

## **SMEs strategy and scale constraints impact on agri-food supply chain collaboration and firm performance**

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### **Abstract**

This study examined the impact of collaboration in agri-food supply chains on firm performance and the moderating role of scale constraints and firm strategy. Collaboration was measured by three constructs: horizontal collaboration, vertical collaboration, and customer engagement and SME performance with three variables: growth, value for money and innovativeness. Two strategies were evaluated: price strategy and quality strategy. Three types of scale constraints were assessed: financial, efficiency, and innovation.

A survey of 504 agri-SMEs was conducted to test the research hypotheses developed according to the resource based view. Data analysis included a moderated hierarchical analysis. The results show that supply chain collaboration impacts positively on agri-SME performance, whilst it is partially accepted that scale constraints moderate the supply chain collaboration-SME performance relationship. The findings show that SME strategy moderates the supply chain collaboration-SME performance relationship.

This study provides evidence that agri-SMEs can strategize their supply chain collaborations by removing scale constraints. When supply chain collaborations help SMEs to overcome financial, efficiency or innovation constraints, then SMEs' performance improves. Second, this study contributes to the understanding of dynamic capabilities in SMEs using the extended resource based view, which has been overlooked by prior studies.

**Keywords: Agri-SMEs, supply chain collaboration, firm performance, strategy, scale constraints, survey**

## **1. Introduction**

Expectations from food supply chains have increased during the last decades (Porter and Reay 2016). Consumer needs are not limited to food safety and quality but, increasingly, include innovation, sustainability, competitive prices and value-for-money (Tell et al. 2016). Further, reducing food loss and waste across the supply chain has significant environmental, societal, and economic repercussions (Devin and Richards 2018). Increasing food supply chain efficiency requires significant changes in food production and delivery systems (Dania, Xing, and Amer 2018). However, across the globe, food supply chains are dominated by small and medium enterprises (SMEs) (Vandeplas, Minten, and Swinnen 2013). For example, the vast majority of the over 15 million EU holdings/enterprises in the food chain, including 300,000 food processors are small or medium sized (ESCIP 2016). SMEs have inherent constraints such as financial and operational constraints (Hessels and Parker 2013; Clegg 2018). Further, agri-SMEs are exposed to a number of uncertainties such as price volatility and asymmetric price transmission, market dynamism, regulatory pressures and ambiguities, particularly in international trade, regarding food standards (Rezitis and Tsionas 2018). At the other end, concentration in the food processing industry and retail sectors is much higher (56%) than in the agricultural sector, which creates power imbalance in favour of large enterprises over agri-SMEs (Hingley 2005).

Supply chain collaboration and integration are well-established practices to reduce uncertainties, and to streamline production and distribution systems (Leuschner, Rogers, and Charvet 2013; Ataseven and Nair 2017). Agri-SMEs can benefit from supply chain collaboration including horizontal collaborations (Alonso, O'Brien, and Alexander 2018) to improve product quality and safety (Leon-Bravo et al. 2017), yet, success is not always guaranteed (Kottila and Ronni 2008; Dania, Xing, and Amer 2018). A better coordination of supply chains via collaboration would result in reduced food loss and, thus, increased firm performance; yet, current supply chains suffer from a high percentage of food waste (Devin and Richards 2018) and frequent food quality and sustainability issues (Bourlakis, Vlachos, and Zeimpekis 2011). Despite the pivotal role of SMEs in food chains, there is a lack of understanding of how SMEs' strategy and scale constraints impact supply chain collaboration and, in turn, firm performance (Brink 2018; Materia, Pascucci, and Dries 2017).

The contribution of the study is threefold:

First, this study contributes to the Resource-Based View (RBV) of the firm by examining the dynamic capabilities in SMEs which has been overlooked by prior studies. This study shows that by accessing and using resources external to them via supply chain collaboration, SMEs can develop dynamic capabilities and then improve their performance. The study uncovers three types of supply chain collaboration: horizontal, vertical and customer engagement. Further, it shows how SMEs' strategy moderates and impacts upon different types of performance (growth, innovation, value-for-money). The results support an extended Resource-Based View (eRBV), which indicates that SMEs should align their strategy (either price or quality) with specific types of supply chain collaborations.

Second, a body of literature argues that SMEs face a dilemma to engage, or not, in supply chain collaborations since they are in a weak bargaining position lacking the required resources and relational capital. This study conducted a large-scale survey of Agri-SMEs to empirically examine this strategic dilemma and the findings show that, according to eRBV, agri-SMEs should strategize their supply chain collaborations to improve their performance, which helps them face the dilemma of whether to engage in supply chain collaborations.

Third, the results are particularly relevant for food supply chain performance, including food loss and waste, quality and sustainability. Since agri-SMEs are the backbone of food production and delivery systems, by improving their innovative performance, reducing cost and food waste, in turn, SMEs can enhance the effectiveness of food supply chains, which can have regional and policy implications.

The next section reviews the relevant literature and develops the research hypothesis. The subsequent section presents the research methodology, data collection and analysis. Then, the findings are presented. The final section discusses the results and theoretical contributions and managerial implications as well as limitations and recommendations for future research.

## **2. Literature Review**

### **2.1. Resource-Based View and SMEs**

The Resource-Based View (RBV) is an established view that promotes value maximization via resource commitment (Hunt and Davis 2012). Firms own or control resources, information and knowledge and use them to create value and grow (Carter, Kosmol, and Kaufmann 2017).

According to the RBV, firm strategy should focus on value creation and capture which directly impact firm performance (Lonial and Carter 2015). Firms create value by activities such as purchasing, operations, sales and service (Lepak, Smith, and Taylor 2007) and then capture value by offering quality products in competitive prices; thus, two established strategies are cost-leadership and product quality differentiation (Banker, Mashruwala, and Tripathy 2014). Both strategies, according to RBV, are rooted in how firms select and structure their resources; for example, purchasing low cost inputs supports cost-leadership strategies while innovation and quality management in operations results in superior products.

SMEs are clearly suffering more than large enterprises (LEs) due to resource constraints (Bourlakis et al. 2014) as evident in their failure rates, e.g., the rate of European SMEs surviving a five-year period was 44.15% in 2016 (Eurostat 2019). Woschke, Haase, and Kratzer (2017) summarise the effects of resource scarcity, which are mostly negative, such as: poor financial performance, lack of innovation, missing market and supply opportunities, yet positive effects can be also possible including creativity in product development and resource recombination.

The RBV posits that firms can use and recombine their resources to build dynamic capabilities, defined as the capacity to create, extend, or modify its resource base, i.e., processes such as product development, strategic decision making and alliancing (Eisenhardt and Martin 2000). Dynamic capabilities help firms to reconfigure their resources and respond effectively to complex and uncertain business environments, such as is the context in which agri-SMEs operate (Devin and Richards 2018). Furthermore, SMEs can expand their resource base via accessing resources, assets and skills external to a firm and using them to maximize their value (Popli, Ladkani, and Gaur 2017). In this sense, supply chain collaboration should be considered as a higher-level, dynamic capability offering a double gain for SMEs: lower transactions costs and access to external resources and capabilities (Hitt, Xu, and Carnes 2016). Lower transaction costs should particularly benefit SMEs having cost strategies while access to external resources should benefit SMEs investing in quality differentiation. However, collaboration with an LE partner may also backfire: a supply chain collaboration may expose an SME in relationship hazards deriving from information asymmetries, hold up costs and resource misappropriation (Arend and Wisner 2005).

As a result, according to the RBV, supply chain collaboration, as a dynamic capability, should positively influence SMEs' performance; yet, due to relationship hazards and resource asymmetries, it might not. Furthermore, both cost and quality strategies appear to benefit from

supply chain collaboration, but it is unclear how they moderate the impact of collaboration on SMEs' performance.

According to RBV, supply chain collaboration, as a dynamic capability, should positively affect firm performance, yet, collaboration can also backfire, especially when the partners are larger enterprises. Therefore, the research questions that arise are: (i) to what extent, if any, do SMEs' collaboration affect firm performance?; and, (ii) which strategy should SMEs follow to maximise value creation and capture? We elaborate this theoretical knowledge in the context of agri-SMEs by formulating the following research hypotheses.

## **2.2. Hypotheses Development**

### **2.2.1. Supply Chain Collaboration and SME Performance**

Supply chain collaboration is a partnership where the parties work together, share information, resources and risks, and make joint decisions to accomplish more benefits than acting independently. Supply chain practices, such as, joint information sharing, decision-making processes and risk sharing can create competitive advantage and higher profits than acting alone by maximizing value for all collaborators and meeting, effectively, customers' needs at a lower cost (Soosay and Hyland 2015).

The benefits of supply chain collaboration are well documented in existing literature (Kwon and Suh 2004), yet, research is more focused on vertical collaborations overlooking the benefits of horizontal collaboration (Danloup et al. 2015). However, horizontal collaboration can also be beneficial for resource-constraint companies like SMEs to purchase inputs in bulk and reduce costs (Bititci et al. 2007), internationalize (Lu and Beamish 2001) and strengthen their market position (Minà and Dagnino 2016). Nevertheless, the effects on horizontal collaboration in firm performance remains under-researched.

Despite the theoretical benefits, supply chain collaboration is not always successful in praxis; difficulties include: inadequate information sharing, unrealistic collaborative arrangements, and contractual inefficiency to prevent abusive and opportunistic actions from partners (Ralston, Richey, and Grawe 2017; Ramanathan and Gunasekaran 2014), highlighting that large companies exercise their powers over smaller suppliers to adopt codes of practice which can be challenging for companies with limited influence. Limited resources and power imbalance force smaller suppliers to comply and accept unfavourable terms, especially when

large companies suppress knowledge transfer for their own benefit (Ralston, Richey, and Grawe 2017). Furthermore, firms external to the supply chain partnership may have access to information, resources and solutions that existing partners lack (Ahuja 2000).

Furthermore, the contextual effects on supply chain collaboration have only been investigated anecdotally, including the agribusiness context. Dania, Xing, and Amer (2018) reviewed the collaboration behavioural factors for sustainable agri-food supply chains using the lens of resource dependency theory. Kottila and Ronni (2008) found that in the Finnish organic food sector the high quality of communication in the creation of trust is a key prerequisite for successful collaboration. Koh et al. (2007) studied supply chain practices by SMEs in Turkish manufacturing and found that strategic collaboration had a direct impact on operational performance. Tatoglu et al. (2016), in a follow-up study, found confirmatory evidence of collaboration impact on operational performance by comparing Turkish with Bulgarian SMEs. Leon-Bravo et al. (2017) studied collaboration in food supply chains to promote sustainability and suggest that companies should prioritize to collaborate with key actors responsible for ensuring product quality and safety. Alonso, O'Brien, and Alexander (2018) studied micro- and small-sized craft breweries and found that horizontal collaboration within other brewers helped increase product quality, gain basic knowledge of new recipes, and enhance strategic knowledge about the industry.

Therefore, we hypothesize:

**H1: The type of supply chain collaboration impacts positively agri-SMEs performance.**

### **2.2.2. SMEs Scale Constraints**

Following the RBV, resource-rich, LE should outperform resource-constrained SMEs and, in turn, medium enterprises should have an advantage over small ones. Compared to larger enterprises, SMEs are constrained by low economies of scale and scope, higher capital, transaction and spill-over costs, limited resources and capabilities which, in general, makes them more vulnerable to LE especially in uncertain and volatile industries (Gherhes et al. 2016; Love and Roper 2015; Singh and Power 2009; Singh, Garg, and Deshmukh 2008). Empirical evidence supports that SMEs' survival rate is worse than that of LE (Eurostat 2019); however, there are notable examples of high-growth SMEs and entrepreneurial companies which

achieved to overcome their scale constraints and generate exceptional value (Blundel and Hingley 2001).

There is scarce empirical evidence on the direct effect of scale constraints' impact upon supply chain collaboration and, in turn, SME performance. Dania, Xing, and Amer (2018) reviewed the literature on collaboration behaviour towards sustainable agri-food supply chains and suggest that collaboration gives smallholders such as farmers and micro agri-food cooperatives access to high-value and profitable markets, and results in reduced risks and costs. Matopoulos et al. (2007) studied the agri-food supply chain in Greece, finding that constraints arise due to the nature of the industry's products, and the specific structure of the sector. Holweg et al. (2005) suggest that supply chain synchronization can control the risk for constrained components or materials, i.e., by monitoring items with long lead times and warning at an early stage of future supply constraints. Rezaei, Ortt, and Trott (2015) found that SMEs gain only in the area of R&D and that partnerships have a significant positive effect on overall firm performance. Simatupang, Wright, and Sridharan (2004) applied the theory of constraints to optimize supply chain profitability and suggest that a collaborative replenishment policy and collaborative performance metrics relax the constraints and improve profitability.

Therefore, we hypothesize:

**H2: SMEs face scale constraints that moderate the relationship between supply chain collaboration and firm performance.**

### **2.2.3. Firm Strategy and Supply Chain Collaboration**

SMEs having to decide to collaborate or not with a larger company face a strategic dilemma, which is not fully explained by the RBV (Rezaei, Ortt, and Trott 2015; Jones et al. 2014):

On the one hand, a supply chain partnership provides access to markets, unique opportunities to learn, increase brand reputation and increase productivity by leveraging their capabilities. In this regard, collaboration, as a dynamic capability, is the outcome of a well-crafted strategy: for example, product innovation may require coordination and cooperation across the supply chain (Lii and Kuo 2016) and SMEs should have a clear strategic orientation towards product quality. Innovation and new product development in the food sector constitute strategic choices for SMEs to obtain a competitive advantage (Ngamkroeckjoti, Speece, and Dimmitt 2005). Avermaete et al. (2003) discuss the need for food sector SMEs to continuously import new products in the market, develop new processes, proceed in changes to their organizational

structure and open new markets. New product developments that cover market needs, and technology that is incorporated in the product and its production process is a challenge for food sector manufacturing firms. Also, SMEs which develop strategic collaborations are more likely to enlarge, innovate and activate in international markets than those that adopt the 'traditional - solitary' approach (Piperopoulos and Scase 2007). Retailers may rely on small-scale producers and processors for quality and innovative food (Vlachos 2015). Therefore, according to the RBV, SMEs aligning their strategy with supply chain collaboration should achieve the greatest impact on their performance. Equally, SMEs acting as cost-effective suppliers of LE also gain, as in the case of internationalization of companies in developing countries when they supply global retailers.

However, on the other hand, an SME aligning its structure and operations with the policies and priorities of its supply chain partner may also accept to engage in activities outside its scope, capabilities, and strategy (Leithold, Haase, and Lautenschläger 2016). Dania et al., (2018) suggest that agri-food supply chain players should adjust their business strategies to the requirements of a supply chain collaboration and not vice versa, as suggested by the RBV. Empirical evidence suggests that SMEs, being in a weak bargaining position, often come to terms with their partners; therefore, supply chain collaboration may be in conflict with their strategic orientation (Hsu, Tan, and Zailani 2016). According to the RBV, a company should develop a strategy to maximize value creation and capture, yet, in the case of SMEs, the successful implication of firm strategy can be conditioned upon the collaboration terms implied by a powerful partner. Therefore, SMEs may create value with their resources, yet, to capture value, they need to organize their resources in a way that benefits their partners more; that is, value capture depends on their partners.

One such example is sustainability: Aschemann-Witzel et al. (2017) point out that by strategizing against food waste companies would improve sustainability of the agricultural and food supply chains. By adopting sustainable practices, agri-SMEs reconfigure their resources and capabilities to meet supply-chain dynamism (Beske, Land, and Seuring 2014). Being sustainable could be the only way to gain access to some markets which, at the same time, offers the opportunity to SMEs that strategize sustainability to leverage their capabilities through exploiting the resources of their supply chain partners (Narula 2004).

Nevertheless, there is limited empirical evidence on the alignment of SMEs' strategy with supply chain collaborations and how it affects firm performance (Luo, Shi, and Venkatesh 2018; Towers and Burnes 2008; Hudson, Smart, and Bourne 2001). Therefore, we hypothesize:

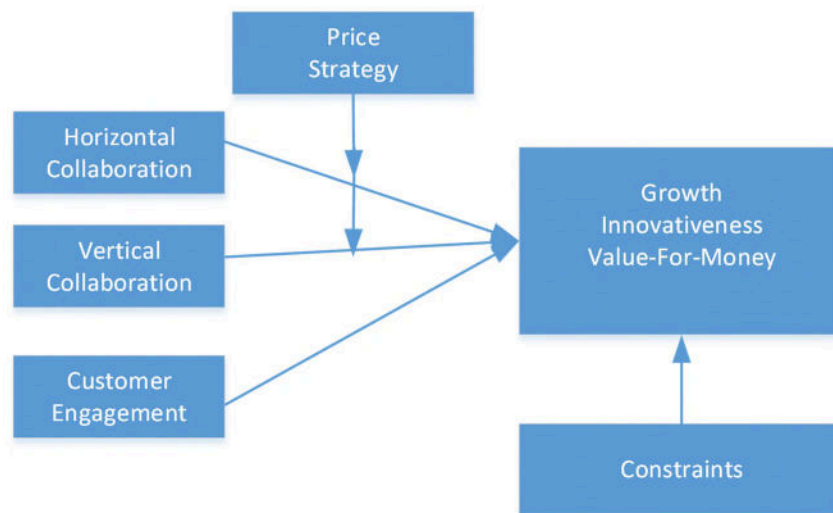


**H3: SME strategy moderates the relationship between supply chain collaboration and firm performance.**

### 3. Methods

#### 3.1. Research Design and Sampling Procedures

While Figure 1 is a model of the collaboration effects on firm performance, innovativeness and growth, we choose to examine it empirically based on the perceptions of the SMEs' managers who decide about the fate of their companies.



**Figure 1 Association between hypotheses and constructs**

Compared to previous agribusiness studies that were either case studies or surveys collecting around 100 questionnaires (Psomas, Bouranta, and Antony 2018; Vlachos and Bourlakis 2006), we conducted a large-scale survey of food companies operating for a minimum of five years in Greece. We included companies from the food processing and trading sub-sectors, excluding hospitality and retailing in order to preserve homogeneity in our sample and make results more valid to wider agribusiness populations. In-depth interviews were conducted with key decision-makers prior to designing a pre-test. The questionnaire was pre-tested with randomly selected firms. Based on the results of the pre-test instrument, the final questionnaire was refined. The respondents were mainly food owners, managing directors or production managers. An experienced researcher undertook the collection of questionnaires. We distributed 1,000 questionnaires by post, email and on-site visits to companies' premises. In return, we received 504 completed questionnaires, indicating a 50.4% response rate. The non-response bias was assessed by comparing early respondents with late respondents (Armstrong and Overton 1977); no significant difference was found. To ensure that the respondents were comparable to non-respondents, analyses of variances were conducted between these groups and no significant differences were found.

### **3.2. Measures and Data Analysis**

We conducted a moderated hierarchical regression to assess the effects of independent variables (collaboration factors; operational constraints) on dependent variables (firm growth, innovativeness, firm value) and the moderating effect of price versus quality strategy. Prior to regression analysis, we undertook a cluster analysis to classify companies into strategic groups. We used factor analysis (principal component analysis with varimax rotation) to assess the underlying structure of collaboration variables (Harman 1967; Krzanowski 2000). Compared to structural equation modelling, moderated hierarchical regression models produce identical results (Hong and Kim 2019), yet, they offer the advantage of step-by-step modelling and estimating the change of R square for each set of variables in each step which, although time-consuming, provides more insights throughout the process.

Although we believe the reported measures as perceived by managers are appropriate, they have some limitations which should be discussed. Firstly, measures are self-reported responses from managers who may have a personal interest in reporting positive results about their firms;

however, preliminary analysis showed that variance and mean values do not reflect an extremely strong positive bias. Further, self-reported measures may, in some cases, represent more accurate descriptions than more objective measures (Podsakoff and Organ 1986) since objective variables (profits, market share, etc.) are influenced by a vast number of factors that are realistically impossible to control even in a large sample like the one in this study. Secondly, as in all self-reported studies, we addressed the possibility of common method variance using the Harmon's factor test and found no significance common method bias in the sample.

### **3.2.1. Independent Variables**

We completed a rotated factor analysis to extract vertical and horizontal collaboration practices among the companies. The scales were measured on a Likert format ranging from 1 (strongly disagree) to 5 (strongly agree). The results of factor analysis are reported in Table 1. We used the Anderson-Rubin Method, which ensures orthogonality of the estimated factors, to produce factor scores. Five factors were extracted with three of them having Cronbach  $\alpha$  values above 0.6 and they were accepted in further analysis. The first factor, named as "*Horizontal Collaboration*", accounted for 18.955% of the variance; the second factor, "*Vertical Collaboration*", accounted for 12.204% of the total variance; and the last factor, "*Customer Engagement*", accounted for 12.136% of the variance. Horizontal Collaboration refers to the collaboration with other SMEs in the same sector where Vertical Collaboration refers to the collaboration with SME suppliers. Customer Engagement refers to the collaboration with customers which can be retailers, end consumers or importers in the case of global supply chains.

**Table 1 Rotated factor loadings for the Horizontal and Vertical Collaboration**

	Factor Loadings				
	Horizontal Collaboration	Vertical Collaboration	Customer Engagement	Customer Pricing- excluded	Vertical Barriers- excluded
Collaborate with similar companies for customer access	<b>.835</b>				
Collaborate with similar companies to improve production processes	<b>.828</b>				
Collaborate with similar companies to get supplies economically	<b>.777</b>				
Collaborate with similar companies to compete more effectively	<b>.706</b>				
Collaborate with similar companies to right pricing products	<b>.554</b>				
Collaborate with local suppliers		<b>.835</b>			
Collaborate with suppliers to gain get raw materials		<b>.732</b>			
Collaborate with local suppliers to get raw material in bulk		<b>.730</b>			
Personal relationships with customers			<b>.794</b>		
Grow sales with existing customers via personal relationships			<b>.772</b>		
Customer engagement with better quality			<b>.724</b>		
Customer engagement with better price				<b>.794</b>	
Customer engagement with discounts				<b>.761</b>	
Collaborate with suppliers to remove barriers to grow					<b>.795</b>
Collaborate with new suppliers to gain power over suppliers					<b>.745</b>
Eigenvalue	3.035	2.04	1.875	1.26	1.097
Initial percent of variance explained	20.236	13.599	12.502	8.402	7.314
Rotation sum of squared loadings (total)	2.843	1.831	1.82	1.507	1.306
Percent of variance explained	18.955	12.204	12.136	10.049	8.709
Cronbach $\alpha$ (sample $N$ )	.805	.668	.661	.521	.399

Extraction Method: Principal Component analysis. Rotation method: Varimax with Kaiser Normalization

We measured operational constraints in firm profitability and growth with three measures: financial, efficiency, and innovation constraints (Table 2).

**Table 2 Operational Constraints**

<b>Constraints</b>	<b>Measures</b>
<b>Financial</b>	Equipment
	Finance
	Constant production
<b>Efficiency</b>	Waste
	Intensity
<b>Innovation</b>	Operations innovation
	Packaging

### **3.2.2. Firm Strategy Clusters**

Cluster analysis revealed that there are two clusters among the respondents regarding their strategic orientation (Table 3): Cluster 1, named “*Price strategy*”, included those SMEs focused on providing low price products, putting less emphasis on quality. Cluster 2, named “*Quality Strategy*”, focused more on providing quality products to their customers. For example, in the question ‘right pricing is important to keep large customers’, companies in Cluster 1-Price Strategy answered 3.2 with a standard deviation of 0.89 while for companies in the Quality Strategy the mean value was 2.56 and the standard error 0.61.

### **3.2.1. Dependent Variables**

We used the following performance measures: Firm Growth, Innovativeness, and Value (value for money). Innovativeness refers to the development of new products or the upgrade of existing operational processes in the agri-SME. Value for money implies that the agri-SME makes optimal use of its limited resources to produce products that are at the right price for the quality offered. For growth variables, we performed a rotated factor analysis and an extra three factors (Table 4) with two of them having acceptable Cronbach  $\alpha$  values: (a) Growth Potential, that explained 21.380% of the variance; and, Growth Barriers (17.077% of variance).

**Table 3 Cluster membership analysis**

	All respondents			Cluster 1-Price Strategy			Cluster 2-Quality Strategy		
	Sample	Mean	Mean Std. Error	Sample	Mean	Mean Std. Error	Sample	Mean	Mean Std. Error
Legal form	493	2.95	0.072	178	3.04	.120	308	2.90	.091
Years	503	4.80	0.066	178	4.68	.114	316	4.89	.081
Firm size	504	18.97	3.077	178	16.88	5.822	317	19.92	3.630
Quality is important to gain new customers	504	4.56	.036	178	4.43	.080	317	4.63	.034
Price is important for our sales	502	4.10	.044	178	4.35	.061	317	3.96	.058
There are significant entry barriers to our sector	498	3.79	.053	178	4.06	.075	317	3.65	.069
Extending our product range, it would be an issue for our company	501	3.02	.054	178	3.85	.068	317	2.56	.061
Right pricing is important to keep large customers	502	2.59	.053	178	3.20	.089	317	2.25	.060
Product range differentiation is important for us	503	3.40	.062	178	3.38	.101	317	3.41	.080
Making new products does not hinder our growth	503	2.78	.057	178	3.56	.079	317	2.37	.066

**Table 4 Rotated factor loadings –Growth factors**

	Factor Loadings		
	Growth-Potential	Growth Barriers	Growth resources
Growth network access	0.824		
Growth supply	0.823		
Growth capital	0.629		
Growth product	0.602		
Growth barrier management		0.732	
Growth barrier		0.702	
Growth problems		0.693	
Growth initiative			0.716
Growth human resources			0.691
Growth customers base expansion		-0.392	0.546
Eigenvalue	2.322	1.535	1.442
Initial percent of variance explained	23.217	15.352	14.420
Rotation sum of squared loadings (total)	2.138	1.708	1.453
Percent of variance explained	21.380	17.077	14.533
Cronbach $\alpha$ (sample $N$ )	.691	.580	.400

Extraction Method: Principal Component analysis. Rotation method: Varimax with Kaiser Normalization

### 3.2.2. Control Variables

We used four demographics control variables: (i) the firm size measured as the number of employees, (ii) the years from establishment, (iii) the sector that the company operated, and (iv) the legal form (private, public, limited).

## 4. Findings

We completed moderated hierarchical regression analyses to measure the effects of independent variables (horizontal collaboration, vertical collaboration, customer engagement) on performance variables (growth, sales, and innovativeness). Table 5 reports the results of correlation analysis highlighting the significant values ( $p < 0.5$ ). The control variable firm size was correlated with year ( $r = 0.123$ ,  $p < .01$ ) and legal status ( $r = -0.263$ ,  $p < .01$ ). Independent and dependent variables showed various degrees of correlation with the highest being between

Growth performance with Financial constraints ( $r=0.353$ ,  $p<.01$ ), Efficiency constraints ( $r=0.234$ ,  $p<.01$ ), Horizontal Collaboration ( $r=0.173$ ,  $p<.01$ ), and Vertical Collaboration ( $r=0.127$ ,  $p<.01$ ).

Value for money was correlated with Customer Engagement ( $r=0.338$ ,  $p<.01$ ); Innovativeness with Efficiency constraints ( $r=0.295$ ,  $p<.01$ ), Financial constraints ( $r=0.266$ ,  $p<.01$ ), and Growth performance ( $r=0.226$ ,  $p<.01$ ). Legal Status and innovation constraints also showed high correlation ( $r=-.314$ ,  $p<.01$ ).

We then carried out the moderated hierarchical regressions in three steps: (i) control, (ii) independent, (iii) constraints. We ran the analysis for each cluster and for the total samples. The results are reported in Table 7, Table 8, Table 9 and Table 10 of the appendix and summarized in Table 6).



**Table 5 Means, Standard Deviations and Correlation Matrix**

No	Correlations	Mean	Std. Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	<i>Control Variables</i>																
1	Firm size	18.966	69.079	1													
2	Years	4.797	1.480	<b>.123**</b>	1												
3	Sector	1,556	27	-0.019	-0.019	1											
4	Legal Status	2.953	1.594	<b>-.263**</b>	-0.074	0.016	1										
	<i>Moderators</i>																
5	Price Strategy (1 or 2)			0.021	0.067	0.063	-0.042	1									
	<i>Independent Variables</i>																
6	Horizontal Collaboration	-0.000	1.000	-0.027	-0.031	<b>.179**</b>	0.050	<b>-.198**</b>	1								
7	Vertical Collaboration	-0.000	1.000	<b>-.117**</b>	<b>.117**</b>	-0.013	.188**	0.059	0.000	1							
8	Customer Engagement	-0.000	1.000	-0.071	0.001	-0.018	-0.034	<b>.136**</b>	0.000	-0.000	1						
	<i>Constraint Variables</i>																
9	Financial constraints	2.804	0.960	-0.070	-0.076	-0.061	0.087	<b>-.333**</b>	<b>.157**</b>	-0.003	-0.026	1					
10	Efficiency constraints	3.473	1.069	0.011	0.010	<b>.244**</b>	0.001	-.091*	<b>.133**</b>	0.067	<b>.111*</b>	<b>.239**</b>	1				
11	Innovation constraints	3.388	1.022	0.083	0.038	0.004	<b>-.314**</b>	<b>-.103*</b>	0.087	0.012	0.072	<b>.184**</b>	<b>.104*</b>	1			
	<i>Performance Variables</i>																
12	Growth performance	-0.000	1.000	-0.087	-0.038	-0.079	0.069	<b>-.133**</b>	<b>.173**</b>	<b>.127**</b>	0.081	<b>.353**</b>	<b>.234**</b>	0.061	1		
13	Growth barriers performance	0.000	1.000	-0.030	-0.023	0.007	0.041	<b>-.133**</b>	-0.068	-0.057	0.017	<b>.124**</b>	0.063	<b>.099*</b>	0	1	
14	Innovativeness performance	3.401	1.201	-0.019	0.045	<b>-.104*</b>	<b>.100*</b>	<b>-.151**</b>	0.074	-0.034	0.017	<b>.266**</b>	<b>.295**</b>	-0.017	<b>.226**</b>	0.041	1
15	Value for money performance	4.335	1.003	-0.012	-0.007	0.081	<b>-.133**</b>	0.058	-0.085	-0.013	<b>.338**</b>	<b>-.165**</b>	0.045	0.019	0.042	<b>.162**</b>	<b>-.102*</b>

\*\* . Correlation is significant at the 0.01 level (2-tailed).\* . Correlation is significant at the 0.05 level(2-tailed). In bold, significant correlation values (p<0.5) are highlighted

**Table 6 Summary of Moderated Hierarchical Regression Results**

	Cluster 1 - Price Strategy			Cluster 2 - Quality Strategy			Total Sample		
	Dependent Variable: Growth Performance								
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
<b>F Value</b>	2.884*	<b>5.066***</b>	4.531*	2.268*	3.006**	9.880***	2.145*	4.612***	11.70***
<b>Adjusted R<sup>2</sup></b>	0.044	0.148	0.178	0.016	0.045	0.230	0.009	0.051	0.186
<b>Δ R<sup>2</sup></b>	0.067*	<b>0.117***</b>	0.043*	0.030*	0.037**	0.188***	0.018*	0.047***	0.138***
	Dependent Variable: Growth barriers								
<b>F Value</b>	0.959	1.746*	1.621	0.420	0.624	1.245*	0.349	0.879	2.209**
<b>Adjusted R<sup>2</sup></b>	-0.00	0.031	0.036	-0.00	-0.00	0.008	-0.00	-0.00	0.025
<b>Δ R<sup>2</sup></b>	0.023	0.049*	0.023	0.005	0.009	0.026*	0.003	0.010	0.032**
	Dependent Variable: Innovativeness								
<b>F Value</b>	1.114	1.032	2.974***	1.096	1.450	4.653***	2.270*	1.763	8.254***
<b>Adjusted R<sup>2</sup></b>	0.002	0.001	0.108	0.001	0.010	0.109	0.010	0.011	0.134
<b>Δ R<sup>2</sup></b>	0.027	0.017	<b>0.118***</b>	0.014	0.019	<b>0.105***</b>	0.019*	0.006	0.126***
	Dependent Variable: Value for money								
<b>F Value</b>	0.681	4.066***	4.594**	3.498**	8.866***	6.597	3.681**	11.75***	9.101*
<b>Adjusted R<sup>2</sup></b>	-0.00	0.116	0.180	0.032	0.156	0.158	0.022	0.138	0.147
<b>Δ R<sup>2</sup></b>	0.016	<b>0.137***</b>	0.076**	0.045**	<b>0.130***</b>	0.010	0.030**	<b>0.120***</b>	0.014*

Note: \*\*\* denotes p<.001, \*\* denotes p<01, \* denotes p<.1

Note: Table summarizes the findings from **Table 7**, **Table 8**, **Table 9** and **Table 10** found in Appendix

Growth performance showed significant relation with both Price Strategy (Step 2:  $R^2 = .148$ ;  $\Delta R^2 = .117$ ,  $p < .01$ ;  $F = 5.066$ ,  $p < .001$ ), Quality Strategy (Step 3:  $R^2 = .230$ ;  $\Delta R^2 = .188$ ,  $p < .001$ ;  $F = 9.880$ ,  $p < .001$ ) and overall sample (Step 3:  $R^2 = .186$ ;  $\Delta R^2 = .138$ ,  $p < .01$ ;  $F = 11.700$ ,  $p < .001$ ); however, there were some striking differences (Table 6). Regarding Price Strategy, Vertical Collaboration ( $\beta = 0.32$ ,  $p < .001$ ) and Customer Engagement ( $\beta = 0.11$ ,  $p < .1$ ) contributed to Growth performance while the control factors (firm size, years, sector, legal status) and constraints (financial, efficiency, innovation) had no significant effects (Table 7). However, for those companies that followed a Quality Strategy, scale constraints were more important than collaboration factors; specifically, financial constraints ( $\beta = 0.4$ ,  $p < .001$ ) and efficiency constraints ( $\beta = 0.19$ ,  $p < .001$ ) followed by Horizontal Collaboration ( $\beta = 0.12$ ,  $p < .1$ ). Legal status ( $\beta = -0.07$ ,  $p < .1$ ) was statistically significant, yet, had limited power over growth performance under quality strategy.

Growth barriers performance showed no significant or low beta values with either price strategy (Step 2:  $R^2 = .003$ ;  $\Delta R^2 = .049$ ,  $p < .1$ ;  $F = 1.746$ ,  $p < .1$ ), quality strategy (Step 3:  $R^2 = .008$ ;  $\Delta R^2 = .026$ ,  $p < .1$ ;  $F = 1.245$ ,  $p < .1$ ), or overall sample (Step 3:  $R^2 = .025$ ;  $\Delta R^2 = .032$ ,  $p < .01$ ;  $F = 2.209$ ,  $p < .01$ ) (Table 6, Table 8). For price strategy, Horizontal Collaboration ( $\beta = -0.14$ ,  $p < .1$ ) and Vertical Collaboration ( $\beta = 0.19$ ,  $p < .1$ ) were negatively associated with growth barriers, which can be interpreted as SMEs being able to rely on supply chain collaboration to overcome growth barriers when they focus on price. For quality strategy, financial constraints ( $\beta = 0.13$ ,  $p < .1$ ) and Innovation constraints ( $\beta = 0.12$ ,  $p < .1$ ) were associated with growth barriers; collaboration factors showed no significant beta weights.

Innovativeness showed significant relationships with both Price strategy (Step 3:  $R^2 = .108$ ;  $\Delta R^2 = .118$ ,  $p < .001$ ;  $F = 2.974$ ,  $p < .001$ ) and Quality strategy (Step 3:  $R^2 = .134$ ;  $\Delta R^2 = .126$ ,  $p < .001$ ;  $F = 8.254$ ,  $p < .001$ ), with scale constraints playing a significant role (Table 6, Table 9). Specifically, the same two factors contributed to Innovativeness; these were efficiency constraints (price strategy:  $\beta = 0.34$ ,  $p < .001$ ; quality strategy:  $\beta = 0.30$ ,  $p < .001$ ) and financial constraints (price strategy:  $\beta = 0.29$ ,  $p < .01$ ; quality strategy:  $\beta = 0.28$ ,  $p < .01$ ). In Quality strategy, in the Step 2 model (without scale constraints), Horizontal Collaboration ( $\beta = 0.12$ ,  $p < .1$ ) and Vertical Collaboration ( $\beta = -0.11$ ,  $p < .1$ ) appear to have a significant effect on innovativeness, yet the overall output is not significant ( $R^2 = .01$ ,  $\Delta R^2 = .019$ ).

Similar to Innovativeness, Value for money performance showed significant relationships for both Price strategy (Step 2:  $R^2 = .116$ ;  $\Delta R^2 = .137$ ,  $p < .001$ ;  $F = 2.066$ ,  $p < .001$ ) and Quality

strategy (Step 2:  $R^2=.156$ ;  $\Delta R^2=.130$ ,  $p<.001$ ;  $F= 8.866$ ,  $p<.001$ ); however, it is the collaboration factors that played a significant role compared to Innovativeness where beta values of financial and efficiency constraints were significant (Table 6, Table 10). Specifically, Customer Engagement ( $\beta=0.29$ ,  $p<.001$ ) and Horizontal Collaboration ( $\beta=-0.15$ ,  $p<.01$ ) for Price Strategy and Customer Engagement ( $\beta=0.44$ ,  $p<.001$ ) for Quality strategy. Legal Status also had a significant beta value ( $\beta=-0.11$ ,  $p<.01$ ) for quality strategy.

## **5. Discussion and Conclusions**

### **5.1. Hypotheses Test Findings**

This study examined the impact of collaboration in agri-food supply chains on firm performance and the moderating role of scale constraints and firm strategy. Collaboration was measured by three constructs: horizontal collaboration, vertical collaboration, and customer engagement and SME performance with three variables: growth, value for money and innovativeness. Two strategies were evaluated: price strategy and quality strategy. Three types of scale constraints were assessed: financial, efficiency, and innovation. Four demographic variables were used as control variables: firm size, firm age, sector, and legal status.

Regarding Hypothesis 1, supply chain collaboration had a significant effect on firm growth, value for money, and innovativeness. Therefore, we accept Hypothesis 1, that supply chain collaboration impacts positively on agri-SME performance. Regarding scale constraints, they had a significant effect on growth performance and innovativeness, while only financial constraints impacted the value for money variable. Therefore, we partially accept Hypothesis 2, that scale constraints moderate the supply chain collaboration-SME performance relationship. Regarding SME strategy, the results indicate that there are differences between price strategy and quality strategy. Therefore, we accept Hypothesis 3, that SME strategy moderates the supply chain collaboration-SME performance relationship.

For agri-SMEs, innovation, efficiency constraints, and financial constraints are important barriers that they need to remove, independent of the strategy they employ. Supply chain collaboration shows an insignificant effect on innovativeness, which seems to be idiosyncratic for agri-SMEs. For value for money, collaboration factors played a significant role and, particularly, customer engagement and horizontal collaboration for price strategy and customer engagement for quality strategy. Agri-SMEs engaging retailers or end-consumers, since some

of them operate retail stores where the end-consumer is the customer, have better results for both price and quality strategies. Horizontal collaboration, such as buying in bulk or wholesale prices with other SMEs within a cluster or obtaining certification of protected designation of origin (PDO), protected geographical indication (PGI), and traditional specialities guaranteed (TSG), can reduce product and distribution costs which, in turn, facilitates a price strategy. The legal status was also found to be significant for quality strategy, which can be interpreted as the fact that customers and partners trust one legal status more than others.

## **5.2. Theoretical Contributions**

This study contributes to the extended resource-based view of the firm and the SMEs' strategy literature (Arya and Lin 2007; Westhead, Wright, and Ucbasaran 2001; Kilpi et al. 2018).

First, the RBV focuses on the links between firm strategy and internal resources to create and capture value (Carter, Kosmol, and Kaufmann 2017). Accessing and using resources, information and knowledge external to the firm, controlled by supply chain partners, provides insights for an eRBV of the firm (Arya and Lin 2007; Popli, Ladkani, and Gaur 2017). This study shows that the eRBV is relevant particularly to SMEs which are often hooked in the desperate bid for survival and growth. Prior research focuses mainly on studying internal resources and dynamic capabilities from the point of view of competence reconfiguration and sensing, seizing capacities, a view that neglects the role of external resources and their alignment with firm strategy which is largely unexplored in the RBV literature (Lonial and Carter 2015).

Specifically, this study responds to the specific call for understanding dynamic capabilities (Wang, Senaratne, and Rafiq 2015; Sapienza et al. 2006), which is an under-researched area in SMEs. The findings show that there are three types of supply chain collaboration in SMEs: horizontal, vertical, and customer engagement. Previous studies have mainly focused on vertical collaborations (Danloup et al. 2015), yet, the findings show that horizontal collaboration can help SMEs to overcome growth barriers and innovate when they follow a quality strategy. Furthermore, customer engagement has a strong effect on value for money and growth when SMEs follow a price strategy. These findings indicate that the conceptualization of supply chain collaboration in SMEs appears to be different than LE: previous studies have found differences in the perceptions of trust and collaboration among supply chain partners (Vlachos and Bourlakis 2006), which can also be apparent in the case of

SMEs. Furthermore, recent studies show the importance of interacting and engaging with customers to create value (Vargo and Lusch 2004). This study shows that customer engagement has a strong effect upon value creation and capture, which indicates that SMEs can use dynamic capabilities in several ways to create and capture value.

The findings shed light into SMEs' strategic dilemma to what extent to collaborate with a larger enterprise (Rezaei, Ortt, and Trott 2015; Jones et al. 2014). The results show that strategy moderates all types of firm performance (growth, innovation, value-for-money) but the effects vary depending on the type of collaboration and performance dimension. For example, to innovate, the quality strategy clearly moderates the horizontal and vertical collaboration types. However, for SMEs with a quality strategy, horizontal collaboration has a positive effect in innovativeness while vertical collaboration a negative effect. Since horizontal collaboration takes place with companies of the same scale and strategy, where vertical collaboration can occur with larger supply chain partners, this finding indicates that SMEs should align their strategy with their horizontal collaboration capabilities (Wiengarten et al. 2010; Sanders, Autry, and Gligor 2011). The findings for growth performance further support the strategy-collaboration alignment: SMEs with a price strategy benefit from vertical collaboration while SMEs with a quality strategy benefit from horizontal collaboration. Customer engagement has a greater effect with quality strategy than price strategy. Further, this study uncovers the role of scale constraints to develop collaboration capabilities and create value. Indeed, SMEs' involvement in supply chain collaboration does not directly improve their performance but indirectly via relaxing scale barriers adjusted by the specific SME strategy (Ali, Nagalingam, and Gurd 2017). The motive for SMEs to overcome their institutional constraints (i.e., financial, operational, innovative) is the ability to develop second-order dynamic competences such as vertical and horizontal collaboration and customer engagement which, in turn, leads to superior performance (Ko and Liu 2017).

The findings are particularly important for the food supply chains which are dominated by SMEs (Vandeplas, Minten, and Swinnen 2013); therefore, to a large extent, the performance of the food sector in terms of resilience (Stone and Rahimifard 2018), risk (Nyamah et al. 2017) and sustainability is directly dependent upon the dynamic capabilities and performance of small and medium enterprises (Stone and Rahimifard 2018; Pomponi, Fratocchi, and Tafuri 2015; Nyamah et al. 2017). Contemporary food production and delivery systems comprise of complex vertical and horizontal inter-firm relationships (Dania, Xing, and Amer 2018; Porter and Reay 2016). Within this context, agri-SMEs, apart from resource constraints, also face power

imbalance which favours large retailers (Hingley 2005), thus they need to adopt their strategies aligning them with specific collaboration types. Effective supply chain collaboration not only improves SMEs' performance, it also creates value in terms of reduced food loss and waste (Devin and Richards 2018), improved food quality and sustainability (Bourlakis, Vlachos, and Zeimpekis 2011).

### **5.3. Managerial Implications**

The results from this study present a number of implications for SME owners, managers and practitioners involved with this sector. First, the results indicate the necessity where small and medium agri-food SME companies need to formulate and implement a clear strategy to guide them towards supply chain collaborations and alliances. Agri-SMEs should become involved in horizontal and vertical collaborations in order to grow, innovate and improve their product offerings. However, supply chain collaborations are overly dynamic and considered as a high-level capability that companies should develop by focusing on removing scale constraints such as financial, operational and innovation. For example, companies may relax innovation constraints, which can be quite idiosyncratic, by engaging in bids, research collaborations, hiring high-skilled personnel and developing new products systematically. In so doing, they can increase their innovation capability which, in turn, would help them in developing supply chain collaborations more easily with innovation-seeking partners. Additionally, companies may engage in horizontal collaborations to purchase supplies in bulk or wholesale terms which can relax their financial constraints. These companies could also consider possible collaboration in relation to distribution and supply chain operations such as warehousing and transportation and this will improve relevant operational efficiencies, too. Overall, this work will provide a clear and succinct strategic roadmap for owners and managers of SMEs aiming to devise and implement future collaborations with other SMEs and supply chain partners. Our work has shown how three distinctive types of collaboration (horizontal, vertical, customer engagement) can benefit SMEs in relation to future growth and performance. Specific aspects of this performance were considered in this work, including food waste and other sustainability-related issues, which require urgent attention by food companies in general and food SMEs in particular.

#### **5.4. Limitations and Recommendations**

This study conducted a large-scale survey of agri-food companies to examine the impact of supply chain collaboration on firm performance and the moderating role of scale constraints and firm strategy. Current food supply chains are far from being efficient and sustainable (Devin and Richards 2018); this study examined agri-SMEs which play a key role in food systems and showed that by developing collaboration capabilities and aligning them with firm strategy, SMEs can improve their performance and, thus, the performance of food systems. Future studies in food supply chains should examine strategy, collaboration and performance using a theoretical lens beyond the resource based view such as transaction cost economics, agency theory and service-dominant logic.

The study focused on one country; future studies may replicate the survey in other regions to assess whether there are country-specific effects. Further, the study employed hierarchical regressions to test the degree of association between dependent and independent variables. Future research may examine the necessary and sufficient conditions of supply chain collaboration based on Boolean logic, e.g., Fuzzy Sets Qualitative Comparative Analysis. This study examined three categories of scale constraints and three types of SME performance. Future research should examine more variables of firm performance and the role of institutional and contextual constraints on food supply chain collaboration.



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