177*	0.114	0.580
<i>LOCs</i>									
Purchasing Cost	0.036***	0.004		0.036**	-0.016		0.024*	-0.008	
Purchasing Quality	0.097***	0.010		0.099**	-0.042		0.066*	-0.022	
Purchasing Time	0.061***	0.008		0.062**	-0.035		0.041*	-0.019	
Purchasing Flexibility	0.063***	0.008		0.064**	-0.036		0.043*	-0.019	
Production Cost	0.085***	0.059*		0.091***	0.012		0.100***	0.103***	
Production Quality	0.126***	0.074**		0.134***	0.015		0.148***	0.130***	
Production Time	0.084***	0.065*		0.089***	0.013		0.099***	0.114***	
Production Flexibility	0.091***	0.077**		0.096***	0.015		0.106***	0.135***	
Transport Cost	-0.001	-0.027		0.004	-0.009		0.015	-0.006	
Transport Quality	-0.001	-0.041		0.005	-0.013		0.017	-0.009	
Transport Time	-0.002	-0.043		0.005	-0.014		0.018	-0.009	
Transport Flexibility	-0.001	-0.038		0.005	-0.012		0.017	-0.008	
<i>Outer Weights</i>									
Inv_Raw	0.098	0.701***		0.098	0.701***		0.098	0.701***	
Inv_Fin	0.940***	0.382*		0.940***	0.382*		0.940***	0.382*	
R ²	0.391	0.245		0.313	0.194		0.314	0.164	

Notes: 1. ****p* < 0.01, ***p* < 0.05, and **p* < 0.10

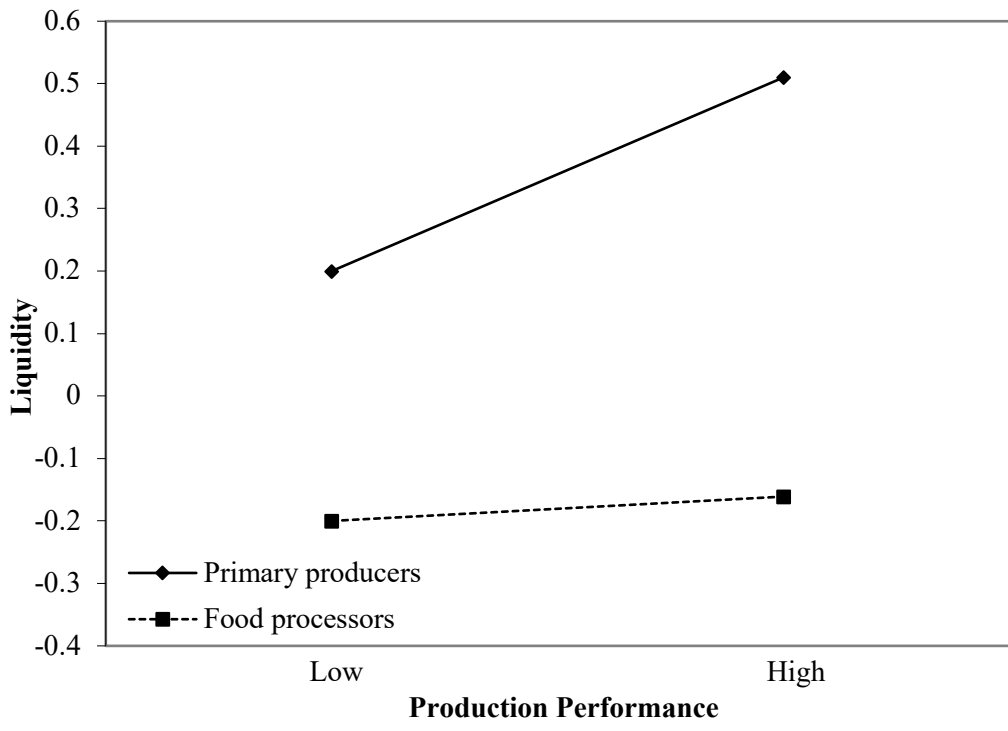
2. The *p*-values are obtained by running 1,000 permutations at a significance level of 5% in SmartPLS 3.



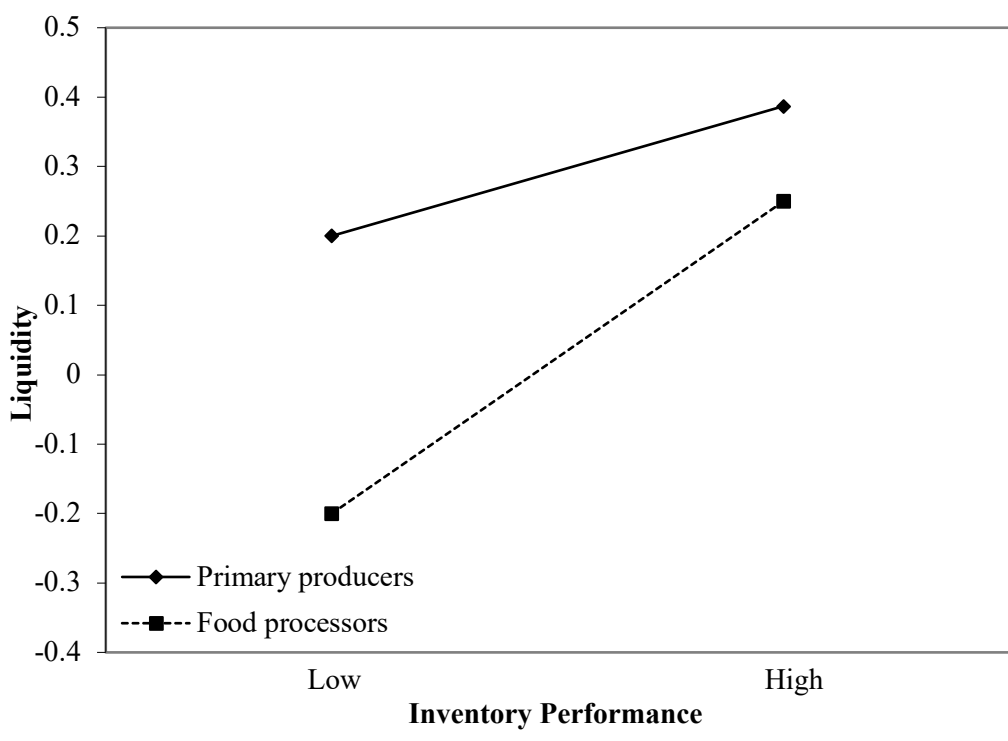
(a)



(b)



(c)



(d)

Figure 3-3 Moderating effect plot

3.5 Discussion

3.5.1 Purchasing Performance

The results reveal that purchasing performance has no significant relationship with SMEs' financial performance, including profitability, liquidity, and revenue growth (*H1*). However, supply chain position plays a significantly moderating role in this relationship. When examining the model separately by supply chain position, it is observed that although the impact of purchasing performance is still insignificant in small food processors, it has significantly positive impacts on small primary producers' profitability, liquidity, and revenue growth. The insignificance of this relationship for small food processors can be explained by the inherent weaknesses of SMEs in purchasing. Many studies indicate that purchasing has not attracted sufficient attention of and is still informal in SMEs due to their lack of resources (e.g. Ellegaard, 2009; Nsimbila and Jurriëns, 2012; Pressey et al., 2009). Most owner-managers or purchasers in SMEs, especially in micro and small firms, do not have essential market knowledge and purchasing experience, so many purchasing-related decisions are made intuitively based on little information. Furthermore, since SME owner-managers are supply risk averters, they exhibit a high degree of supplier loyalty and are inclined to re-buy from the current suppliers, even when the performance of those suppliers is poor (Ellegaard, 2006).

On the other hand, because of the small size, SMEs have weak supply chain power and are vulnerable to commercial requests from their food supply chain partners (Maglaras et al., 2015). For example, most SME owner-managers believe that they pay a higher price to their suppliers, compared to large companies in the same industry (Ellegaard, 2006). Because the purchasing volume of SMEs is small, they can hardly benefit from bulk buying, which usually entails price discounts. In addition, large suppliers usually impose short payment periods on SMEs, which constrains SMEs' cash flow and ability to improve financial performance (Grau and Reig, 2018). Considering the size of most companies in our sample is very small and 85 per cent of them are micro and

small firms with less than 50 employees (Table 3-2), those weaknesses are typical for them.

However, those weaknesses are largely overcome in small primary producers by utilising cooperatives. It is a common practice that primary producers establish and join agricultural cooperatives to increase their bargaining power in purchasing (Grashuis, 2018; Montefrio and Dressler, 2019), which is also evidenced in interviews. Most cooperatives are managed by professionals, so the decision-making process of purchasing is rigorous in most small primary producers. The improved decision-making process increases the effectiveness of purchasing in driving the financial performance of small primary producers. It also enhances the quality of purchased materials, which improves customer satisfaction by influencing the quality of final products, contributing to primary producers' revenue growth. With the increase in supply chain power, cooperatives are able to negotiate price and payment period with their suppliers (Gonzalez, 2017), contributing to primary producers' profitability and liquidity respectively. Primary producers in cooperatives can enjoy the scale economy and price discounts brought by bulk buying, which also improve their profitability. On the other hand, food processors do not normally join cooperatives or purchasing alliances (Ali et al., 2017), as evidenced by the quotations below from two food manufacturers, so they can hardly financially benefit from purchasing.

"In my experience, companies in this industry do not get together [...] People are a little protective because it is a very small and niche market." (Manufacturer of pickles)

"We do not join purchasing alliances because there are not so many people, actually nobody else really, in this area doing the same business." (Manufacturer of pastry)

To capitalise on purchasing to improve financial performance, small primary producers are recommended to emphasise the performance of purchasing quality, which has the largest total effect on all three financial dimensions, followed by purchasing flexibility, time, and cost. This priority sequence in purchasing is also found by González-Benito (2010) for large manufacturing companies in Spain. Purchasing quality is one of the most important aspects from the perspective of production (Bendig et al., 2018). Flexibility and time are becoming increasingly important in modern businesses due to the increasing

variation in customer demands, the popularity of customisation, and customers' requirements for responsiveness (Bhagwat and Sharma, 2007; Bititci et al., 2012). Due to the trade-off between costs and other aspects, the cost of purchased materials is not at the top of the priority list of small primary producers. An egg producer said:

“55 per cent of the cost of an egg is feed, so purchasing is very important. We all will find the more you put in, the more you get out. If you feed quality, you get quality [...] I am willing to sacrifice costs for good feed quality.”

Small primary producers can effectively improve four aspects of purchasing performance by joining cooperatives and establishing long-term relationships with suppliers. To yield financial benefits from purchasing, small food processors are recommended to purchase collaboratively and establish purchasing alliance to improve their purchasing expertise and bargaining power.

3.5.2 Production Performance

It is found that production performance has significantly positive relationships with SMEs' profitability, liquidity, and revenue growth (*H2*). The multigroup analysis results indicate that production performance has significantly positive impacts on all financial dimensions of small primary producers and food processors, except liquidity for food processors. The liquidity of a company is mainly determined by the cash generated and the payment period (Nobanee and Abraham, 2015). As a primary cost centre in companies, production does not normally generate cash or increase cash flows. Compared to primary producers, most food processors are associated with larger customers in the supply chain, like large retailers. Despite that some primary producers supply large retailers directly, the proportion of larger customers for primary producers is incomparable with that for food processors. Due to the weak supply chain power of small food processors, the payment period is usually proposed by their large customers and normally fixed. Thus, the payment period does not change with small food processors' production performance, which explains why production performance does not significantly influence their liquidity. This can also explain the insignificant

relationship between purchasing and transport performance and small food processors' liquidity.

As one of the most critical internal supply chain activities, production has become a valuable way of securing competitive advantages for not only large companies but also SMEs (Li et al., 2006). Consistent with the observation of Kazan et al. (2006), who examine the production performance of Turkish manufacturing companies, this paper suggests that SMEs can improve their financial performance by improving the production performance in terms of quality, flexibility, and cost. Additionally, the results suggest that production time is also significant in improving SMEs' financial performance, which is insignificant in the study of Kazan et al. (2006). This discrepancy may result from their inclusion of large companies and the difference in research contexts including the country and industry.

Most SMEs still take production quality as an order winner and claim that quality is their prime consideration (Hilmola et al., 2015; MacBryde et al., 2013). Production quality can directly influence customer satisfaction, which contributes to SMEs' profitability and revenue growth. In the examined food industry, the quality of final products also determines food safety and further public health (Henchion and McIntyre, 2005), so production quality has the highest priority in improving small primary producers' financial performance, including profitability, liquidity, and revenue growth. Compared to primary producers, which are typically small in size, there are normally more large food processors although this study focuses only on those classified as SMEs. To compete with larger companies in the same market, small food processors normally focus on improving the performance of production flexibility by enhancing the ability to change production volumes, to introduce changes in products, and to change production schedules, which is a critical competitive advantage over their large competitors. The importance of production flexibility is addressed by the following quotation from a manufacturer of pastry:

"I always try to be flexible and responsive in production. Obviously, large companies cannot make it, so it offers me a lot of advantages and competitiveness."

Therefore, although production quality is still important, production flexibility is prioritised over it in improving the profitability and revenue growth of small food processors.

Production time is another aspect that is significant in positively influencing small primary producers' and food processors' financial performance. Time-based competition strategies have been widely adopted in many industries (Han et al., 2013). Shortening the production cycle time and facilitating on time production by eliminating non-value-adding activities help improve SMEs' production efficiency and customer satisfaction, contributing to their financial performance (Whicker et al., 2009). However, the production cycle time in agriculture is normally determined by nature. Although some techniques such as glasshouses and modern breeding techniques can help change and shorten the production cycle time, most small primary producers lack financial resources to invest in them. Consequently, the performance of production time has the lowest priority in improving small primary producers' financial performance, yet higher performance in production time does significantly increase their financial performance. Finally, production cost has gradually become an order qualifier in food processors (MacBryde et al., 2013), so further cost improvements after a certain level do not largely enhance their financial performance.

In summary, to take advantage of production's potential for improving all three financial dimensions, small primary producers need to lay most emphasis on the performance of production quality, followed by production flexibility, cost, and time. However, because of the fierce competition from the large counterparts, small food processors need to prioritise production flexibility over quality to improve their profitability and revenue growth. Production time is also more important than production cost in small food processors. By adopting quality management practices like ISO standards, Six Sigma, Kaizen, and total quality management, SME owner-managers can improve their companies' production quality (Kumar et al., 2014). SMEs with financial slack can improve their production flexibility, shorten the production cycle time, and produce on time as

planned by adopting technologies such as flexible manufacturing systems and information technology (Bhagwat and Sharma, 2007; Gunasekaran et al., 2001).

3.5.3 Transport Performance

The results reveal that transport performance has no significant relationship with any financial dimensions of SMEs (*H3*). There is no difference in the significance when separating SMEs into primary producers and food processors. This insignificance may result from the prevalent adoption of transport outsourcing and enabling customers to collect products. There are generally three transport modes that can be adopted by companies: own-account, outsourcing, and customer collection, and companies can adopt any one or combination of them. As shown in Table 3-9, 20 per cent of sample SMEs used their own-account transport only, suggesting 80 per cent of them employed at least one transport mode from outsourcing and customer collection.

Table 3-9 Transport modes distribution by supply chain position

Transport options	Primary producers	Food processors	Total
Own-account	20	43	63 (20%)
Outsourcing	39	53	92 (29%)
Customer collection	37	0	37 (12%)
Own-account & outsourcing	18	21	39 (12%)
Own-account & customer collection	12	11	23 (7%)
Outsourcing & customer collection	14	5	19 (6%)
All three	17	28	45 (14%)
Total	157	161	318 (100%)

As indicated, 61 per cent of SMEs in the sample completely or partially outsourced their transport. Although outsourcing is a critical and extensively adopted approach to acquire essential and specialised resources by SMEs (Gunasekaran and Ngai, 2003), its financial benefits are identified to be limited (Meixell et al., 2014). Solakivi et al. (2011) empirically investigate the impact of transport outsourcing on SMEs' financial performance and find it insignificant. A wine manufacturer who is outsourcing the transport mentioned:

"We will not have lorries going out every single day, so it would be pointless for us to run our own lorry [...] Obviously, we do not have to worry about the vehicles [...] but I do not think there is really a financial benefit."

Outsourcing is usually associated with many hidden costs that tend to be overlooked by SME owner-managers, including additional transport costs, communication charges, risk costs, and costs arising from incompatible organisational cultures and systems (Meixell et al., 2014). This is evidenced by the following quotation from an egg producer:

“If we get somebody else to deliver products for us, it would cost much more, because they would have to make a profit.”

A crop grower also noted:

“We like to deliver ourselves, because that means when the load gets to the mills, the drivers work for us. If there is a problem with quality, our drivers argue in our case [...] If the drivers work for others, then we get no argument.”

SMEs should closely collaborate with hauliers to financially take advantage of transport outsourcing (Mothilal et al., 2012), but the collaboration between SMEs and hauliers is still infrequent and ineffective in practice due to small volumes and the relatively infrequent use of transport (Soinio et al., 2012). Under transport outsourcing, many customers may attribute transport performance to hauliers rather than SMEs. Consequently, this ad hoc transport outsourcing leads to the insignificant impact of transport performance on SMEs' financial performance.

Moreover, the performance evaluation in this study is based on SMEs' self-reported conceptual measures. Under extensive transport outsourcing, transport performance is out of the control of most SMEs and accurate performance information should be obtained from hauliers instead. Due to the ineffective communication with hauliers, SMEs may not be able to evaluate their transport performance accurately, which can bias their responses to the survey. This might be another cause for the insignificant impact of transport performance on financial performance.

On the other hand, 39 per cent of the sample SMEs allowed customers to collect products by themselves. Particularly, with the prevalence of factory gate pricing, which is a pricing strategy for final products excluding transport costs, an increasing number of food processors in the UK rely on retailers for final product transport (Hingley et al., 2006; Potter et al., 2007). As a supply chain activity that

interacts directly with customers, transport is supposed to influence companies' financial performance via not only increased transport charges but also improved customer satisfaction (Ralston et al., 2015). However, under customer collection, SMEs cannot mark up their transport charges to increase revenues and profits, which is similar to the case of transport outsourcing. Since it is customers who are responsible for transport performance in this situation, transport does not necessarily influence customers' evaluation of SMEs, thus having no significant impact on SMEs' financial performance.

3.5.4 Inventory Performance

This study identifies that inventory performance significantly and positively influences SMEs' profitability, liquidity, and revenue growth (*H4*). Multigroup analysis by supply chain position shows that inventory performance has significantly positive impacts on small primary producers' three financial dimensions and small food processors' profitability and liquidity. This is consistent with the findings of Koumanakos (2008) and Hançerlioğulları et al. (2016) which focus on large companies, indicating inventory performance is critical for both large companies and SMEs in terms of financial performance. This research also extends the evidence for the argument that the sources, costs, and benefits of inventory improvements are different (Capkun et al., 2009) to SMEs by identifying the significant difference of inventory components in improving SMEs' inventory and financial performance. It is observed that final product inventory has a significant and stronger impact than raw material inventory on the overall inventory performance and further financial performance of small primary producers. This finding is not surprising because final products account for a larger proportion of primary producers' inventory in terms of both volume and value compared to raw materials. Due to the small size, most primary producers purchase locally (Ellegaard, 2008), so their suppliers are usually responsive and there is no need to keep a large volume of raw materials. Since final products can generate sales directly, primary producers keep them more to accommodate price fluctuation and make more profits (Blinder and Maccini, 1991). One crop grower highlighted in the interview:

“Final product inventory is much more important than raw materials, partly because final products are ten times more than raw materials in tonnage. For example, last December, we had 1,200 tons of grain in store and only 100 tons of fertiliser [...] The price difference in final products is also more. For example, we can sell wheat at the moment for 160 pounds a ton, and back at the harvest time it was 130.”

In line with the findings by Capkun et al. (2009) who investigate the inventory performance of large US-based manufacturing companies, this study finds that raw material inventory contributes more to small food processors' overall inventory performance and further profitability and liquidity than final product inventory, despite the significance of both. The primary materials for food processors are normally fresh ingredients, like fruits, vegetables, and meats, which are more perishable than final products. Consequently, an improvement in raw material inventory performance by keeping an appropriate inventory level without either interrupting production or generating waste is the main concern in food processors' inventory management, as evidenced by two food processors:

“We are now having difficulty with fresh materials, and this is quite an acute problem for me [...] My finance will be much improved if the supply and inventory of them become better.” (Manufacturer of pastry)

“Raw material inventory is more important, because you have to be flexible to produce what is required when it is required, so if you have not got adequate raw materials, you are running the risk that you are not going to be able to acquire them and therefore not be able to satisfy demands.” (Manufacturer of beer)

The low importance of final product inventory in small food processors may result from their weak downstream supply chain competencies. Final product inventory is mainly determined by downstream customer-oriented factors, such as customer responsiveness, forecast errors, and match between production and demand (Hopp and Spearman, 2008, p.606). Therefore, companies with better downstream supply chain competencies can quickly identify new distribution channels and obtain better sales terms, thus decreasing final product inventory and improving financial performance (Steinker et al., 2016). However, as mentioned, small food processors do business with larger customers in the supply chain and are vulnerable to commercial requests from them, which weaken small food processors' competency to effectively reduce their final

product inventory. With retailers' wide implementation of factory gate pricing in the UK food industry (Hingley et al., 2006; Potter et al., 2007), the final product inventory level of food processors relies more on retailers' decisions, such as transport frequency and volume, so it can hardly be effectively managed by food processors. Moreover, many small food processors make to order, so they keep no or a very small volume of finished products, as noted by two food manufacturers:

"We make to order, so as soon as we finish packing, in the same day or the next day, they get settled to the distributor. We also supply some restaurants, and that would go off within a couple of days." (Manufacturer of pickles)

"Most of my outputs are made to order [...] All products will be produced today and delivered tomorrow morning [...] The final product inventory might be few hours only." (Manufacturer of pastry)

Koumanakos (2008) asserts that the higher the inventory level of an SME, the lower its rate of returns, which is verified by Johnston (2014), implying the inventory levels of SMEs are normally too high to be efficient. Considering the significant influence of inventory performance on SMEs' financial performance and the use of formal inventory management practices is still inadequate in SMEs (Rajeev, 2008), there is great potential for SMEs to improve their financial performance by adopting formal inventory management practices. Because of the significant and stronger impact of final product inventory, which is determined by customer-oriented factors, small primary producers should allocate more resources on improving the communication and relationship with customers and employ practices such as sales value-based ABC analysis. On the other hand, since raw material inventory has a stronger impact on small food processors and is largely influenced by supplier-oriented factors, such as discounts, scale economies, quality problems, and changes in demand and supply (Hopp and Spearman, 2008, p.604), those SMEs are recommended to lay more emphasis on supplier relationship management and adopt inventory management practices like usage value-based ABC analysis and economic order quantity (EOQ). As primary producers and food processors are in the same supply chain and adjacent to each other, vendor managed inventory (VMI) is the most

recommended inventory management practice in this case, which can help decrease both small primary producers' final product inventory and processors' raw material inventory.

3.6 Conclusion

This paper fulfils the research objective by empirically identifying the impact of purchasing, production, transport, and inventory performance on the financial performance of SMEs, including profitability, liquidity, and revenue growth, based on the data of 318 SMEs from the UK upstream food supply chain. Discussions and explanations for the results are provided based on interviews with the survey respondents and relevant literature.

3.6.1 Theoretical Implications

This study makes a number of contributions to the existing literature. First, it expands the body of literature of SCM and finance in SMEs. Due to the heterogeneity of SMEs in SCM compared to large companies, the effectiveness of SCM on the financial performance of SMEs is still controversial. Most relevant studies focus on external supply chain activities (e.g. Kumar et al., 2016; Sukwadi et al., 2013), and, therefore, a research gap exists for the relationship between internal supply chain activities and SMEs' financial performance. This research closes this gap by identifying positive impacts of production and inventory performance on SMEs' financial performance, including profitability, liquidity, and revenue growth. Although purchasing and transport performance can contribute to large companies' financial performance (Shi and Yu, 2013), this study finds it insignificant in SMEs due to their inherent weaknesses, like weak supply chain power and lack of resources. Those findings empirically demonstrate the heterogeneity of SMEs in SCM and indicate that SMEs and large companies should be examined separately in SCM research.

This study empirically demonstrates that SCM is a good fit for SMEs, because internal supply chain activities like production and inventory management are effective in improving SMEs' financial performance. It also provides evidence for the argument that SMEs have not fully exploited the potential of internal supply

chain activities to improve financial performance (Kumar and Singh, 2017), since some internal supply chain activities like purchasing and transport do not significantly influence SMEs' financial performance. Given that a high degree of utilisation and exploitation of internal supply chain activities is a prerequisite for the effectiveness of external supply chain activities (Huo, 2012), this paper potentially explains the insignificant relationship between external supply chain activities and SMEs' financial performance identified previously (e.g. Arend and Wisner, 2005).

Furthermore, although some researchers have realised the moderating effect of supply chain position on SCM (e.g. Shah and Shin, 2007; Töyli et al., 2008), to the best of the author's knowledge, none of them examine supply chain position explicitly as a moderator in the relationship between supply chain activities and firms' financial performance. This paper further extends its contribution to the intersection field of SCM, finance, and SMEs by investigating the moderating effect of supply chain position on the relationship between internal supply chain activities and SMEs' financial performance. Multigroup analysis results indicate that supply chain position significantly moderates the impact of purchasing performance on SMEs' profitability and the impacts of purchasing, production, and inventory performance on SMEs' liquidity.

When examining primary producers and food processors separately, differences in the significance of supply chain activities on financial performance between the two groups are observed. Those variances between primary producers and food processors emanate from their differences in implementing SCM and challenges brought by supply chain position. For instance, compared to primary producers, food processors are associated with larger customers, which usually propose fixed and long payment periods, constraining food processors' capability to improve their liquidity by supply chain activities. As a result, this study highlights that supply chain position is a critical factor that cannot be ignored in SCM, providing a novel perspective for future studies.

3.6.2 Managerial Implications

This paper also offers significant practical implications for SME owner-managers. Given that SMEs are resource-constrained by nature and tend to exploit internal resources for business improvements (Ellegaard, 2006), this research can help owner-managers of UK food SMEs make informed decisions regarding resource allocation on internal supply chain activities. Food SMEs with different supply chain positions and financial objectives should have different managerial focuses. To improve profitability, liquidity, and revenue growth, primary producers can rely on the improvement of their purchasing, production, and inventory performance. For food processors, improving production and inventory performance can significantly contribute to their profitability, and improving inventory performance can increase their liquidity. Production is the only internal supply chain activity that can be used to increase food processors' revenue growth.

Food SMEs at different supply chain positions are recommended to have different managerial priorities if they tend to take advantage of internal supply chain activities to improve financial performance. To capitalise on purchasing in improving financial performance, primary producers should emphasise purchasing quality, followed by purchasing flexibility, time, and cost. Regarding production performance, primary producers are recommended to improve their production quality first. Subsequently, resources can be allocated in sequence to the aspects of production flexibility, cost, and time. On the other hand, the priority sequence of the four aspects of production performance for food processors is flexibility, quality, time, and cost. Moreover, final product inventory is more financially important than raw material inventory for primary producers, while food processors should prioritise the performance of raw material inventory over that of final product inventory.

3.6.3 Limitations and Future Research

First, although the research is designed to mitigate the effect of common method variance, it still relies on the perceptual performance measures only. Therefore, further research can adopt objective instead of perceptual measures, such as financial indicators, and combine data from different sources. Second, this study

focuses only on SMEs in the UK upstream food supply chain, which constrains the generalisability of this study. Future research is recommended to replicate this study in other countries and/or industries. It would also be interesting in future research to isolate the financial performance of food products in wholesalers and retailers and extend the current research to further downstream of the food supply chain.

3.7 References to Chapter 3

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**4 PAPER THREE – WORKING
CAPITAL MANAGEMENT AND
SMES’ FINANCIAL
PERFORMANCE:
MODERATING EFFECTS OF
FIRM SIZE AND SUPPLY
CHAIN POSITION**

4.1 Introduction

In comparison with large companies, small and medium-sized enterprises (SMEs) are more vulnerable to financial challenges and are readily exposed to harsh payment terms imposed by their powerful supply chain partners (Maglaras et al., 2015). Moreover, SMEs depend heavily on owners' finances, trade credit, and short-term loans (Nobanee and Abraham, 2015). Therefore, SMEs should pay particular attention to working capital management (WCM). This study adopts the SME definition by the European Commission (2015), defining that SMEs are firms that have fewer than 250 employees and annual turnover no more than €50 million or total asset no more than €43 million.

WCM comprises three components: inventory management, accounts receivable management, and accounts payable management. Companies with financial difficulties tend to capitalise on WCM to liberate cash through lowering inventory levels, extending trade credit from suppliers, and shortening debtor collection periods (Coulibaly et al., 2013). Efficient WCM improves large companies' financial performance (e.g. Deloof, 2003; Grau and Reig, 2018; Shrivastava et al., 2017). However, SMEs by nature have fewer resources than large companies, including financial resources, management professionals, and technologies, which constrain their capability to take advantage of WCM to improve financial performance (Orobia et al., 2013). Additionally, SME owner-managers are less constrained in decision-making than managers of large companies due to the flat management structure, so they tend to take risky decisions (Zahra, 2005), such as granting an excessive amount of trade credit to stimulate sales, which negatively influences their cash flow and thus their sustainability. Considering that SME owner-managers still plan, monitor, and control their working capital intuitively (Orobia et al., 2013), they could benefit from the results on the relationship between WCM and financial performance presented in this paper.

Firm size and supply chain position moderate the relationship between WCM and financial performance. The amount of resources held by a company is positively associated with its size (Bourlakis et al., 2014), so large firms have more

resources than small ones to effectively manage working capital. Supply chain position is the location of a company along the supply chain. The examined food supply chain usually consists of four positions: primary producers, processors, wholesalers, and retailers (Jie and Gengatharen, 2019). Companies with different supply chain positions have different supply chain power (Maglaras et al., 2015), which influences their capability to use WCM to improve financial performance. However, there is a scarcity of empirical research examining the moderating effect of firm size on the relationship between WCM and financial performance of companies, and few studies examine firm size within SMEs (Bourlakis et al., 2014). To the best of the author's knowledge, no empirical paper specifically takes supply chain position as a moderator and explores its effect on the relationship between WCM and SMEs' financial performance.

The research on the relationship between WCM and SMEs' financial performance is inconclusive. While some researchers observe a negative relationship between WCM and SMEs' financial performance (e.g. Pais and Gama, 2015; Tran et al., 2017), others identify positive (e.g. Martínez-Sola et al., 2014) or concave relationships (e.g. Afrifa, 2016; Baños-Caballero et al., 2012). Furthermore, most relevant studies to this topic focus on the impact of WCM on profitability only (e.g. Lyngstadaas and Berg, 2016; Tran et al., 2017), lacking the multiplicity of financial goals (Töyli et al., 2008). Besides profitability, liquidity is another critical financial objective for SMEs and is commonly addressed by SME owner-managers in practice because it determines SMEs' survival (LeCornu et al., 1996; McMahan and Stanger, 1995). SMEs may harm their liquidity if they overemphasise profitability (Nobanee and Abraham, 2015), so they should address both profitability and liquidity when evaluating their financial performance. Hence, this study aims to empirically investigate the impact of WCM and its three components on SMEs' profitability and liquidity along with the moderating effects of firm size and supply chain position.

Because the impact of WCM on firms' financial performance is contingent on the countries and industries they belong to (Grau and Reig, 2018), this study specifically focuses on SMEs from the UK upstream food supply chain. The UK

food supply chain is characterised by the dominance of a few large retailers (Zissis et al., 2018); therefore, upstream SMEs' WCM can be largely influenced by actions of powerful retailers, such as setting long payment periods. So, SME owner-managers must understand the relationship between WCM and their companies' financial performance and further follow efficient WCM strategies. The UK food industry consists of a large number of SMEs, accounting for 97 per cent of the whole sector (DEFRA, 2018). In the food supply chain, while the upstream primary producers and food processors produce food only, the downstream food wholesalers and retailers normally engage in other industries and sell other products apart from food, so their financial performance is affected by non-food products. Since this study focuses on the impact of WCM on SMEs' financial performance, it is important to control for the products they sell. Therefore, this paper examines the upstream food supply chain only, including primary producers, consisting of crop growers and animal raisers for food consumption, and food processors, consisting of food and beverage manufacturers.

The contribution of this study is threefold. First, it expands the body of literature of WCM in SMEs by empirically testing the relationship between WCM and SMEs' financial performance and prioritising WCM components in driving SMEs' financial performance. Second, this study identifies the moderating effects of firm size and supply chain position on the relationship between WCM and SMEs' financial performance, contributing to the area of supply chain finance in the SME context. Third, it interprets the association between WCM and SMEs' financial performance and the moderating effects of firm size and supply chain position based on empirical evidence. Understanding the impact of WCM on and the relative importance of its components for SMEs' financial performance can inform the resource allocation decisions of SMEs.

The remainder of this paper is structured as follows. Section 4.2 provides a review of the literature and develops hypotheses, followed by a description of the methodology adopted. Following the results of data analysis in Section 4.4, Section 4.5 provides discussions and conclusions are presented in Section 4.6.

4.2 Literature Review and Hypothesis Development

According to the Chartered Institute of Management Accountants (CIMA, 2005), working capital is the fund available for conducting the day-to-day operations of a company, normally calculated as current assets minus current liabilities. The primary objective of WCM is to ensure that firms have sufficient cash flow to run daily operations and to minimise the risk of inability to pay short-term liabilities (Şamiloğlu and Akgün, 2016). The cash conversion cycle (CCC), a widely adopted measure of WCM, is calculated as inventory holding days (IHD) plus accounts receivable days (ARD) minus accounts payable days (APD) (Lind et al., 2012). CCC is a comprehensive indicator from the supply chain perspective, as it connects purchasing activities with suppliers, internal production activities, and sales activities with customers (Farris and Hutchison, 2002). The shorter the CCC, the less the working capital tied up, and the more efficient is the company's WCM (Yazdanfar and Öhman, 2014).

4.2.1 Working Capital Management and Profitability

Profitability is the ability of a company to generate profits, which is commonly measured by return on assets (ROA) in percentage (Wagner et al., 2012), calculated as profit or loss before tax divided by total assets times 100. The level of investment in working capital is determined by companies' WCM strategy. An aggressive WCM strategy results in a decrease in working capital investment by reducing inventory levels, decreasing accounts receivable, and delaying payment to suppliers, while the conservative strategy advocates increasing inventory and accounts receivable levels and reducing accounts payable to increase investment in working capital (Afrifa, 2016). Any change in working capital is associated with both benefits and costs (Baños-Caballero et al., 2012; Tauringana and Afrifa, 2013), which influences profits in both directions.

Holding inventory is associated with various costs, including costs of materials, space, labour, deterioration, theft, and capital (Slack and Brandon-Jones, 2019, p.455), so inventory reduction can lead to improved profitability due to reduced associated costs. However, reducing inventory increases the risk of stockouts, which is harmful to sales and reduces profitability through lower revenues

(Baños-Caballero et al., 2012). Instead, increasing inventory levels can not only reduce the risk of stockouts (Deloof, 2003), but also prevent production disruptions (García-Teruel and Martínez-Solano, 2007) and accommodate price fluctuations (Blinder and Maccini, 1991), resulting in an increase in companies' profitability through higher revenues, but equally, in an increase in inventory holding costs and a reduction of profitability through higher costs.

Granting trade credit and increasing accounts receivable can stimulate sales and increase profits by motivating customers to buy more, as it allows customers time to pay (Deloof and Jegers, 1996; Long et al., 1993) and verify product quality prior to payment (Lee and Stowe, 1993), signals trust between companies and their customers, and strengthens long-term customer relationships (Wilner, 2000). It can encourage customers to buy products even in time of low demand (Emery, 1987). Nevertheless, increasing capital tied up in accounts receivable increases companies' capital and opportunity costs, decreasing profitability. On the other hand, a reduction in trade credit and accounts receivable liberates cash tied up, which can be invested in products with higher returns, increasing profitability (Tauringana and Afrifa, 2013), but it can also demotivate customers to buy, negatively influencing profitability.

Finally, increasing accounts payable by delaying payments to suppliers is an inexpensive source of financing (Deloof, 2003), so it reduces companies' financing and capital costs, thus increasing their profits. To speed up cash collection, many suppliers offer price discounts for early payment (Orobia et al., 2013), so delaying payments to suppliers can also damage SMEs' profitability due to the loss of discounts (Wilner, 2000). Therefore, no matter which WCM strategy is adopted, the relationship between WCM and companies' profitability is not straightforward and needs to be empirically examined.

Grau and Reig (2018) suggest the relationship between WCM and firms' profitability is contingent on the countries and industries they belong to, so relevant research should be country- and industry-specific. Karadağ (2018) analyses the extent of the adoption of WCM practices by SMEs in Turkey and posits that the adoption of all three WCM practices is positively associated with

profitability of SMEs, while inventory management has the weakest association. Most other studies adopt CCC as a proxy of WCM, and studies examining the association between CCC and SMEs' profitability in countries like Sweden (Yazdanfar and Öhman, 2014), Norway (Lyngstadaas and Berg, 2016), Spain (García-Teruel and Martínez-Solano, 2007), Portugal (Pais and Gama, 2015), and Vietnam (Tran et al., 2017) all identify a significantly negative relationship, but few studies focus specifically on the UK or the food industry (Afrifa et al., 2016).

Compared to large companies, SMEs tend to invest more in working capital than would be appropriate (Howorth and Westhead, 2003). Particularly, in the examined UK food supply chain, which is dominated by a few large retailers (Zissis et al., 2018), upstream SMEs do not have the power to dictate payment terms but instead are subject to long payment periods from large retailers. Therefore, UK food SMEs are imposed to have excessive accounts receivable and tend to hold excessive inventories due to high costs of losing sales, so the costs of increasing working capital exceed the benefits yielded. Although there is an inverted U-shaped (concave) relationship between CCC and profitability and an optimal working capital level exists in large companies (Aktas et al., 2015; Baños-Caballero et al., 2014), only the right-hand side of the inverted U-shape is expected in SMEs, forming a linear and negative relationship between CCC and profitability. An increase in IHD or ARD extends the CCC, thus decreasing profitability, while increasing APD shortens the CCC so is expected to improve SMEs' profitability. The hypotheses are formulated as follows:

H1. IHD negatively affects profitability of SMEs.

H2. ARD negatively affects profitability of SMEs.

H3. APD positively affects profitability of SMEs.

H4. CCC negatively affects profitability of SMEs.

4.2.2 Working Capital Management and Liquidity

Liquidity indicates firms' ability to pay off debts when they become due (Karadağ, 2018), and the traditional measure of liquidity is the current ratio (CR), calculated as current assets divided by current liabilities. SMEs usually take advantage of WCM to eliminate the risk of illiquidity (having assets that cannot be easily converted to cash) (Orobia et al., 2013), so it is reasonable to contend that WCM influences the liquidity of SMEs. Shortening CCC by reducing inventories and accounts receivable can liberate cash tied up and increase cash flow (Johnson and Templar, 2011), which improves SMEs' liquidity. The longer a firm delays payments to its suppliers, the more the cash it reserves (Tauringana and Afrifa, 2013), so a short CCC by accumulating accounts payable also helps SMEs increase their liquidity. Then the following hypothesis is proposed:

H5. CCC negatively affects liquidity of SMEs.

Because the three components of WCM are also part of the CR, the indicator for liquidity, there is a linear dependence between liquidity and IHD, ARD, and APD, so the relationship between CCC components and liquidity is not explicitly examined in this paper.

4.2.3 Firm Size

Firm size is associated with companies' working capital levels. Koralun-Bereźnicka (2014) investigates the working capital level of European companies and identifies that IHD, ARD, APD, and CCC of large companies are significantly longer than those of SMEs. Although WCM is crucial for all companies, given SMEs' capital-starved nature and limited access to external financing, WCM is of greater relevance for SMEs than it is for large companies (Nobanee and Abraham, 2015). Comparatively, SMEs are more vulnerable to working capital fluctuations than large firms (Rafuse, 1996). Due to lack of reputation, SMEs tend to grant trade credit to attract customers, but large firms may not be interested in granting trade credit because their large size has already indicated reputation (Long et al., 1993).

Despite the difference between large firms and SMEs in WCM, this heterogeneity also exists within SMEs, which can influence the relationship between WCM and their financial performance. Focusing on US industrial firms, Nobanee and Abraham (2015) categorise them into small, medium, and large firms and observe that there is a significantly negative relationship between CCC and the liquidity of small firms, while this relationship is insignificant in large and medium-sized firms. However, they do not take firm size as a moderator and examine its impact on the relationship between CCC and firms' liquidity particularly. Martínez-Sola et al. (2014) investigate the accounts receivable of Spanish manufacturing SMEs and find that the positive relationship between the investment in accounts receivable and profitability becomes stronger with increase in firm size.

The European Commission (2015) categorises SMEs into three sizes: companies having fewer than 10 employees with an annual turnover or total assets less than or equal to €2 million are considered micro, companies having fewer than 50 employees with an annual turnover or total assets less than or equal to €10 million are considered small, and companies having fewer than 250 employees with an annual turnover less than or equal to €50 million or total assets less than or equal to €43 million are considered medium (see Figure 3-2). The amount of working capital held by SMEs is positively associated with firm size. Specifically, because of larger volumes of business, larger SMEs like medium-sized firms normally have more working capital than smaller SMEs like micro firms by keeping more inventories and granting more trade credit (Wasiuzzaman, 2018). As larger SMEs have better creditworthiness and consequently easier access to external funds, they are also better able to grant trade credit than smaller SMEs (García-Teruel and Martínez-Solano, 2010). Regarding accounts payable, García-Teruel and Martínez-Solano (2010) find a significantly positive relationship between firm size and SMEs' accounts payable, suggesting that compared to smaller SMEs, larger SMEs receive more finance from their suppliers and have more accounts payable. Although larger SMEs have more financial resources and do not need to rely heavily on accounts payable for financing, they still receive more trade credit from suppliers than smaller SMEs do due to the better creditworthiness and greater growth opportunities (García-Teruel and Martínez-Solano, 2010).

Consequently, the larger the firm size, the more working capital is held, and the stronger the relationship between WCM and SMEs' financial performance. Furthermore, since larger SMEs have more resources than smaller SMEs (Bourlakis et al., 2014), such as financial resources and specialised knowledge and skills, they are more capable of taking advantage of WCM to improve financial performance. The arguments suggest the following hypotheses:

H6. Firm size moderates the relationship between WCM and financial performance of SMEs.

H6a. The negative relationship between IHD and profitability is stronger with increase in SMEs' firm size.

H6b. The negative relationship between ARD and profitability is stronger with increase in SMEs' firm size.

H6c. The positive relationship between APD and profitability is stronger with increase in SMEs' firm size.

H6d. The negative relationship between CCC and profitability is stronger with increase in SMEs' firm size.

H6e. The negative relationship between CCC and liquidity is stronger with increase in SMEs' firm size.

4.2.4 Supply Chain Position

A company's supply chain position influences its supply chain power and accessible resources (Maglaras et al., 2015), which determine its working capital levels and further influence the relationship between WCM and its financial performance. Powerful companies can finance their weak customers by extending payment periods and adjusting credit terms, thus holding more working capital (Saranga, 2009). However, some powerful companies may take advantage of the imbalanced supply chain relationship and impose harsh payment terms and inventory policies on their supply chain partners, reducing the amount of working capital held. Pirttilä et al. (2010) investigate the working capital of the pulp and paper supply chain and find that WCM is more efficient with a

shorter CCC for downstream paper manufacturing companies than it is for upstream suppliers. However, there is a different case for the automotive supply chain, where car manufacturers in the downstream have a longer CCC than upstream raw material and component suppliers (Lind et al., 2012), which results from car manufacturers' financing business to end customers. Therefore, the analysis of the role of supply chain position in WCM should be industry-specific.

For the UK food supply chain, the average payment period is 30 days, but it takes retailers 45 days on average to pay their suppliers (Perkins, 2019), and over 30 per cent of invoices are not paid within agreed periods (Lloyds Bank, 2019). Compared to primary producers, food processors are positioned closer to retailers in the supply chain, and most of them supply retailers directly. Thus, food processors are expected to hold more accounts receivable than primary producers due to retailers' possible late payment, so the negative relationship between ARD and profitability should be stronger for food processors than it is for primary producers. Meanwhile, to maintain a smooth cash flow and to avoid investing heavily in working capital, companies tend to delay payments to suppliers if they cannot receive customers' payment on time (Lind et al., 2012), so it is reasonable to expect that food processors also hold more accounts payable than primary producers. In regard to inventory, the value of inventory is increasing as it gets closer to the point of consumption, so compared to upstream primary producers, an inventory reduction is expected to have a greater effect on profitability of downstream food processors (Lambert and Pohlen, 2001). Since the variations of ARD and APD between companies usually offset each other, the difference in CCC is normally determined by IHD (Lind et al., 2012). Thus, food processors which tend to hold more inventories to ensure the supply to retailers will have a longer CCC than primary producers. Based on the arguments, the following hypotheses are proposed:

H7. Supply chain position moderates the relationship between WCM and financial performance of SMEs.

H7a. The negative relationship between IHD and profitability is stronger for food processors than it is for primary producers.

H7b. The negative relationship between ARD and profitability is stronger for food processors than it is for primary producers.

H7c. The positive relationship between APD and profitability is stronger for food processors than it is for primary producers.

H7d. The negative relationship between CCC and profitability is stronger for food processors than it is for primary producers.

H7e. The negative relationship between CCC and liquidity is stronger for food processors than it is for primary producers.

4.3 Methodology

4.3.1 Data

The data used in this study were obtained from FAME, a comprehensive and widely used financial database provided by Bureau van Dijk containing over 11 million companies in the UK and Ireland. Since the target population of this study is SMEs in the UK upstream food supply chain, including primary producers and food processors, the UK SIC code was employed to define the industry in FAME: companies with a primary SIC code listed in Table 4-1 were in the upstream food supply chain. Among the adopted SIC codes, those starting with 01 and 03 indicated primary producers, while those starting with 10 and 11 indicated food processors. A balanced panel data set was required, because it reduces the noise introduced by unit heterogeneity by allowing for equal observations for every unit in each time period (Tauringana and Afrifa, 2013). Thus, availability sampling was adopted and companies that met all criteria below can be included in the initial sample.

- 1) The primary trading address is in the UK, since UK is the research context.
- 2) Companies can be defined as SMEs according to the definition by the European Commission (2015), since this study investigates SMEs.
- 3) Companies' primary SIC code is listed in Table 4-1, because this study focuses on the upstream food supply chain.
- 4) Companies have available data in FAME for all variables required (all variables in Table 4-2) from 2012 to 2018.

The period between 2012 and 2018 was selected because it provided the largest number of firm-year observations and the most recent data. Since this study focuses on UK SMEs, the average GBP/EUR conversion rate during the examined 2012-2018 period was adopted to determine the firm size (micro, small, and medium), which was 1.22. Consequently, data of 358 SMEs in the UK food industry were initially retrieved from FAME.

Table 4-1 Sample profile by SIC code, supply chain position and firm size

SIC code	Description	N	%
<i>Primary producers</i>			
01.11	Growing of cereals (except rice), leguminous crops and oil seeds	32	9%
01.12	Growing of rice	–	–
01.13	Growing of vegetables and melons, roots and tubers	14	4%
01.14	Growing of sugar cane	–	–
01.19	Growing of other non-perennial crops	–	–
01.2	Growing of perennial crops	2	1%
01.3	Plant propagation	–	–
01.41	Raising of dairy cattle	5	2%
01.42	Raising of other cattle and buffaloes	–	–
01.45	Raising of sheep and goats	3	1%
01.46	Raising of swine/pigs	10	3%
01.47	Raising of poultry	10	3%
01.49	Raising of other animals	–	–
01.5	Mixed farming	10	3%
03	Fishing and aquaculture	9	3%
Total primary producers		95	29%
<i>Food processors</i>			
10	Manufacture of food products	206	64%
11	Manufacture of beverages	24	7%
Total food processors		230	71%
<i>Firm size</i>			
Micro		13	4%
Small		40	12%
Medium		272	84%
Total sample SMEs		325	100%

Notes: Firm size is based on the data of 2018.

To avoid misclassification of companies into the desired SIC codes, the author manually checked the industry by triangulating their SIC codes with other accessible information such as websites and industry descriptions to ensure the reliability and validity of the industry and supply chain position classification. As a result, 33 SMEs which were not in the food industry despite their indicated SIC codes were excluded during this process. To avoid the influence of outliers, 0.5 per cent of the most extreme top and bottom values for each variable were pairwise removed from the data set (Lyngstadaas and Berg, 2016; Pais and Gama, 2015). Finally, 325 SMEs were retained in the sample, resulting in 2,275 firm-year observations. Table 4-1 shows that there are 95 primary producers and 230 food processors, accounting for 29 and 71 per cent of the sample respectively. Small and medium-sized firms account for 12 and 84 per cent of the sample respectively, and 4 per cent of sample companies are classified as micro firms.

4.3.2 Variables and Estimation

Panel data regression analysis was performed in Stata 16 to examine the relationship between WCM and SMEs' financial performance. All variables adopted and their definitions are summarised in Table 4-2. ROA and CR are two dependent variables to respectively measure profitability and liquidity. Independent variables include CCC, the proxy of WCM, and its three components: IHD, ARD, and APD. The control variables included in this study are sales (SALE), sales growth (GRT), firm age (AGE), leverage ratio (LEV), current asset ratio (CAR), and current liability ratio (CLR), which are considered to influence companies' profitability and liquidity and are obtained from relevant studies (e.g. Lyngstadaas and Berg, 2016; Nobanee and Abraham, 2015; Pais and Gama, 2015). To facilitate the investigation of the moderating effect of firm size, two dummy variables FS_1 and FS_2 are introduced and their values for each firm size is shown in Table 4-3. Medium-sized firms are assigned 0 for both variables so adopted as the comparison baseline. A moderator variable SCP is introduced to indicate supply chain position, where primary producers are denoted as 0 while food processors are assigned 1.

Table 4-2 Variables included in the regression model and relevant definitions

Variables	Definitions	Sources								
		1	2	3	4	5	6	7	8	9
<i>Profitability variable</i>										
ROA	Return on assets in percentage, calculated as (profit or loss before tax)/(total assets)×100	x	x	x			x		x	x
<i>Liquidity variable</i>										
CR	Current ratio, calculated as (current assets)/(current liabilities)								x	
<i>WCM variables</i>										
IHD	Inventory holding days, calculated as inventories/turnover×365			x			x		x	
ARD	Accounts receivable days, calculated as (accounts receivable)/turnover×365			x			x		x	
APD	Accounts payable days, calculated as (accounts payable)/turnover×365			x			x		x	
CCC	Cash conversion cycle, calculated as IHD + ARD – APD	x	x	x			x		x	
<i>Control variables</i>										
SALE	Sales, measured as the logarithm of sales		x	x						x
GRT	Sales growth in percentage, calculated as $(Revenue_{it}-Revenue_{i(t-1)})/Revenue_{i(t-1)}\times 100$, where i indicates company and t indicates year	x	x	x			x	x	x	
AGE	Firm age, the number of years that the firm has been operating	x								x
LEV	Leverage ratio, calculated as total liabilities/total assets	x	x	x			x	x	x	
CAR	Current asset ratio, calculated as (current assets)/(total assets)	x		x			x	x	x	
CLR	Current liability ratio, calculated as (current liabilities)/(total liabilities)						x		x	
<i>Moderator variables</i>										
FS_1	First dummy variable of firm size, where medium-sized firms are denoted as 0 while micro and small firms are assigned 1				x					
FS_2	Second dummy variable of firm size, where micro firms are denoted as 1 while small and medium-sized firms are assigned 0				x					
SCP	Supply chain position, a dummy variable where primary producers are denoted as 0 while food processors are assigned 1						x			

Notes: For sources, 1 – Afrifa (2016); 2 – Baños-Caballero et al. (2012); 3 – Deloof (2003); 4 – European Commission (2015); 5 – Lind et al. (2012); 6 – Lyngstadaas and Berg (2016); 7 – Nobanee and Abraham (2015); 8 – Pais and Gama (2015); 9 – Yazdanfar and Öhman (2014).

Table 4-3 Firm size and corresponding dummy variable values

Firm size	FS 1	FS 2
Medium	0	0
Small	1	0
Micro	1	1

In line with Deloof (2003) and Tauringana and Afrifa (2013), the following regression models are specified to test hypotheses. Models 1 to 5 aim to test $H1$ to $H5$ respectively.

$$ROA_{it} = \beta_0 + \beta_1 IHD_{it} + \beta_2 SALE_{it} + \beta_3 GRT_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 CAR_{it} + \beta_7 CLR_{it} + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 ARD_{it} + \beta_2 SALE_{it} + \beta_3 GRT_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 CAR_{it} + \beta_7 CLR_{it} + \varepsilon_{it} \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 APD_{it} + \beta_2 SALE_{it} + \beta_3 GRT_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 CAR_{it} + \beta_7 CLR_{it} + \varepsilon_{it} \quad (3)$$

$$ROA_{it} = \beta_0 + \beta_1 CCC_{it} + \beta_2 SALE_{it} + \beta_3 GRT_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 CAR_{it} + \beta_7 CLR_{it} + \varepsilon_{it} \quad (4)$$

$$CR_{it} = \beta_0 + \beta_1 CCC_{it} + \beta_2 SALE_{it} + \beta_3 GRT_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 CAR_{it} + \beta_7 CLR_{it} + \varepsilon_{it} \quad (5)$$

where i indicates company, t indicates year, and ε_{it} is the error term.

The Hausman (1978) test with the null hypothesis that the unobserved heterogeneity is uncorrelated with independent variables was performed to decide the appropriateness of the fixed or random effects model. If the hypothesis is rejected with a significant p -value, the fixed effects model is selected, otherwise the random effects model is adopted. The results of the test are reported in Section 4.4.

4.3.3 Interview

To deepen and enrich our understanding of the relationship between WCM and SMEs' financial performance, a mixed method was adopted by complementing quantitative analysis with follow-up semi-structured interviews. Interview is a valuable source of research evidence and provides richness of explanations of various phenomena (Eisenhardt, 1989). The interview guide was developed based on the quantitative results obtained with an aim to extend the interpretations of them and is provided in the Appendix C.2. The interviews were conducted over phone or Skype and lasted between 30 and 45 minutes. With the permission of participants, all interviews were audio recorded, transcribed verbatim, and analysed using content analysis (Gold et al., 2010) in NVivo 12.

A total of seven executives from UK food SMEs participated in the interviews, and their profile is presented in Table 4-4. All participants were high level decision-makers, ensuring the reliability of the qualitative data collected.

Table 4-4 Profile of interview participants

Characteristics	Frequency	%
<i>Job title</i>		
Founder/Owner/CEO/Director/Partner/General Manager	7	100%
<i>Location</i>		
England	5	71%
Scotland	2	29%
Wales	-	-
Northern Ireland	-	-
<i>Industry</i>		
Growing of cereals (except rice), leguminous crops and oil seeds (SIC 01.11)	2	29%
Raising of poultry (SIC 01.47)	1	13%
Manufacture of food products (SIC 10)	2	29%
Manufacture of beverages (SIC 11)	2	29%
<i>Supply chain position</i>		
Primary producers	3	43%
Food processors	4	57%
<i>Firm size</i>		
Micro	4	57%
Small	3	43%
Medium	-	-

4.4 Data Analysis and Results

4.4.1 Descriptive Statistics

Descriptive statistics for the variables in the study sample are provided in Table 4-5. ROA on average is 8.28 per cent while the median is 6.57 per cent, indicating that most SMEs in the UK upstream food supply chain are profitable. Considering the common rule of thumb that companies with a CR greater than 2 are able to meet their short-term liabilities (Atrill and McLaney, 2017, p.218), the average CR of 2.25 suggests most SMEs in the sample do not have liquidity issues. It takes on average 48 days for the SMEs in the sample to turn over their inventory, and their average ARD and APD are around 47 and 30 days respectively, resulting in an average CCC of approximately 66 days. Sales do not differ greatly between SMEs in the sample, and their age is 35 years on average. The average sales growth of the SMEs in the sample is 5.60 per cent per year, and their mean leverage ratio is 0.49. Their current assets account for on average 59 per cent of total assets, and 74 per cent of their total liabilities are current liabilities.

Table 4-5 Descriptive statistics

Variables	Mean	Median	SD	Minimum	Maximum
ROA	8.279	6.566	10.342	-19.088	98.785
CR	2.250	1.691	1.863	0.162	15.588
IHD	48.451	41.551	54.981	3.033	632.179
ARD	47.082	46.304	17.310	1.592	123.737
APD	29.876	27.137	16.731	1.260	107.062
CCC	65.976	57.760	56.500	-16.565	672.165
SALE	4.133	4.193	0.363	2.232	5.086
GRT	5.597	4.365	16.094	-50.271	103.544
AGE	34.631	28.000	22.998	2.000	121.000
LEV	0.488	0.483	0.217	0.044	1.089
CAR	0.585	0.615	0.221	0.014	0.996
CLR	0.742	0.813	0.228	0.026	1.182
FS_1	0.170	0.000	0.375	0.000	1.000
FS_2	0.040	0.000	0.196	0.000	1.000
SCP	0.708	1.000	0.455	0.000	1.000

4.4.2 Correlation Analysis

Table 4-6 presents the results of Pearson pairwise correlation analysis. It is observed that CCC is negatively correlated with ROA at the significance level of 0.01. IHD, ARD, and APD, the three components of WCM, all have negative correlations with ROA at the 0.01 significance level. CCC is also significantly and negatively correlated with SMEs' liquidity, measured by the CR.

Field (2009, p.224) suggests that multicollinearity is a problem only when the correlation coefficient exceeds 0.80, which is detrimental to the accuracy of regression analysis. According to Table 4-6, none of the correlations among the explanatory variables exceeds 0.80 except the one between IHD and CCC. However, the two variables are not included in the same regression model for any of the hypotheses, so they do not cause multicollinearity problems. The author further calculated the variance inflation factor (VIF) for each independent variable in all five models to examine the multicollinearity issue. The results show that the largest VIF value is 1.70 (see Appendix F.1), well below the threshold value of 5 (Hair et al., 2014), verifying there is no multicollinearity problem in the analysis.

Table 4-6 Pearson correlation analysis results

	ROA	CR	IHD	ARD	APD	CCC	SALE	GRT	AGE	LEV	CAR	CLR	FS_1	FS_2	SCP
ROA	1														
CR	0.106***	1													
IHD	-0.130***	-0.338***	1												
ARD	-0.096***	-0.385***	0.070***	1											
APD	-0.152***	0.262***	0.250***	0.211***	1										
CCC	-0.113***	-0.537***	0.908***	0.306***	0.047***	1									
SALE	0.078***	0.085***	-0.228***	0.055**	-0.036*	-0.184***	1								
GRT	0.126***	0.020	-0.009	0.061***	0.089***	0.000	0.097***	1							
AGE	-0.108***	-0.180***	-0.040*	0.041*	-0.094***	0.007	-0.025	-0.068***	1						
LEV	-0.240***	0.132***	0.015	0.035*	0.228***	-0.031	0.102***	0.110***	-0.231***	1					
CAR	0.251***	-0.020	-0.017	0.060***	-0.022	0.021	0.336***	0.012	-0.165***	-0.060***	1				
CLR	0.188***	0.070***	-0.059***	0.044**	0.052**	-0.085***	0.204***	0.024	-0.064***	-0.187***	0.558***	1			
FS_1	0.025	-0.050**	0.132***	-0.112***	-0.053**	0.101***	-0.514***	-0.098***	0.015	-0.063***	-0.066***	-0.047**	1		
FS_2	-0.069***	-0.105***	0.256***	-0.060***	0.030	0.206***	-0.647***	-0.053**	0.056***	-0.075***	-0.205***	-0.093***	0.453***	1	
SCP	0.096***	-0.013	-0.142***	0.176***	-0.101***	-0.066***	0.294***	0.048**	-0.037*	-0.025	0.384***	0.314***	-0.255***	-0.249***	1

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

4.4.3 Regression Analysis

The panel data regression results are provided in Table 4-7. Since p -values generated by Hausman test are significant at the 0.01 level, the fixed effects model is preferred for all models tested. It is identified that IHD ($\beta = -0.121, p < 0.01$) and ARD ($\beta = -0.078, p < 0.01$) are significantly and negatively associated with ROA, so $H1$ and $H2$ are supported. However, contrary to the hypothesis, APD is significantly and negatively associated with ROA ($\beta = -0.057, p < 0.01$), so $H3$ is not supported. Among the three components of WCM, IHD has the strongest relationship with ROA due to the highest coefficient, followed by ARD and APD. Model 4 reveals that as the proxy of WCM, CCC has a significantly negative relationship with ROA ($\beta = -0.083, p < 0.01$), suggesting SMEs can improve their profitability through decreasing the amount of working capital tied up, so $H4$ is supported. Moreover, $H5$ is also supported with a significantly negative relationship between CCC and CR ($\beta = -0.035, p < 0.01$). The R^2 values of the five models are respectively 0.186, 0.147, 0.135, 0.174, and 0.334, and comparable to R^2 values reported in relevant studies (e.g. Afrifa, 2016; Grau and Reig, 2018; Tauringana and Afrifa, 2013).

Table 4-7 Panel data regression results

Model	1	2	3	4	5
Dependent variable	ROA	ROA	ROA	ROA	CR
IHD	-0.121***				
ARD		-0.078***			
APD			-0.057***		
CCC				-0.083***	-0.035***
SALE	6.932***	9.737***	9.884***	9.361***	-0.153
GRT	0.037***	0.047***	0.046***	0.038***	-0.003**
AGE	-0.328***	-0.421***	-0.466***	-0.391***	-0.007
LEV	-19.294***	-22.808***	-21.477***	-21.508***	-0.017
CAR	13.005***	11.852***	12.445***	12.121***	0.506*
CLR	-0.500	-0.469	0.015	-1.268	-0.029
Constant	-1.151	-9.405	-11.781	-7.248	5.190***
F	61.39	46.17	41.98	56.59	136.27
R^2	0.186	0.147	0.135	0.174	0.334
Hausman test	0.000	0.000	0.000	0.000	0.000

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

In control variables, SALE has a significantly positive relationship with ROA while not CR. GRT is significantly and positively associated with ROA, while the relationship between GRT and CR is significantly negative. Both AGE and LEV have significantly negative relationships with ROA, but their relationships with CR are insignificant. CAR is significantly and positively associated with both ROA and CR, which implies that SMEs' profitability and liquidity can be improved with the increase in the proportion of current assets to total assets. However, CLR is not significantly associated with either ROA or CR.

To investigate the moderating effect of firm size, two dummy variables of firm size FS_1 and FS_2 and two interaction variables between the examined WCM variable and FS_1 and FS_2 are added to each main model. Since interaction variables are the multiplication between WCM variables and firm size variables, multicollinearity poses a threat to the analysis. To reduce the problem with multicollinearity, the author standardised WCM variables, including IHD, ARD, APD, and CCC, by transforming them into Z-scores before calculating interaction variables (Dawson, 2014). The following VIF calculation suggests the largest VIF value is 3.05 (see Appendix F.1), so multicollinearity is not a concern. It should be noted that because the size of most sample SMEs is stable during the examined period, FS_1 and FS_2 are approximate time-constant variables. As a result, they cannot be included by themselves in a fixed effects model (Wooldridge, 2012, p.487), so the random effects model was adopted to test the moderating effect of firm size, regardless of the Hausman test results.

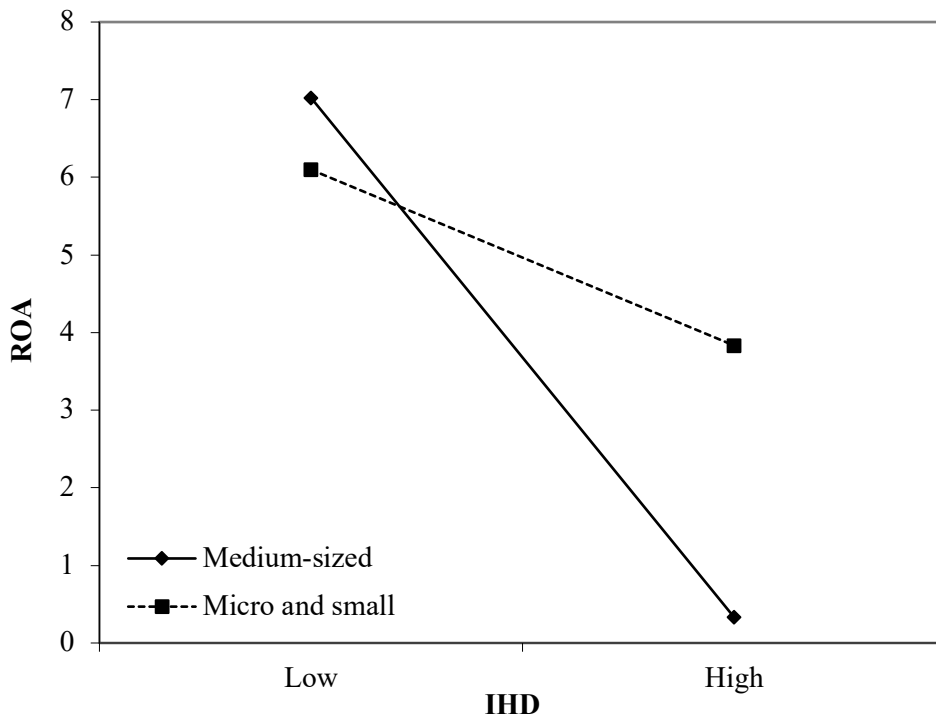
Table 4-8 shows the results for the moderating effect of firm size. Although FS_2 does not significantly moderate the negative relationship between IHD and ROA, FS_1 has a significantly positive moderating effect, ($\beta = 2.217$, $p < 0.01$), meaning that the negative relationship between IHD and ROA is stronger for medium-sized firms than it is for micro and small firms (Figure 4-1a), so *H6a* is supported. *H6e* is also supported, because both FS_1 and FS_2 have a significantly positive moderating effect on the relationship between CCC and CR (FS_1: $\beta = 0.379$, $p < 0.01$; FS_2: $\beta = 0.424$, $p < 0.05$), suggesting that the negative relationship between CCC and CR is stronger for small and medium-sized firms than it is for micro firms; furthermore, compared to micro and small

firms, this relationship is stronger for medium-sized firms (Figure 4-1b). However, no moderating effect of FS_1 and FS_2 is found in other relationships, so *H6b*, *H6c*, and *H6d* are not supported. Thus, *H6* is partially supported. The author also adopted the continuous variable SALE as a proxy of firm size (Baños-Caballero et al., 2012; Yazdanfar and Öhman, 2014) and obtained similar findings (see Appendix F.2).

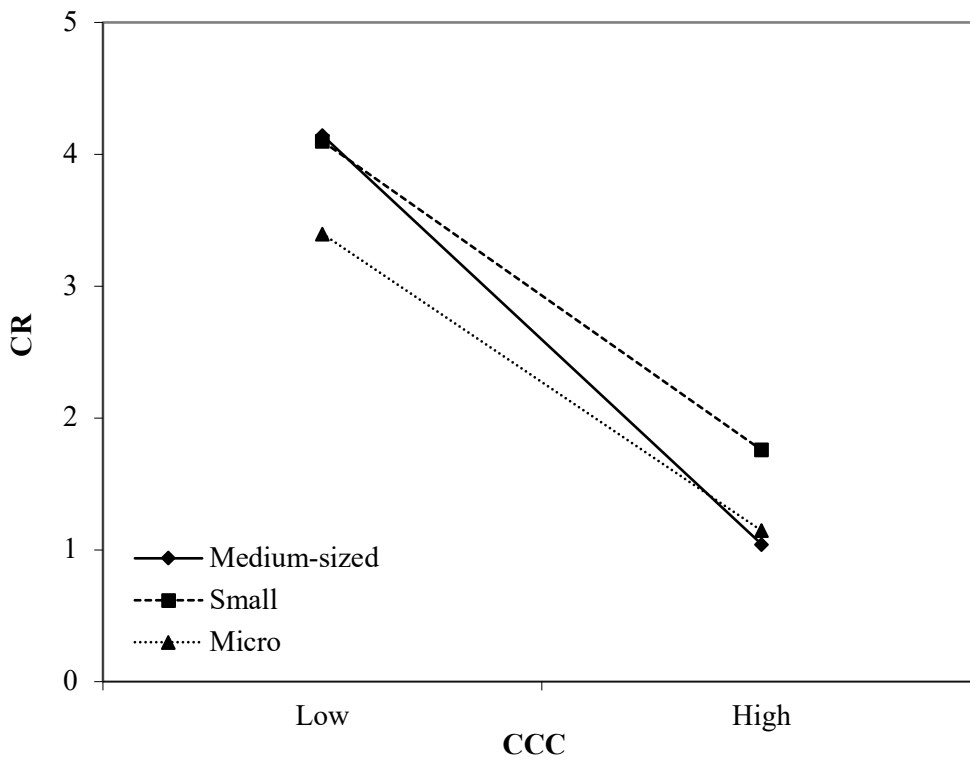
Table 4-8 Regression results for moderating effect of firm size

Model	6	7	8	9	10
Dependent variable	ROA	ROA	ROA	ROA	CR
IHD	-3.351***				
ARD		-1.274			
APD			-0.868***		
CCC				-1.595***	-1.548***
IHD×FS_1	2.217***				
IHD×FS_2	1.367				
ARD×FS_1		0.198			
ARD×FS_2		-0.497			
APD×FS_1			-0.639		
APD×FS_2			1.253		
CCC×FS_1				0.734	0.379***
CCC×FS_2				0.841	0.424**
FS_1	1.307	1.080	1.022	1.326	0.339**
FS_2	-0.504	-0.527	0.254	0.108	-0.317
SALE	2.023	2.301*	2.430	2.526**	0.015
GRT	0.057***	0.061***	0.061***	0.059***	-0.001
AGE	-0.076***	-0.070***	-0.076***	-0.074***	-0.016***
LEV	-16.677***	-17.068***	-16.634***	-17.347***	-0.017
CAR	11.393***	10.739***	10.547***	11.048***	0.357
CLR	-0.582	-0.335	-0.053	-0.891	-0.068
Constant	3.648	2.883	2.216	2.355	2.575
Wald chi-square	384.94	342.63	323.08	340.53	894.43
R ²	0.161	0.131	0.123	0.129	0.352

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$



(a)



(b)

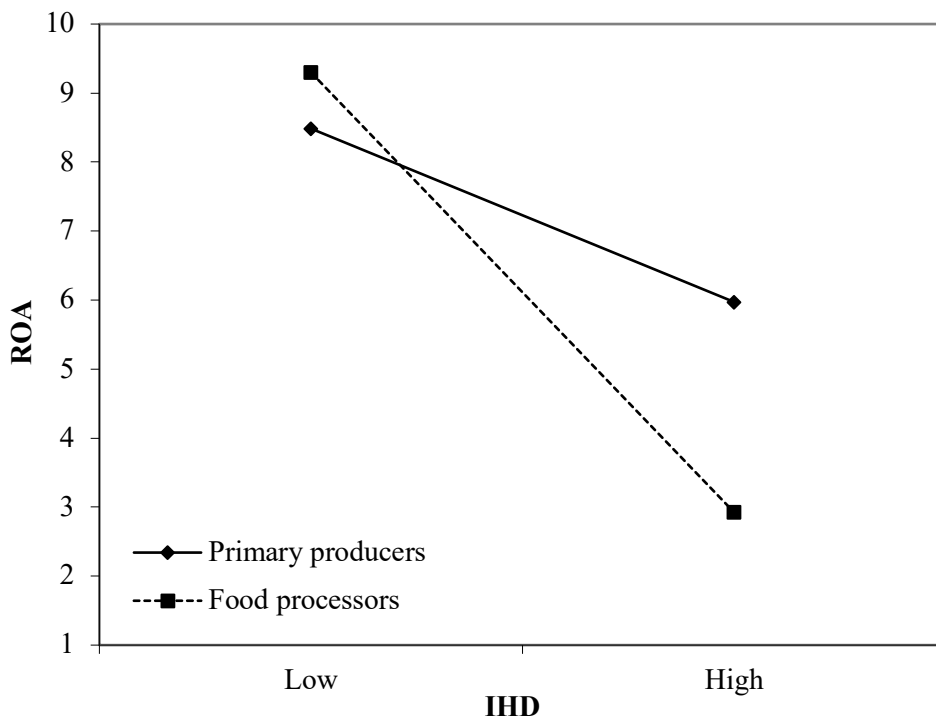
Figure 4-1 Plot of moderating effect of firm size

An interaction variable between the standardised WCM variable and SCP is added to each main model along with SCP to investigate the moderating effect of supply chain position. The VIF values of all variables are uniformly below the threshold value of 5 (see Appendix F.1) (Hair et al., 2014). Since SCP is a time-constant variable, again, the random effects model was adopted to test the moderating effect of supply chain position (Wooldridge, 2012, p.487). Table 4-9 reveals that SCP significantly and negatively moderates the negative association between IHD and ROA ($\beta = -1.934$, $p < 0.01$). Specifically, the negative relationship between IHD and ROA is stronger for food processors than it is for primary producers (Figure 4-2a), so *H7a* is supported. Contrary to the hypothesis, SCP positively moderates the negative relationship between ARD and ROA ($\beta = 1.022$, $p < 0.05$), indicating that the negative relationship between ARD and ROA is weaker for food processors compared to that for primary producers (Figure 4-2b), so *H7b* is not supported. SCP has no significant moderating effect on other examined relationships, so *H7c*, *H7d*, and *H7e* are not supported. Consequently, *H7* is partially supported.

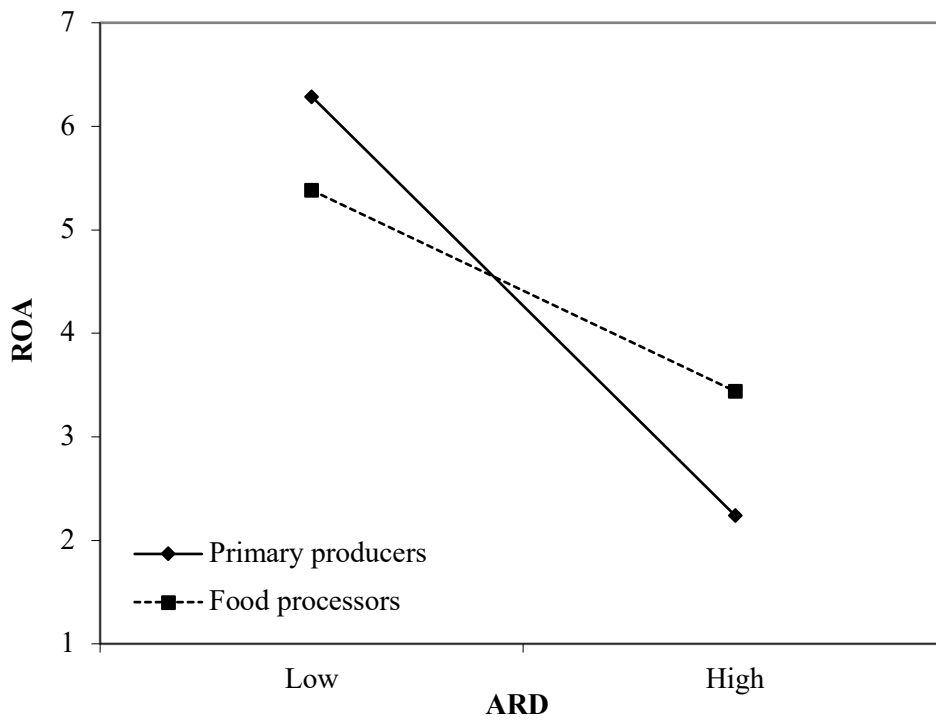
Table 4-9 Regression results for moderating effect of supply chain position

Model	11	12	13	14	15
Dependent variable	ROA	ROA	ROA	ROA	CR
IHD	-1.258***				
ARD		-1.964***			
APD			-0.542		
CCC				-1.292***	-1.472***
IHD×SCP	-1.934***				
ARD×SCP		1.022**			
APD×SCP			-0.594		
CCC×SCP				-0.050	0.109
SCP	-1.134	0.174	-0.882	-0.733	-0.290
SALE	1.374	2.012*	2.016*	1.762*	-0.154
GRT	0.057***	0.060***	0.062***	0.059***	-0.002
AGE	-0.076***	-0.070***	-0.077***	-0.074***	-0.016***
LEV	-16.763***	-17.177***	-16.507***	-17.376***	-0.022
CAR	11.555***	10.606***	10.901***	11.279***	0.360
CLR	-0.400	-0.396	0.191	-0.837	-0.065
Constant	7.217*	4.212	4.294	6.148	3.557***
Wald chi-square	373.59	346.30	322.48	335.14	852.37
R ²	0.155	0.134	0.123	0.128	0.332

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$



(a)



(b)

Figure 4-2 Plot of moderating effect of supply chain position

The results of the hypothesis testing are summarised in Table 4-10. The robustness of the findings was examined by regressing another representative profitability indicator, return on equity (ROE, calculated as (profit or loss before tax)/(total equity)×100) and liquidity indicator, quick ratio (QR, calculated as [(current assets)-inventories]/(current liabilities)) on the same independent and control variables (Pais and Gama, 2015), and similar findings were obtained (see Appendix F.3 to F.5).

Table 4-10 Summary of hypothesis testing results

Hypotheses	Coefficients	Results
<i>H1.</i> IHD negatively affects profitability of SMEs.	-0.121***	Supported
<i>H2.</i> ARD negatively affects profitability of SMEs.	-0.078***	Supported
<i>H3.</i> APD positively affects profitability of SMEs.	-0.057***	Rejected
<i>H4.</i> CCC negatively affects profitability of SMEs.	-0.083***	Supported
<i>H5.</i> CCC negatively affects liquidity of SMEs.	-0.035***	Supported
<i>H6.</i> Firm size moderates the relationship between WCM and financial performance of SMEs.		Partially supported
<i>H6a.</i> The negative relationship between IHD and profitability is stronger with increase in SMEs' firm size.	FS_1: 2.217*** FS_2: 1.367	Supported
<i>H6b.</i> The negative relationship between ARD and profitability is stronger with increase in SMEs' firm size.	FS_1: 0.198 FS_2: -0.497	Rejected
<i>H6c.</i> The positive relationship between APD and profitability is stronger with increase in SMEs' firm size.	FS_1: -0.639 FS_2: 1.253	Rejected
<i>H6d.</i> The negative relationship between CCC and profitability is stronger with increase in SMEs' firm size.	FS_1: 0.734 FS_2: 0.841	Rejected
<i>H6e.</i> The negative relationship between CCC and liquidity is stronger with increase in SMEs' firm size.	FS_1: 0.379*** FS_2: 0.424**	Supported
<i>H7.</i> Supply chain position moderates the relationship between WCM and financial performance of SMEs.		Partially supported
<i>H7a.</i> The negative relationship between IHD and profitability is stronger for food processors than it is for primary producers.	-1.934***	Supported
<i>H7b.</i> The negative relationship between ARD and profitability is stronger for food processors than it is for primary producers.	1.022**	Rejected
<i>H7c.</i> The positive relationship between APD and profitability is stronger for food processors than it is for primary producers.	-0.594	Rejected
<i>H7d.</i> The negative relationship between CCC and profitability is stronger for food processors than it is for primary producers.	-0.050	Rejected
<i>H7e.</i> The negative relationship between CCC and liquidity is stronger for food processors than it is for primary producers.	0.109	Rejected

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

4.5 Discussion

4.5.1 WCM and SMEs' Financial Performance

In line with the argument by Koumanakos (2008) and Johnston (2014) that inventory levels of SMEs are normally too high to be efficient, this study finds that IHD significantly and negatively influences SMEs' profitability (*H1*), suggesting that SMEs can improve their profitability by reducing inventory levels. In the food industry, most materials and products are perishable and have a short shelf life, so unlike other industries where surplus inventories can be consumed or sold in the future, excessive inventories in the food industry will lead to waste directly, which harms companies' profits. Thus, inventory management is of great importance for SMEs' profitability.

It is also found that ARD has a significantly negative impact on SMEs' profitability (*H2*), so shortening ARD can help improve their profitability. Although granting trade credit is widely used by large companies to attract customers and stimulate sales (Deloof and Jegers, 1996; Wilner, 2000), it is not an appropriate strategy for SMEs from the perspective of profitability. SMEs lack financial resources by nature, so they are less able to grant trade credit than large companies. SMEs that tend to grant trade credit to customers need to acquire external funds, such as bank loans, to maintain a smooth cash flow, which generate high costs due to interest. For SMEs that can hardly obtain external financing, granting trade credit even poses risks to their survival. Therefore, the costs associated with granting trade credit exceed the relevant benefits for SMEs. Indeed, this is validated by a pickle manufacturer:

"If I can collect the receivable faster, I do not need the overdraft and pay interest. I can maintain a good cash flow and invest the money in expanding my business, which I believe is beneficial for my profits."

In contrast to the hypothesis, a significantly negative impact of APD on SMEs' profitability is identified (*H3*), verifying that improving working capital at the expense of suppliers by delaying payments to them is an inefficient practice (Hofmann and Kotzab, 2010). Other relevant studies also obtain similar findings

(e.g. Deloof, 2003; Pais and Gama, 2015; Tran et al., 2017), which can be explained from a supply chain perspective. Specifically, in a supply chain context, a company's accounts payable is its suppliers' accounts receivable. The examined primary producers and food processors are two adjacent entities in the food supply chain, so most food processors' accounts payable is primary producers' accounts receivable, despite that some primary producers do not supply food processors directly and some suppliers for food processors are not in the typical food supply chain that is examined, like suppliers of packaging materials. Therefore, given the significantly negative relationship between ARD and profitability, a negative association between APD and profitability can be reasonably expected.

Moreover, many suppliers offer price discounts as a way of speeding up cash collection (Orobia et al., 2013), so buying SMEs may lose discounts if they delay payments to suppliers, which reduces their profitability. On the other hand, delaying payments can incur charges and penalties (Tauringana and Afrifa, 2013) and negatively influence the relationship with suppliers and future transactions, which is harmful to buying SMEs' profitability. As a result, some SMEs even try to speed up the payments to maintain a good relationship with suppliers and improve profitability, as noted by various food SMEs:

“One supplier gives us a 2.5 per cent discount if we pay immediately [...] We do not delay payments, because if you delay payments you become a very bad customer [...] We do speed up the payment to generate some goodwill with suppliers, and if you speed it up, you become a good customer and then get better services in the future [...] We are not going to deal with customers who do not pay on time, and we will terminate the relationship immediately.” (Crop grower)

“If we delay the payment, our suppliers will delay the delivery [...] That will be a big disaster, because the birds cannot get anything to eat [...] We even try to pay them earlier if we can, because we will get better and faster delivery.” (Egg producer)

“There will be a financial penalty if I delay the payment, either they would increase price on the next order, or they would charge a penalty for late payment directly.” (Manufacturer of wine)

It is worth noting that the possible endogeneity problem that less profitable SMEs tend to delay payments to their suppliers (Deloof, 2003) may also generate the negative relationship between APD and profitability.

The results reveal significantly negative impacts of CCC on both profitability (*H4*) and liquidity (*H5*) of SMEs. It is argued that there is a trade-off between profitability and liquidity and if firms focus on increasing their profitability they can harm their liquidity (Nobanee and Abraham, 2015), but this study shows that WCM is a tool for SMEs to improve both profitability and liquidity. To take advantage of WCM to improve financial performance, SME owner-managers are recommended to focus on inventory management first by decreasing the IHD, which has the strongest relationship with SMEs' profitability, followed by ARD and APD. The interview results further suggest that on-time payment is a critical aspect in accounts receivable and payable management, as highlighted by an egg producer:

"As long as my customers pay me on time, I can pay my suppliers on time, so it is a great cycle. Compared to collecting receivable faster, on-time payment is more important. As everybody is happy in that cycle, it is great for the business."

An SME's profitability is harmed if it cannot receive customers' payments on time. Then it tends to delay payments to suppliers to ensure a continuous cash flow (Lind et al., 2012), which is further harmful to its profits, due to the negative association between APD and profitability. Therefore, on-time payment ensures a healthy CCC along the supply chain and contributes to SMEs' financial performance.

4.5.2 Moderating Effect of Firm Size

This study identifies a significant moderating effect of firm size on the relationship between IHD and SMEs' profitability. Specifically, the negative relationship between IHD and profitability is stronger for medium-sized firms than it is for micro and small firms (*H6a*), which can be explained by the greater capability of medium-sized firms in inventory management. Although formal inventory management is still inadequate in SMEs (Rajeev, 2008), it is adopted more with increase in size (de Haan et al., 2007). This is also evidenced by interviews and

all three small firms participating in the interview adopted information systems to assist them with inventory management, while none of the four micro firms uses any inventory management systems. Despite that medium-sized firms are not included in the interview sample, it is reasonable to expect that they adopt more formal inventory management practices than micro and small firms due to the larger firm size and wider operations and product portfolios to manage. Therefore, compared to micro and small firms, medium-sized firms can manage their inventories more efficiently and are more able to capitalise on inventory management to improve profits by effectively reducing IHD. This can be demonstrated by the significant correlation between firm size variables and IHD (Table 4-6) – the larger the size of an SME, the more resources it has to invest in inventory management, the shorter its IHD, and the better the profitability. In addition, the inventory level of SMEs is usually increasing with growing firm size, so compared to micro and small firms, a one-day IHD reduction in medium-sized firms is associated with more reductions in inventory volumes and values, which have a stronger impact on profitability.

Similarly, with increase in firm size, the amount of working capital held by SMEs increases as well (Wasiuzzaman, 2018), so a one-day CCC reduction in medium-sized firms liberates more working capital tied up than it does in small firms and further micro firms, which has a higher impact on liquidity, explaining the finding that the negative relationship between CCC and liquidity becomes stronger with increase in SMEs' firm size (*H6e*). Moreover, as indicated by the significant correlation between firm size variables and CCC in Table 4-6, CCC is shorter with growing firm size, because larger SMEs have more resources to effectively reduce the CCC (Moss and Stine, 1993). Therefore, medium-sized firms have more capabilities than small firms to capitalise on WCM to improve liquidity, and small firms have more capabilities than micro firms. When this was explained in the interview, two SME owner-managers said:

“Larger companies have more muscle, so if my company becomes larger, I would be able to better negotiate payment periods with customers and suppliers.” (Manufacturer of pickles)

“With the bigger size, one of the things I can do is to negotiate my payment terms better.”
(Crop grower)

4.5.3 Moderating Effect of Supply Chain Position

It is found that supply chain position moderates the relationship between IHD and SMEs' profitability. In detail, the negative relationship between IHD and profitability is stronger for food processors than it is for primary producers (*H7a*). Some primary producers keep inventories to accommodate price fluctuation, which contributes to their profits and offsets the negative impact of IHD on profitability. This is evidenced by a crop grower:

“We keep stocks of fertiliser because normally, it is much cheaper to buy in June or July rather than the following February. There is a cost saving of 15 or 20 per cent if you buy it earlier [...] We also keep some final products because of the price difference over time. For example, we can sell wheat at the moment for 160 pounds a ton, and back at harvest time it was 130.”

However, keeping inventories to accommodate price fluctuation is not an appropriate strategy for food processors, because their inventories are more perishable than those for primary producers, including both raw materials and final products. Therefore, although the relationship between IHD and profitability is still negative for primary producers, it is not as strong as it is for food processors. Additionally, as the value of inventory is increasing when it gets closer to the point of consumption (Lambert and Pohlen, 2001), a one-day IHD reduction can lead to more cost reductions and further profit improvements for food processors than it does for primary producers.

Furthermore, due to the perishability of inventory, inventory management is more important for food processors, as noted by a manufacturer of pastry:

“When the inventory is stable with a long shelf life, it does not cause me a problem [...] We are now having difficulty with fresh materials, and this is quite an acute problem for me [...] My finance will be much improved if the supply and inventory of them become better.”

As a result, food processors tend to adopt formal inventory management practices, which is not the case for primary producers. Two of the interviewed

food processors used inventory management systems and another two adopted the make-to-order strategy to effectively reduce inventory, while only one of the three interviewed primary producers had a formal inventory management system. Thus, food processors are more capable of reducing inventory levels than primary producers, resulting in a stronger relationship between IHD and profitability. However, it is noted that the non-adoption of formal inventory management practices of the two interviewed primary producers may emanate from their micro firm size, so this argument needs further empirical evidence with a larger sample size.

Contrary to the hypothesis, the results indicate that the negative association between ARD and profitability is stronger for primary producers than it is for food processors (*H7b*). Compared to primary producers, most food processors are associated with larger customers in the supply chain, like large retailers. Although some primary producers also supply large retailers directly, the proportion of larger customers for primary producers is incomparable with that for food processors. Due to the relatively strong supply chain power, larger customers tend to propose long and fixed payment periods for food processors and usually delay payments (Lloyds Bank, 2019). As a result, food processors can hardly shorten their ARD, thus having difficulty in taking advantage of accounts receivable management to improve their profits. A crop grower addressed the payment issue of retailers:

“Most retailers are very big and powerful, so they are normally bad at paying processors and packers, which further influences processors’ and packers’ payments to us. That is why in this country, we have the Groceries Code Adjudicator (GCA) and Groceries Supply Code of Practice (GSCP).”

Indeed, having realised the possible negative effect of larger retailers’ strong supply chain power, the UK government has established regulators like the GCA and formulated regulations like the GSCP to ensure that retailers treat their suppliers lawfully and fairly.

4.6 Conclusion

This paper fulfils the research objective by empirically identifying the relationships between IHD, ARD, APD, and CCC and SMEs' financial performance, measured by profitability and liquidity, based on data of 325 SMEs from the UK upstream food supply chain for the period between 2012 and 2018. Firm size and supply chain position are also found to moderate the relationship between WCM and SMEs' financial performance. Discussions and explanations for the results are provided based on interviews with executives from UK food SMEs and the relevant literature.

4.6.1 Theoretical Implications

This study contributes to the literature in a number of ways. First, given that the relationship between WCM and SMEs' financial performance is still inconclusive and few relevant studies focus specifically on the UK or the food industry (Afrifa et al., 2016), this research expands the body of literature of WCM in SMEs by revealing the criticality of WCM in driving the financial performance of UK food SMEs and prioritising WCM components in improving their financial performance. Despite some relevant studies in this area, most of them lack the multiplicity of financial goals by focusing on profitability only (Töyli et al., 2008). This research bridges this gap by adopting liquidity along with profitability to evaluate SMEs' financial performance. As a proxy of WCM, CCC is negatively associated with both profitability and liquidity of SMEs. This finding challenges the traditional trade-off between profitability and liquidity (Nobanee and Abraham, 2015) and contends that WCM can improve SMEs' profitability and liquidity simultaneously.

All three working capital components – IHD, ARD, and APD – have significantly negative relationships with SMEs' profitability. Upon the identification of linear and negative relationships between WCM and its components and SMEs' financial performance, this paper verifies that most SMEs hold an excessive amount of working capital (Howorth and Westhead, 2003). Given the concave relationship between CCC and profitability in large companies (Aktas et al., 2015; Baños-Caballero et al., 2014), findings of this study empirically demonstrate the

heterogeneity of SMEs in WCM and strengthen the idea that SMEs and large companies should be examined separately in WCM research.

Moreover, the existing research on firm size differentials almost exclusively focuses on SMEs versus large companies, while few studies investigate the difference within SMEs (Bourlakis et al., 2014). Additionally, according to the best of the author's knowledge, no empirical study has examined supply chain position as a moderator in the relationship between WCM and firms' financial performance. This paper closes those gaps and contributes to the areas of supply chain management and supply chain finance by identifying the moderating effects of firm size and supply chain position on the relationship between WCM and SMEs' financial performance. It is found that the negative relationship between IHD and profitability is stronger for medium-sized firms than it is for micro and small firms, and the negative relationship between CCC and liquidity is stronger with increase in SMEs' firm size, highlighting the existence of heterogeneity within SMEs. Supply chain position is also found to significantly moderate the impact of IHD and ARD on SMEs' profitability, providing a novel perspective for supply chain finance-related studies.

Most studies examining the relationship between WCM and firms' financial performance fail to explain the reasons behind the identified phenomena. This paper contributes to knowledge by shedding light on the relationship between WCM and SMEs' financial performance and the moderating effects of firm size and supply chain position based on empirical evidence. The moderating effect of firm size emanates from the positive association between the amount of working capital being held and firm size and that larger SMEs have more resources to effectively manage working capital. The variances between primary producers and food processors emanate from their differences in managing working capital and challenges brought by supply chain position, such as weak supply chain power. Those findings enrich our understanding of the impact of WCM on SMEs' financial performance and contribute to expanding the literature on WCM and supply chain finance.

4.6.2 Managerial Implications

This paper also offers significant implications for SME owner-managers and policymakers. Given that SMEs are resource-constrained by nature (Ellegaard, 2006), this paper can help owner-managers of UK food SMEs make informed decisions regarding resource allocation on WCM, which can contribute to both their profitability and liquidity. Since IHD has the strongest relationship with SMEs' profitability, SME owner-managers should prioritise shortening IHD by allocating more resources on inventory management, followed by accounts receivable and payable management. WCM is a supply chain-wise activity and delaying payments to suppliers is harmful to both supplying and buying SMEs' profitability. Therefore, SMEs should speed up the payment to suppliers, especially those SMEs that can collect payments from customers faster.

SMEs with different firm sizes and supply chain positions should have different managerial focuses. Medium-sized firms should lay more emphasis on WCM, especially inventory management, by reducing IHD and CCC. Micro and small firms can adopt more formal WCM practices, such as WCM policies, inventory management systems, and financial management systems, to increase the effectiveness of WCM and their capability to yield financial benefits from it. In comparison to primary producers, inventory management is more effective for food processors in terms of profitability improvement, so primary producers are recommended to adopt appropriate inventory management strategies and systems to increase the impact of inventory management on their financial performance.

This study also calls for large retailers to pay their small suppliers on time and shorten the payment period to ensure SMEs' survival and a healthy supply chain development. From the supply chain perspective, if all supply chain members can collectively speed up payments to their suppliers, the working capital tied up in the supply chain will be reduced, improving the competitiveness of the whole supply chain. However, before speeding up payment, on-time payment is a prerequisite, which warrants a healthy and predictable CCC and benefits the financial performance of all companies in the supply chain. Policymakers and the

government should also establish regulators and effectively enforce regulations to avoid large retailers' abuse of power and protect food SMEs from working capital issues resulting from large retailers' late payment.

4.6.3 Limitations and Future Research

This study concentrates only on SMEs in the UK upstream food supply chain because of their specialisation on food products, which constrains the generalisability of the findings. It is recommended that future research can replicate this study in other countries and/or industries. Future research can also isolate the financial performance of food products in wholesalers and retailers and extend the current research to downstream members of the food supply chain. Due to data availability, the number of sample companies is unbalanced across three firm sizes. Although the number of observations in each firm size group is sufficient to warrant the reliability of findings, future research can obtain a balanced data set in terms of firm size to increase the accuracy of firm size-related results. The author argues that food processors adopt more formal inventory management practices than primary producers, which leads to the moderating effect of supply chain position on the relationship between IHD and profitability, but the small sample of interviewees constrains the representativeness of this argument. Therefore, future research is recommended to empirically investigate the difference in inventory management between primary producers and food processors.

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5 CONCLUSIONS

5.1 Achievement of Research Objectives

The aim of this thesis is to test the relationship between supply chain activities and financial performance of small and medium-sized enterprises (SMEs) and examine the moderating effects of firm size and supply chain position on this relationship, which is further split into five research objectives. The three papers in this thesis collectively and successfully achieve those research objectives and relevant results are summarised in Table 5-1.

Paper One fulfils Research Objective 1 based on 110 papers identified through a systematic literature review (SLR). A conceptual framework is established with nine supply chain activities contributing to financial performance of SMEs, which are further classified into three categories: internal supply chain activities, consisting of purchasing, production, transport, and inventory management, external supply chain activities, including supplier partnership and customer partnership, and spanning supply chain activities, comprising supply chain strategy, quality management, and information sharing (Figure 2-3). However, two supply chain activities, outsourcing and sustainable supply chain management (SCM), which are applicable to large companies, are found ineffective in improving SMEs' financial performance because of the associated hidden costs of these activities. The literature supports that firm size and supply chain position moderate the relationship between supply chain activities and SMEs' financial performance.

Paper One also contributes to fulfilling Research Objective 2 by establishing a framework of financial key performance indicators (KPIs) for SMEs (Figure 2-2). Those KPIs reflect five financial dimensions which are classified into two sequential business objectives: financial objectives include profitability, liquidity, and asset utilisation, while competitiveness is measured by growth and market share.

Table 5-1 Achievement of research objectives

Number	Research objectives	Results
1	To identify supply chain activities that can influence SMEs' financial performance from the extant literature.	<ul style="list-style-type: none"> • Nine supply chain activities that contribute to SMEs' financial performance are identified from the literature: purchasing, production, transport, inventory management, supplier partnership, customer partnership, supply chain strategy, quality management, and information sharing. • Two supply chain activities, outsourcing and sustainable supply chain management, are found ineffective in improving SMEs' financial performance.
2	To identify financial dimensions and indicators that are critical in measuring SMEs' financial performance from the extant literature.	<ul style="list-style-type: none"> • A framework of financial KPIs for SMEs is established, which can be classified into five financial dimensions: profitability, liquidity, asset utilisation, growth, and market share.
3	To empirically investigate the relationship between internal supply chain activities and SMEs' financial performance.	<ul style="list-style-type: none"> • Production and inventory performance have significantly positive effects on SMEs' financial performance, including profitability, liquidity, and revenue growth. • Purchasing and transport performance do not have significant effects on SMEs' financial performance. • All three working capital components, inventory holding days, accounts receivable days, and accounts payable days, have significantly negative relationships with SMEs' profitability. • Cash conversion cycle, as a proxy of working capital management, is negatively associated with both profitability and liquidity of SMEs.
4	To empirically investigate the moderating effects of firm size and supply chain position on the relationship between internal supply chain activities and SMEs' financial performance.	<ul style="list-style-type: none"> • Firm size significantly moderates the relationships between inventory holding days and profitability and between cash conversion cycle and liquidity. • Supply chain position significantly moderates the relationship between purchasing performance and SMEs' profitability. • Supply chain position significantly moderates the relationship between purchasing, production and inventory performance and SMEs' liquidity. • Supply chain position significantly moderates the relationship between inventory holding days and accounts receivable days and SMEs' profitability.
5	To explore reasons for the significant or insignificant relationship between internal supply chain activities and SMEs' financial performance and the moderating effects of firm size and supply chain position.	<ul style="list-style-type: none"> • The moderating effect of firm size emanates from the positive association between firm size and the amount of inventory and other types of working capital being held and that larger SMEs have more resources to effectively manage supply chain activities. • The variances between primary producers and food processors emanate from their differences in implementing supply chain activities and challenges brought by supply chain position, such as weak supply chain power.

Paper Two and Three provide empirical evidence for Research Objective 3, 4 and 5. Based on survey data collected from 318 SMEs in the UK upstream food supply chain, partial least squares structural equation modelling (PLS-SEM) results in Paper Two indicate that superior production and inventory performance can significantly improve SMEs' financial performance, including profitability, liquidity, and revenue growth, while purchasing and transport performance do not have significant effects. According to financial data of 325 SMEs in the UK upstream food supply chain from 2012 to 2018, panel data regression results in Paper Three suggest that inventory holding days (IHD) have a significantly negative relationship with SMEs' profitability, triangulating the finding in Paper Two that improving inventory performance by decreasing IHD can increase SMEs' profitability. Paper Three further expands the research area to working capital management (WCM) and identifies that in addition to IHD, other two working capital components, accounts receivable days (ARD) and accounts payable days (APD), also have significantly negative relationships with SMEs' profitability. Cash conversion cycle (CCC), as a proxy of WCM, is negatively associated with both profitability and liquidity of SMEs. Therefore, Research Objective 3 is successfully achieved.

In regard to Research Objective 4, Paper Two identifies no significant moderating effect of firm size on the relationship between the examined four internal supply chain activities (purchasing, production, transport, and inventory performance) and SMEs' financial performance, so relevant results are not reported in the thesis. However, Paper Three reveals that firm size significantly moderates the relationship between IHD and SMEs' profitability. Specifically, the negative relationship between IHD and profitability is stronger for medium-sized firms than it is for micro and small firms. Moreover, firm size moderates the relationship between CCC and SMEs' liquidity – the negative relationship between CCC and liquidity becomes stronger with increase in SMEs' firm size.

Supply chain position also moderates the relationship between supply chain activities and SMEs' financial performance. First, supply chain position moderates the impact of inventory performance on SMEs' profitability and

liquidity. In detail, the positive impact of inventory performance on SMEs' profitability and liquidity is stronger for food processors than it is for primary producers. Supply chain position also significantly moderates positive relationships between purchasing performance and SMEs' profitability and between purchasing and production performance and SMEs' liquidity. Those relationships are stronger for primary producers than they are for food processors. Additionally, the negative relationship between ARD and SMEs' profitability is stronger for primary producers than it is for food processors. Due to the significant moderating effect of supply chain position, the author separately examines SMEs at different supply chain positions in Paper Two and prioritises sub-constructs of the four supply chain activities in improving their financial performance. As a result, Research Objective 4 is fully achieved.

The identified relationships between internal supply chain activities and SMEs' financial performance and the moderating effects of firm size and supply chain position on those relationships are interpreted based on the existing literature and qualitative data collected from interviews with seven executives from UK food SMEs. The moderating effect of firm size emanates from the positive association between firm size and the amount of inventory and other types of working capital being held and that larger SMEs have more resources to effectively manage supply chain activities. The variances between primary producers and food processors emanate from their differences in implementing supply chain activities and challenges brought by supply chain position, such as weak supply chain power. For instance, compared to primary producers, food processors are associated with larger customers, which usually propose fixed and long payment periods, constraining food processors' capability to improve their liquidity by supply chain activities. Consequently, Research Objective 5 is successfully fulfilled.

5.2 Contributions

5.2.1 Theoretical Contributions

This research makes a number of contributions to the existing literature and theories. First, it expands the body of literature of SCM to the SME context. Due to the heterogeneity of SMEs in SCM compared to large companies and the large-firm focus of contemporary SCM theories and activities (Kull et al., 2018), the effectiveness of SCM in improving financial performance of SMEs is still controversial (e.g. Arend and Wisner, 2005; Hamister, 2012; Jayaram et al., 2014; Thakkar et al., 2013; Vaaland and Heide, 2007; Williams, 2006). However, to the best of the author's knowledge, there is no study having a conclusive overview of the impact of supply chain activities on SMEs' financial performance, so this research closes this gap by systematically reviewing the relevant literature, identifying nine effective and two ineffective supply chain activities for SMEs, and articulating their impacts on SMEs' financial performance. The established conceptual framework (Figure 2-3) summarises the existing research on the relationship between supply chain activities and SMEs' financial performance and highlights that although SMEs can improve their financial performance by using some supply chain activities, not all supply chain activities that can contribute to large companies' financial performance are appropriate for SMEs.

Furthermore, most empirical studies examining the impact of supply chain activities on SMEs' financial performance focus on external supply chain activities (e.g. Kumar et al., 2016; Sukwadi et al., 2013), and, therefore, a research gap exists for the relationship between internal supply chain activities and SMEs' financial performance. This research closes this gap by identifying positive impacts of production and inventory performance on SMEs' financial performance, including profitability, liquidity, and revenue growth. Although purchasing and transport performance can contribute to large companies' financial performance (Shi and Yu, 2013), they are financially insignificant for SMEs. Those findings empirically demonstrate the heterogeneity of SMEs in SCM and strengthen the idea that SMEs and large companies should be examined separately in SCM research.

Since some internal supply chain activities like production and inventory management are effective in improving SMEs' financial performance, this research empirically demonstrates that SCM is a good fit for SMEs. It also provides evidence for the argument that SMEs have not fully exploited the potential of internal supply chain activities to improve financial performance (Kumar and Singh, 2017), because some internal supply chain activities like purchasing and transport do not significantly influence SMEs' financial performance. Given that a high degree of utilisation and exploitation of internal supply chain activities is a prerequisite for the effectiveness of external supply chain activities (Huo, 2012), this research potentially explains the insignificant relationship between external supply chain activities and SMEs' financial performance identified previously (e.g. Arend and Wisner, 2005).

Second, most studies and companies evaluate financial performance based on profitability only, lacking the multiplicity of financial goals (Töyli et al., 2008). Although financial performance measurement is a common theme for businesses, most KPI frameworks are designed for large companies instead of SMEs. This research addresses this gap by establishing a framework of financial KPIs which is applicable for SMEs at different development stages, contributing to performance measurement of SMEs. Moreover, it is widely argued that as a part of supply chain performance measurement, the causal relationship between supply chain activities and financial outcome measures should be established (Iltner and Larcker, 2003), so this research also contributes to supply chain performance measurement of SMEs.

Third, considering that the relationship between WCM and SMEs' financial performance is still inconclusive and few relevant studies focus specifically on the UK or the food industry (Afrifa et al., 2016), this research makes contributions to supply chain finance of SMEs by revealing the criticality of WCM in driving the financial performance of UK food SMEs and prioritising WCM components in improving their financial performance. It is found that as a proxy of WCM, CCC is negatively associated with both profitability and liquidity of SMEs, which challenges the traditional trade-off between profitability and liquidity (Nobanee

and Abraham, 2015) and contends that WCM can improve SMEs' profitability and liquidity simultaneously. Upon the identification of linear and negative relationships between WCM and its components and SMEs' financial performance, this paper verifies that most SMEs hold an excessive amount of working capital (Howorth and Westhead, 2003). Given the concave relationship between CCC and profitability in large companies (Aktas et al., 2015; Baños-Caballero et al., 2014), those findings empirically demonstrate that the heterogeneity of SMEs also exists in WCM, so SMEs and large companies should not be treated as a homogenous group in WCM research.

Fourth, the existing studies of firm size differentials almost exclusively focus on SMEs versus large companies, while few studies investigate the difference within SMEs, i.e. between micro, small, and medium-sized firms (Bourlakis et al., 2014). Additionally, although some researchers have realised the moderating effect of supply chain position on SCM (e.g. Shah and Shin, 2007; Töyli et al., 2008), according to the best of the author's knowledge, almost none of them explicitly examine supply chain position as a moderator in the relationship between supply chain activities and firms' financial performance. This research further extends its contribution to the intersection field of SCM, finance, and SMEs by investigating the moderating effects of firm size and supply chain position on the impact of internal supply chain activities and WCM on SMEs' financial performance. By identifying the significant moderating effect of firm size on the relationship between inventory performance and SMEs' financial performance, this research proves that the heterogeneity regarding inventory management exists not only between SMEs and large companies but also within SMEs.

On the other hand, supply chain position is found to significantly moderate the impact of some supply chain activities and WCM components on certain financial dimensions of SMEs, and differences in the significance of internal supply chain activities on financial performance between primary producers and food processors are also observed. As a result, this research highlights that supply chain position is a critical factor that cannot be ignored in SCM and WCM, providing a novel perspective for SCM and supply chain finance-related studies.

Finally, most studies examining the relationship between supply chain activities and WCM and firms' financial performance fail to explain the reasons behind the identified phenomena. This paper contributes to knowledge by shedding light on the impact of internal supply chain activities and WCM on SMEs' financial performance and the moderating effects of firm size and supply chain position based on empirical evidence. Those findings enrich our understanding of the impact of supply chain activities and WCM on SMEs' financial performance and contribute to the literature on SCM and supply chain finance.

5.2.2 Methodological Contributions

Although it is widely accepted and well established in the literature that the performance of internal supply chain activities, including purchasing, production, and transport, is commonly measured by four dimensions: cost, quality, time, and flexibility (Christopher, 2016, p.143), there is a lack of a comprehensive set of measurement items for performance measurement of internal supply chain activities. Most studies examining performance of supply chain activities focus only on single supply chain activity (e.g. González-Benito, 2007; Islam et al., 2013) or even single performance dimension of a supply chain activity, such as flexibility (e.g. Olhager, 1993). Additionally, most supply chain performance measurement items are designed for manufacturing firms (e.g. Caniato et al., 2014; Chavez et al., 2017), lacking the applicability to companies at other supply chain positions or in other industries.

This research develops a comprehensive set of measurement items for four internal supply chain activities (purchasing, production, transport, and inventory management) in manufacturing companies through an extensive review of relevant studies. Other two sets of measurement items with wording being adapted to contexts of crop growing and animal raising respectively are also developed (Appendix B.3). Therefore, those measurement items can be used to evaluate the internal supply chain performance of both manufacturing and agricultural companies. Those measurement items were then tested through semi-structured interviews with seven academic experts and six executives from UK food SMEs to ensure their understandability. Since the content validity of

those measurement items are well supported by the literature and verified by both academic experts and practitioners, they can be used directly by future research to evaluate performance of internal supply chain activities, thus contributing to the methodology of supply chain performance measurement.

Despite that the mixed method combining both quantitative and qualitative methodologies is widely used in SCM research, most relevant studies adopt the sequential exploratory research design (Saunders et al., 2016, p.171). Under this research design, qualitative research is conducted first to explore and develop theories, followed by quantitative research to test the theories developed (e.g. Valsamakis and Sprague, 2001). However, in the situation that theories are advanced by testing established theories in different contexts and further exploring factors leading to variances in phenomena between contexts, the sequential explanatory research design is more appropriate, where qualitative research is conducted following quantitative research. Considering that contemporary SCM theories are mainly designed for large companies, the sequential explanatory research design provides an avenue for extending SCM theories to SMEs and other contexts. By first quantitatively examining the financial contribution of supply chain activities that are applicable to large companies in SMEs and further qualitatively interpreting the unique characteristics of the financial impact of supply chain activities in SMEs, this research demonstrates that the sequential explanatory research design is valid in SCM research and for SCM theory development.

5.2.3 Practical Contributions

This research makes significant practical contributions and offers numerous practical implications for SME owner-managers. First, given that SMEs are resource-constrained by nature and tend to exploit internal resources for business improvements (Ellegaard, 2006), this research can help owner-managers of UK food SMEs make informed decisions on the priority of internal supply chain activities in improving their companies' financial performance. SMEs with different firm sizes should have different managerial focuses on inventory management. Compared to micro and small firms, IHD has a stronger and

negative impact on profitability of medium-sized firms, so medium-sized firms should lay more emphasis on improving the effectiveness of their inventory management practices to decrease inventory levels and IHD and further to improve their profitability. On the other hand, the weaker relationship between IHD and profitability for micro and small firms partially emanated from their infrequent adoption of formal inventory management practices. Therefore, in terms of inventory management, micro and small firms should focus on adopting more formal inventory management practices, such as ABC analysis and inventory management systems, to increase their capability to yield financial benefits from inventory management.

UK Food SMEs with different supply chain positions and financial objectives are also recommended to have different managerial priorities of internal supply chain activities to improve financial performance. To improve profitability, liquidity, and revenue growth, primary producers can rely on the improvement of their purchasing, production, and inventory performance. For food processors, improving production and inventory performance can significantly contribute to their profitability, and improving inventory performance can increase their liquidity. Production is the only internal supply chain activity that can be used to increase food processors' revenue growth. To capitalise on purchasing in improving financial performance, primary producers should emphasise purchasing quality, followed by purchasing flexibility, time, and cost. Regarding production performance, primary producers are recommended to improve their production quality first. Subsequently, resources can be allocated in sequence to the aspects of production flexibility, cost, and time. On the other hand, the priority sequence of the four aspects of production performance for food processors is flexibility, quality, time, and cost. In comparison to primary producers, inventory management is more effective for food processors in terms of profitability improvement, so primary producers are recommended to adopt appropriate inventory management strategies and systems to increase the impact of inventory management on their financial performance. Moreover, final product inventory is more financially important than raw material inventory for primary

producers, while food processors should prioritise the performance of raw material inventory over that of final product inventory.

Second, this research can assist owner-managers of UK food SMEs to make informed decisions regarding resource allocation on WCM components. Since IHD has the strongest relationship with SMEs' profitability, SME owner-managers should prioritise shortening IHD by allocating more resources on inventory management, followed by accounts receivable and payable management. WCM is a supply chain-wise activity and delaying payments to suppliers is harmful to both supplying and buying SMEs' profitability. Therefore, SMEs should speed up the payment to suppliers, especially those SMEs that can collect payments from customers faster. Since the impact of CCC on liquidity becomes stronger with increase in SMEs' firm size, reducing CCC would be a particularly effective method for larger SMEs, like medium-sized firms, when they encounter liquidity problems. Smaller SMEs, like micro firms, should invest more in WCM, such as financial management systems, to increase its effectiveness.

Third, this research also calls for large retailers to pay their small suppliers on time and shorten the payment period to ensure SMEs' survival and a healthy supply chain development. From the supply chain perspective, if all supply chain members can collectively speed up payments to their suppliers, the working capital tied up in the supply chain will be reduced, improving the competitiveness of the whole supply chain. However, before speeding up payment, on-time payment is a prerequisite, which warrants a healthy and predictable CCC and benefits the financial performance of all companies in the supply chain.

Fourth, the situation that SME owner-managers are overloaded with financial data which are too complex to inform decision-making (Hudson et al., 2001) can be alleviated by adopting the framework of financial KPIs. This framework provides SME owner-managers with a comprehensive way to evaluate their companies' financial performance with a limited number of financial indicators. To measure SMEs' performance from the financial perspective, owner-managers need to ensure the achievement of their financial objectives in terms of liquidity indicating survival, asset utilisation focusing on efficiency, and profitability

suggesting the bottom line. With the development and expansion, SMEs should increasingly emphasise competitiveness constructed by market share and growth.

This research is also of great implications for the government and policymakers. Given the heterogeneity in terms of inventory management and WCM within SMEs (i.e. between micro, small, and medium-sized firms) and that the amount of resources held by SMEs is positively associated with their firm size (Bourlakis et al., 2014), the UK government and policymakers should formulate preferential policies and provide financial support for smaller SMEs, like micro and small firms, to encourage them to adopt formal inventory management and WCM practices and to invest in inventory management and financial management systems. The government can also organise training programmes for SME owner-managers to improve their inventory management and WCM capability and the effectiveness of their management.

In light of the cause of the difference in the impact of purchasing performance on financial performance between primary producers and food processors, the UK government and policymakers should encourage small food processors to establish and join purchasing alliances to enhance their bargaining power and purchasing expertise. Relevant associations, such as the Chartered Institute of Procurement and Supply (CIPS), can also unite their members in collaborative purchasing. Finally, the UK government and policymakers should establish regulators and effectively enforce regulations to avoid large retailers' abuse of power and protect food SMEs from working capital issues resulting from large retailers' late payment.

5.3 Limitations

There are a few limitations of this research. First, the literature search in the SLR (Paper One) cannot be guaranteed to be exhaustive. The adoption of keywords in literature search might omit some relevant papers which do not use those specific keywords, and some relevant papers may not be indexed by the adopted databases.

Second, the two empirical studies (Paper Two and Three) concentrate only on SMEs in the UK upstream food supply chain because of their specialisation on food products, which constrains the generalisability of the findings.

Third, Paper Two relies on perceptual performance measures only, which could lead to the issue of common method variance. However, statistical test based on Harman's single factor (Podsakoff et al., 2003) shows that common method variance is of no concern in Paper Two.

Fourth, the examination of the moderating effect of supply chain position in Paper Two may be subject to measurement errors resulting from the use of different versions of the questionnaire for crop growers, animal raisers, and food processors respectively. Those three versions only have the wording being adapted to specific contexts and their content validity and consistency were pilot tested with academic experts and practitioners in the examined industry, so the measurement error is minimised.

Fifth, although the number of observations in each firm size group in Paper Three is sufficient to warrant the reliability of relevant findings, the number of sample companies is unbalanced across three firm sizes due to data availability, which may negatively influence the accuracy of firm size-related findings.

Finally, the sample of interview participants for both empirical studies is small. Interview in this research is mainly used to interpret the quantitative results obtained by backing up arguments derived from the literature, so given the support of literature, the small sample of interviewees does not significantly influence the validity and reliability of relevant arguments.

5.4 Future Research Directions

This research provides a plethora of future research avenues. First, the conceptual model of the relationship between supply chain activities and SMEs' financial performance established based on the systematic review of literature requires further empirical examination. This model consists of a variety of supply chain activities but not all of them are widely adopted by SMEs due to resource constraints, such as information technology. Future research can refine the

model through case studies or qualitative interviews to identify which supply chain activities are commonly adopted by and mostly relevant, suitable, and appropriate for SMEs to improve financial performance. Given the empirical investigation of internal supply chain activities in this research, future research can further validate the conceptual model by empirically examining the impact of external and spanning supply chain activities on SMEs' financial performance. Particularly, considering the prevalence and importance of outsourcing in SMEs but very few studies empirically investigate the effect of outsourcing on financial performance of SMEs, future research is recommended to address this gap. Moreover, future research can extend the examination of the moderating effects of firm size and supply chain position by comparing the effect of external and spanning supply chain activities on financial performance of SMEs with different firm sizes and/or supply chain positions.

Second, the limitations of empirical studies can be addressed in the future. Since the generalisability of the two empirical papers (Paper Two and Three) is constrained due to the focus on SMEs in the UK upstream food supply chain only, future research is recommended to replicate both studies in other countries, especially developing countries, and industries with high specialisation, like the furniture industry. It is observed that the explanations for the impact of supply chain activities on SMEs' financial performance and the moderating effect of supply chain position in this research are mainly country- and industry-specific, such as the perishability of food inventory and imbalanced supply chain power in the UK food supply chain (Zissis et al., 2018), so it is expected that replication studies in other countries and industries can obtain different findings. It would also be interesting in future research to isolate the financial performance of food products in wholesalers and retailers and extend the current empirical studies to further downstream of the food supply chain. Despite that common method variance is not an issue in the empirical research, future research can combine data from different sources to further mitigate its effect. For example, future research can collect primary supply chain data of SMEs via survey and retrieve secondary financial data of corresponding SMEs from financial databases to investigate the relationship between supply chain activities and SMEs' financial

performance. Furthermore, future research can obtain a balanced data set in terms of firm size to increase the accuracy of firm size-related results.

Third, this research also sheds light on some topics for future research. Although it is argued that a high degree of utilisation and exploitation of internal supply chain activities is a prerequisite for the effectiveness of external supply chain activities (Huo, 2012), there is a lack of studies empirically examining this relationship. By further collecting data of external supply chain activities, future research can empirically test if a good performance of internal supply chain activities is a prerequisite for external supply chain activities to generate financial benefits, which can better assist SME owner-managers to manage and allocate resources on different supply chain activities. Moreover, to deepen the understanding of the moderating effects of firm size and supply chain position on the relationship between supply chain activities and food SMEs' financial performance, it is recommended that future research should investigate the reasons behind by conducting case studies or large-scale interviews. For instance, future research can examine the difference in inventory management between primary producers and food processors. The investigation of the moderating effect of supply chain position can be extended to large firms to check if the heterogeneity between SMEs and large firms still exists in regard to supply chain position.

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APPENDICES

Appendix A Systematic Literature Review Appendices

A.1 Quality Appraisal Criteria

Table A-1 Quality appraisal criteria

Element	0-Absence	1-Weak	2-Moderate	3-Strong	Not applicable
Theoretical Background	The paper does not provide enough information to assess this criterion.	Poor awareness of existing literature and debates. Theoretical background is not clearly described.	Basic understanding of the issues around the topic being discussed. Theoretical background is stated, but the research is not clearly positioned.	Deep knowledge of relevant literature. Theoretical background is clearly defined, and the research is positioned within existing literature.	This element is not applicable to the document or study.
Methodology	The paper does not provide enough information to assess this criterion.	Flawed research design. Unreliable methodology or unclear description of methodology.	Research design may be improved. The methodology is transparently described, but there are minor discrepancies.	The research design is robust. Clearly defined methodology, logical and rigorous.	This element is not applicable to the document or study.
Findings	The paper does not provide enough information to assess this criterion.	Poor linkage between findings and contributions. Vague relationship among findings, methodology and data.	There is a linkage between contribution, findings and the methodology with minor discrepancies	Findings are clearly grounded in the data and the methodology used. Contributions are stated on the basis of findings.	This element is not applicable to the document or study.
Contribution	The paper does not provide enough information to assess this criterion.	Study adds little to the body of knowledge in this area.	Study builds upon the existing theory and provides an adequate contribution to knowledge.	A significant addition to current knowledge. Expanding the way that the issue was explained so far.	This element is not applicable to the document or study.

Source: Adapted from Pittaway et al. (2004)

A.2 Formulae of Financial KPIs

Table A-2 Calculation formulae of financial KPIs

Business processes	Financial dimensions	Financial KPIs and calculation formulae
Financial objectives	Profitability	Return on sales (ROS) = $\frac{\text{Net profits}}{\text{Total sales}}$
		Return on equity (ROE) = $\frac{\text{Net profits}}{\text{Total equity}}$
	Liquidity	Current ratio = $\frac{\text{Current assets}}{\text{Current liabilities}}$
		Quick ratio = $\frac{\text{Current assets} - \text{Inventories}}{\text{Current liabilities}}$
	Asset utilisation	Asset turnover = $\frac{\text{Total sales}}{\text{Total assets}}$
		Inventory turnover = $\frac{\text{Cost of goods sold}}{\text{Total inventory}}$
Competitiveness	Market share	Market share = $\frac{\text{Sales}_t}{\text{Sales of the industry}_t}$
	Growth	Sales growth = $\frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_{t-1}}$
		Profit growth = $\frac{\text{Net profits}_t - \text{Net profits}_{t-1}}{\text{Net profits}_{t-1}}$
		Market share growth = $\frac{\text{Market share}_t - \text{Market share}_{t-1}}{\text{Market share}_{t-1}}$

Appendix B Questionnaire Pilot Test

B.1 Questionnaire Pilot Test Results

As Paper Two involves three areas, namely, SCM, financial performance measurement (FPM), and SME, academic experts in each area should be included in the pilot test to ensure the content validity of the questionnaire. Additionally, since the context of this study and the target of this questionnaire is SMEs in the UK food industry, researchers who are specialised in the food industry should also be involved. The target experts and their relevant research domains are shown in Table B-1.

Table B-1 Target academic experts and relevant research domains

Expert	Introduction	SCM	FPM	SME	Food Industry
Expert 1	Expert 1's domain of research is at the intersection of finance, small business and corporate strategic management decisions.		×	×	
Expert 2	Expert 2's research interests are mainly on firms – bank lending relationship. In addition, Expert 2 is interested in small firms' capital structure and its optimisation as well as small business financial planning.		×	×	
Expert 3	Expert 3's current research interests are related to supply chain finance and supply chain costing, particularly the interfaces between supply chain management, management accounting and marketing.	×	×		
Expert 4	Expert 4 recently completed a major project to dramatically improve the food supply chain to meet the rising global demand for food and to protect the environment.	×			×
Expert 5	Expert 5's research focuses on logistics and supply chain	×			×

	management, with a particular interest in the management of supply chains which handle perishable products such as food or blood.				
Expert 6	Expert 6 is involved in a number of research and teaching activities, including food supply chain vulnerability, product recalls impact on shareholder value, total cost of ownership, procurement management practice, etc.	×	×		×
Expert 7	Expert 7's interest of research is at the interface of performance measurement with strategic management and control systems.		×		

It can be observed that each of the four areas is covered by at least two academic experts, highlighting the comprehensiveness of the pilot test. Each academic expert was contacted through email with a one-page research introduction and the questionnaire attached. The feedback was provided through face-to-face meetings or emails. The comments and suggestions from those academic experts are provided in Table B-2.

Table B-2 Pilot test results with academic experts

Expert	Comments and suggestions
Expert 1	<ul style="list-style-type: none"> The length of the questionnaire and the questions designed are appropriate, and there is no significant issue. He suggested that the questionnaire should be circulated with researchers who are more specialised in survey data collection.
Expert 2	<ul style="list-style-type: none"> The length of the survey is appropriate as it takes no more than 15 minutes to complete. The questions are clear and understandable. Asking respondents to compare their performance with their main competitors is problematic. In some questions, respondents may not have clear ideas on their main competitors' performance, such as the percentage of disqualified crops. Some respondents may put off from answering the entire survey when they find a question strange and are not able to answer it. He listed two alternative solutions to address this issue:

	<p>1) Tell respondents that they do not have to answer all questions, so they can leave it blank if they do not know the answer. The risk is that we may receive completed questionnaire with most questions left blank because people are lazy with surveys.</p> <p>2) Add another option “I do not know”. Although the risk that respondents tick “I do not know” for most questions remains, the probability is lower according to the experience of Dr Moro.</p> <ul style="list-style-type: none"> • Regarding the measurement of financial performance, because finance is a sensitive topic and firms are usually conservative, the three financial dimensions adopted are comprehensive and there is no need to consider other dimensions. • Normally, the response rate of surveys aimed at SMEs is very low (usually between 5% to 10%), and 300 to 500 observations are a reliable sample size. • Sending questionnaires through emails can result in a lower response rate because the emails sent may be considered spam. He agreed that we first send the electronic questionnaire through emails to the identified SMEs with email addresses available. If we cannot obtain a significant sample size, we can then send the paper version to SMEs randomly selected from the rest in the database.
Expert 3	<ul style="list-style-type: none"> • Asking respondents to compare performance with their main competitors may be difficult, as they do not have the detailed knowledge of their competitors. Alternatively, we can ask participants to evaluate their performance in comparison with the industry average because individual companies’ performance is influenced by the industry they belong to. • In addition to profitability, liquidity, and revenue growth, he suggested considering asset utilisation in the financial performance measurement. Christopher (2011, p.58) also highlights that profitability, liquidity, and asset utilisation are three most critical financial dimensions in supply chain management. To measure asset utilisation, a common indicator is the sales to total assets ratio. • He reminded that it could be biased to analyse the data of all industries together, including crop growing, animal raising, and food manufacturing, because each industry has its own characteristics. For example, if the average profit ratio of crop growers is 5% and a crop grower has a profit ratio of 6%, it is an outperformer. On the other hand, if the average profit ratio of food manufacturers is 10% and a food manufacturer has an 8% profit ratio, it is an underperformer. If we consider the two industries as a whole, the average profit ratio may change to 7%, so at that time, the crop

	<p>grower is an underperformer while the food manufacturer becomes an outperformer. However, this problem could be solved by asking respondents to evaluate their performance in comparison with the industry average (Bititci et al., 2013).</p>
Expert 4	<ul style="list-style-type: none"> • The main concern is related to the comparison of SMEs' performance with their main competitors. It is unlikely that SME owner-managers will have that level of detailed information about their main competitors, so respondents will get frustrated if they cannot answer those questions and quit afterwards. • Comparing with the main competitor is problematic by itself because the choice of a competitor is also subjective. What if the competitor chosen is poorly performed? • For many of the questions, respondents could answer based on their own view of their companies' performance without making a comparison. Therefore, she thought letting respondents assess their performance directly based on the Likert scale is the easiest way and can increase the response rate. • Many SMEs have outsourced their transport functions, so we should pay more attention to that when analysing the data. Actually, there is a question in the questionnaire designed examining if participant companies outsource their transport functions.
Expert 5	<ul style="list-style-type: none"> • She proposed if it is better to mention in the cover letter that the target respondents of the research are food growers and manufacturers. • She suggested changing "... please read the instructions carefully and answer the questions as best as you can" in the cover letter to "... please read the instructions carefully and answer the questions to the best of your knowledge". • In "for each of the aspects listed below, ...", the word "aspects" is vague. She thought "factors" is probably a better word. • She was afraid some terms, such as purchasing performance, production performance, and inventory performance, are not understandable to SMEs, especially farmers. • For all inventory-related questions, stock is probably a clearer word. • Regarding the comparison of performance with the main competitor, it may be more complicated if the company has many competitors of different sizes and market power, so the choice of competitor may largely influence their answers to the questions.

	<ul style="list-style-type: none"> • Q1.3 The conformance between purchasing specifications and purchased materials/products. She suggested simplifying this question as “do you get what you buy” or something similar for the easier understanding of respondents. • Q1.4 The quality consistency of purchased materials/products over time, Q3.5 The quality consistency of harvested crops over time, Q5.5 The quality consistency of final products over time, and Q7.5 The quality consistency of final products over time. The term “quality consistency” is clumsy and ambiguous, which should be revised. • Q3.2 Utilisation of production capacity (e.g. land, machinery, tools, etc.). While the utilisation of machinery is clear, the utilisation of land is nuanced, so she suggested also considering the yield of land. • She raised the question that for crop growing and animal raising which have a long time in production, shall we consider the amount of product in growing as inventory as well? • Q5.8 Flexibility to change production volumes. This question is ambiguous. • Q6.2 The inventory level of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.). This question may not be relevant in many cases because those products normally have very short shelf lives, if not frozen. • At the end of the questionnaire, replace “thanks for your contribution” by “thank you for your contribution”. • Overall, she strongly advised to pilot test the questionnaire with practitioners in all groups (food growers, animal raisers and food manufacturers) to ensure the terminology we use is understandable.
Expert 6	<ul style="list-style-type: none"> • The questions designed are clear and understandable, and the length of the questionnaire is appropriate. • In the cover letter, there are too many reasons given to respondents to reject the survey, and it is not feasible for respondents to withdraw or modify their answers after submission. Therefore, he suggested deleting the sentence “if needed you can decline this survey altogether” and “you are also allowed to withdraw or modify the information provided after submitting the survey”. • In addition to the email sent, it will be helpful to highlight the target respondent (the CEO/owner of SMEs) in the cover letter as well. • There is no motivation provided in the cover letter for participants to complete the survey. He suggested writing in the cover letter that we can offer an executive summary of

	<p>the research results to the respondents or provide a prize draw if possible, which is probably more attractive for SMEs, especially micro firms.</p> <ul style="list-style-type: none"> • Asking respondents to compare performance with their main competitors is problematic because no one knows exactly about their competitors' performance. He thought comparing performance with the industry average is a better and softer way and may increase the response rate. However, asking respondents to evaluate their performance directly based on the Likert scale without comparison is uncommon in the literature and may result in the paper unpublishable. • Some questions are sensitive in the food industry, which may lead to biased answers. For example, food safety is a critical issue in the food industry, so it is expected no one will choose "worse" or "far worse" when comparing their product quality with main competitors. However, it is a limitation of the survey method and there is no proper way to overcome it. • What if the participant company is involved in two or more industries in Q2? He suggested further pilot testing the questionnaire with food SMEs to see if the case is common in practice. • Q3.7 "harvesting crops on time as planned" seems not like a production performance indicator, because the on-time harvest mostly depends on external factors such as weather, which are out of control of the company. • He was not sure if Q3.9 "capability to introduce new products" is relevant with production performance. • The values given in Q14 and Q15 to define SMEs are weird because they have decimals. The reason is that the definition of SMEs adopted is made by the European Commission and the original values are in euro, because our research context is in the UK, we transferred them into pounds with decimals. • He strongly suggested adding an option either "not applicable" or "I don't know" to every question because there are some sensitive questions and respondents may be unwilling to answer them.
Expert 7	<ul style="list-style-type: none"> • The questions in general are clear and understandable, but three questions need to be highlighted: <ol style="list-style-type: none"> 1) Q3.2 Utilisation of production capacity (e.g. land, machinery, tools, etc.). In the farming industry, farmers will definitely try to fully exploit their land, while the time to use machinery is usually fixed at harvesting, so respondents can hardly measure and compare their corresponding performance.

	<p>2) Q3.6 Agricultural cycle time (the time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting). The agricultural cycle time is usually fixed, so respondents can hardly measure and compare their performance on that.</p> <p>3) Q5.6 Production cycle time (e.g. chicken laying cycle, cow lactation cycle, the time required to grow juvenile animals until they are ready for slaughter, etc.). The same as the reason above, the production cycle time in animal raising is usually fixed, so respondents can hardly measure and compare their performance on that.</p> <ul style="list-style-type: none"> • He suggested providing an “I don’t know” option for each question if the problems mentioned above cannot be perfectly solved. • Asking respondents to rate their performance in comparison with their main competitors is very common in performance measurement research and is probably the best way to obtain the performance information we need. Considering that SME owner-managers, especially farmers, usually talk with each other, they should have a rough understanding of their competitors’ performance even though they may not be very sure. • Alternatively, he mentioned that we can replace “...compare with your main competitor” in the question by “...compare with your main competitor or other similar companies in the same industry” to simplify the comparison object, but it is uncommon in the extant literature. • The comparison with the industry average is worse than the comparison with main competitors because SME owner-managers usually do not have a sense of the average performance in their industries due to the limited resources. • He expected the response rate will be around 1% to 2% if we despatch the questionnaire through emails. Sending through post can potentially increase the response rate but we should consider the costs associated. • The contact information of companies in FAME is not up to date, so some of our target respondents may be invalid. • The core of this survey is to obtain an enough number of sample SMEs. Compared to sending questionnaires directly to SMEs in the food industry, it is easier to get a higher response rate if we contact those SMEs through industry associations, such as the National Farmers’ Union (NFU). He suggested collecting data through email first and trying alternative approaches if we cannot obtain a significant sample size.
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On the other hand, the questionnaire should also be pre-examined by industrial practitioners. As this questionnaire is designed for crop growers, animal raisers, and food processors separately, it is essential to pilot test the questionnaire in all three groups. Two practitioners in each group were invited to participate in the test, so the questionnaire was pre-tested by six executives from different food SMEs in the UK. Table B-3 introduces the six participants and their companies.

Table B-3 Introduction to target industrial practitioners

Practitioner	Industry	Job position	Company introduction
Practitioner 1	Crop grower	Owner	This company mainly produces biodynamic fruit, including various varieties of apples and pears as well as soft fruits (blackberries, redcurrants, gooseberries, blueberries and raspberries), juices, preserves, eggs, seasonal vegetables and mushrooms.
Practitioner 2	Crop grower	Precision Farming and CSR Manager	It is an independent producer organisation comprising 19 grower members in the UK.
Practitioner 3	Animal raiser	Owner	The main business of this company is egg production.
Practitioner 4	Crop grower & Animal raiser	Owner	It is a mixed farm, which grows crops like barley and raises animals such as dairy cattle and sheep.
Practitioner 5	Food processor	Owner	It is a gin distillery, which produces small batch craft gins and is run by a small team of distillers.
Practitioner 6	Food processor	Owner	This company is an independent small-batch copper-pot distillery producing a range of spirits and liqueurs from raw materials.

The same as the pilot test with academic experts, each practitioner was contacted through email with a one-page research introduction and the questionnaire

attached. The feedback was obtained through email or phone call. Table B-4 shows the pilot test results with those practitioners.

Table B-4 Pilot test results with industrial practitioners

Practitioner	Comments and suggestions
Practitioner 1	<ul style="list-style-type: none"> • The questions for crop growers are understandable, and none of them is invasive or intrusive. • However, every question is based on the comparison with the main competitor. Although farmers are knowledgeable, they are usually small and do not know such detailed information of their competitors' performance. Thus, it is difficult to compare their performance with that of their main competitor. • He mentioned that he could make a guess of their competitors' performance, but it would be unreliable, so he would not attempt to complete the questionnaire. • He suggested rephrasing the overall question. He can easily and is willing to answer those questions if they are not related to competitors but instead to the satisfaction and perception of the performance of his own farm.
Practitioner 2	<ul style="list-style-type: none"> • There is no question that is not understandable or vague, but the overall comment is that it is very difficult to answer these questions in comparison with their competitors. • He felt that he cannot answer Q1 purchasing performance and Q3 production performance questions from the perspective of G's Growers, because they do not contact their competitors at this level. • It could be easier to evaluate their own performance without the comparison with the main competitor. For example, he had a perception of his company's financial performance regarding profitability, liquidity, and revenue growth, but he did not know such detailed information of their competitors. • On the other hand, it is tricky that G's Growers is a cooperative of growers, so they do not direct deal with purchasing and production in farming. He did not think G's Growers is a typical respondent for this questionnaire, and he was willing to introduce me to some of their farmer members.
Practitioner 3	<ul style="list-style-type: none"> • Overall, some questions need to be contextualised for UK agriculture and UK farmers. • There is a need to define "main competitor" in the farming context: is it a neighbour, another farmer in the UK, or a farmer in another country?

	<ul style="list-style-type: none"> • It seems difficult for farmers to compare their performance with that of their main competitors unless the respondent takes part in a very detailed benchmarking service, such as Farm Business Survey (FBS) benchmarking. • Q3.1 Total costs of production (e.g. costs of labour, seeds, water, fertiliser, electricity, rent, etc.). The raking of different costs should be reconsidered because water and electricity are usually insignificant in farming. • Q3.2 Utilisation of production capacity (e.g. land, machinery, tools, etc.). Do we measure utilisation of efficiency? • Q3.4 The percentage of disqualified crops (e.g. misshapen, under-sized, etc.). This could be replaced by “the percentage of crops that do not meet specification”. • Q3.6 Agricultural cycle time (the time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting). The terminology used is incorrect. • Q3.10 Flexibility to change seeding time and/or harvest time (e.g. growing off-season crops). The terminology used is incorrect. • In Q4.1 The inventory level of raw materials (e.g. seeds, fertiliser, etc.), inventory performance needs to be defined in a farming context: low inventory is perceived as good performance. However, farm input price incentives often mean holding what might seem large inventories. For example, fertiliser is very much cheaper in the autumn. • In Q4.2 The inventory level of harvested crops, again, farmers that have storage will hold crops – knowing that the price always increases. • Q5.1 Total costs of production (e.g. costs of labour, fodder, water, electricity, etc.). The ranking of costs should be reconsidered. • Q5.2 Utilisation of production capacity (e.g. machinery, tools, space, etc.). Do we measure utilisation of efficiency? • In Q6 inventory performance measurement, there is a need to define inventory performance in a fresh producing situation, where products are perishable. • In Q10 transport performance measurement, it is essential to clarify is the competitor in a haulage context or production context. • In Q11 financial performance measurement, farmers are very unlikely to know their competitors’ financial information.
Practitioner 4	<ul style="list-style-type: none"> • The overall concern is that there are many variable factors in farming that can influence the production performance,

	<p>such as weather and disease. Those factors are out of the control of farmers, so it is difficult to give specific answers to the asked questions. She said that she was able to complete the questionnaire but afraid that the answers provided may be inaccurate and invalid, because the performance varies largely over time due to those mentioned factors. The answer she provided today may not reflect the reality in the past few years or the future.</p> <ul style="list-style-type: none"> • She thought this questionnaire is more suitable for farming which has a horticultural or poly tunnel setting or where animals are reared indoors for intensive meat or egg production, because they can control those unpredictable factors. • It is possible to make a guess of the performance of a similar farmer in the region and make a comparison, but the information provided may be inaccurate because she did not have very detailed information about the performance of the neighbour farmer. • The understandability of the questions is good, but some questions may not be relevant to farmers. For example, Q1.7 Suppliers' flexibility to adapt production capacity to the needs of your company and Q1.8 Suppliers' capability to introduce changes in the products you buy, small farmers normally do not need a large amount of raw materials and customised products. However, she did not suggest providing an "N/A" option because many respondents may choose "N/A" directly without consideration.
Practitioner 5	<ul style="list-style-type: none"> • The questions are all reasonable and there is not difficulty in answering those questions. • He did not feel uncomfortable with or unwilling to answer any questions. • He pointed out that although he did not know exactly how the main competitor performed, he could make a guess at how his company compares generally with the competitor regarding the aspects examined in the questionnaire. Therefore, he had no difficulty in answering those questions in comparison with the main competitor. • He suggested the questionnaire should be uploaded to an online survey platform if distributed through email, so the respondents can directly skip the questions not designed for them by selecting their main industry in Q2.
Practitioner 6	<ul style="list-style-type: none"> • Every question for food processors is understandable and no question is intrusive.

	<ul style="list-style-type: none"> • He found most questions impossible to answer because he had no idea about his competitors' performance in the areas asked. • He did not know all his competitors or have relations with them typically due to distance and opportunity, so it is difficult to know their performance and confirm a main competitor. • He mentioned that the best he can do was to give his perception of how well his competitors were performing and/or the performance of his own company.
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Based on the results obtained from the pilot test with both academic experts and industrial practitioners, the questionnaire was revised. The following actions were taken:

- The cover letter was modified.
- Add a question to obtain the consent from participants: "I have read the above information and voluntarily agree to participate in this survey".
- For measurement items targeting crop growers and animal raisers, use the question "for each of the aspects listed below, how does your company's [purchasing/production/transport/inventory] performance compare with a similar farmer located in the region? Please try to provide your best guess and mark a number".
- For measurement items targeting food manufacturers, use the question "for each of the aspects listed below, how does your company's [purchasing/production/transport/inventory] performance compare with your main competitor in the UK? Please try to provide your best guess and mark a number".
- Underline the word "best guess" in all questions and make it bold.
- As there are different questions for crops growers, animal raisers and food manufacturers in terms of purchasing, production, transport and inventory performance, it is essential to create separate measurement blocks for them respectively.

- The question Q2 “please select the industry that your company belongs to” was changed to “please select the main industry that your company belongs to” and was moved to the first question because all following questions are based on the industry selected.
- In Q3.2, Q6.2, Q9.2, Q12.2, Q15.2, Q18.2, “utilisation of...” was changed to “total utilisation of...”.
- In Q3.4, “the percentage of disqualified crops (e.g. misshapen, under-sized, etc.)” was replaced by “the percentage of crops that do not meet specification (e.g. misshapen, under-sized, etc.)”.
- In Q3.6, “agricultural cycle time (the time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting)” was replaced by “the time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting”.
- In Q3.9, “capability to introduce new products” was replaced by “capability to grow other crops and introduce new products”.
- In Q3.10 “flexibility to change seeding time and/or harvest time (e.g. growing off-season crops)” was replaced by “ability to grow off-season crops”.
- In Q9.4 “the percentage of disqualified final products (e.g. underweight animals, animals with disease, broken eggs, etc.)” was replaced by “the percentage of final products that do not meet specification (e.g. underweight animals, animals with disease, broken eggs, etc.)” .
- In Q9.9, “capability to introduce new products” was replaced by “capability to raise other animals and introduce new products”.
- In Q20, “please select the location of your company’s registered home office” was replaced by “please select the location of your company’s operating activities”.

- To define SMEs, the respondents will be asked to provide their financial information, so the average conversion rate between GBP and EUR during 2017 – 2018 was adopted, which was 1:1.14 instead of 1:1.15. The options in Q21 and Q22 were modified accordingly.
- Add another question Q29 “would you like to receive a copy of our final report based on the data from this survey”.
- At the end of the questionnaire, “thanks for your contribution” was replaced by “thank you for your contribution”.

B.2 Initial Questionnaire Before Pilot Test



Dear Participant,

You are invited to participate in a study that investigates supply chain finance of small and medium-sized enterprises (SMEs). My name is Denghao Wei, a PhD researcher at Cranfield School of Management, Cranfield University, under the supervision of Prof Michael Bourlakis and Dr Emel Aktas. I am conducting this survey as a part of my PhD research.

The objective of this study is to examine the impact of different supply chain activities on the financial performance of SMEs and shed light on how SMEs can capitalise on supply chain activities to improve their financial performance.

Your participation in this study is completely voluntary. If needed you can decline this survey altogether. Your responses will remain confidential and anonymous, and you are also allowed to withdraw or modify the information provided after submitting the survey. No one other than the researcher will know your individual answer to this questionnaire.

If you agree to participate in this research, please read the instructions carefully and answer the questions as best as you can. It should take less than 15 minutes to complete.

If you have any questions, please feel free to contact the researcher at denghao.wei@cranfield.ac.uk or +44 (0)1234 758562 or his supervisors at m.bourlakis@cranfield.ac.uk or emel.aktas@cranfield.ac.uk. Thank you for your participation.

Sincerely yours,

Denghao Wei

Q1. For each of the aspects listed below, how does your company's **purchasing performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q1.1	Total costs of purchases (e.g. purchasing price, inbound transport cost, communication cost, etc.)					
Q1.2	Quality of purchased materials/products					
Q1.3	The conformance between purchasing specifications and purchased materials/products					
Q1.4	The quality consistency of purchased materials/products over time					
Q1.5	On time delivery from suppliers					
Q1.6	Purchasing cycle time (period between order placed and the receipt of ordered materials/products)					
Q1.7	Suppliers' flexibility to adapt production capacity to the needs of your company					
Q1.8	Suppliers' capability to introduce changes in the products you buy					

Q2. Please select the industry that your company belongs to:

- A. Growing crops for food consumption (*Please go to Q3*)
- B. Raising animals for food consumption (*Please go to Q5*)
- C. Manufacturing food products (*Please go to Q7*)
- D. Manufacturing beverages (*Please go to Q7*)
- E. Other (please specify _____) (*Please go to Q7*)

Q3. (For participants selecting A in Q2 only)

For each of the aspects listed below, how does your company's **production performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q3.1	Total costs of production (e.g. costs of labour, seeds, water, fertiliser, electricity, rent, etc.)					
Q3.2	Utilisation of production capacity (e.g. land, machinery, tools, etc.)					
Q3.3	Quality of harvested crops					
Q3.4	The percentage of disqualified crops (e.g. misshapen, under-sized, etc.)					
Q3.5	The quality consistency of harvested crops over time					
Q3.6	Agricultural cycle time (the time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting)					
Q3.7	Harvesting crops on time as planned					
Q3.8	Flexibility to change production volumes					
Q3.9	Capability to introduce new products					
Q3.10	Flexibility to change seeding time and/or harvest time (e.g. growing off-season crops)					

Q4. (For participants selecting A in Q2 only)

For each of the aspects listed below, how does your company's **inventory performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
4.1	The inventory level of raw materials (e.g. seeds, fertiliser, etc.)					
4.2	The inventory level of harvested crops					
4.3	Overall inventory level					

(Please go to Q9)

Q5. (For participants selecting B in Q2 only)

For each of the aspects listed below, how does your company's **production performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q5.1	Total costs of production (e.g. costs of labour, fodder, water, electricity, etc.)					
Q5.2	Utilisation of production capacity (e.g. machinery, tools, space, etc.)					
Q5.3	Quality of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.)					
Q5.4	The percentage of disqualified final products (e.g. underweight animals, animals with disease, broken eggs, etc.)					
Q5.5	The quality consistency of final products over time					
Q5.6	Production cycle time (e.g. chicken laying cycle, cow lactation cycle, the time required to grow juvenile animals until they are ready for slaughter, etc.)					
Q5.7	Fulfilment of formulated production schedules (producing final products on time as planned)					
Q5.8	Flexibility to change production volumes					
Q5.9	Capability to introduce new products					
Q5.10	Flexibility to change production schedules					

Q6. (For participants selecting B in Q2 only)

For each of the aspects listed below, how does your company's **inventory performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
6.1	The inventory level of raw materials (e.g. fodder, etc.)					
6.2	The inventory level of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.)					
6.3	Overall inventory level					

(Please go to Q9)

Q7. (For participants selecting C or D or E in Q2 only)

For each of the aspects listed below, how does your company's **production performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
7.1	Total costs of production (e.g. material cost, labour cost, overhead cost, setup cost, etc.)					
7.2	Utilisation of production capacity (e.g. machinery, tools, space, etc.)					
7.3	Quality of final products					
7.4	Defect rate in production					
7.5	The quality consistency of final products over time					
7.6	Production cycle time (the time required to convert raw materials into final products)					
7.7	Fulfilment of agreed production schedules					
7.8	Flexibility to change production volumes					
7.9	Capability to introduce changes in products					
7.10	Flexibility to change production schedules					

Q8. (For participants selecting C or D or E in Q2 only)

For each of the aspects listed below, how does your company's **inventory performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
8.1	Raw material inventory level					
8.2	Work-in-process inventory level					
8.3	Finished goods inventory level					
8.4	Overall inventory level					

(Please go to Q9)

Q9. How does your company deliver final products to customers? (Please select all applicable options)

- A. We do our own transport
- B. We outsource the transport
- C. Our customers collect by themselves
- D. Other (please specify _____)

Q10. For each of the aspects listed below, how does your company's **transport performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
10.1	Total costs of transport (e.g. fuel cost, labour cost, truck lease expense, truck depreciation, etc.)					
10.2	Utilisation of transport capacity (e.g. fleet, truck, labour, etc.)					
10.3	Quality of delivered products					
10.4	Quality and accuracy of delivery documentation					
10.5	Delivery lead time (the period between when products are available for delivery and the receipt of products by customers)					
10.6	On-time deliveries					
10.7	Capability to handle urgent deliveries					
10.8	Capability to handle special delivery requirements from customers					

Q11. For each of the aspects listed below, how does your company's **financial performance** compare with your main competitor? Please mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
11.1	Profitability					
11.2	Liquidity (the ability to pay off the debts as they come due)					
11.3	Revenue growth					

Q12. Please select the location of your company's registered home office:

- A. England
- B. Scotland
- C. Wales
- D. Northern Ireland
- E. Other (please specify _____)

Q13. Please select the total number of employees in your company:

- A. 1-9
- B. 10 – 49
- C. 50 – 249
- D. 250 or more

Q14. Please select the revenue of your company last year (in GBP):

- A. Up to 1.8 million
- B. 1.9 – 8.7 million
- C. 8.8 – 43.4 million
- D. Higher than 43.4 million

Q15. Please select the total assets (on the balance sheet) of your company on the closing day last year (in GBP):

- A. Up to 1.8 million
- B. 1.9 – 8.7 million
- C. 8.8 – 37.3 million
- D. Higher than 37.3 million

Q16. Please specify your job title _____

Q17. How long have you been working in the current company? _____ year(s)

Q18. How long have you been working in the current industry? _____ year(s)

Q19. How long has your company been operating? _____ year(s)

Q20. Are you willing to participate in future research?

- A. Yes. Please provide your email address or other information for future contact

- B. No.

Thanks for your contribution

B.3 Revised Questionnaire After Pilot Test



Dear Participant,

You are invited to participate in a survey regarding the supply chain finance of small and medium-sized enterprises (SMEs). My name is Denghao Wei, a PhD researcher at Cranfield School of Management, Cranfield University, under the supervision of Prof Michael Bourlakis (m.bourlakis@cranfield.ac.uk) and Prof Emel Aktas (emel.aktas@cranfield.ac.uk).

The aim of this study is to investigate how SMEs in the UK food industry can take advantage of supply chain activities to improve their financial performance. The target respondents of this survey are owners or CEOs or people in any position related to the supply chain (such as Logistics Director or Supply Chain Director) in UK food SMEs.

Your participation in this survey is completely voluntary. Your responses will remain confidential and anonymous, and no one other than the researcher will know your individual answers to this survey. You are also allowed to withdraw or modify the information provided after submitting the survey.

If you agree to participate in this survey, please read the instructions carefully and answer the questions to the best of your knowledge. It should take less than 10 minutes to complete. As feedback, you will receive a copy of our final report based on the data obtained from this survey.

If you have any questions, please feel free to contact me at denghao.wei@cranfield.ac.uk or +44 (0)1234 758562 or my supervisors. Thank you in advance and any assistance from you will be fully appreciated.

Sincerely yours,

Denghao Wei

I have read the above information and voluntarily agree to participate in this survey.

- A. Yes
- B. No

- Q1. Please select the main industry that your company belongs to:
- A. Growing crops for food consumption (*Please go to Q2*)
 - B. Raising animals for food consumption (*Please go to Q8*)
 - C. Manufacturing food products (*Please go to Q14*)
 - D. Manufacturing beverages (*Please go to Q14*)
 - E. Other (please specify _____) (*Please go to Q14*)

This page is for participants selecting A in Q1 only

Q2. For each of the aspects listed below, how does your company's **purchasing performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q2.1	Total costs of purchases (e.g. purchasing price, inbound transport cost, communication cost, etc.)					
Q2.2	Quality of purchased materials/products					
Q2.3	The conformance between purchasing specifications and purchased materials/products					
Q2.4	The quality consistency of purchased materials/products over time					
Q2.5	On time delivery from suppliers					
Q2.6	Purchasing cycle time (period between order placed and the receipt of ordered materials/products)					
Q2.7	Suppliers' flexibility to adapt production capacity to the needs of your company					
Q2.8	Suppliers' capability to introduce changes in the products you buy					

Q3. For each of the aspects listed below, how does your company's **production performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q3.1	Total costs of production (e.g. costs of labour, seeds, water, fertiliser, electricity, rent, etc.)					
Q3.2	Total utilisation of production capacity (e.g. land, machinery, tools, etc.)					
Q3.3	Quality of harvested crops					
Q3.4	The percentage of crops that do not meet specification (e.g. misshapen, under-sized, etc.)					
Q3.5	The quality consistency of harvested crops over time					
Q3.6	The time required to grow and harvest crops, including loosening the soil, seeding, irrigation, fertilising, and harvesting					
Q3.7	Harvesting crops on time as planned					
Q3.8	Flexibility to change production volumes					
Q3.9	Capability to grow other crops and introduce new products					
Q3.10	Ability to grow off-season crops					

(Please go to Q4)

Q4. For each of the aspects listed below, how does your company's **inventory performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
4.1	The inventory level of raw materials (e.g. seeds, fertiliser, etc.)					
4.2	The inventory level of harvested crops					
4.3	Overall inventory level					

Q5. How does your company deliver final products to customers? (Please select all applicable options)

- A. We do our own transport
- B. We outsource the transport
- C. Our customers collect by themselves
- D. Other (please specify _____)

Q6. For each of the aspects listed below, how does your company's **transport performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
6.1	Total costs of transport (e.g. fuel cost, labour cost, truck lease expense, truck depreciation, etc.)					
6.2	Total utilisation of transport capacity (e.g. fleet, truck, labour, etc.)					
6.3	Quality of delivered products					
6.4	Quality and accuracy of delivery documentation					
6.5	Delivery lead time (the period between when products are available for delivery and the receipt of products by customers)					
6.6	On-time deliveries					
6.7	Capability to handle urgent deliveries					
6.8	Capability to handle special delivery requirements from customers					

Q7. For each of the aspects listed below, how does your company's **financial performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
7.1	Profitability					
7.2	Liquidity (the ability to pay off the debts as they come due)					
7.3	Revenue growth					

(Please go to Q20)

This page is for participants selecting B in Q1 only

Q8. For each of the aspects listed below, how does your company's **purchasing performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q8.1	Total costs of purchases (e.g. purchasing price, inbound transport cost, communication cost, etc.)					
Q8.2	Quality of purchased materials/products					
Q8.3	The conformance between purchasing specifications and purchased materials/products					
Q8.4	The quality consistency of purchased materials/products over time					
Q8.5	On time delivery from suppliers					
Q8.6	Purchasing cycle time (period between order placed and the receipt of ordered materials/products)					
Q8.7	Suppliers' flexibility to adapt production capacity to the needs of your company					
Q8.8	Suppliers' capability to introduce changes in the products you buy					

Q9. For each of the aspects listed below, how does your company's **production performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q9.1	Total costs of production (e.g. costs of labour, fodder, water, electricity, etc.)					
Q9.2	Total utilisation of production capacity (e.g. machinery, tools, space, etc.)					
Q9.3	Quality of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.)					
Q9.4	The percentage of final products that do not meet specification (e.g. underweight animals, animals with disease, broken eggs, etc.)					
Q9.5	The quality consistency of final products over time					
Q9.6	Production cycle time (e.g. chicken laying cycle, cow lactation cycle, the time required to grow juvenile animals until they are ready for slaughter, etc.)					
Q9.7	Fulfilment of formulated production schedules (producing final products on time as planned)					
Q9.8	Flexibility to change production volumes					
Q9.9	Capability to raise other animals and introduce new products					
Q9.10	Flexibility to change production schedules					

(Please go to Q10)

Q10. For each of the aspects listed below, how does your company's **inventory performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
10.1	The inventory level of raw materials (e.g. fodder, etc.)					
10.2	The inventory level of final products (e.g. slaughter-ready animals, meat, eggs, milk, etc.)					
10.3	Overall inventory level					

Q11. How does your company deliver final products to customers? (Please select all applicable options)

- A. We do our own transport
- B. We outsource the transport
- C. Our customers collect by themselves
- D. Other (please specify _____)

Q12. For each of the aspects listed below, how does your company's **transport performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
12.1	Total costs of transport (e.g. fuel cost, labour cost, truck lease expense, truck depreciation, etc.)					
12.2	Total utilisation of transport capacity (e.g. fleet, truck, labour, etc.)					
12.3	Quality of delivered products					
12.4	Quality and accuracy of delivery documentation					
12.5	Delivery lead time (the period between when products are available for delivery and the receipt of products by customers)					
12.6	On-time deliveries					
12.7	Capability to handle urgent deliveries					
12.8	Capability to handle special delivery requirements from customers					

Q13. For each of the aspects listed below, how does your company's **financial performance** compare with a similar farmer located in the region? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
13.1	Profitability					
13.2	Liquidity (the ability to pay off the debts as they come due)					
13.3	Revenue growth					

(Please go to Q20)

This page is for participants selecting C or D or E in Q1 only

Q14. For each of the aspects listed below, how does your company's **purchasing performance** compare with your main competitor in the UK? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
Q14.1	Total costs of purchases (e.g. purchasing price, inbound transport cost, communication cost, etc.)					
Q14.2	Quality of purchased materials/products					
Q14.3	The conformance between purchasing specifications and purchased materials/products					
Q14.4	The quality consistency of purchased materials/products over time					
Q14.5	On time delivery from suppliers					
Q14.6	Purchasing cycle time (period between order placed and the receipt of ordered materials/products)					
Q14.7	Suppliers' flexibility to adapt production capacity to the needs of your company					
Q14.8	Suppliers' capability to introduce changes in the products you buy					

Q15. For each of the aspects listed below, how does your company's **production performance** compare with your main competitor in the UK? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
15.1	Total costs of production (e.g. material cost, labour cost, overhead cost, setup cost, etc.)					
15.2	Total utilisation of production capacity (e.g. machinery, tools, space, etc.)					
15.3	Quality of final products					
15.4	Defect rate in production					
15.5	The quality consistency of final products over time					
15.6	Production cycle time (the time required to convert raw materials into final products)					
15.7	Fulfilment of agreed production schedules					
15.8	Flexibility to change production volumes					
15.9	Capability to introduce changes in products					
15.10	Flexibility to change production schedules					

(Please go to Q16)

Q16. For each of the aspects listed below, how does your company's **inventory performance** compare with your main competitor in the UK? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
16.1	Raw material inventory level					
16.2	Work-in-process inventory level					
16.3	Finished goods inventory level					
16.4	Overall inventory level					

Q17. How does your company deliver final products to customers? (Please select all applicable options)

- A. We do our own transport
- B. We outsource the transport
- C. Our customers collect by themselves
- D. Other (please specify _____)

Q18. For each of the aspects listed below, how does your company's **transport performance** compare with your main competitor in the UK? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
18.1	Total costs of transport (e.g. fuel cost, labour cost, truck lease expense, truck depreciation, etc.)					
18.2	Total utilisation of transport capacity (e.g. fleet, truck, labour, etc.)					
18.3	Quality of delivered products					
18.4	Quality and accuracy of delivery documentation					
18.5	Delivery lead time (the period between when products are available for delivery and the receipt of products by customers)					
18.6	On-time deliveries					
18.7	Capability to handle urgent deliveries					
18.8	Capability to handle special delivery requirements from customers					

Q19. For each of the aspects listed below, how does your company's **financial performance** compare with your main competitor in the UK? Please try to provide your **best guess** and mark a number (1=far worse, 2=worse, 3=similar, 4=better, 5=far better)

No.	Aspects	1	2	3	4	5
19.1	Profitability					
19.2	Liquidity (the ability to pay off the debts as they come due)					
19.3	Revenue growth					

(Please go to Q20)

Q20. Please select the location of your company's operating activities:

- A. England
- B. Scotland
- C. Wales
- D. Northern Ireland
- E. Other (please specify _____)

Q21. Please select the total number of employees in your company:

- A. 1 – 9
- B. 10 – 49
- C. 50 – 249
- D. 250 or more

Q22. Please select the revenue of your company last year (in GBP, please keep two decimal places):

- A. Up to 1.75 million
- B. 1.76 – 8.77 million
- C. 8.78 – 43.86 million
- D. Higher than 43.86 million

Q23. Please select the total assets (on the balance sheet) of your company on the closing day last year (in GBP, please keep two decimal places):

- A. Up to 1.75 million
- B. 1.76 – 8.77 million
- C. 8.78 – 37.72 million
- D. Higher than 37.72 million

Q24. Please specify your job title _____

Q25. How long have you been working in the current company? _____ year(s)

Q26. How long have you been working in the current industry? _____ year(s)

Q27. How long has your company been operating? _____ year(s)

Q28. Are you willing to participate in future research?

- C. Yes. Please provide your email address or other information for future contact
- D. _____
No

Q29. Would you like to receive a copy of our final report based on the data from this survey?

- A. Yes. Please provide your email address or other information for future contact
- B. _____
No

Thank you for your contribution

Appendix C Interview Guide

C.1 Interview Guide for Paper Two

Purchasing Performance

- To what extent do you think your companies' financial performance can be improved by improving the purchasing performance? Such as improving the quality of raw materials, ensuring the on-time delivery of materials, etc. Why?
- Have you joined any cooperatives or alliances so you can purchase together with other similar companies?
 - [If YES] What are the benefits of joining cooperatives or alliances when it comes to purchasing?
 - [If NO] What are the challenges when it comes to purchasing? Why?
 - Is it common that other similar companies in this industry join cooperatives or purchasing alliances?
- Which aspect in purchasing do you focus on most: quality, cost, or something else? Why?

Production Performance

- To what extent do you think your companies' financial performance can be improved by improving production performance? Such as reducing production costs, improving product quality, shortening the production time, etc. Why?
- Which aspect in production do you focus on most: quality, flexibility, cost, or something else? Why?

Transport Performance

- How do you deliver the final products to your customers? Do you deliver yourself, outsource it, ask customers to collect, or any combinations of the above?
- [Under outsourcing and/or customer collection] What is the influence of transport outsourcing and/or customer collection on your financial performance?
- Is it common to outsource transport and/or get customers collecting products among other similar companies in this industry?
- In the current situation, to what extent do you think your companies' financial performance can be improved by improving transport performance? Why?

Inventory Performance

- Do you keep inventories of raw materials or buy them when you need?
 - [If YES] Approximately how many days of raw materials do you keep?
 - [If small volume] Why do you keep a small volume of raw materials?
- Comparatively, which inventory type is more important for your financial performance, raw material or final product inventory? Why?

C.2 Interview Guide for Paper Three

Inventory Management

- How do you manage inventory? Do you use any information systems or strategies?
- Do you keep inventories of raw materials or buy them when you need?
 - [If YES] Approximately how many days of raw materials do you keep?
 - [If small volume] Why do you keep a small volume of raw materials?
- Comparatively, which inventory type is more important for your financial performance, raw material or final product inventory? Why?

Accounts Receivable Management

- How do your customers pay you – do they pay you immediately or there is a fixed payment period?
 - [If fixed period] On average, how long is this payment period?
- To what extent do you think it is feasible to speed up your customers' payment?
- To what extent do you think it is feasible to speed up your customers' payment if you become larger?

Accounts Payable Management

- How do you pay your suppliers – do you pay immediately or there is a fixed payment period?
 - [If fixed period] On average, how long is this payment period?
- Do you tend to delay the payment to your suppliers? Why?
- What is the consequence if you delay the payment to suppliers?
- What is the consequence if you speed up the payment to suppliers?
- To what extent do you think it is feasible to negotiate the payment period with suppliers and delay the payment?
- To what extent do you think it is feasible to negotiate the payment period with suppliers and delay the payment if you become larger?

Appendix D Interview Transcripts

D.1 Transcript of Interview 1

- Interview ID: Interview 1
- Gender: Male
- Job position: General Manager
- Interview date and time: 7.00 – 8.00 Wednesday 25th March 2020
- Company location: England
- Company industry: Crop grower
- Firm size: Micro
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 1, 2, 3

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yes.

Researcher Okay, thank you. In your answers to the survey last time, I noticed your main business is growing crops, right?

Interviewee Yeah.

Researcher Okay. Let's focus on the purchasing performance first. To what extent do you think your company's financial performance can be improved by improving your purchasing performance, such as improving the quality of materials, ensuring the on-time delivery of materials, etc.?

Interviewee Not much because we pay a lot of attention to doing that already as always have.

Researcher Any other reasons?

Interviewee Well, obviously, the potential suppliers keep changing, so you have to keep up to date with which suppliers are better than others.

Researcher Have you joined any cooperatives?

Interviewee I am not quite sure what you mean by cooperatives. Is cooperative like Mole Valley Farmers?

Researcher Yes, I think so.

Interviewee Then it is buying groups which we don't belong to.

Researcher Okay. So when you will sell your products you have cooperative but when you buy something you don't have any cooperatives for that?

Interviewee Yes, you are right.

Researcher Is that common that farmers join cooperatives?

Interviewee If you include the setups like Mole Valley Farmers as cooperatives, yes, we do.

Researcher Is it common that they use the cooperatives to buy materials like seeds or fertilisers?

Interviewee Yes. The cooperatives now are big stores where you can go and buy nuts and bolts and bags. Anything you like. We buy all our miscellaneous supplies from a cooperative.

Researcher But also when you buy something you don't use cooperatives, so what are the challenges for you when it comes to purchasing?

Interviewee Well, we bought most of our big purchases, like fertilisers and seeds from all the commercial companies.

Researcher I mean, any challenges for you, when you just buy by yourself and have no cooperatives to help you?

Interviewee No, because we do our major purchases on our own. But obviously we talk to other farmers and find out what the market is like, and then we'd make up our own mind.

Researcher Right, okay. In purchasing, which aspect do you focus on most, is the quality of the materials or cost or something else?

Interviewee Well, it's always a trade-off between quality and cost. Exactly what we're looking for is good value for money. That doesn't necessarily mean the cheapest normally.

Researcher Any other aspects?

Interviewee Well, there is a question of prompt delivery, and if a firm is good or bad in dealing with shortages or damage.

Researcher Okay, so delivery is another aspect.

Interviewee Yeah.

Researcher Okay. Let's go to production performance. A similar question: to what extent do you think your company's financial performance can be improved by improving your production performance, such as improving the quality of your products or shortening the production cycle time by using technologies?

Interviewee On an arable farm, the best way to improve your financial performance is to improve the yields. That is entirely due to the weather. For example, this year, the yields are going to be about half what they were last year because of the weather. Quality is mainly due to the weather as well, unfortunately.

Researcher But you can also try to improve it with some technologies or by using fertilisers, isn't it?

Interviewee Yeah, there are things you can do to improve quality of grain with production techniques, but that's very, very small improvements. The main 90% of the financial performance depends upon the weather.

Researcher Do you think production performance can contribute significantly to your financial performance?

Interviewee Oh yeah, of course. The breakeven you can wait on this arm is two tons to the acre, that means if you get four tons to the acre instead of three you double your profits.

Researcher Yeah, you're right. So basically, you think the production is your main business, so if you can improve your production, you can definitely increase for example, your profitability, your revenue, etc.

Interviewee Yeah, for sure.

Researcher In production, which aspect do you focus on most, is that quality or production cost or something else?

Interviewee Mainly production costs, because the yields are more or less out of our arms because of the weather. So all we can do to retain profitability is to reduce the costs.

Researcher How about quality?

Interviewee Well, quality is marginal, because obviously, there are minimum qualities on our growing contracts, so you have to stick to minimum and above the minimum; otherwise, you get deductions.

Researcher Do you mean that normally the quality is pretty stable?

Interviewee Well, the quality depends upon the weather, but the point is that the difference between the best quality years and the worst quality year on this farm is about 5%. But the difference between good and bad yields is 100% something.

Researcher If you say the quality depends most on the weather, but the weather is the same for everyone. If your quality is not very good because of the weather, it could be the same for other competitors. So in that way, the quality is not that important?

Interviewee The problem is the weather varies so much. Quite often, we get good quality when other people don't, vice versa, so the weather isn't the same for everybody actually.

Researcher Okay, thank you. Then we can go to the transport performance. One simple question, how do you deliver your final product to your customers, do delivery yourself, outsource it, ask your customers to collect it or any combination of the methods?

Interviewee The combination depends on the crop. Wheat we mainly we deliver ourselves. We deliver oats but many are collected. Barley we deliver our 50%, and local customers collect the other 50%. With straw, it's about 20% delivered and 80% collected.

Researcher Do you use any third-party company for delivery?

Interviewee Yeah, we have a haulier who does all this for us.

Researcher Okay, so you have all the three methods, you deliver yourself, you have the third-party companies and also you get your customers to collect it.

Interviewee Correct.

Researcher Okay, so what's the influence of transport outsourcing or getting customers to collect products on your financial performance?

Interviewee Well, we like to deliver wheat to mills and barley if we are selling to a local customer. **We like to deliver ourselves, because that means when the load gets to the mills, the drivers work for us. If there is a problem with quality, our drivers argue in our case**, whereas if you sell on the collected basis, the drivers working for the mill, so there is a sort of non-financial advantages of having your own transport.

Researcher So can I say that if you deliver yourself, the delivery quality can be controlled by yourself, but if you outsource it to a third party company, it's out of your control, so you don't really tend to do like this and tend to deliver yourself?

Interviewee Yeah, well, the key point is at the intake at the mill. It's all tested for quality. If it is a marginal quality or slightly below quality, looks slightly out of spec. **If the delivery drivers working for the mill, then you get no argument.** If the delivery drivers working for us, then he can argue our case. So with marginal quality decisions, they can go in our favour.

Researcher Okay. That's a very specific reason. If you outsource your transport to a third-party company, do you think you can get some benefits from it in terms of the finance? Can you save any costs or gain some profits?

Interviewee Well, we always have benefited from slightly lower rates, but this year, we've discovered that actually, there is no difference.

Researcher Is it common to outsource transport or get customers to collect products among other similar companies or other farmers?

Interviewee Most farmers have grain collected by the buyer.

Researcher Okay. In the current situation, you have the combination of all the three transport methods, so to what extent do you think your company's financial performance can be improved by improving your transport performance?

Interviewee Well, we like to think that the we've got the best combination of the three different methods but obviously we keep it under review every year.

Researcher What I mean is actually how important is transport to your financial performance?

Interviewee Well, it is important, but it's only a very small percentage. We are talking one or two percent of the financial performance. Even lower, even lower.

Researcher So actually, transport performance is not that important for financial performance. It's just a way to deliver the final products to customers.

Interviewee No.

Researcher Right. Let's go to the inventory performance. Do you keep any inventory of raw materials like seeds or fertilisers or you just buy them when you need?

Interviewee Well, seed is the easy one because we grow our own seeds. So they are on the farm from harvest until they are planted.

Researcher How about other raw materials?

Interviewee Fertiliser is the big one. Normally, we buy whatever is cheapest, which is normally in June, so we have a lot of stock of fertiliser from June until it is used.

Researcher Okay, so basically you keep some inventories there and use them when you need.

Interviewee Yeah.

Researcher Approximately how many raw materials like fertilisers do you keep?

Interviewee We have a hundred tons of fertiliser in store.

Researcher Oh really? In comparison with your final product inventory, by final product I mean the harvested crops, which inventory is larger?

Interviewee Of course, the harvested crops are more, otherwise we'd be losing lots of money, because we keep all our grain in store until January. So we have the whole profit in store for four months.

Researcher Okay, so you keep more final products compared to your raw materials.

Interviewee Yeah. **For example, last December, we have 1,200 tons of grain in store and only 100 tons of fertiliser.**

Researcher Okay. You mentioned that you keep a lot of raw materials like fertilisers, but why do you do like this?

Interviewee **We keep stocks of fertiliser because normally, it is much cheaper to buy in June or July rather than the following February. There is a cost saving of 15 or 20% if you buy it earlier.** Unfortunately, this year, it's not worth like that because of the lack of demand. It is actually 15% cheaper now than it was when we bought it back in June.

Researcher Okay. But actually, every product has its own shelf life. How about the fertiliser? Can you keep it for a long time?

Interviewee Well, you can't. It depends upon the fertiliser, but we don't want to keep fertilisers for more than one year. We buy one year's inputs for fertiliser once a year in June.

Researcher Okay. Comparatively, which type of inventory is more important for your financial performance, raw material or final product inventory?

Interviewee **Final product inventory is much more important than raw materials, partly because final products are ten times more than raw materials in tonnage, and partly because the difference in price is more. For example, we can sell wheat at the moment for 160 pounds a ton, and back at harvest time it was 130.**

Researcher Okay, right. Let's go to the final aspect, which is about working capital management. Do you tend to delay the payment to your suppliers?

Interviewee No.

Researcher Normally, how do you pay them? Do you pay them immediately or you have a fixed payment period?

Interviewee Well, normally everything is bought on 30 days credit, so you have a monthly account. But with fertilisers, you can negotiate, maybe six months.

Researcher So you can negotiate with them and it's very flexible.

Interviewee Yeah.

Researcher Okay. Is there any consequence if you speed up the payment, say if you pay them quickly?

Interviewee Well, we do pay quickly. **Sometimes we pay within 24 hours and the reason for that is to generate some goodwill with suppliers.**

Researcher But can you get any financial benefits like a price discount?

Interviewee Well, **one supplier gives us a two and a half per cent discount if we pay immediately.**

Researcher So basically, if you pay quickly you can get some, although not a lot, discounts.

Interviewee Yeah.

Researcher Okay, but what's the consequence if you delay the payment?

Interviewee Well, **we don't delay payments. We do speed them up, and the reason is that if you delay payments you become a very bad customer. You hope that if you speed it up, you become a good customer and then get better services in the future.**

Researcher Yeah. Normally you buy the products from the same supplier every year?

Interviewee Well, that's why it turns out that if we want to buy something, we always get those three different prices from three different people. We don't just use the same supplier every time regardless.

Researcher It's a very wise strategy because it can reduce your risks. In another way, how do your customers pay you? Do you have a fixed payment period for them, or they pay you immediately?

Interviewee Also, an interesting one. Most of ourselves in the grain almost invariably is 28 days. Some companies pay on the 21st of the following month, which can obviously be anything from 21 days to 51 days. But normally this year in fact all our contracts have been on 28 days. 28 days after delivery.

Researcher Can they negotiate the payment period with you?

Interviewee It's a pretty standard universal thing throughout the trade, 28 days.

Researcher Okay. If they speed up the payment, can they get some discounts?

Interviewee The fact we've dealt with four different big customers this year, and two of them have paid more quickly than they needed to. One of them has been absolutely on 28 days and one of them has been 7 to 10 days late.

Researcher Any penalties for them?

Interviewee The penalty is **we are not going to deal with customers who do not pay on time, and we will terminate the relationship immediately.**

Researcher I am not sure if it easy to find more customers in this industry. If it is not easy, it may not be a good idea to terminate the relationship with customers?

Interviewee Well it's easy to find customers of grains in Devon, because we're a deficit county, and grain has to be sourced from other counties - Wiltshire, Hampshire, Oxfordshire - to come down here to feed all the animals. Because we are here with grain available, then we've got people phoning up to us to buy it.

Researcher Okay. I think for all companies, they tend to get their customers pay quickly in order to maintain a good liquidity, so to what extent do you think it's feasible to speed up your customers payment to you?

Interviewee Not feasible at all, because I told you about the grain payments which are usually in industry standard 28 days. But in the case of straw, we sell straw to about 30 customers and they're obviously fellow farmers. What happens there is that they generally all wait until they get the BPS basic payment scheme money in December and then they all pay, when they've got their money from the government. So it's very difficult to get them to pay you before the basic payment scheme money comes, and the problem is we don't know when that comes. Some people don't get it until three or four months late. Effectively, we were acting as bankers for the government. Government doesn't pay our customers, so they don't pay us.

Researcher But do you have any very large customers which have enough cash flows, so you can negotiate with them?

Interviewee Well, there is one interesting development, which is that one of our grain customers has introduced a scheme whereby if you sell grain to them for forward delivery, then they're prepared to advance you 90% of the money when you sign the contract. So there is an advantage if you want to draw money a few months ahead of delivery. But that company would be the only one to deal with it, and the other companies do not offer that facility. Farmers are completely constrained when the government pays them. The commercial companies are constrained by the industry standard, which is 28 days.

Researcher Okay. That's all for the interview. Thank you very much for your time and your participation. Hope you have a good day.

Interviewee Thank you. Bye.

D.2 Transcript of Interview 2

- Interview ID: Interview 2
- Gender: Male
- Job position: Owner
- Interview date and time: 9.00 – 10.00 Wednesday 25th March 2020
- Company location: Scotland
- Company industry: Animal raiser
- Firm size: Micro
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 1

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yeah.

Researcher I noticed in your answers to the survey last time, your main business is raising animals, right?

Interviewee Yeah.

Researcher Can you please briefly introduce your business?

Interviewee Okay, we have, I believe, approximately 100,000 free range laying hens.

Researcher Okay, do you have any business, like growing crops or only raising animals?

Interviewee We have, I believe, about 70 or 80 acres of farming.

Researcher Right, but your main business is raising animals.

Interviewee Yeah.

Researcher Okay. Let's focus on your purchasing performance first. To what extent do you think your financial performance can be improved by improving your purchasing performance? By improving purchasing performance, I mean improving the quality of raw materials, ensuring the on-time delivery of raw materials, etc.

Interviewee Right, the big problem is that we base at the far north of Scotland, and transport up there is very, very difficult. So, the main purchase that we have is bird feed, which amounts to somewhere around half a million pounds a year. Now I have formulated exactly what I want the birds to eat. I then went to a local mill in Aberdeen called Pablo, and I spoke to one of the directors there.

I had a meeting with him for half a day. We went through the diet to find a formulation. He changed it to what we needed, and we were quite happy. We have talked about diet, as I said, it is a very awkward part of the world. It's not cold, but very windy, and that really hurts the birds. It really makes them cold. If they are not happy, they don't lay eggs. At the moment, they are extremely happy, whatever the weather is. The feed is not changed in what I would say 10 years. My son has changed this. He is quite happy, and the hens are happy. He went to an agricultural college and he did do the formulation there. I went to a University, and we did see formulation in a lot more detail. We can get the raw materials, or the mill can get the raw materials and they will deliver. We give them a 36-hour notice and they will deliver a full wagon load of about 28 tons of exactly what we want.

Researcher Okay, but to what extent do you think the purchasing can contribute to your financial performance like profits?

Interviewee **55 per cent of the cost of an egg is feed, so purchasing is very important. We all will find the more you put in, the more you get out. If you feed quality, you get quality.**

Researcher Right, so actually the quality of the feed can directly determine the quality of your products.

Interviewee Oh, definitely, yeah.

Researcher Okay. Have you joined any cooperatives for purchasing?

Interviewee No, we negotiate every year for a 12-month fixed price, so we know where we are for 12 months. They know where they are, and they haven't significantly increased their price for ten years.

Researcher Okay. I know you haven't joined any cooperatives, but is that common for other similar companies or farms to join cooperatives?

Interviewee Possibly. There is no one nearer as a cooperative. The nearest cooperative farmer is in Aberdeen, which is 240 miles away.

Researcher Okay, so that's the main problem. In your purchasing, have you encountered any challenges in general? You mentioned the distance, but anything else?

Interviewee The distance is the biggest problem. We have to get this delivered, so we have to buy a wagon load because of the long distance from suppliers. We buy a wagon load of eggs packaging materials, boxes, anything like that. We need to get them once off, so we've got a full wagon load and it's cheaper. We buy in bulk, we get a discount. To be honest with you, if we didn't buy in bulk, we will have a lot of problems getting it delivered, because we are very isolated.

Researcher Okay, we will come back to this point later on. Which aspect in purchasing do you focus on most, quality or cost or something else?

Interviewee Quality, by a long way.

Researcher Okay, but why quality is important?

Interviewee The thing is that if what you are feeding is not a top quality, you will not get a top-quality product out. This is specific to the birds that we have but it still works for everything else. If you feed for a week, it's no good. We have to have a balanced and quality diet for those birds.

Researcher I think there is always a trade-off between cost and quality, so can I say that **you are willing to sacrifice your costs in order to improve the quality?**

Interviewee **Yeah, absolutely.**

Researcher All right. Let's go to the production performance then. A similar question, to what extent do you think your company's financial performance can be improved by improving your production performance, like your production cost, production quality, etc.?

Interviewee Right, that's the yield of eggs from the birds. We are in the top 10% in the country, so we don't think we can improve much on that. We keep them busy, and we keep them warm. The only thing that we're possibly bothered about is something like the bird flu. Other than that, we are very isolated. We do not have people coming to the farm for eggs. They all get delivered.

Researcher You mentioned that you can't really further improve the production performance because you perform pretty well, but to what extent do you think there's a causal relationship between the production and financial performance?

Interviewee We can live with the cost, quite a high cost, but it's a high-quality feed. Now, if we increase the quality of the feed, the cost obviously will go up as well. We're not going to get much more out of the birds. They are designed to lay 300 to 310 eggs a year each. We are hoping that we get an average of 308 eggs per bird per year, so we're not going to do much better.

Researcher Alright, but in another way, if your production performance is decreased, your financial performance will be definitely decreased as well.

Interviewee Yeah, terrifically as well, a lot.

Researcher Okay. Let's compare purchasing and production. Which one do you think is more important?

Interviewee Production.

Researcher Okay, which aspect in production do you focus on most, quality, cost, or something else?

Interviewee Quality.

Researcher Okay, so I think quality is the core of your business.

Interviewee Yeah.

Researcher Okay, but why quality is that important?

Interviewee If we don't achieve a lot of eggs per bird, we aren't making a profit. Nobody will keep 100,000 birds - they have to make a profit.

Researcher So you think the quality of your production can contribute directly to your profit.

Interviewee In fact, I will say that is number one.

Researcher Yeah, okay. Let's go to transport performance. How do you deliver your final products to your customers? Do you deliver by yourself or you have a third-party company, or you just let your customers collect it?

Interviewee We have five company vans. We deliver eggs every day to shops, restaurants, hotels, and cafes. We also supply wholesalers. We have tried to get into Tesco, but unfortunately, their conditions for supplying [record unclear].

Researcher But you also deliver to other retailers directly.

Interviewee Oh, yeah. And every Saturday we have a market stall in the local town of Wick. It's very helpful. We like that.

Researcher Okay, but actually do use any third-party companies for delivery?

Interviewee If we get a little bit of overproduction, we will sell a few pallets to them and they go away to your destination.

Researcher Okay, but if you can deliver by yourself, you will deliver it.

Interviewee Oh, yeah.

Researcher Under the condition of outsourcing, say letting the third party to deliver your products, do you think you can get some financial benefits from it? Or it's just a contingency plan.

Interviewee It's a contingency plan.

Researcher Okay, so you don't really think you can financially benefit from it.

Interviewee No.

Researcher Why?

Interviewee Because our vans go out every morning, loaded with eggs and come back empty or very near empty. **Now if we get somebody else to deliver products for us, it would cost a lot much more, because they would have to make a profit.** So we do it all ourselves.

Researcher Yeah. Do you think it's a common practice that farmers, no matter the crop growers or animal raises, outsource their transport to third party?

Interviewee I think it is possibly yes. It depends on the size of the business.

Researcher Okay. In essence, under the condition that you deliver your products by yourself, how do you think your financial performance can be improved by improving your transport performance?

Interviewee The customer is happy if we deliver our eggs. They like that, so they pay a bit more.

Researcher Oh, really? But do you think that by improving the transport performance, like improving the transport quality or decreasing the cost, you can improve your financial performance?

Interviewee Yes, it bounds to do, but it won't be a lot, it's only marginal. Our transport cost is about something like 6%.

Researcher Okay. To summaries, in the situation that you deliver products by yourself, you think it can contribute marginally to your financial performance, but if you outsource it, you probably can't get any benefit.

Interviewee No, and we may lose out, because we know where and what we are delivering. If we give it to somebody else, we have to give them a list, and then we have to instruct them to do it. No, no, it doesn't help.

Researcher Yeah, make sense. Let's go to inventory performance right now. You mentioned that your raw material is primarily the bird feed. Approximately how many raw materials do you keep?

Interviewee Very few.

Researcher Why?

Interviewee The feed is all made in the feed mill. Now, if we had our own feed mill, we would have an enormous amount paperwork to do. We will be inspected almost every day by people who have not really got a proper job. They have to find something wrong.

Researcher So for the raw materials, do you only buy them when you need?

Interviewee We don't really use raw materials. The feed is the biggest thing. The raw materials are bought by the mill. We get the finished product and we buy egg packaging boxes, but they are not a raw material.

Researcher But how about the bird feed? Do you buy them when you need, or you keep some inventories for that?

Interviewee There are two 25 tons tower silos with feed. When one tower is empty, it switches over onto the next tower. Then we ring up the mill to get more.

Researcher Yeah, okay. If we can divide the inventory into two types, they are raw material inventory and final product inventory, and comparatively, which type of inventory do you think is more important for your financial performance?

Interviewee I think it's probably the final product.

Researcher Do keep any inventory for final products?

Interviewee Oh, yeah.

Researcher I understand food is normally perishable and the shelf life is very short, so how many days of final product inventory do you keep?

Interviewee No more than five days. We keep a little bit inventory, but 90% of the time, what is produced yesterday is sold today.

Researcher Alright. Let's go to the final aspect, which is about working capital management. By working capital here, I mean the accounts payable and receivable. In terms of the payment to your suppliers, do you tend to extend or delay the payment to them?

Interviewee No.

Researcher Why?

Interviewee The arrangement that we have with the feed mill is that they will deliver within 36 hours, and I pay at the end of every month. That's the deal.

Researcher So you have a fixed date to pay them.

Interviewee Yeah.

Researcher What's the consequence if you delay the payment?

Interviewee **If we delay the payment, they delay delivery.**

Researcher So it will influence your production directly.

Interviewee Oh, yeah. **That will be a big disaster, because the birds cannot get anything to eat.**

Researcher Okay. By contrast, do you tend to speed up the payments? Do you pay them earlier?

Interviewee **Yes, if we can.**

Researcher Right, but what's the consequence? What kind of benefits can you receive if you pay them quickly?

Interviewee **We will get better and faster delivery.**

Researcher How about the price? Do you get the price discount or something?

Interviewee Oh, no, not the price.

Researcher Right, no matter you pay them earlier or later, it only matters the delivery.

Interviewee Yeah. At the end of the month, all the bills that they receive get paid.

Researcher Can you negotiate the payment date with them? Like for this month, my cash flow is not so good, and I don't have so much money, so can you just say pay them after five days?

Interviewee No, that never happened.

Researcher Do you think if you delay the payment, it will influence your relationship with your suppliers?

Interviewee Yeah, definitely. That's why I don't want to do it. When everything is happy, the birds are happy, we are happy with the delivery, everything is fine. Now, they deliver what they say they're going to deliver, so we pay.

Researcher Okay. In another way, how do your customers pay you?

Interviewee 95% pay at the end of the month. Some of them are a bit slow, so my wife knows, I give them a note. My wife is terrific. She can speed the people and get money out of them.

Researcher You only mentioned that 95% pay you at the end of the month, so how about the rest 5%?

Interviewee They usually pay every week or immediately when we deliver, but that's all. We deliver when you want, and you pay when we want. Otherwise, forget it!

Researcher Yeah, okay. You mentioned that you also deliver to retailers, but for many retailers, they are pretty big and powerful. So do they have a longer payment period?

Interviewee No. What we deliver in January, we send the bill the first week in February, and they pay by the last day of February.

Researcher Okay. Is it possible that they negotiate the payment period with you?

Interviewee No, no, we don't do that. If they want the delivery on the day they want, we want the payment when we want it.

Researcher Okay. You mentioned that your wife is pretty good at collecting money from your customers, so do you think it is feasible to further speed up the payment from your customers?

Interviewee I don't think it's possible.

Researcher Although you know that if you can shorten the payment period, it is better for you, because you have more cash and better cash flows.

Interviewee Not really. Everything is ok. We get money in, and we pay money out. Every month, there is a cycle. **As long as my customers pay me on time, I can pay my suppliers on time, so it is a great cycle. Compared to collecting receivable faster, on-time payment is more important. As everybody is happy in that cycle, it is great for the business.**

Researcher Great! Thank you and that's all about the interview.

Interviewee Oh yeah, thank you.

D.3 Transcript of Interview 3

- Interview ID: Interview 3
- Gender: Male
- Job position: Director
- Interview date and time: 15.00 – 16.00 Wednesday 25th March 2020
- Company location: Scotland
- Company industry: Food manufacturer
- Firm size: Micro
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 1

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yeah.

Researcher According to your answers to the survey last time, I noticed your main business is manufacturing food, right?

Interviewee That's right. Yes.

Researcher Can you please briefly introduce your business?

Interviewee The main business is actually to produce a good quality food, which is meat free. That's a general summary of what we do.

Researcher All right. Approximately how many employees in your company?

Interviewee We only have two.

Researcher Okay, so now let's focus on purchasing performance. If you want to produce foods, of course you have to get some raw materials. To what extent do you think your company's financial performance like profitability, liquidity, etc. can be improved by improving your purchasing performance? By purchasing performance here, I mean the quality of your raw materials, the on-time delivery of your raw materials, etc.

Interviewee The raw material in some respects is straightforward. **When it is more or less stable with a long shelf life, that does not cause me a problem.** I'm talking here about legumes, greens, seeds and so on like that. **We are now having difficulty with fresh materials. This is quite an acute problem for me** because where I'm located is 25 miles from Glasgow, and these are the hubs which generally have availability of some fresh supplies. So I haven't got to manipulate along that to find what I need. In some

cases, I don't need very much, and when I don't need much, I simply go to the local supermarkets like Aldi or Morrison's and pick up some what I want. **My finance will be much improved if the supply and inventory of them become better.**

Researcher For raw materials, because they are normally fresh, do you keep a large amount of raw materials or you just buy when you need?

Interviewee No. **Most of my outputs are made to order.** So basically, what normally happens: any orders coming in today, we will put the raw materials required on our list and then acquire them and whichever we assign for tomorrow's production.

Researcher Do you also have a fixed supplier for your raw materials?

Interviewee Yes. As I said early on, the legumes and greens and seeds are the problem because I get them more or less in weekly, and they just sit on the shelf and I drag them off when I need them. Better fresh materials, and what I mean by fresh, you might call it kale, spinach, carrots, onions, things like that which have relatively short lives. That's the main difficulty which I have.

Researcher Okay. To what extent do you think by improving the quality of your raw materials or decreasing the cost of them can contribute to your financial performance at the end?

Interviewee Quality is always critical to me. Quality, freshness, is the real concern. That's my main driver.

Researcher We have pretty different aspects in purchasing, like quality, cost, delivery, and flexibility, but which aspect is actually your focus?

Interviewee Quality is always my focus.

Researcher Okay, can I say that you would like to sacrifice your cost in order to improve your quality?

Interviewee I would certainly agree with that.

Researcher All right. When you purchase something, have you joined any like alliances or cooperatives to help you purchase?

Interviewee Well, there's not really much in the way in the area which I function. That's about our limit, so the purchasing is a little bit of a problem. **We do not join purchasing alliances because there are not so many people, actually nobody else really, in this area doing the same business.**

Researcher Even some other similar companies in the same industry, they don't use the alliance or cooperative for purchasing?

Interviewee No. The majority of them tend to be on the meat side of things, but I'm totally meat free, so a unique position.

Researcher Okay. Right now, when it comes to purchasing, what challenges are you faced with?

Interviewee Probably the challenge I have is how to improve production. I'm actually looking at some new pieces of equipment, but invariably what does it going to be? I'm going to have to move premises and adjust premises.

Researcher Yeah. If we look your production as a chain, you'll probably start from purchasing and then production and then inventory or warehousing and then deliver the products.

Interviewee Correct.

Researcher So among the four aspects: purchasing, production, inventory, and at the end transport, which one is actually your focus?

Interviewee My focus is production and how to improve production. They go forward on our distribution there, you know, obviously, the manufacture of them and then the distribution.

Researcher Okay. Let's go to the production performance right now. A similar question, to what extent do you think your company's financial performance can be improved by improving your production performance such as reducing the production cost, improving the product quality, etc.?

Interviewee I would actually say we are looking at improving my production facilities, namely the machinery and obviously the space to work. My production targets will be improved drastically, which would mean that my financial performance can be simply improved. With the same amount of staff doing, I could actually increase my production factor by three or four, so the cost per unit comes down substantially.

Researcher Okay, so think there's a strong causal relationship between your production and your finance.

Interviewee Yeah, exactly.

Researcher Okay. Another similar question, among the aspects in production, which one do you focus on most quality, flexibility, cost or something else?

Interviewee Well, cost is always in mind, but quality, I never compromise on that.

Researcher So that's definitely your priority.

Interviewee That's definitely a priority. Looking in general terms, you're looking at retailers, this category. You've got two which are very prominent on quality, which are Waitrose and Marks & Spencer. You could look at other ones, a whole collection there, which hopefully has good quality, but I'm more interested in cost. So I tend to come up more on the Waitrose and Marks & Spencer's side of things for quality. And the cost has to match up with what we can do. As I sacrifice quality, I can certainly cut cost, but that's something I just wouldn't do. Another thing is flexibility, **I always try to be flexible and responsive in production. Obviously, large companies cannot make it, so it offers me a lot of advantages and competitiveness.**

Researcher Okay. Quality is definitely important for your company, but as you know, there is a trade-off between quality and cost. What's the role of cost for your company? How important is it?

Interviewee The cost is obviously important. I am trying to make sure my costs are right by having a low-cost production facility. My property is

rented, but the rent which I pay is very low. For instance, I'm less than five pounds per square foot, but a bit for other premises, most of them are talking at excess of 10 pounds per square foot. So by focusing on facilities and being as efficient as we could, that's where I keep the cost down. There are other people having a nice and big place with 20 elbow room and shiny windows but forgetting about the quality.

Researcher Okay. That means you also try to decrease the cost but definitely not to compromise your quality.

Interviewee That's correct. I'm happy to cut the cost elsewhere, but not being detrimental to the quality of the product.

Researcher Okay. Then let's move to transport performance. Normally, how do you deliver your final products to your customers?

Interviewee It's quite unique that we do all the deliveries ourselves. This is a purposeful decision, because I've actually turned down some of the big boys who were interested in and get me on board. There is a wholesaler, which you may well be familiar with, called Bookers. They've actually been taken over about a year or 18 months ago by Tesco. But when Bookers were on the [road], the chief executive who I know quite well, Charlie, was desperate to improve his production. I think he has got about 20 distribution centers in Scotland. It was the first story. I've been talking this through the idea behind him that he would bring it in and put it out to the convenience stores, so we would not be going to the supermarket, we go to convenience stores. If you look into convenience stores, the market there is quite favorable to having local supplies. Because they tend to [look] on the longer shelf life products rather than the short life stuff. My argument to that was, why would I want to give Charlie a very good price for my product? Then have to wait 30, 60, 90 days to get paid? I'm subsidizing his company for him to sell to the local convenience store. But what I do in fact is to take 10 minutes and run down the road and deliver to them with a price which will include distribution cost and profit. I know the money is coming to me and the fact that we are paid everyday rather than waiting 30, 60, 90 days. So this was the model on which I built the business that we own the distribution.

Researcher Okay. Have you ever tried or used the third-party companies to help you deliver?

Interviewee No.

Researcher Why? Why don't you use them?

Interviewee Well, there are a few things. When you have them working with you, you are then at the mercy of their sales force to promote your product, which means that you are depending on other people to sell for you. If they are really interest in it and personnel are very excited, they will push your products. But if they're not in that category, you're just listed on the computer.

Researcher So you don't think you can really benefit from using the third party companies to help you deliver the product?

Interviewee No, I don't think so.

Researcher All right. Under the current situation that you deliver by yourself, to what extent do you think your financial performance can be improved by improving your transport performance, like ensuring the quality of the delivered product?

Interviewee Well, I don't think there's much improvement I could take, apart from being quite efficient in they're doing it. What I mean by efficiency here is to look at logistics. I'm quite happy to up to an area and deliver in a street. I'm happy to go to the next street alone and the next street alone and so on. So I try to keep my distribution fairly tight, so that from one spot of delivering goods to the next spot for delivering goods, the distance is more measured in minutes rather than miles.

Researcher Do you mean that the improvement space for your transport is not that much?

Interviewee There's not a lot of space in there to give me some improvements.

Researcher In another way, can we say that transport performance is not very important for your financial performance compared to purchasing and production?

Interviewee You sum that up very well.

Researcher Okay, that's good. I know you don't really use a third-party company for delivery, but is that common in other similar companies in this industry? Is it common for them to use the third-party logistics?

Interviewee Not in such a small business which I am doing. It tends to be in the micro business. There are a few selected customers that I wish to distribute to. I tend to look at the central Scotland as a suitable margin for me. If I want to increase that and start heading north of England, Midlands, or further London or wherever, then I will be looking at a third party to come on board.

Researcher Okay. Let's go to inventory performance. If we divide the inventory into some subtypes, we have actually two types. One is the raw material inventory, and another is the finished goods inventory. Between the two types of inventory, which one is your management focus?

Interviewee My management focus is always on the final products.

Researcher Why?

Interviewee Well, because if you don't sell stuff you won't exist.

Researcher Yes. You mentioned that you don't keep a lot of raw material inventory, so no matter in terms of value or volume, the raw material inventory is not as important as final products? Is it one of the reasons?

Interviewee You get the key reason.

Researcher Any other reasons?

Interviewee No. I'm probably a very much quality and sales minded individual. I'm producing quality products and then go to sell them, so the distribution of these finished products is critical. And in all honesty, raw materials are relatively easy to source. Again, as I mentioned, the dry goods are quite easy, and only the fresh materials cause headache to me.

Researcher How many days of inventory do you keep in terms of the raw material?

Interviewee I usually have at least a week's supply and some products could be three- or four-weeks' supply.

Researcher How about for your final products?

Interviewee **It might be few hours**, so what you produce today are sold today.

Researcher You don't keep any inventory?

Interviewee I don't store much at all. **They will be produced today and delivered tomorrow morning.**

Researcher Okay, but what's the reason for that? Because they are very perishable or something else?

Interviewee Well, I just developed it and it works. The bottom line comes. If you look at the fresh counter or fresh fridges in the supermarket, you'll see that the shelf life on there tends to be about eight days, so you do a production and deliver them within eight days from that.

Researcher But have you encountered any situation that your customers need more but you don't have some inventories there to supply them?

Interviewee My products have good quality. The minimum shelf life I have is 16 days.

Researcher Okay. Actually, you don't keep the inventory, but you move the inventory to your customers.

Interviewee That's right. Inventory is pretty much created by the orders coming in today.

Researcher All right. Let's go to the final aspect, which is about the working capital management. By working capital here, I mean the accounts payable and receivable. Do you tend to delay the payment to your suppliers?

Interviewee No. I pay them straight up front.

Researcher Okay, so you don't have anything like a fixed payment period.

Interviewee Nope. I will actually order stuff today or tomorrow, and I will have them delivered on Monday. I would simply just pick up the invoice and pay today or just pay the driver on Monday.

Researcher Is it possible to delay the payment?

Interviewee Oh, yes. They give me the option, but that costs me money. Why does it cost me money? This is quite important. If I pay today, the invoice is done and it sits on the pending file, maybe notice for the accountant. If I don't pay it, I will need to pay at some time. That means I need to focus my attention to ensure I pay within

the period to keep my reputation correct. That's really a stress to me and taking my focus away off production and selling.

Researcher Right. The reason why you don't really tend to delay the payment is because you take care of your reputation.

Interviewee That's correct. I keep the costs down, because I'm not staying spending time.

Researcher Okay, so in this sense I think you highly value the relationship with your suppliers.

Interviewee Yes, and it gives value to me.

Researcher Yeah. Do you receive any penalties if you delay the payment?

Interviewee No.

Researcher Do you have any benefits if you pay them quicker?

Interviewee I get a fairly good price for what I do. The discounts for what I get are more attractive than it would be if I pay within 30 days or 60 days.

Researcher Okay. How about customers paying you?

Interviewee If you look at my customers, they pay me the same way. Always immediately.

Researcher In terms of customers paying you, can they negotiate the payment period with you?

Interviewee They can pay me when they order or pay me when they get the products. It's very successful. If you go to a shop to buy milk or a loaf of bread on a couple of apples, do you pay them immediately or at the end of the week or next week? That's a question you would ask yourself.

Researcher Do you supply to any large retailers like Tesco or Morrison's?

Interviewee I don't involve in these ones at all because there are too many problems with it. If I sell a product to a convenience store at a pound rate, they would want to buy that for 40 pence. When I sell that for 40 pence, I might meet myself one or two pence profit. But when I sell it to my convenience store for a pound, I've got a lower additional cost of distribution, etc. and then probably making 20 pence profits rather than two pence profits. If it says I will have the 20 pence profit now, I will deliver that, rather than having the two pence profit in 60 days. I actually quite happily get through convenience stores and keep them on a happy tune with a good service and good product.

Researcher Okay. You are not involved in selling to large retailers is because they have a very strong bargaining power, so they try to decrease your price.

Interviewee That's exactly true.

Researcher Okay. Actually, for large retailers, they tend to delay the payment and normally have the fixed payment periods, for example, 10 days, 20 days. Do you think that's also a reason for you not be involved in dealing with them?

Interviewee That's a hundred percent. Because I've actually got a secure finance. I've got fairly secure quality, fairly secure distribution, so

all at all, the business runs. The only stress I've got is to make sure what the people have ordered today, and they get it tomorrow. That's all the production stress or business stress which I have.

Researcher Yeah. Actually, I have interviewed some people in the food industry, but you are the first one that can let your customers pay you immediately. Is it easy to persuade them to pay you so quickly?

Interviewee I don't find that problem.

Researcher Yeah, okay. All right. I think that's all about the interview today. Thank you very much for your participation and your valuable time.

Interviewee Thank you.

D.4 Transcript of Interview 4

- Interview ID: Interview 4
- Gender: Male
- Job position: Head Winemaker
- Interview date and time: 14.00 – 15.00 Friday 27th March 2020
- Company location: England
- Company industry: Beverage manufacturer
- Firm size: Small
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 2

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yeah.

Researcher In your answers to my survey last time, I noticed your business is actually beverage manufacturing. I checked your website today and noticed you are manufacturing sparkling wine, right?

Interviewee Yeah.

Researcher I also noticed that you have your own vineyard, possibly meaning that you just make your wine from the grapes grown by yourself. Do you buy any other grapes from other suppliers?

Interviewee Yes. When we started 25 years ago, the wine we made was just from our vineyards. Currently, we have nine growers that grow for us, so 80% of the fruit we use for our wines is contract growers.

Researcher Okay, so you have the contract with them, and they supply continuously.

Interviewee Yeah.

Researcher Apart from the grapes, do you have any other raw materials, like sugar?

Interviewee Apart from the grapes, everything else is outsourced. We buy it.

Researcher All right. Let's focus on your purchasing right now. The question is to what extent do you think your financial performance, like profitability or liquidity, can be improved by improving your purchasing performance? By improving purchasing performance here, I mean improving the quality of your materials or on time delivery of your raw materials, etc.

Interviewee A lot of that works on an economy of scale. Whether it's sugar or bottles or dry goods like corks or labels, we will agree with those suppliers on a volume for the year and then we will draw down on that. Also, we do a lot of contract wine making for other people, so we include all of that within our purchasing, which obviously brings the cost down because of the volume increase. Obviously, we're a quite small industry globally, so our buying power is much smaller than say France or Italy where actually the industry is a main tertiary industry, so with several other producers we will buy together. For example, packaging, we will buy from France but two or three of us will place the order together, so we're buying a much bigger volume.

Researcher Actually, you just purchase with other companies together to achieve the economies of scale.

Interviewee Yeah.

Researcher Is it common to use such I can call it purchasing alliance or cooperative in your industry?

Interviewee It's getting less and less common, as we get bigger and brands management becomes more important. But certainly, when we're a much smaller industry, we're very much working together. There are probably about 10 of us similar age vineyards and similar size, who do a lot of work collaboratively in that respect. We work with them because we all sort of study together, so we know each other very well. And yeah, again, they're all fairly similar size.

Researcher As you mentioned, if you purchase together you may achieve economies of scale. Any other benefits from that?

Interviewee I suppose not so much purchasing collaboratively, but we meet up as a forum four times a year to discuss all sorts of things. This gives us a time to discuss if we found something new or a new supplier or more efficient or cheaper supplier, so we help each other in that way.

Researcher It is more like a knowledge sharing.

Interviewee It's exactly what it is. Yeah.

Researcher Okay. You know in purchasing, we have different aspects, like cost, quality, time, flexibility, etc. Which aspect in purchasing do you focus on most?

Interviewee It very much depends on what those products are. Sugar, for example, we use throughout the year, but it's not a set volume each month. It varies depending on the process. Obviously, we use a lot more at harvest. For example, we use a company, very local to us, that is really reactive, so we can literally phone them up on Monday and say we would like two tons of sugar, and they are like okay, we'll drop it off tomorrow. Or for example, at harvest, we've had a rush, because they are local, we can go or send someone over in a van and pick up something and bring it back. So they may not necessarily be the cheapest sugar

suppliers, but for us, they're the most reactive and as you say, flexible. Whereas other things like, for example, the metal stillages that the bottles go into after they've been filled. We buy them from a company in France because they're the largest supplier of this type of crates, so they're the best. From that point of view, it is a receptacle to store wine in, so the quality may not necessarily be the best, but it does what we need, and its price is sustainable,

Researcher How about the grapes, which are the main raw material for you?

Interviewee With grapes, that's slightly different because they're very much more of a collaboration, so it's in their interest to grow the best grapes they can because they get the highest price. And it's very much in our interest to help them grow the best grapes they can because we want the best quality. Also with grapes, it's slightly different because it needs to have the correct aspects, the correct altitude, the correct soil. So when we are deciding who we do and don't work with, all of that has to come into play. Also because it's quite an organic partnership, it takes a lot of understanding from both parties. The relationship has to be there with the grower or the farmer, so, you know, there's sometimes very difficult conversation to have on both sides. So if you don't have a good relationship with those people, it can either fall apart, or you're not getting the best for one or both parties. The process of choosing growers is actually quite a complicated one. It's not the same as who to buy granulated sugar from or who to buy sulfur dioxide.

Researcher Yeah, okay. Let's go to production performance right now. To what extent do you think by improving your production performance can improve your financial performance?

Interviewee As a business, we've been evolving and growing for 25 years. We've expanded a year on year. We do everything that we can do to improve efficiency and therefore, obviously the internal economy. For example, from a production point of view, we're constantly looking at how we can update and upgrade equipment. There is a process where we have to filter the wines. At the moment, the way we do it, for our size of business, is quite time consuming and the raw materials to do it are quite expensive, but the actual filter is quite cheap. What we are doing as we've got bigger is that we are now trialing different types of filters which have no environmental impacts because they don't generate any waste. They don't need any raw materials. It's just that the initial outlay for the actual unit is so much higher. Compared to the standard diatomaceous earth filter you can pick up for one or two thousand euros, a [cross plate] filter is the best part of 150,000 to 200,000. Using the filter we have now takes two people probably 10 hours to do say 10,000 liters, whereas this filter, the new filter, takes one person to set up, leave it in a corner and it will do

everything for you, so you can get on with other things. It's just justifying that economy of scale. The outlay is massive to start with, but then in 10 years' time, it's paid for itself and the time and raw materials that you are not using. Another way we are looking at that is the process of the actual processing grapes. At the moment, the way we do it is very labor intensive. It takes six people 45 minutes to load four tons into a press. For the 2021 harvest, we are looking at automating that whole process so that two people could load four tons in 15 minutes.

Researcher May I know how many employees you have?

Interviewee Across the whole business, we have 32. But some of those are in the administration side, and they might work part time. Quite a lot of people will do three days a week for five hours. In the winery, which is where all the processing takes place, there are three people. And then we have what we call postproduction, which is all the finishing of the wine, labeling and things like that. There are three people, so six people in production.

Researcher Okay. If we go back to production side, to summarize your talking, you think there is a strong relationship between your production and your financial performance.

Interviewee Yeah.

Researcher Between purchasing and production, which one do you think has a stronger impact on your financial performance?

Interviewee Probably purchasing, I think. From the production side of it, we can change whatever we want, but it's the grapes that we buy and the raw materials that we use has the bigger trickle of effects, because all the equipment that we use for production is static. Once we've bought it, that's the outlays gone, but the purchasing is very fluid. The price of grapes changes over a three-year contract, and raw materials change on an annual basis, if not quarterly. For supply and demand, for example, for the materials we use for filtering, they come from China. If there is an issue that happens there, or in the transportation of it, or in the delivery within domestically has a consequence on the price that we have no control on. And obviously, because it's a food and beverage industry, what we are making, we have to have full traceability throughout the whole process, so all the different things that we have to buy to make that product is probably what we put the most focus on.

Researcher The risk of the supply side is higher than production.

Interviewee Yeah.

Researcher Okay. Which aspect in production do you focus on most, quality, flexibility, time or something else?

Interviewee Well, quality is always at the foremost. I mean, quality of the product is the most important thing. And then after that would be consistency and price.

Researcher Okay. How do you see the role of cost in your production?

Interviewee Probably the biggest flexible cost, outside raw materials, is staffing. We like to pride ourselves that we are quite an ethical company, so we always pay above the minimum wage, or above the livable wage rather. Obviously, that changes quite a lot. We need a lot of staff or a lot of external staff at harvest for six weeks, and then when we are bottling, we need external staff, so it's factoring that into the production cost, probably is the trickiest thing.

Researcher Can I say that you are willing to sacrifice your cost to improve your quality?

Interviewee Yeah.

Researcher Okay. Let's go to the transport part. How do you deliver your final product to customers?

Interviewee We use a haulage company.

Researcher So you outsource it.

Interviewee Yeah.

Researcher What's the benefit of it? Why do you use a third-party company?

Interviewee **Obviously, we don't have to worry about the vehicles. We will not have lorries going out every single day, so it would be pointless for us to run our own lorry.** Obviously, it doesn't work like that. In one week, we might have maybe 10 lorries coming in and out, and then we might not have anything for two or three weeks.

Researcher Do you think you can really financially benefit from using it?

Interviewee Financially it would make no sense for us to buy a lorry. I would have to maintain the lorry; I would have to employ someone who is qualified to drive the lorry. For someone that's probably only going to work a week a month, it's just not sustainable.

Researcher But how about outsourcing to the third party? Do you think you can financially benefit from using the third-party company?

Interviewee **I do not think there is really a financial benefit,** but the company that we use is a relatively small company. We've used him for the last 20 years and he is very much a family friend, so from that point of view, we have a lot of flexibility. For example, at harvest, he brings all the fruit to us from all over the South of England. He is very reactive. We can phone him up on a Sunday, and then he can have a lorry sitting outside of our winery on a Monday morning. So there is that flexibility.

Researcher Okay, but you don't really think by using the third-party company, you can improve your performance, like profit or liquidity.

Interviewee Well, I think the weighting increases our profit is the fact that we're not having to outlay and we're not having to pay someone directly to do that for us. We can outsource it.

Researcher Okay. Is it common to outsource the transport to other companies in your industry?

Interviewee Yeah, very. There is probably only one winery that has a big enough size that could warrant having their own hauler, but they

even still outsource. They have vans, so they can do local deliveries. We do local deliveries ourselves, but anything nationally, everybody outsources.

Researcher Okay. Let's go to the inventory part. For your raw materials like grapes or sugar, do you just buy them when you need, or you keep some inventories for them?

Interviewee Well, **we have a system to indicate us when to buy**. The problem with a lot of our things is they have a very finite lifespan, so they're very much bought when we need them. Anything non consumable, we will buy bulk but anything perishable will buy when we need it.

Researcher The reason is that they're perishable.

Interviewee Yeah.

Researcher Okay. Between the raw material inventory and final product inventory, which one do you think is your main management focus or which one is more challenging for you?

Interviewee Probably the final products. For us the average bottle price is super important because that relates directly to our profit and turnover. Because we sell to numerous different outlets, the bottle price changes depending on what the outlet is. So probably our biggest focus on profit or certainly turnover is ensuring that the average bottle price is as high as we can get.

Researcher All right, okay. Let's go to the final aspect, which is the working capital management. By working capital here, I mean mainly the accounts payable and receivable. Do you tend to delay the payment to your suppliers?

Interviewee Not particularly. I mean, on certain things, if it's a massive outlay, we will ask for 60 days rather than 30 days, but within our industry 30 days is fairly standard.

Researcher Okay, but what if you delay the payment after 30 days? Do you receive any penalties?

Interviewee Yeah, for a lot of the people that we would buy from, there would be a penalty.

Researcher What kind of penalty is it?

Interviewee **There will be a financial penalty, either they would increase price on the next order, or they would charge a penalty for late payment directly.**

Researcher What if you speed up the payment? Do you get anything like a reward or discount?

Interviewee No, and it doesn't help our bank balance if we pay them early. There is no financial benefit to pay anyone early.

Researcher Okay. What's the normal payment periods?

Interviewee 30 days. I mean we have a couple of [slides] which might go to 60 days but generally it is 30.

D.5 Transcript of Interview 5

- Interview ID: Interview 5
- Gender: Female
- Job position: Director
- Interview date and time: 15.00 – 16.00 Friday 17th April 2020
- Company location: England
- Company industry: Food manufacturer
- Firm size: Micro
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 2

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yeah.

Researcher I checked your websites and noticed that you are the manufacturer of pickles, right?

Interviewee Yeah.

Researcher Can you briefly introduce your business?

Interviewee We make a small business, I guess, you define it as micro. We produce naturally fermented vegetable pickles come around the world and it's a small batch producer based in London.

Researcher Okay. How many employees do you have?

Interviewee I'm the only full-time employee, and then I have two people who help me on Mondays and Wednesdays, which Mondays are our production day and Wednesday is our packing day. It's really tiny.

Researcher All right. Let's focus on your purchasing performance first. You definitely have to buy some raw materials for your production and what are your main raw materials?

Interviewee Although we are a very tiny entity, we do supply to some quite big shops, like Ocado and Whole Foods. On what we purchase is we purchase sea salts, it's a big ingredient for us. We purchase chili powder for kimchi, and then all the other ingredients are fresh vegetables. That is our main purchasing and of course we purchased packaging.

Researcher All right, I'm just curious - to produce kimchi, you know, I really like it because it is perfect for barbecue and some noodles, what's the raw material, is the Chinese leaf or something else?

Interviewee We make Chinese leaf kimchi. For the kimchi we use Chinese leaf, spring onions, ginger, garlic and Korean chili flake.

Researcher Okay, apart from the fresh materials, do you need any unperishable materials, like yeast?

Interviewee No, it's wild fermentation. We don't use a starter culture. All vegetables already have an amount of lactic acid bacteria on them, and those are the ones that we want to encourage because they are the good bacteria, so we just make the environment right for them to flourish.

Researcher Okay, so your main raw materials are basically perishable.

Interviewee Except for the chili flake which is dried. It is perishable, but it's got a long shelf life of about a year.

Researcher Okay. To what extent do you think your company's financial performance, say profitability or liquidity, can be improved by improving your purchasing performance by, for example, improving the quality of your materials or ensuring the on-time delivery of your materials?

Interviewee We could definitely improve on constantly looking at especially with the fresh vegetables. Reliability is an issue for us. Cost is an issue and quality. All three.

Researcher Okay. Have you joined any cooperatives or purchasing alliance so that you can buy raw materials with other similar companies?

Interviewee No, I haven't.

Researcher Okay, but is it common for other similar companies to do like this, if you know that?

Interviewee **In my experience, companies in this industry do not get together**, but I'm not sure why. I would think actually a smaller company would benefit more from cooperatives or alliances, wouldn't they? Because they might have a small volume.

Researcher Yeah. I think so. It's pretty common for farmers because they live pretty close to each other, but for you it is probably not the case. Probably there are not so many similar companies in your area?

Interviewee Well, they definitely are in London. When we started out, we were the only case selling kimchi that wasn't a specialist Korean store, so we were the first ones on the shelves. But nowadays in cases like Planet Organic and Whole Foods, there are about 10 brands and a lot of them are based in London. It's probably about 5 or 6.

Researcher Okay, but it's not very common for them to gather together.

Interviewee No. I think in part it's the logistics. If we got together and bought Chinese leaf. For half a year that would be imported from Europe the other half of the year you can get it in Britain, but it's always more expensive, the British one. If we bought a large amount and then to get it to each of our premises in relatively small amounts. So I buy between 200 and 400 kilograms a week, but I think some of my colleagues would be buying say 100 kilos or 200 kilos, and then get a van to go and deliver to each of them, probably end up costing the same as if we just bought it directly. I think the other

- reason that we don't get together is probably competition. I'm sure there is an element.
- Researcher You mentioned that you don't get together in purchasing, but also not in other areas like production or marketing?
- Interviewee No, in my experience of this, I think **people are a little protective because it is a very small and niche market**. If it is a huge market, maybe people would feel more open, but it's a very small market comparatively, so I think people probably feel a little protective.
- Researcher Alright, so do you think the competition in this market is very competitive or fierce?
- Interviewee That's difficult to say. It never used to be but at the moment, there are a lot of brands going after quite a small number of consumers. So yes, I guess it is quite competitive at the moment.
- Researcher All right. In terms of purchasing, any challenges you have right now?
- Interviewee Yes. Definitely with fresh vegetables. I think we are kind of in an odd size group, so we usually buy from small merchants that sell from the vegetable markets. Their main business is supplying to restaurants and hotels, and they are not used to dealing with manufacturers. But because we are not really quite big enough to import ourselves. We are still in an odd size that is too small to go to really big to import ourselves and a little bit too big. For instance, these kind of veg merchants, the way they sell is not by weight they sell by boxes, so they really catering for restaurants maybe. Also, the price fluctuates and there is no fixed price. From week to week, the price can change completely, but the quality is not as consistent as I would like it to be. It's not very fresh because they are small merchants, so they are keeping the Chinese leaf in their own fridges for a while and they'll try and pass on some bad stuff on you. They are wheelers and dealers and that's their business.
- Researcher All right. Do you have a stable supplier for all your raw materials, or you change your suppliers from time to time?
- Interviewee I change quite often because I have never found anyone that I'm wholly happy with. I've just changed my supplier and hopefully next week, and this will be better. They're a much bigger company, and they import directly themselves when it's not the British season. When it is the British season, they are buying directly from growers and distributing to me, so I'll be able to get my hands on local produce, and prior to this I couldn't get my hands on local produce during the British season. This will ensure that I'm getting local fresh produce. I've only just got big enough to be able to order from them also, so now I'm ordering say 300 or 400 kilograms and they are willing to come out and deliver to me. It becomes cost efficient in transport wise.
- Researcher Okay. Just now you mentioned some different aspects in purchasing such as the cost, quality, reliability and probably

- another one flexibility that you focus on. Among those aspects, which one is actually your management focus?
- Interviewee We make to order, so we're not very flexible because that way we've got no waste. We're a very small entity, we can't afford to waste, and we don't want to waste, so I get an order, I place my vegetable order and they deliver, so flexibility is not an issue. I would say that quality, price and reliability are equally weighted. All three of those. Reliability is very important because I have two people come in to help myself on Monday and if orders are not there, then it's a problem.
- Researcher What do me exactly by reliability? Do you mean the delivery reliability?
- Interviewee Yes, delivery and stock of course. For instance, recently because of the coronavirus, stock became very unreliable somewhat. My last merchant couldn't deliver one week and we did admit a few days late and that does happen outside of coronavirus: you will get weather changes, and that can affect fresh veg deliveries and give you big price fluctuations and quality differences and also even just not arriving being unreliable.
- Researcher Okay. Can I say that by reliability you mean two aspects: one is the stock availability and another one is the on-time delivery of your raw materials.
- Interviewee Yes, I would summarise like that.
- Researcher Okay. Also in other two aspects, cost and quality, I think there's definitely a trade-off between them: if you increase your quality you will definitely increase your cost, so how do you balance them?
- Interviewee I would say it's quite interesting because it depends on what your measure of quality is. For instance, for us, buying different sized cabbages is fine. Supermarkets always want quite uniform sizes, but we can buy what's called second-class Chinese leaf, which means that it's not uniform in size. What is important to us is that it's fresh. Sometimes for Chinese, you get these little black spots from being kept too cold in the fridge. Although we will use a Chinese leaf with those black spots because it's not in any way dangerous or anything, we prefer not to have that. And of course, freshness because we're not cooking the Chinese leaf. It's a raw pickle, so the quality is going to be quite premium.
- Researcher Okay, let's go to production performance. To what extent do you think your company's financial performance can be improved by improving your production performance, such as reducing the production cost, increasing the quality, shortening the production time, etc.?
- Interviewee Definitely, it can be hugely. If we could improve production costs, that would be great. Our production costs are quite high, because I pay the London living wage and I don't want to save money by paying staff less, which means that the way to save on production costs would be to invest in machinery at some point.

- Researcher Yeah. Actually, you know your base is in London so that's also the reason why the production cost is high. Have you ever considered moving out?
- Interviewee I definitely have thought of moving outside of London, but I wouldn't yet because at the moment I don't think it would pay off because we are so small, and our volumes are quite small. Because I deliver my main distributors in London, so I think whatever I made up for would cancel out. But if we got bigger, I would consider moving outside of London to Sussex or somewhere like that to bring the cost down.
- Researcher Yeah. We probably can categorise production into the same areas as in purchasing, say quality, flexibility cost, and time. Among all those aspects for your production, which one is your management focus?
- Interviewee Well, I think probably our biggest focus is quality of production. The kind of products we make is an artisanal product. It's not a cheap product. It's not hugely expensive, it's not super luxury item, but it's not a cheap item either. For us in order to justify that cost, quality is number one. Although production costs are high at the moment, I consider that something I can bring down in the long run. Our business is not profitable at the moment, but we do break even. I take a very small salary - 720 quid a month. It's not survivable, but I figured that this is the growth stage, so that when we increase sales and we get a bit bigger, we can invest in machinery. At that stage, we will become profitable.
- Researcher Yeah. We can go to transport performance right now. Normally, how do you deliver your final products to customers, do you deliver yourself or you have the third-party company or you let customers collect them?
- Interviewee By far, most of our stock goes to a distributor which is usual in the food industry. Because we sell through retail outlets, retail outlets don't really like small brands delivering to them. They like to receive one large order from the distributor.
- Researcher That's actually a wholesaler.
- Interviewee Yeah, they are a wholesaler. They are not a usual third party and they are a wholesaler. We send all our stuff to a wholesaler, and they buy from us outright, and they deliver to all the shops. But we maintain relationships with the shops that we're delivering, but they are not actually buying from us - they are buying from the wholesaler.
- Researcher For the current situation, do you think it's better than delivering yourself in terms of financial performance?
- Interviewee I think it would be logistically very difficult to deliver ourselves to the shops that we supply. The shops wouldn't accept it, the bigger shops. The smaller shops, it's not worth our while because some of them will buy one case. So I think it's the only way to operate in this industry.

Researcher Basically, you don't have any other choices.

Interviewee I don't think so. Maybe if you were really big, but then the small independent shops, they would still not want to deliver to you, because it wouldn't be worth your while.

Researcher In the current situation, you have a third-party company to deliver for you, but have you encountered any problems in delivery?

Interviewee In delivery, no, because they have to handle that. With a wholesaler, it's their reputation. Their whole reason for existing is to make sure that those shops had the stock that they ordered. An additional advantage to that is that they have to control stock levels, so they have to order enough to make sure that they can supply those shops. So they take the risk of overstocking or understocking instead of me taking the risk. That's why I can make to order. Whereas if I were controlling stock levels of the shops, it would be harder for me to make to order.

Researcher Okay. You mentioned that the delivery performance may just influence their reputation, but in this situation, do you think the delivery performance by the third-party company can influence your financial performance?

Interviewee I'm sure it will definitely have. I've got a good example of that. Last year, our distributor ran lower stocks - they didn't order properly, and I was not aware of their stock levels. So they ran out of stock and they couldn't deliver to Ocado. As a result, we lost our pick-face at Ocado. Pick-face is you get allotted a little space in the warehouse, especially in an online case like Ocado and that little space is yours. If you lose that, then it takes a lot of time and effort to get it re-established. In our case, it took three months to get the pick-face back, so we lost thousands of pounds in those three months.

Researcher Okay. Just now we talked about purchasing, production, transport those three functions or areas. Which one is the most important for you and which one is the least important?

Interviewee I guess production is the most important. That's the heart and soul of the product. Because it's an artisanal product, so it's all about process. If the process is not done correctly and to the highest standards, then the end product isn't what it should be.

Researcher Okay, and which one is the least important do you think?

Interviewee I think they are all important. I guess the least important is probably purchasing performance if I had to choose one, but I would find all three are very close. The reason that is the least important is because that doesn't reflect as much on the end products. For instance, if shops don't get their pickles like Ocado didn't, not only do I lose my pick-face, but I lose credibility and possibly sales. So for transport, if it doesn't get there in time, I'm going to lose sales. Production, if it's not made properly, it's not the product it should be.

Researcher Yeah, but to some extent, your purchasing performance like quality can influence your production quality as well.

Interviewee That's why it's so difficult to rank them.

Researcher Yeah. Let's go to the inventory performance. In regard to your final products, may I know how long of the average shelf life?

Interviewee Six weeks.

Researcher All right. For raw materials, do you keep some raw materials in stock, or you just buy them when need?

Interviewee We keep salts and we keep chili powder, all dry ingredients, but fresh vegetables we buy weekly for each batch we make. As soon as we get the fresh vegetables, we process them,

Researcher So basically, you keep the weekly inventory for your fresh materials.

Interviewee Yeah.

Researcher But for other materials, approximately how many days of inventory do you keep?

Interviewee Chili powder, we probably keep in stock maybe two or three months' worth. The same for packing materials - two or three month.

Researcher Just now you mentioned that you make to order, so do you keep any inventory for the final products?

Interviewee **We make to order as I said, so as soon as we finish packing, in the same day or the next day, they get settled to the distributor. We also supply some restaurants which are closed at the moment, and that would go off within a couple of days.**

Researcher Okay, so probably the next question is pretty straightforward: which one between the raw material inventory and final product inventory is more important for your financial performance? I think it's probably raw material because you don't have any finished products, right?

Interviewee Right, but inventory is not a big thing because we are working on this very kind of supply and demand way. Inventory on either side is not a huge thing for us.

Researcher All right. But in the inventory area, what's your biggest challenge?

Interviewee I am not sure if we really have any challenges. I just make sure that we've got what we need and that we order in time. But even that, it is pretty easy.

Researcher If you buy raw materials, do you also buy according to the orders you received?

Interviewee For vegetables we do, yes. Any stock that we hold inventory of, we just buy kind of bulk amounts to last two or three month. For vegetables we buy by the kilogram, exactly the right amount, make to order.

Researcher Okay. So in this case, you don't waste any materials.

Interviewee We don't waste anything. What will happen is that sometimes obviously, you can't be completely exact because of the differences in water content. Sometimes we have too few cases or a few too

many, but I seem to have managed to persuade the wholesaler to work with that. If I've got 10 cases too many, I will send it anyway and tell them and if I've got too few, same thing, and they seem to be happy with that.

Researcher Okay. Let's go to the final aspect, which is working capital management. By working capital here, I mean the accounts payable and receivable. Have you encountered any situation that your cash is not enough, and you may need some financing from other companies or organisations, such as bank loans?

Interviewee I've got a 5,000-pound overdraft for cash flow purposes and I've got a business credit card.

Researcher Okay. To what extent do you tend to use working capital to improve your cash flow for example, by extending the payment to suppliers or speed up customer's payment?

Interviewee I can't do that at the moment because we took a loan when we moved into our premises of 20,000 pounds to equip our premises. It's given me a bad credit rating with the fact that I have that loan is reflecting as a loss. I think partly my accountant didn't do a very good job, but the way they filed it when they filed the corporate accounts made it look like we just lost that money, so I can't get credit, so we pay everyone within seven days.

Researcher Okay. But you if you can, do you tend to delay the payment to your suppliers?

Interviewee No.

Researcher Why?

Interviewee I don't like to do that to my veg supplier who I could delay payments to. I know that he's a very small business and that he's quite reliant on prompt payment, so I usually pay him the same day.

Researcher Okay. If you delay the payment, do you get any bad consequences or penalties?

Interviewee No.

Researcher Okay, so normally your payment day is seven days right now.

Interviewee Well, no, depends on the product. For vegetables, he likes to get it the same day or the next day, so I usually do that but sometimes I just forget.

Researcher Is it flexible to change the payment day, like I forget it so I pay you four days later?

Interviewee Yes, sure. Within those seven days, it's flexible. And then the packaging company, they do accept 30 days for me, so I guess for the packaging company, depending on my finances, sometimes I will pay towards the end of those 30 days, if I'm waiting for my invoices to be paid. But if I've got money in the bank, I'll just pay them.

Researcher Okay. If you pay them more quickly, can you get any reward or discount?

Interviewee No. None of my present merchants offer that.

Researcher Okay. In another way, how do your customers pay you?

Interviewee Our terms with the wholesaler, which is, like more than 90% of our business, are that they pay 30 days after that month is finished. If I send them an order on the first of January, they're going to pay for that at the end of February, and if I send them an order on the 30th of January, they're going to pay for that at the end of February as well. So anywhere between 30 and 60 days.

Researcher Okay, so actually your receivable day is longer than your payable day, but it's probably not good for your business.

Interviewee No, probably not.

Researcher Because you have to maintain your cash flow, and you may have to keep a lot of cash in hand.

Interviewee Yes. I guess at the moment we do because we just breakeven, sometimes it's very tight, the cash flow. I only just kind of make it. That's why I got the 5,000-pound overdraft. You are right, **if I can collect the receivable faster, I do not need the overdraft and pay interest. I can maintain a good cash flow and invest the money in expanding my business, which I believe is beneficial for my profits.**

Researcher Yeah. Is it possible to let the wholesaler pay you more quickly?

Interviewee No, I've asked, but those are their terms. That's how they operate, their whole system is set up to operate like that, and they are reluctant to make exceptions because I think it would create more work.

Researcher All right. But do you think if your company is larger, or like other large companies in the same industry, can they negotiate the payment term with the distributors?

Interviewee Quite possibly. Retailers have more reliance on larger companies, so they cannot afford not to stock. **Those producers would have more muscle, so if my company becomes larger, I would be able to better negotiate payment periods with customers and suppliers.**

Researcher I notice I missed one question in transport. You mentioned that you get the distributor to help you deliver the products, is it common for other similar companies in this industry to use the distributor or wholesaler to sell their products?

Interviewee Almost everyone who sells to retail outlets in this industry works with a distributor. Some people do some direct sales as well and some sales to restaurants, but even if a sale to restaurants, they use a different distributor that specialises in restaurant distribution. Almost everyone in the food industry will want to use a wholesaler.

Researcher Okay, so what's the benefit? Why do you want to use it? I know it's probably the only choice for you but any benefits you can get?

Interviewee The benefits are that they handle the logistics. If you're a small company, and you're supplying 100 different shops, and you have to make sure that they get their deliveries on time, no matter how small or big those are, and that you have enough stock to fulfil those orders. That's quite challenging for a small brand, so I think that is

an advantage in using a wholesaler, but they also take a percentage - they work on a 27% margin. And the shops work on anywhere between 25 to 40% in the shops I supply, but some other shops like Holland & Barrett, they have a 60% margin.

Researcher You also deliver to Holland & Barrett.

Interviewee No. They did get in contact with me recently, but their margins were too great. I couldn't accept a 60% margin. I couldn't afford to supply them.

Researcher Okay. Because you deliver similar products to large retailers and probably some small shops, can you see the difference in the margins?

Interviewee Well, my margin remains the same. It's the wholesaler that gives the bigger shops discounts, so their margin decrease. For instance, Whole Foods have a big account for the wholesaler, so they will get say a 15 to 20% discount from the wholesaler, whereas the small shops won't get any discount at all, but my margin never changes.

Researcher Okay, so no matter to whom they sell to, they pay you the same price.

Interviewee Yes.

Researcher Okay. I think that's all about the interview. Thank you very much for your time. I really appreciate it.

Interviewee Thank you.

D.6 Transcript of Interview 6

- Interview ID: Interview 6
- Gender: Male
- Job position: General Manager
- Interview date and time: 16.00 – 17.00 Tuesday 28th April 2020
- Company location: England
- Company industry: Beverage manufacturer
- Firm size: Small
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 1, 2

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible – there is no right or wrong answer here. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information, and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yeah.

Researcher OK, I checked your website and actually, I noticed that you are a brewery for beers. Can you please briefly introduce your business?

Interviewee Yeah, we are a relatively young business. We were established in 2018. We provide beer to both wholesale and retail customers throughout the UK. We have grown rather rapidly. Before the current crisis, we were enjoying 30 plus percent growth both on volume and turnover.

Researcher That's the annual growth.

Interviewee Yes. And we had quite significant expansion plans. We've won a number of awards for our beers. We had all the momentum behind us, and we were launching new products plan to launch new more. We've invested in more equipment so we can produce more. We would have been reaching our capacity at our site this year in looking for a new site. Obviously, we'll see what it's like when the government let everybody go back to drink in pubs.

Researcher Yeah, let's see. In order to produce beer, what kind of materials you have to buy?

Interviewee Well, there are four things really, which are malt, hops, water and yeast. Of those we buy three of them, which is the malt, the hops and the yeast. And we buy those from a number of suppliers in the UK although we have started dealing with a pop supplier from Japan who have just started in the UK.

Researcher Do you have fixed suppliers, or you change your suppliers from time to time?

Interviewee The way it works with hops and malts is because they're a cereal crop and there's a fixed amount we agree a contract each year, where the supplier guarantees a certain amount and then we're committed to buy in that quantity throughout the year. Normally, that will be fine. However, with the growth we were experiencing before, that's why we've now started dealing with [recording unclear], because we'd had our allowance and had to look for more. With the explosion of craft or restrict in the UK, it's becoming harder and harder to secure the amount of products you need.

Researcher Yeah. How many employees do you have?

Interviewee In total, we have about 15. Well, we had about 15.

Researcher Okay. Have you joined any cooperatives or purchasing alliances in order to purchase together with other similar companies?

Interviewee Well, that was something we're looking to do in a number of areas, both for purchasing raw materials and also for distribution costs. Also, we use an online service as well as transport costs, for delivery costs for packages and parcels. However, it's something suppliers don't like doing and dealing with cooperatives because obviously, it lowers their margins. But it's something that a number of my peers in other companies, we speak quite directly in agreement that we actually need to start doing something along those lines and not too distant future.

Researcher You mentioned that suppliers don't really like it, but is it easy for you to cooperate with other similar companies?

Interviewee No, the difficulty is around. There are a number of systems in the industry that we use, **we use a system called BrewMan**, and there's another one called Merlin, there's Sage. There's a whole host of systems and that's really the issue is to align as one buying group. We need to agree who will process, who will pay, etc. We all have to have really the same system to enable us to do that, and that's quite difficult.

Researcher Yeah, you mentioned that you haven't started doing it, but you're managing to do it. According to your knowledge and experience, is it common for other similar companies to do like this? Or they have already started doing like this?

Interviewee No, I mean, neither locally nor prior to this job I ran another brewery in Somerset. Prior to that, I worked for another one in Dartmoor and prior to that I've had about 20 years with I think they call themselves Advisor UK now or something. Both in the corporate company and in the smaller ones, there's always a reticence to share your margins. So again, that's one of those things that is difficult to overcome as well as the system. There is a little reticence amongst a number, and it does take quite a bit of time to build up the trust where you can off the record share those sorts of things to see how far apart you are and what sort of benefits it may bring.

- Researcher Yeah. To what extent do you think your financial performance say profitability or liquidity can be improved by improving your purchasing performance?
- Interviewee Significantly, that's one of the biggest issues because we are limited in our capacity, and therefore limited in our demand, we have to pay premium prices. Obviously, as with any business, the more you can crush the cost, the greater your margins improve. What we're having to do, at the moment, is continually renegotiate more drops down. My challenge to my team is right at 5% cost saving each year, which up to now they've been delivering. But if we could have the power that a buying group to get to a decent level so I'm trying to put this in perspective: we buy malts in sacks, but if we could have a malts silo, we would reduce our costs on malt by about 65%.
- Researcher That's a lot.
- Interviewee It's huge, because basically it would come in a trunk and be tempting to feel like a big vessel outside. Whereas at the moment they have to process it, they do it, etc. So it's a huge saving for us if we could get to that scale to be able to purchase in one.
- Researcher Okay. You talk a lot about the cost of your purchasing, but actually, if we can consider purchasing, we probably can categorise it into different aspects. Apart from cost, we have quality, we have the time, we have the flexibility of the suppliers, so according to your knowledge or experience, which one would you focus on most?
- Interviewee Well, we are a premium brand with a premium product, so our number one criteria for any things we use is it's got to be a premium product, because we spent a lot of time, effort and energy acquiring an accreditation which is called SLASA plus Beer, which stands for state and local supplier approval. What that means is it's a quality accreditation which is available. If I run through it very quickly, you have nothing, then you can go to something called CFSQ, which used to say, yeah, okay, you do things relatively well. And then before ISO, there's SALSA plus Beer, and less than 10% of breweries in the country currently have it. By having it, that enables us to sell to groups like the Ei group, which is the biggest company in the UK and has just been bought by Stonegate. It also enables us to sell to people like, Tesco, Morrison's, ASDA, and Sainsbury's. So, it's hugely important that we buy the right quality to maintain that and then show our processes are robust and right, so if anything went wrong, we can go back and say it was from that sack of malt or that sack of hops grown in that field on that thing and we can then tell everybody what other products that particular batch has been used in and withdraw them. So quality is the number one thing priority for us.
- Researcher So can I say that you are willing to sacrifice your cost for good quality?

Interviewee I wouldn't quite go too far as saying but we will pay a premium to ensure we get the right quality of product.

Researcher Yeah, but there's always a trade-off between the cost and quality. If you want to improve your quality, you definitely have to increase costs in order to make it.

Interviewee Yeah.

Researcher Have you encountered any difficulties or any challenges in purchasing apart from what you mentioned? Anything else?

Interviewee Predominantly, in the moment, as I mentioned earlier on, there's an explosion of craft brewers, which therefore puts a lot more demand on the suppliers. So it is becoming harder and harder to secure the quantity we want. However, what we've had working on our behalf in the past is the fact that we've been growing at 30% every year, so obviously ensuring the supply is what we should back.

Researcher All right. Let's go to the production performance. A very similar question: to what extent do you think your financial performance can be improved by improving your production performance, like by improving the quality of your products, shortening the production cycle time, or reducing the cost?

Interviewee The easiest way for us to improve performance is to improve yield. I'll give you an example on that. We have a keg product which we developed called Pale Ale, which we have something called fermentation vessel which is a 20-barrel unit and apart from that, we would hope to get a certain number of casks or kegs. So, we would hope to get 90 kegs or 80 casks to the fermentation vessel. Now, by the brewers' skill, we can quite often get more than that, but when we started Pale Ale, because it's a product that works quite differently, we were originally getting 40 or sometimes even less kegs. It is the yield and we've steadily improved that now, and we continue to try and improve the yields and they do that by chemistry. Basically, by continually tweaking the recipes and the ingredients to try and get a little bit more. So that is the easiest way to improve production.

Researcher Okay, but from another perspective, is it easy to shorten the production cycle time? I mean, from the material to the final product. I know the fermentation is probably a relatively fixed time, but is it possible to shorten it by using technology?

Interviewee Well, yes, somewhat, depending on what we're doing and how strong it is. For example, if we're bringing a cask scale, that would generally take a week to ferment. Sometimes we can get in six days, and if we're lucky, we might be able to get out in five, but generally, it takes a week. If we then produce a keg product, it takes double that time, so it takes two weeks. Again, that's to do with the fermentation process. And then if we brew a [logger], which we're trying to develop, that would normally take between 8 and 12 weeks. We've probably spent six months developing it to try to bring that down to six weeks. Obviously, before the situation changed,

- we were just about there, and we'd agreed to launch it with a customer of ours. So, yes, the production cycle can be reduced. The [logger] is the one that gives us the biggest flexibility, but it also gives us the biggest challenge because it's a very particular style.
- Researcher Okay. You mentioned the flexibility. How do you see the flexibility of your company compared to other companies?
- Interviewee We are less flexible than others because we've grown it such an extent - when the brewery was built two years ago, the new kit put in it was expected to last between 8 and 10 years. We smashed every target that had been given to us. Literally we've just had come into the country and we're at maximum capacity. We physically have no room to put anything else in. Also, the knock-on effect of that is it means we've got nowhere to do our own keg-in, we've got nowhere to do our own bottling, we've got nowhere to do our own canning, we've got nowhere to store enough products. So in the moment, we have to go outside for bottling and canning, and we have to use external facilities for storage. Now, if we could get a bigger site, we could put those in, and we would save ourselves quite a pretty penny.
- Researcher Yeah. Compared to other large companies in the industry, how about your performance in flexibility compared to them?
- Interviewee Again, because of the scale they brew and the equipment they have. For example, at the moment, bottles and cans are very much in demand. Because they have the facilities and the size, it's very easy for them to switch the production into those pack formats rather than casing casks. At the moment because the requirement for casks is almost nil, all they're doing is switching their production facility to bottles and cans. And they have those facilities on site, we don't, we can't go elsewhere. And again, because we have to go elsewhere, you have to book a slot. so you're not necessarily guaranteed to get the adaptability when you want it. You have to slot in with everybody else.
- Researcher Okay. If we still categorise production into the four aspects: quality, cost, flexibility and time. Which one would you focus most on?
- Interviewee Going forward, it would have to be cost, because the situation is changing things considerably. Our biggest issue now is ensuring we survive: the government already said they're not opening pubs until December, so we have hardly any income coming in between now and then. So all our investment monies, back pocket, emergency funds are actually being taken now to keep us going. At the moment we are debt-free. We have no loan, no anything, no mortgage. We are now applying for a 400,000-pound loan, and that's just to make sure that when it does start, we have enough working capital to take us through that.
- Researcher Yeah, but for the time being, it's probably a very difficult time for all businesses, so they all are going to cut down the cost in order to

- keep surviving, but how about for the normal time? Think about the time before coronavirus, what would you focus on?
- Interviewee For the normal time it would be quality number one. Improvements in the production cycle number two, cost number three, and flexibility number four.
- Researcher Okay. This question could be a bit tricky: between purchasing and production, which one is more important for your company?
- Interviewee Production. The reason being is if you don't have the product to sell, you're not going to make any money. If you can produce more, you should generally be able to sell more. And if you produce the right products, you can produce a profit with a higher margin. So definitely, definitely production.
- Researcher All right, fair enough. Let's go to the next aspect, which is transport performance. How do you deliver your final products to your customers?
- Interviewee Okay, we have three routes to deliver at the moment: we have vans which predominantly deliver to local outlets that would be individual pubs or individual shops. We then have the lorry, which we would normally use to deliver to wholesalers. We would take a bulk order to somebody who's wholesaling our products for us using that, but close to home. And then we use an outside company called Gardeners to deliver bigger quantities to our pub group customers over in Whitefield and various other areas. They are quite away. That's because drivers are limited to a certain amount of hours, so where the third party can just hop on, we have to plan drivers to go there and come back in the day and you can't always do that within the hours they're like,
- Researcher Okay, so basically you have your own-account transport and also use the third-party company for your delivery.
- Interviewee Yes.
- Researcher What's the benefit of using the third-party company?
- Interviewee The main issue is cost. Because obviously, they charge more than it would be if we did it. If you deliver to our local customers, when you're dropping off a product, you can quite often pick up the empties. When we're delivering into wholesalers or using Gardeners, we have to pay for each way. Quite often, there's not enough there to collect, so we would have a one-way cost to deliver it, and then we would have to pay again to get them to go again to collect any empties.
- Researcher Do you think by using the third-party company you can financially benefit from it?
- Interviewee Not at the moment, because we are not in a big enough scale. The best way with third-party haulage companies is to fill up a 40-foot container. However, we don't do that, we might fill up an 18 tonne lorry. For example, Tesco quite often would say deliver a container in, and you can reduce your overheads by supplying them in those sorts of quantities. Whereas, because we can't at the moment, we

have to pay a premium and the smaller quantity we deliver, the higher premium we have to pay.

Researcher Yeah. For your own-account transport, do you think that improving your transport or delivery performance can improve your financial performance?

Interviewee Yeah, the main thing is route planning. Again, the fact of being small is we don't have all the latest gadgets and gizmos in kit. Having worked for multinational, I know you can use certain software, which will tell you which side of the lorry to load and which areas are closed between certain times so you can plan the route effectively. We don't have that, so we rely on the driver. Quite often they end up reaching out and saying, oh, I can't get into here because of this or whatever, so they have to go away and then come back. That would be the easiest way - effective route planning software.

Researcher In terms of the third-party company, do you think their transport performance can influence your financial performance?

Interviewee Yeah, definitely. An example of that would be because our products are alive, we have to be careful when we get the third-party collect it. We cannot get them to collect it on a Friday, no matter what the demand was. The reason for that is they don't drive over the weekend, so if they collect the product, it will sit outside in the lorry, and if it's a hot day, obviously that's not great. If it's a really cold day, it will make the product go hazy. We know if we get feedback from a customer that we might have sent the delivery on Thursday and they say no, it's not arrived, and then it arrives with them on the Monday or Tuesday, we will then get problems because they've left it in their yard in their lorry. If the weather has been either too hot or too cold, it affected the quality of the product.

Researcher Okay. Let's go to the inventory performance. You just now mentioned something about your raw materials, do you keep some inventories for them, or you buy them when you need?

Interviewee As I said, the two main ones are hops and malt, and we enter an annual contract with them. Then our brewery system, which is called BrewMan has production part to it. It measures exactly how much we're using, and it tells us when our stock is getting low and when we need to reorder. So it's something that we have to monitor very carefully, because what we can't do is run out of critical products and then not be able to get it, so it's monitored on a weekly basis and we do regular stock takes.

Researcher Yeah. Approximately how many days of inventory do you keep?

Interviewee Well, it's slightly odd because the first thing is our site is small and we can only physically hold so much. So we've been quite lucky in able to negotiate with some of our suppliers, say, look, can we buy it in bulk and leave it with you and then just call it off when we need it. And so far, the main two we use are fine with that JIT principle.

- Researcher Okay, but for your final products, how many days of inventory do you keep?
- Interviewee That's difficult, we take a guess. The reason being is, as I say, we're limited on space and what we can store, and we have to forecast what product we think is going to sell when and then we brew accordingly. What can cause us difficulty is if a big customer at the last minute says, I'll tell you we include X product in our promotion for next month, which can drain our supplies. It is a bit of a toss a coin in the air, but generally our cask products would have 42 days life and our keg products would probably have 60 and we certainly would be brewing again when they got down to 28 days life. We will try and keep a rolling count, and that's a good thing with the system we use as a specific thing for production. It keeps a track on us and every day and lets us know where we are. As I said, the only time that gets skewed is when a big customer places a last-minute big order.
- Researcher So basically, you don't keep a lot of final products in your warehouse.
- Interviewee No, because it's perishable and has a certain life. The big issue at the moment is just before the current lockdown, we got a national listing with our biggest customer. We also got a feature in a national brochure, so we had stocked up in particular on two brands to cover that demand, probably by about four times what we normally hold. And then obviously the situation holds, so unfortunately, we're going to have to tip it all down the drain.
- Researcher That's a great pity. In terms of management for the two types of inventory, raw materials and final products, which one do you think is more important for your business?
- Interviewee **Raw material. Again, because you have to be flexible to produce what is required when it is required, so if you have not got adequate raw materials, you are running the risk that you are not going to be able to acquire them and therefore not be able to satisfy demands.** But that's why our just-in-time system with our major suppliers works quite well for us because we know what states our raw materials are, and if it's getting low, we've got an advance warning to look to try and do something else.
- Researcher Is it also because that your inventory of final products is very few?
- Interviewee Yeah. I mean, again, having a perishable product, we spend a lot of energy trying to make sure that we produce it when it's required, and we don't produce too much. We have been let down for example, by Morrison's where we have to sell an awful lot of products to a huge discount on the below cost. So it's one of those important things to us. We don't produce it until we actually need.
- Researcher All right. You don't actually make to order, and you still make to forecast but relatively your forecast is more accurate.
- Interviewee Yeah, by saying that our forecast is dictated by what we know we try and run with customers an annual plan, so we will agree with

them 12 months in advance: we'll have a promotional period here, we'll deliver this stuff, we'll put a new product in there. That's why our forecasting can be relatively accurate, except for a last-minute thing, because we know what's coming up, because it's been agreed with customers.

Researcher All right. Let's go to the final aspect, working capital management. By working capital here I mean cash, receivable and payable. Have you encountered any situation that you need some cash and you don't have it and you have to borrow from other places?

Interviewee Well, we're in a position that our shareholders have been quite supportive. I bought in 18 months ago to move us on to the next stage. Since then, I've probably done a seven figure fundraise amongst the shareholders, which was to buy more equipment, vehicles, more staff, which they were happy to stump up for. As it stands at the moment, our working capital is going to be under severe strain. We don't want to go back to the shareholders to raise working capital because in a very short period of time, we're hoping to go back to our plans to acquire a new site and buy new kits such as our own bottling line, and our own canning line and our own catering facility as well. So working capital at the moment, while it's never been a problem, is now becoming one.

Researcher Yeah. To what extent do you tend to get more cash by speeding up the payments from customers and also delaying the payment to your suppliers? You know, by doing that, you can get more cash.

Interviewee Our principle before the current crisis was, we pay when it's due. Because we want to maintain good relationships with our suppliers. We don't want a reputation for being a late payer, so it's been quite important to us that we pay on time. With regards to outstanding debt to the company, I'm going to refer to her as a credit control Rottweiler who is very tenacious, so we have a very low incidence of outstanding debt. We generally don't offer more than 30 days credit, and to big customers, don't offer any more than 60 days credit. If they were a day late, they receive phone calls asking when they're going to pay it, if there are any issues, if they want to go on payment plans. Prior to this, our management of our debt was very good. Our overall debt ratio was less than 1%.

Researcher Yeah. What's the normal your payment period to the suppliers?

Interviewee I would say, half are on receipt and half are either 30- or 60-day credit.

Researcher Okay. You mentioned that you don't want to delay the payment in order to maintain a good reputation of our company, but any other reasons that you don't want to delay the payment?

Interviewee Yeah, actually, we know exactly where we are at any one time. I know that sounds silly, but our view in this crisis rather than delay payments with everybody is let's pay everybody and then we can see exactly where we are. We know what's paying, rather than do various payment schedules or payment plans, we get all the pain

away at the beginning. Then we know exactly what's coming and we're not having any big bills because it's really important when we get to trade again. They were not then saddled by repaying things that should have been paid for a period of time ago. That's why with the change to December that we've chosen to take care of our first ever loan.

Researcher Okay, but if you delay the payment, will you get any penalties from the suppliers?

Interviewee Yeah, there are some. For example, our casing casks some way higher, and there are late payment penalties from those. Actually, they're the only one where there's a late payment penalty.

Researcher But if you speed up the payment, if you pay them earlier, can you get some rewards like a discount?

Interviewee Unfortunately, no.

Researcher So there is no motivation to pay them earlier.

Interviewee No.

Researcher Okay, but for your customers, if they pay earlier to you, do you have any rewards?

Interviewee No, because again, we have various customers like paying at different times. We have what's called cash before order, which are those let's say, naughty boys with payments in the past, we say right, we take your order, but we won't deliver it until you've paid for it, but that's very few, I'm glad to say. Then we have a large proportion that are on cash on delivery, so when we deliver the money, the drivers collect it and bring it back with them, and I would say that's probably 60 percent of our customer base. And then really the only ones where we have credit are the wholesalers and the big pub groups who operate on either 30 or 60 days.

Researcher Under the current situation, are you going to shorten the payment period for customers in order to get more cash and get cash quickly from them?

Interviewee No, actually we've taken the opposite approach. The reason being is I think anybody that's too harsh and is seen is not supporting their customers, when we come to trade again, that will be remembered. So we've taken the approach and said, look, if things are bad, please speak with us, and we may be able to arrange a payment plan where you pay over a period of time. Or, please be honest with us, if you don't think you're going to be able to pay it, at least we'll be able to come and collect the stock from you and recoup the duty. So we tried to be positive at the time of negativity. And that has actually been commented on quite a bit because there are a number of other suppliers, just like you said, either shorten their credit terms or refuse to do anything. We understand the reason, and I think that was the view for everything was going to start again relatively quickly.

Researcher Yeah. I missed one question before, which is about the transport. You mentioned that you use the third-party company for your

delivery, but is it a common practice in your industry for other similar companies?

Interviewee Yeah, it's widespread. Until the brewery gets to a certain size, it would have to use third party. I mean, owning your own fleet of lorries is quite an expensive thing. There are lots of rules and regulations and additional costs. For example, the London Mayor pass the law that any vehicles over a certain weight going in have to have cameras and all the warnings that say turning left now and all these things, which means you have to buy additional equipment and then you have to buy a system that tracks it, records it, maintains it, and reports on it.

Researcher All right. Thank you. I think that's all about the interview.

Interviewee Great.

D.7 Transcript of Interview 7

- Interview ID: Interview 7
- Gender: Male
- Job position: Director
- Interview date and time: 15.00 – 15.30 Thursday 3rd June 2020
- Company location: England
- Company industry: Crop grower
- Firm size: Small
- Transport mode (1. Own account/2. Outsourcing/3. Customer collection): 1, 3

Researcher At the beginning of the interview, let me introduce myself. I am a PhD researcher at Cranfield University. This interview is part of a project called Supply Chain Finance of SMEs conducted by our university. The aim of this study is to investigate how SMEs in the UK food industry can use supply chain activities to improve their financial performance. In your answers, please just be as honest as possible - there is no right or wrong answers. For research purpose, I will be recording your answers. Of course, I will not retain any of your personal information and your answers will remain totally anonymous and confidential. You can also withdraw your answers and recording any time after the interview. So, are you ready to start?

Interviewee Yes.

Researcher Okay. Just before the interview, I checked your website and your Instagram. I saw some pictures and videos of your farm. A very good marketing actually, very impressive. Also, I noticed that you produce not only crops or vegetables but also some meat like beef and lamb for your sister businesses, but which one is your main business, is the crop or meat?

Interviewee We are basically looking after the arable business. My brother manages the butcher business. But they are together, because the livestock grows on the arable fields and I finished the livestock to sell to my brother, so I'm producing the livestock on the farm, we feed them, we look after them, we buy them, we sell them to him. He markets the meat to the consumer. They're completely different businesses. I'm selling to him, but I do actually sell to other people as well. My main business is a mixed farming business which is livestock and arable.

Researcher Which one is more important for you? Which one is the primary one?

Interviewee For me the primary one is arable.

Researcher Okay. How many employees do you have?

Interviewee Ten.

Researcher All right. If you want to produce crops, definitely you have to buy some raw materials, like fertilisers or seeds. When you buy them, have you joined any cooperatives?

Interviewee We were one of the founding members of an original cooperative, which was Loddon Farmers, but for the last many years, we have been a member of Anglia Farmers, which took over Gordon Farmers years ago. We are members of Anglian Farmers cooperative.

Researcher Okay. What are the benefits?

Interviewee The buying power, that is the biggest buying cooperatives in the country. It's massive, really huge, many multimillion-pound buying power.

Researcher So you mean that you can get the price lower?

Interviewee Yes.

Researcher Apart from the buying power, any other benefits you can perceive?

Interviewee Special deals and let us know what's going on in the industry.

Researcher Yeah. Is it a common practice in the farming industry to join cooperatives?

Interviewee Well, a lot of people are. In general, yes.

Researcher Okay. When you buy materials, do you have any challenges?

Interviewee Quality, sometimes. Getting good enough quality sometimes can be difficult.

Researcher Okay. Do you think by joining the cooperative, you can improve your quality performance?

Interviewee It depends on how good your agronomist is. We don't have an agronomist through the buying group. We actually employ our own agronomist and we trust what he advises us and that has been good for many years. I don't think necessarily that improves your performance other than making it cheaper for you to buy stuff. But at the end of the day, it is how well you run your business, and that fixes how good you are doing what you do.

Researcher Okay. Let's go to the inventory. How do you manage your inventory, do you have any information systems or inventory management systems?

Interviewee We have a farm office with 10 computers in it, and we employ four people in the office. That is quite a big farm office, not many farmers have four people in the home office.

Researcher Okay. Any specific system like inventory management system you use?

Interviewee Well, I built a lot of my own systems, using Excel databases and things like that. We also have Muddy Boots, we have Gatekeeper, and we have Farmplan. We have lots of those sorts of things which are standard things across the industry. I also have my own systems for potatoes, so I can see which fields outperform the other fields, which varieties outperform the other varieties, and which is the best variety from the best person, etc.

Researcher Okay. Let's go to your finance. How do you manage your finance, do you have any specific person or system for that?

- Interviewee We have a Farmplan system, which does a lot of the accounts coming in and payments going out that sort of things. And a farm business manager.
- Researcher When you sell products to your customers, how do they pay you? Do they have any specific payment periods, or they pay you immediately?
- Interviewee I specialised mainly in potatoes, so taking potatoes as an example. I have a number of contracts with different processors and packers for potatoes, so I signed a contract to grow X many tonnes say 100 tonnes for them at a fixed price and grow 100 tonnes at a fixed price for them. Any surplus to that is in mind to market myself and make as much money as I can. Very often within those deals and those negotiations that I have with my customers be then either a package or a processor, I will do other things that will end up making more benefits. For example, the cost of the seed, which they ask them to supply the seed and I will control the cost of the seed of the crop I harvest, so I haven't actually got to play that cash out, and that helps my cash flow. I will control the cost of the seed, and when they start receiving the crop, their seed contract comes off that. In some cases, there's no cost involved in that as part of the deal. In some cases, they put a small management charge on that for interest. Very often, they would like sort of fixed payment terms. Sometimes it's a month after delivery, sometimes it's 28 days after delivery, and sometimes it's longer than that. So I need to negotiate each part on a contract with every of them. If they want me to grow potatoes for them, then they are going to have to negotiate with me on all these different aspects, so I can try and get the best deal for my business.
- Researcher Okay. On average, how long is this payment period?
- Interviewee Average is monthly. One month after delivery, so if I send a load in, they will pay the month after they receive it.
- Researcher Right. Do you think it's feasible to speed up your customers payment, I mean shorten the payment period?
- Interviewee I would like to, but the problem, especially in agriculture, is that the products are going through a processor or packer to a supermarket. The supermarkets do not pay them very well, so they do not have the money to pay us. They are in the middle. **Because the supermarkets do not pay the processor or packer, the processor or packer cannot pay us**, because they are not a bank. That is where the breakdown comes. **That is why in this country, we have the Groceries Code Adjudicator and Groceries Supply Code of Practice**, because the supermarkets are the bad boys. **Most retailers are very big and powerful, so they are normally bad at paying processors and packers.**
- Researcher So in your opinion, you normally get a delayed payment, and the root reason for that is the bad payments from the retailers or supermarkets.
- Interviewee Yeah, supermarkets are bad boys.

Researcher Alright. If you can expand your firm size, do you think it is more feasible for you to speed up the payment?

Interviewee Certainly, **with the bigger size, one of the things I can do is to negotiate my payment terms better.** But especially in the potato industry and others, to be fair, the supermarket is so powerful. In my short life of doing potatoes, say 30 years, I've lost hundreds of thousands of pounds because the people I've been dealing with have gone bust and lots of these potato people will go bust. I know three of them have gone bust because of money. Because they are dealing with supermarkets and supermarkets don't pay them, they cannot pay us. At the end, they go bust and that leaves me with a hole in my pocket because they have not paid me. So it's all very well getting bigger and bigger and I can get bigger and bigger, but unless I get paid by some good companies managing to find the supermarkets, I'm not big enough. I'm fairly big, but I'm not a big enough producer to argue terms with supermarkets. Supermarkets in this country are far too powerful. They are not employing ten people; they're employing 10,000 people. They have dedicated teams working on making sure they buy their products cheaper and cheaper every year.

Researcher Right. In another way, how do you pay your suppliers?

Interviewee We pay farmers once a month.

Researcher Okay. Do you tend to delay the payment to your suppliers because it can increase your cash flow?

Interviewee We can do. We have options and we have done in the past. We can choose not to buy them. If we want to, we can do that. But we've got to also look after our reputation, and it is not a good thing to do reputation wise.

Researcher Apart from reputation, any other penalties do you receive if you delay the payment?

Interviewee That just destroys relationships.

Researcher In another way, do you tend to speed up the payment to suppliers?

Interviewee Yes.

Researcher Any benefits?

Interviewee I try to speed up payments to suppliers if they're very small, but we would never speed up payment to a big multinational. Never do that.

Researcher Okay. If you speed up the payment, can you get any benefits like price discount?

Interviewee Yeah, you can get some credibility.

Researcher Is it possible to negotiate the payment period with them say, well, I don't have money right now? Normally, I have to pay within one month, but can I pay you after one month?

Interviewee Yes, I can.

Researcher Can you also negotiate with large multinational companies?

Interviewee Yes, I can negotiate with the bigger guys. I would not do with smaller companies, but I will do with big ones, definitely.

Researcher All right. I know that your firm is pretty large compared to other family businesses. How about for other companies, can they negotiate the payment period?

Interviewee Depends on how good they are and what their negotiation skills are like.

Researcher Do you think it's relevant with firm size? Because you are bigger than others.

Interviewee It is not necessarily how big you are. Are you seem to be doing the job properly, are you efficient, and are your operation good? Not necessarily how big you are, because you can have many thousands of acres but are not as profitable and as good as a small guy.

Researcher Okay. Last question, which is about your transport or delivery. After you produce crops or vegetables, how do you deliver them to customers?

Interviewee For cereals and oil seeds, we've very often delivered ourselves. We like to deliver ourselves, because if there are any problems, they can be solved straightaway. It's also cheaper for us to deliver our own crops really than it is to hire in an outside haulier. If it's potatoes, very often it is fixed with the contract of how much they're going to pay for. If it is ex-farm, which means that I sell to them from my farm gate, they have to come pick them up at their cost. Very often, if I can use my own lorry, they will pay me very well. There is a cost in addition to ex-farm, because I'm hauling them, and this is what you're going to pay me for haulage.

Researcher That's all the interview. Thank you very much for your time.

Interviewee No problem. Stay safe.

Appendix E PLS-SEM Model Discriminant Validity Assessment Results

E.1 Fornell and Larcker Criterion Results

Table E-1 shows that the square root of AVE for each reflective construct (highlighted in bold on the diagonal) is greater than its correlation with other constructs (values in the corresponding off-diagonal positions), so discriminant validity is built based on the Fornell and Larcker criterion (Hair et al., 2017, p.116).

Table E-1 Fornell and Larcker criterion results

Reflective constructs	Production Cost	Production Flexibility	Production Quality	Production Time	Purchasing Cost	Purchasing Flexibility	Purchasing Quality	Purchasing Time	Transport Cost	Transport Flexibility	Transport Quality	Transport Time
Production Cost	0.909											
Production Flexibility	0.091	0.857										
Production Quality	0.330	0.337	0.842									
Production Time	0.409	0.481	0.488	0.860								
Purchasing Cost	0.435	-0.011	0.133	0.181	1.000							
Purchasing Flexibility	0.203	0.223	0.165	0.286	0.391	0.932						
Purchasing Quality	0.066	0.171	0.270	0.258	0.322	0.466	0.874					
Purchasing Time	0.212	0.147	0.190	0.310	0.421	0.553	0.510	0.910				
Transport Cost	0.394	0.162	0.257	0.314	0.362	0.303	0.193	0.249	0.889			
Transport Flexibility	0.070	0.366	0.285	0.254	0.079	0.323	0.221	0.264	0.316	0.952		
Transport Quality	0.197	0.270	0.391	0.343	0.178	0.296	0.300	0.288	0.465	0.556	0.917	
Transport Time	0.259	0.288	0.335	0.345	0.195	0.316	0.281	0.290	0.483	0.625	0.720	0.928

E.2 Cross Loadings Results

Table E-2 shows that each reflective indicator's outer loading on its assigned construct (highlighted in bold) is higher than all of its cross-loadings with other constructs (other values in the same row), so discriminant validity is established (Hair et al., 2017, p.115).

Table E-2 Cross Loadings Results

Reflective indicators	Purchasing Cost	Purchasing Quality	Purchasing Time	Purchasing Flexibility	Production Cost	Production Quality	Production Time	Production Flexibility	Transport Cost	Transport Quality	Transport Time	Transport Flexibility
Pur_Cost	1.000	0.322	0.421	0.391	0.435	0.133	0.181	-0.011	0.362	0.178	0.195	0.079
Pur_Qual_1	0.204	0.783	0.357	0.360	-0.030	0.238	0.150	0.152	0.099	0.222	0.204	0.148
Pur_Qual_2	0.290	0.907	0.465	0.411	0.086	0.232	0.276	0.138	0.215	0.277	0.260	0.198
Pur_Qual_3	0.338	0.924	0.502	0.445	0.102	0.241	0.240	0.160	0.181	0.282	0.267	0.226
Pur_Time_1	0.361	0.472	0.909	0.493	0.218	0.168	0.309	0.154	0.241	0.288	0.280	0.298
Pur_Time_2	0.405	0.457	0.911	0.513	0.168	0.177	0.256	0.114	0.213	0.237	0.248	0.183
Pur_Flex_1	0.377	0.465	0.562	0.939	0.202	0.153	0.273	0.223	0.275	0.256	0.298	0.310
Pur_Flex_2	0.351	0.400	0.464	0.925	0.175	0.155	0.260	0.191	0.291	0.298	0.291	0.291
Pro_Cost_1	0.396	0.068	0.166	0.168	0.905	0.245	0.394	0.097	0.330	0.152	0.202	0.029
Pro_Cost_2	0.396	0.053	0.218	0.200	0.913	0.352	0.350	0.069	0.384	0.204	0.268	0.096
Pro_Qual_1	0.055	0.318	0.200	0.179	0.216	0.854	0.406	0.342	0.186	0.389	0.318	0.284
Pro_Qual_2	0.174	0.065	0.056	0.052	0.312	0.773	0.354	0.185	0.227	0.214	0.208	0.158
Pro_Qual_3	0.114	0.279	0.208	0.175	0.308	0.894	0.466	0.312	0.236	0.372	0.310	0.269
Pro_Time_1	0.185	0.198	0.288	0.253	0.380	0.303	0.833	0.364	0.249	0.185	0.244	0.142
Pro_Time_2	0.132	0.243	0.249	0.241	0.329	0.519	0.886	0.456	0.288	0.389	0.342	0.283
Pro_Flex_1	0.020	0.121	0.137	0.208	0.141	0.311	0.495	0.858	0.236	0.295	0.324	0.356
Pro_Flex_2	0.022	0.178	0.142	0.221	0.058	0.268	0.363	0.851	0.068	0.200	0.205	0.308
Pro_Flex_3	-0.077	0.146	0.097	0.140	0.025	0.282	0.363	0.863	0.095	0.187	0.197	0.268
Tra_Cost_1	0.390	0.159	0.221	0.259	0.357	0.173	0.248	0.082	0.881	0.351	0.435	0.276
Tra_Cost_2	0.259	0.183	0.223	0.280	0.344	0.280	0.308	0.202	0.897	0.472	0.424	0.285
Tra_Qual_1	0.144	0.273	0.228	0.241	0.180	0.396	0.315	0.306	0.402	0.911	0.622	0.489
Tra_Qual_2	0.182	0.277	0.298	0.300	0.181	0.324	0.315	0.193	0.450	0.923	0.698	0.529
Tra_Time_1	0.179	0.261	0.286	0.308	0.225	0.309	0.312	0.256	0.467	0.663	0.927	0.565
Tra_Time_2	0.183	0.260	0.252	0.278	0.256	0.311	0.328	0.277	0.429	0.674	0.928	0.594
Tra_Flex_1	0.109	0.236	0.300	0.324	0.093	0.271	0.244	0.358	0.284	0.517	0.606	0.951
Tra_Flex_2	0.042	0.185	0.203	0.291	0.040	0.272	0.240	0.338	0.317	0.541	0.584	0.952

Appendix F Regression Model Quality and Robustness Assessment Results

F.1 VIF Values of All Models

Table F-1 VIF values of all models

Variables	Model														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IHD	1.08					1.42					3.51				
ARD		1.01					1.28					3.62			
APD			1.08					1.35					2.84		
CCC				1.07	1.06				1.40	1.40				3.20	3.22
IHD×FS_1						2.89									
IHD×FS_2						3.05									
ARD×FS_1							1.51								
ARD×FS_2							1.35								
APD×FS_1								1.97							
APD×FS_2								1.69							
CCC×FS_1									2.27	2.30					
CCC×FS_2									2.40	2.47					
FS_1						1.42	1.46	1.46	1.42	1.44					
FS_2						2.28	2.02	1.89	2.26	2.23					
IHD×SCP											3.31				
ARD×SCP												3.50			
APD×SCP													2.84		
CCC×SCP														3.07	3.10
SCP											1.25	1.37	1.26	1.24	1.24
SALE	1.26	1.18	1.18	1.24	1.21	2.30	2.25	2.30	2.28	2.19	1.35	1.23	1.23	1.32	1.29
GRT	1.02	1.03	1.03	1.02	1.02	1.03	1.03	1.03	1.03	1.03	1.02	1.03	1.03	1.03	1.03
AGE	1.10	1.11	1.10	1.10	1.10	1.11	1.11	1.11	1.11	1.11	1.10	1.11	1.10	1.10	1.10
LEV	1.15	1.14	1.21	1.14	1.14	1.16	1.14	1.20	1.15	1.16	1.14	1.14	1.20	1.14	1.14
CAR	1.68	1.64	1.63	1.70	1.67	1.67	1.70	1.65	1.70	1.72	1.71	1.73	1.70	1.73	1.75
CLR	1.57	1.52	1.54	1.57	1.57	1.53	1.54	1.54	1.54	1.58	1.53	1.53	1.57	1.55	1.59
Average	1.26	1.23	1.25	1.26	1.25	1.80	1.49	1.56	1.69	1.69	1.77	1.81	1.64	1.71	1.72

F.2 Moderating Effect of Firm Size with SALE as Proxy

Table F-2 Regression results for moderating effect of firm size with SALE as proxy

Dependent variable	ROA	ROA	ROA	ROA	CR
IHD	-3.976***				
ARD		-1.186***			
APD			-0.697**		
CCC				-1.356***	-2.132***
IHD×SALE	-0.967***				
ARD×SALE		0.408			
APD×SALE			-0.023		
CCC×SALE				-0.376	-0.256***
SALE	3.471***	3.639***	3.835***	4.004***	-0.025
GRT	0.043***	0.045***	0.047***	0.045***	-0.002
AGE	-0.411***	-0.454***	-0.483***	-0.478***	-0.007
LEV	-20.983***	-22.584***	-22.434***	-22.605***	0.035
CAR	11.703***	11.891***	11.863***	11.502***	0.448*
CLR	-0.515	-0.494	-0.094	-0.744	0.026
Constant	25.743***	28.116***	28.810***	29.320***	2.150***
F	46.67	40.90	38.00	39.93	130.55
R ²	0.164	0.147	0.138	0.144	0.355
Hausman test	0.000	0.000	0.000	0.000	0.000

Notes: 1. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

2. IHD, ARD, APD, CCC, and SALE are standardised to Z-scores to reduce the problem with multicollinearity.

F.3 Main Model Robustness Assessment Results

Table F-3 Main model regression results with ROE and QR

Dependent variable	ROE	ROE	ROE	ROE	QR
IHD	-0.255***				
ARD		-0.231***			
APD			-0.215***		
CCC				-0.199***	-0.028***
SALE	13.470**	20.150***	22.645***	21.372***	-0.097
GRT	0.099***	0.112***	0.102***	0.082***	-0.002**
AGE	-1.471***	-1.681***	-1.843***	-1.645***	-0.007
LEV	-10.513**	-17.960***	-14.142***	-13.855***	0.019
CAR	20.829***	16.378***	20.123***	18.181***	0.445**
CLR	1.924	1.761	-0.500	-0.464	-0.024
Constant	15.760	0.303	-11.098	-5.026	3.825***
F	30.61	22.73	22.80	29.08	138.54
R ²	0.102	0.078	0.078	0.097	0.338
Hausman test	0.000	0.000	0.000	0.000	0.000

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

F.4 Moderating Effect of Firm Size Robustness Assessment Results

Table F-4 Regression results for moderating effect of firm size with ROE and QR

Dependent variable	ROE	ROE	ROE	ROE	QR
IHD	-8.056***				
ARD		-3.844***			
APD			-4.181***		
CCC				-4.653***	-1.231***
IHD×FS_1	5.082***				
IHD×FS_2	2.780				
ARD×FS_1		1.583			
ARD×FS_2		-7.591**			
APD×FS_1			-0.435		
APD×FS_2			4.098*		
CCC×FS_1				2.601	0.300***
CCC×FS_2				-0.183	0.352**
FS_1	2.763	2.272	1.7404	2.770	0.280**
FS_2	-0.691	-3.340	0.300	1.885	-0.229
SALE	-2.468	-1.569	-1.934	-1.552	0.022
GRT	0.132***	0.140***	0.145***	0.135***	-0.001
AGE	-0.191***	-0.174***	-0.189***	-0.184***	-0.013***
LEV	0.398	-0.518	2.554	-1.015	0.009
CAR	22.232***	20.920***	20.238***	22.102***	0.319*
CLR	0.579	1.455	2.945	-0.417	-0.058
Constant	18.624	15.335	15.143	16.275	1.801***
Wald chi-square	159.86	143.70	138.15	133.70	905.42
R ²	0.081	0.091	0.087	0.087	0.314

Notes: 1. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

2. IHD, ARD, APD, and CCC are standardised to Z-scores to reduce the problem with multicollinearity.

3. FS_1 and FS_2 are time-constant variables and cannot be included by themselves in a fixed effects model, so the random effects model is adopted.

F.5 Moderating Effect of Supply Chain Position Robustness Assessment Results

**Table F-5 Regression results for moderating effect of supply chain position with
ROE and QR**

Dependent variable	ROE	ROE	ROE	ROE	QR
IHD	-2.208*				
ARD		-4.533***			
APD			-1.649*		
CCC				-2.898***	-1.170***
IHD×SCP	-6.366***				
ARD×SCP		1.025			
APD×SCP			-3.578***		
CCC×SCP				-1.530	0.089
SCP	-1.876	1.226	-1.598	-1.001	-0.244*
SALE	-3.893	-2.313	-2.755	-3.147	-0.120
GRT	0.132***	0.140***	0.149***	0.137***	-0.001
AGE	-0.191***	-0.175***	-0.194***	-0.184***	-0.013***
LEV	0.494	-0.531	3.100	-1.153	0.004
CAR	22.516***	20.524***	20.575***	22.249***	0.325*
CLR	1.106	1.052	3.728	-0.280	-0.055
Constant	25.692**	18.288*	18.918*	24.032**	2.625***
Wald chi-square	160.23	138.06	142.83	130.27	860.42
R ²	0.079	0.083	0.089	0.085	0.336

Notes: 1. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

2. IHD, ARD, APD, and CCC are standardised to Z-scores to reduce the problem with multicollinearity.

3. SCP is a time-constant variable and cannot be included by itself in a fixed effects model, so the random effects model is adopted.