

## **The Effect of Supply Chain Management on Competitive Advantage: Mediating Role of Supply Chain Responsiveness in Ethiopian Food Processing Industry**

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### **Abstract**

This study aims to examine the indirect impact of supply chain management (SCM) in its five dimensions (supplier relationship, customer relationship, information sharing, information quality and postponement) on the competitive advantage in its five dimensions (Cost, Quality, Delivery Time, flexibility, and innovation) through supply chain responsiveness as a mediator. Furthermore, 234 questionnaires were distributed in food processing industries. The total of 215 questionnaires was analyzed. For a robust result, we conducted exploratory factor analysis (EFA) using Varimax rotation and confirmatory factor analysis (CFA) to check the scale. Furthermore, we test validation of the second-order construct. Structural equations modelling (SEM) using AMOS 24 was used to test the hypotheses. The results of analysis show that the supply chain management practice (SCMP) has a positive and statistically significant influence on supply chain responsiveness ( $\beta = 0.909$ , p-value = 0.000) and the competitive advantage of firms with the standardized coefficient of ( $\beta = 0.639$ , p-value = 0.000). Similarly, the supply chain responsiveness has a positive and significant effect on competitive advantage by ( $\beta = 0.352$ , p-value = 0.000), on the other hand, supply chain management practice (SCMP) has a significant indirect effect on competitive advantage by ( $\beta = 0.320$ , p-value = 0.000) through supply chain responsiveness. Accordingly, we suggest that managers of food processing should properly manage their supply chain management practice, develop a responsive supply chain to gain a competitive advantage. But this study was limited only to food processing with plc and Share Company.

**Key words:** *Supply chain Management, Supply chain Responsiveness, Competitive Advantage, and Ethiopian food processing industry*

## 1. INTRODUCTION

In today's competitive business, most of the firms increased focus on delivering value to the customer. The focus on attention of businesses is providing products and services that are more valuable compared to its competitors. These forces supply chain to be more responsive and create competitive advantage. The growth of supply chain management aims to improve profit, customer response, customer value, interconnection, and interdependence among firms (Inda Sukati et al., 2012). Likewise, Thatte (2007) affirmed that getting the right product, at the right price, at the right time to the customer is not only improved competitive success but also the key to survival.

Supply Chain Management is an approach that is used to achieve a more efficient integration of various organizations from suppliers, manufactures, distributors, retailers, and customers. This means that goods are produced in the right amount, at the right time and at the right place in order to achieve the minimum overall cost of the system and also reach the desired service level (Levi, 2000). In the Supply Chain there are three types of flows that must be managed, first the flow of goods that flows from upstream to downstream, second is the flow of money and the like that flows from upstream to downstream, the third is the flow of information that can occur from upstream to downstream or information about inventory product, production capacity and shipping information (Pujawan, 2017).

Competitive advantage is the ability of a company to get greater profits from competitors engaged in the same industry (Porter, 1985). Furthermore, Competitive advantage is the advantage achieved by a company over its competitors by offering more value to consumers, either through lower prices for products or services or by providing additional benefits and better services (Attiany, 2014). Additionally, Vargas et al. (2018) define that competitive CA as a contact to original marketplaces comparative to the business's main entrants, design and product growth relation, and upgrading of the organization's status comparative to its key rivals.

Chronic malnutrition, extreme poverty, rapidly rising and young unemployed urban populations, civil and political conflict, and intensifying droughts all strain the country's ability to provide for itself (Michael A. Raynor, 2019). Despite the challenges, the Ethiopian

government's vision for the country is to become a lower-middle-income country by 2025. Ethiopia has now made significant progress in reducing poverty and increasing food production, food security, and nutrition, although challenges remain. Ethiopia's economy experienced strong, broad-based growth, averaging 9.4% a year from 2010/11 to 2019/20, Ethiopia's real gross domestic product (GDP).

The food industry is one of the fastest growing industrial branches in the manufacturing sector in Ethiopia. Agro-industries (food and beverages) contribute approximately 50% of manufactured goods (UNIDO, 2012). This sector has great potential, also owning substantial natural and human resources, as well as a long tradition (Banja Luka, 2014).

In reviewing studies, we found that several research gaps have existed in this area; past studies focused on supply chain management practice were done in developed countries (Al-Shboul, M.A.R., and et. al., 2017); Christopher, M. and Peck, H. (2004) and developing countries (Dr. Siddig Balal Ibrahim, Abdelsalam Adam Hamid, 2012; Tilahun Woldie Mengistu & Regina Birner, 2018) on supply chain management practice and competitive advantage by Suhong Li, et. al., 2004; Somuyiwa, 2013; Satria Yunas, 2016; S.K. Chadha, et.al. 2018); and on supply chain responsiveness in relation to competitive advantage (Ashish A. Thatte, 2007; Faheem Gul Gilal et.al., 2017) was conducted with an orientation to developed countries. Although very few research studies on supply chain management practice, supply chain responsiveness, and competitive advantage have been conducted in developing countries (Ashish A. Thatte et al., 2013; Dr. Kamel Mohammad Al-Hawajreh1, et al., 2014), the findings of those studies are inconclusive and non-generalizable for all developing countries like Ethiopia, and they ignore supply chain management practice measurements like information quality, internal lead time. To fill this research literature gap, this study was conducted with the development of five dimensions for supply chain management practice and four dimensions for supply chain responsiveness.

The purpose of this study was to examine the effect of supply chain management practices on competitive advantage through supply chain responsiveness in the Ethiopian medium and large food processing industries. Hence, this paper addressed the main objectives of investigating the effect of supply chain management practices on the competitive advantage of the Ethiopian food processing industry through supply chain responsiveness.

## 2. LITERATURE REVIEW

As Waghmare and Mehta (2014) explained that SC is a complex link of providers, distributors, and clients who share wisely achieved information about requests, choices, and performance, they identify that the success of one part of the SC means achievement for all. further, Verma and Singhal (2018) explain the Supply chain as it is the combined work of several members such as providers, contractors, traders, and sellers, this integration is important for the strategies to gain SC effectiveness in the flow of material and other capitals in the business; also, the combined efforts contain management and collaboration amongst the components.

Supply Chain Management (SCM) has become part of the senior management agenda since the 1990s. Executives are becoming aware that the successful coordination, integration and management of key business processes across members of the supply chain will determine the ultimate success of the single enterprise (Van der Vorst, 2000). In the Supply Chain there are three types of flows that must be managed, first the flow of goods that flows from upstream to downstream, second is the flow of money and the like that flows from upstream to downstream, the third is the flow of information that can occur from upstream to downstream or information about inventory product, production capacity and shipping information (Pujawan, 2017).

### 2.1 Empirical review and Hypothesis

As Suhong Lia., et.al, (2004) assert that SCM practices impact not only overall organizational performance but also the competitive advantage of an organization. They are expected to improve an organization's competitive advantage through price/cost, quality, delivery dependability, time to market, and product innovation (Suhong Lia., et.al, (2004). Likewise, prior studies have indicated that the various components of SCM practices (such as strategic supplier partnership, customer relationship, and information sharing and information quality) have an impact on a variety of aspects of competitive advantage (such as price/cost). For example, strategic supplier partnership can improve supplier performance; reduce time to market (Ragatz GL, Handfield RB, Scannell TV (1997), and increase the level of customer responsiveness and satisfaction (Power DJ, Sohal A, Rahman SU, 2001). Information sharing leads to high levels of supply chain integration (Jarrell JL., 1998) by enabling organizations to make reliable delivery and introduce products to the market quickly. Information sharing and

information quality contribute positively to customer satisfaction (Spekman RE, Kamauff Jr JW, Myhr N1998) and partnership quality (Walton LW, 1996; Lee J, KimY(1999). Moreover, (Suhong Lia, et.al, 2004; Ashish A. Thatte, et.al, 2013; Somuyiwa, Adebambo 2013; S.K. Chadha, S.K. Sharma, and Maninder Singh, 2018; Siahaan T, Nazaruddin, Sadalia I. 2020) accordingly,

H1: Supply chain management practice has a significant influence on the competitive advantage of food processing firms in Ethiopia.

Strategic supplier partnerships including working closely with suppliers to design or redesign products and processes, solve problems, as well as prepare backup plans, are critical in attaining supply chain responsiveness (Storey et al., 2005; Liu and Kumar, 2003). Liu and Kumar (2003) observed that collaborative practices such as 3PL, VMI, and CPFR between supply chain partners led to increased supply chain responsiveness. Customer relationship is essential for attaining supply chain-wide responsiveness (Storey et al., 2005; Martin and Grbac, 2003; Van Hoek et al., 2001; Harris, 2005; Handfield and Bechtel, 2002). Likewise, Ashish A. Thatte, et.al, (2013) assert that supply chain management practices specifically supplier partnership (Inda Sukati, and et.al, 2012; Nur Atiqah Binti Zahari Azar, 2015; Kerwin Salvador P. et.al, 2017). And a great amount of visibility is required through the supply chain in order to attain supply chain responsiveness (Storey et al., 2005) information sharing (Martin and Grbac, 2003; Handfield and Nichols, 2002). Furthermore, Ashish A. Thatte, et.al, (2013) has a significant influence in increasing responsiveness in the supply chain. Lean has gained popularity in a wide range of industrial sectors, ahead of manufacturing, all around the world (Garza-Reyes et al., 2012) the lean practice of firms can enhance the firm's responsiveness to the fluctuating customer demand in the market (Nur Atiqah Binti Zahari Azar, 2015; Kerwin Salvador P. et.al, 2017). Accordingly,

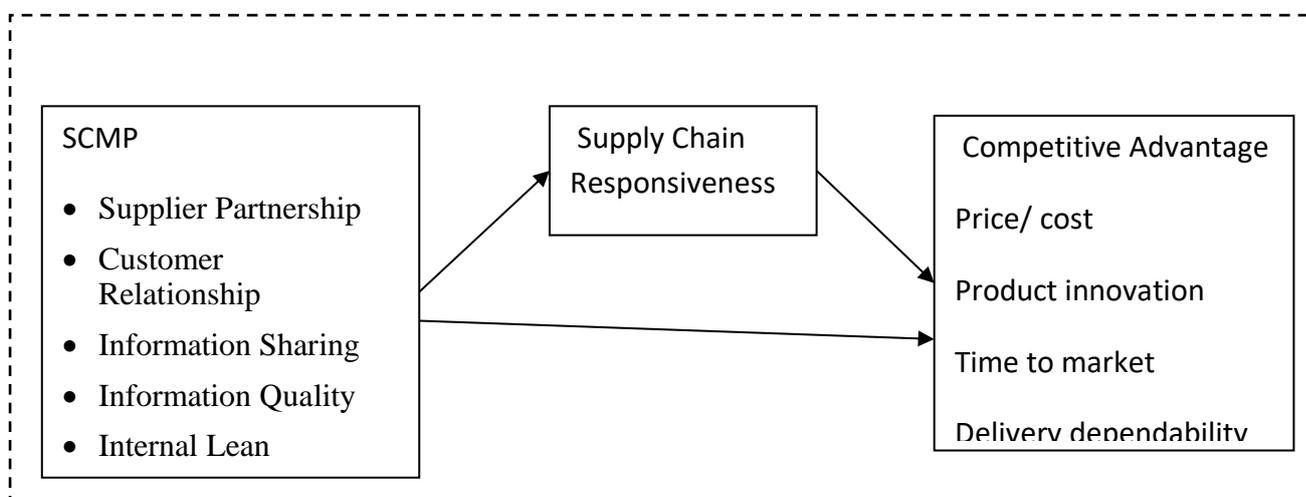
H2: Supply chain management practice has a significant relationship with supply chain responsiveness in the Ethiopian food processing industry.

The improvement of flexibility and speed of response has become increasingly imperative as a method to achieve competitive advantage (Upton, 1997; Martin and Grbac, 2003). Responsiveness to customers is critical to achieving competitive advantage (Williamson, 1991; Martin and Grbac, 2003). Likewise, Ellinger (2000) argues that competitive advantage accrues to those firms that are responsive to customer needs. Firms with more responsive supply chains

will be more adaptive to demand fluctuations and will handle this uncertainty at a lower cost due to the shorter lead time (Randall et al., 2003). More recently Dr. Kamel M. Al-Hawajreh and Dr. Murad S. Attiany (2004); Yusuf et al. (2003; 2004; Ashish A. Thatte, 2007 and Inda Sukati, et.al, 2012) in their study found out that supply chain responsiveness was positively associated with the competitive advantage of a firm. Accordingly,

H3: Supply chain responsiveness has a significant influence on the competitive advantage of the Ethiopian food processing industry.

**Figure 1. Conceptual framework of the study**



*Source: conceptualized by Authors*

### 3. RESEARCH METHODOLOGY

#### 3.1 Research design

A Causal (Explanatory) research design was used with the quantitative research approach. This study focused on food processing firms that have the legal establishment as Share Company and private limited company (plc) operate in the Ethiopian food processing industry. The study determined 234 sample respondents using (Yamane's, 1967) but we use 215 for the current analysis. To collect the necessary data from the employees of the food processing industries the researchers employ five point likert scale questioners and it were distributed using convenience sampling Finally, the collected data was analyzed and the hypothesis were tested using structural equation modeling (SEM)- SPSS, AMOS version 23.

### 4. RESULT AND DISCUSSIONS

The study conducted a validity (convergent, discriminate validity) test through loadings, composite reliability (CR), and average variance extracted (AVE) compared with the correlation (r) value of the constructs.

#### 4.1 Factor Analysis

Exploratory factor analysis (EFA) was conducted to explore the interrelationship between variables, to remove redundant; unnecessary items, and to simplify interrelated indicators through varimax rotation. Before to this, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of Sphericity were conducted.

**Table 1. Factor Analysis Test of KMO & Bartlett's Test of Sphericity and communalities**

Latent	Construct (indicators)	KMO	Bartlett's P-value	Communality
<b>SCMP</b>	Strategic Supplier partnership	0.707	0.000	0.458
	Customer Relationship	0.819	0.000	0.519
	Information sharing	0.732	0.000	0.621
	Internal lean practice	0.749	0.000	0.877
	Information quality	0.773	0.000	0.667
<b>SCR</b>	Assembly responsiveness	0.500	0.000	0.723
	Operation system responsiveness	0.604	0.000	0.920
	Logistic process responsiveness	0.684	0.000	0.694
	Supplier network responsiveness	0.636	0.000	0.495
<b>CA</b>	Time to market(TM)	0.788	0.000	0.835
	Price or Cost (PC)	0.745	0.000	0.785
	Product innovation (PI)	0.695	0.000	0.795
	Delivery dependability (DD)	0.648	0.000	0.888

**Source: SPSS result 2021**

The results illustrate the validity of the constructs factor loadings (standardized regression weights) of individual items. The individual item loading is all above the recommended 0.5, ranging from 0.613 to 0.941 (Anderson & Gerbing, 1988), implying that all items converged well. The results of the CR index for all the constructs range from 0.887 to 0.946, thereby exceeding the estimate criteria used. Likewise, the construct had an Average Extracted Variance value that ranges from 0.584 to 0.638 which is above the (0.5) threshold and this provides evidence for an acceptable level of research scale reliability (Fraering & Minor, 2006; Hair et al., 2009). Hence, all the AVE value is greater than the squared correlation value for the entire construct, thereby confirming the existence of discriminate validity.

We also tested the reliability of constructs using composite reliability and Cronbach alpha

## 4.2. Reliability test

We also tested the reliability of constructs using composite reliability and Cronbach alpha.

**Table 2: Reliability test of constructs using Crombachs Alpha and Item to total correlation**

Items/indicators and constructs	Item-Total Correlation	(Reliability) alpha
Supply chain management practice		<b>0.869</b>
1. Supplier partnership	0.753**	0.772
2. Customer relationship	0.803**	0.840
3. Information sharing	0.760**	0.846
4. Internal lean practice	0.850**	0.882
5. Quality of information	0.882**	0.908
Supply chain responsiveness (SCR)		<b>0.798</b>
1. Assumbly responsiveness	0.684**	0.942
2. supplier network responsiveness	0.705**	0.645
3. logistic system responsiveness	0.672**	0.750
4. Operation system responsiveness	0.666**	0.708
Competitive Advantage		<b>0.755</b>
1. Time to market	0.577**	0.887
2. price/ cost	0.693**	0.856
3. Product Innovation	0.601**	0.658
4. Delivery dependability	0.549**	0.701

**Source: SPSS result, 2021**

Based on the reliability test of constructs and item to the total correlation coefficient, the minimum coefficient of Cronbach Alpha value is 0.645 and the maximum is 0.942 and the average Cronbach Alpha value of all items with their respective latent variable ranged from 0.755 minimum to 0.869 maximum which is good and acceptable based on the acceptable threshold of 0.7 as of (Nunnally, 1978; Bryman & Bell, 2003). This implies that there are realistically highest Cronbach alpha values and it suggested that the measurement of independent variables supply chain management practice in the current study is generally. In the same vein the item to total (first-order construct) in the current study has a positive and moderate level of correlation this ranges from  $r = 0.549$  to  $r = 0.753$  for all items to total correlation. This implies that the measurement or indicator items can measure the latent variables. Exploratory factor analysis (EFA) through varimax rotation was conducted. Before

this, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity was conducted.

### 4.3. Test of validity

In study we the researcher conducted validity (convergent, discriminate validity) test through loadings, composite reliability (CR) and average variance extracted (AVE) compared with the correlation (r) value of the constructs which presented as follows

**Table 3. Test of validity of constructs using CR and AVE**

Construct	Indicators	Factor loading	C.R	AVE	Correlation (r <sup>2</sup> )
SCMP	Supplier partnership	0.664	0.887	0.615	0.254 & 0.189
	Customer Relationship	0.700			
	Internal lean practice	0.935			
	Information sharing	0.782			
	Information quality	0.812			
SCR	Assembly responsiveness	0.846	0.887	0.638	0.254 & 0.546
	Operation system responsiveness	0.955			
	Logistic system responsiveness	0.820			
	Supplier network responsiveness	0.613			
CA	Delivery dependability	0.941	0.946	0.584	0.189 & 0.546
	Product Innovation	0.891			
	Price or cost of product	0.867			
	Time to Market	0.912			

**Source: SPSS and Excel result, 2021**

The results in the above table illustrate the validity of the construct (dependent variable) factor loadings (standardized regression weights) of individual items on the construct Competitive Advantage (CA). The individual item loading are all above the recommended 0.5, ranging from 0.867 to 0.941 (Anderson & Gerbing, 1988), the results of the factor loadings imply that all items converged well on the construct they were supposed to measure the competitive

advantage. Hence, it is confirmed the existence of convergent validity. Internal consistency was also used to evaluate the composite reliability (CR) index of the Competitive Advantage (CA) construct. Using the formulae presented in the previous section, the composite reliability was calculated and tabulated in the above table. The results indicate the CR index for Competitive Advantage (CA) is 0.946, thereby exceeding the estimate criteria used in literature. The construct Competitive Advantage (CA) had an Average Extracted Variance of 0.584 which is above the (0.5) threshold recommended in literature and therefore provides evidence for an acceptable level of research scale reliability (Fraering & Minor, 2006; Hair *et al.*, 2009). Hence, that all the AVE value is greater that squared correlation value of ( $r= 189$  and  $r= 0.546$ ) for the entire Competitive Advantage (CA) construct, thereby confirming the existence of discriminate validity.

**Table 3. Convergent validity based on loading**

Second order construct	First order constructs	Loading
Supply chain management practice (SCMP)	Supplier partnership	0.664
	Customer relationship	0.700
	Information sharing	0.782
	Internal lean	0.935
Competitive advantage (CA)	Quality of information	0.812
	Time to market	0.912
	Price or Cost	0.867
	Product innovation	0.891
Supply chain Responsiveness (SCR)	Delivery dependability	0.941
	Assembly responsiveness	0.846
	Supplier network responsiveness	0.613
	Logistic process responsiveness	0.820
	Operation system responsiveness	0.955

*Source: SPSS result, 2021*

**Table 4: Explanatory factor analysis result based on Rotated Component Matrix<sup>a</sup>**

Latent variables	Indicators	Component		
		1	2	3
Supply chain management practice (SCMP)	Supplier partnership	.664		
	Customer relationship	.700		
	Information sharing	.782		
	Internal lean	.935		

	Quality of information	.812		
Competitive advantage (CA)	Time to market	.912		
	Price or Cost			.867
	Product innovation			.891
	Delivery dependability		.941	
Supply chain Responsiveness (SCR)	Assembly responsiveness	.846		
	Supplier network responsiveness	.613		
	Logistic process responsiveness		.820	
	Operation system responsiveness		.955	
Eigen value		5.052	2.764	1.462
Variance %		38.506	20.317	12.549
% of commutative Variance		38.506	58.824	71.372
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization				

**Source: SPSS result 2021**

a. Rotation converged in 4 iterations

The above table depicted that the rotated component matrix of the constructs with principal component analysis. As factor analysis provides a suitable means to examine convergent validity in this study's factor analysis, loadings are used to detect whether or not an item appropriately loads on its predicted construct. It shows the reliability of individual items (indicators) Muhammed (2010). Accordingly all constructs have been forced into three factors and rotated using the VARIMAX rotation method to assess their loadings and the result indicated that all of items have the loading that ranges from 0.613 to 0.955 this greater than 0.50 load on their predicted construct that demonstrate a higher degree of association between the latent items and that constructs (Field, 2013) this implies that convergent validity is established well. Moreover the factor analysis result presented in table 2 shows that all items had a significant load value with their underlying factors above the cut-off point 0.4. Apart from this, Eigen value of one (1) and the value cumulative variance explained ranged from 38.51 to 71.37 indicated that the amount of variance explained by the three factors – supply chain management practice, supply chain responsiveness and competitive advantage.

#### 4.4. SEM Assumption test

The researcher conducted different test of assumptions of structural equation modeling with different method such as multicollinearity test using Eigen value, variance inflation factor(VIF) level of tolerance and the Pearson correlation coefficient method, and model fit test or assessment using confirmatory factor analysis (CFA) by AMOS 23 as follows.

##### 4.4.1. Test of Multicollinearity Using Pearson’s correlation, tolerance and VIF

Among the assumptions of structural equation modeling is that the independent variables should not have very high association or correlation. When the independent variables are highly correlated, it is regarded as a problem in the model and this problem is called multi collinearity. Multicollinearity among the variables is examined using different methods. Similarly any two independent variables with a Pearson correlation coefficient greater than .9 between them will cause problems (Gujarati and porter (2010)). In this study the primary techniques for detecting the multicollnearity are : - i) correlation coefficient, ii) variance inflation factor (Noora Shrestha, 2020) employed to detect multicollnearity problem in the collected data as follows:

**Table 1 Multicollnearity test using Pearson’s correlation, tolerance and VIF**

variables	SCMP	SCR	CA	Tolerance	VIF
1. Supply chain management practice	1	0.504**	0.435**	0.746	1.341
2. Supply chain Responsiveness	0.504**	1	0.739**	0.746	1.341
3. Competitive advantage	0.435**	0.739**	1		

**\*\*.** Correlation is significant at the 0.01 level (2-tailed)

*Source: SPSS result, 2021*

The above table presents the pearson correlation coefficient between constructs and the variance inflation factor (VIF) and level of tolerance. the result demonstrated that the value of correlation between the two independent variable- supply chain management practice and supply chain responsiveness was (r=0.504) below the acceptable threshold of 0.7 (Noora Shrestha, 2020) and 0.9 (Gujarati and porter (2010)). with the tolerance value of 0.746 and variance inflation factor VIF value of 1.341 for both constructs this value is based on the acceptable threshold of tolerance of 0.746 > 0.10 and/or a VIF 1.341 <10 indicates(O’Brien, D., P. Sharkey Scott, 2012; Gujarati and porter, 2010; Noora Shrestha, 2020).

##### 4.4.2. Test of Multicollnearity using Eigen value Method

Multicollinearity among the variables is examined using different methods from these methods Eigen value is the other method of detecting the presence of multicollinearity problem (Noora Shrestha, 2020). Therefore, the researchers conducted multicollinearity diagnostics using Eigen value condition index is a function of Eigen values and variance proportion to increase the robustness of the data for better analysis. Accordingly the following table presents the analysis result.

**Table 2. Test of Multicollinearity using Eigen value Method**

Model	Dimension	Eigen value	Condition Index	Variance Proportions		
				(Constant)	SCR	SCMP
1	1	2.963	1.000	0.00	0.00	0.00
	2	0.023	11.395	0.39	0.04	<b>0.90</b>
	3	0.015	<b>14.268</b>	0.61	<b>0.95</b>	0.10
a. Dependent Variable: CA						

**Source: SPSS result, 2021**

In the above table for variable supply chain management practice, higher variance proportions i.e. 0.9 (90%) is associated with dimension 2 that has an eigen value of 0.023 and a condition index of (11.395). The variable supply chain responsiveness has the higher variance of 0.95 (95%) and is associated with the dimension 2, with eigen value of (0.015) and a condition index of (14.268). A condition index greater than 15 denotes a probable problem of multicollinearity. The higher condition index is (14.268) for dimension 3 but the variance proportions of variables are not associated with this value. This shows there is no evidence of collinearity among the variables. According to the table the value of condition index is below 15 and variance proportion value of the two variable supply chain management practice and supply chain responsiveness were below the acceptable threshold of less than 0.9 but not supported by the condition index (Noora Shrestha, 2020). Accordingly for this study multicollinearity was not a problem.

### 4.3. Confirmatory factor analysis (CFA) and Model fit assessments

CFA was implemented to determine measures of accuracy of the measurement instruments for the respective construct using AMOS Version 23.0. As the results indicate that the conceptual model fit assessment which is discussed hereafter.

**Table 6. Summary of Model fit Analysis**

Fit criteria	CMIN	DF	$\chi^2/DF$	GFI	AGFI	NFI	IFI	TLI	CFI	RMSEA
Indicator value	45.851	36	1.274	0.969	0.921	0.986	0.997	0.993	0.997	0.036

*Source: AMOS result, 2021*

The results in Table show the acceptable goodness-of-fit of the model as mentioned in Chapter 3. In light of the aforementioned results, it could be suggested that all the indicators are meeting the acceptable thresholds of equal or greater than 0.9 for goodness of fit index (GFI = 0.969, Augmented goodness of fit index (AGFI= 0.922), Normed- Fit- Index (NFI = 0.983), Incremental Fit Index (IFI = 0.996), Tucker Lewis Index (TLI = 0.993), Comparative Fit Index (CFI = 0.996) and equal or less than 0.08 for (RMSEA= 0.036). All these measures confirm a robust and acceptable model fit (Schreiber, Stage, King, Nora & Barlow 2006; Cangur and Ercan, 2015). Furthermore, the level significance p- value and PCLOSE value at RMSEA table of model fit were insignificant with the value of 0.108 and 0.789 > 0.05 for significance level in CMIN table and PCLOSE value respectively.

**Table 7. Summary of model fit based on CFA result**

Indicators of model Fit	Cut-off point	Test result
$\chi^2/DF$	$\leq 5$	1.274 < 5 (good fit)
GFI	$\geq 0.90$	0.969 (good fit)
AGFI	$\geq 0.90$	0.921 (good fit)
NFI	$\geq 0.90$	0.986 (good fit)
IFI	$\geq 0.90$	0.997 (good fit)
TLI	$\geq 0.90$	0.993 (good fit)
CFI	$\geq 0.90$	0.997 (good fit)
RMSEA	$\leq 0.08$	0.036 (good fit)
P – value & PCLOSE	$\geq 0.05$ insignificant	0.126 & 0.764 (good fit)

*Source: articulated from the AMOS Model fit result, 2021*

As the table demonstrate that all the model fit indices the model perfectly fit with the data and confirmable for further analysis.

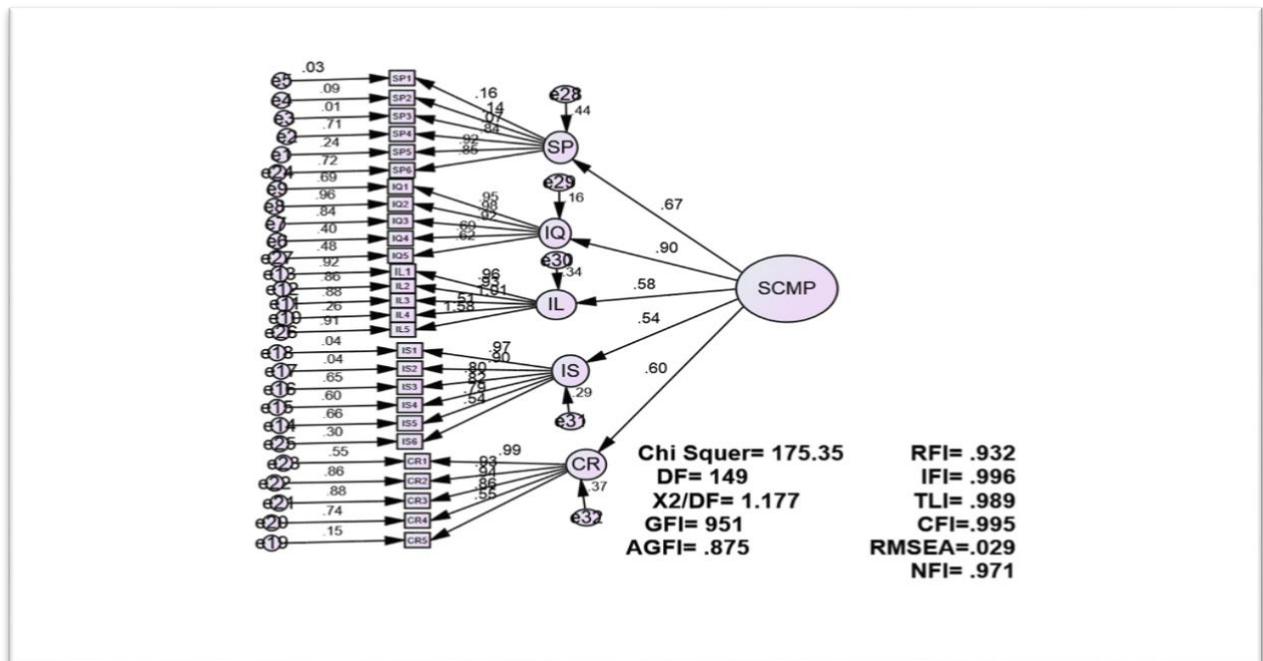
#### 4.4. Validation of second order constructs

The researcher measures the dependent variable independent variable and the mediating variable with their dimensions than the specific questions in the questioners. As a result the researcher conducted the second order construct validation or confirmation as follows.

#### 4.4.1. Confirmation of supply chain Management practice as 2<sup>nd</sup> order constructs

In this study the latent variable supply chain management practice was conceptualized as a high order model composed of five constructs, namely supplier partnership, internal lean practice, customer relationship, information sharing and information quality. Structural equation modeling using AMOS 23 was used to determine whether a higher-order factor model is appropriate for supply chain management practice.

Figure 1. Supply chain management practice as 2<sup>nd</sup> order constructs



Source: AMOS result, 2021

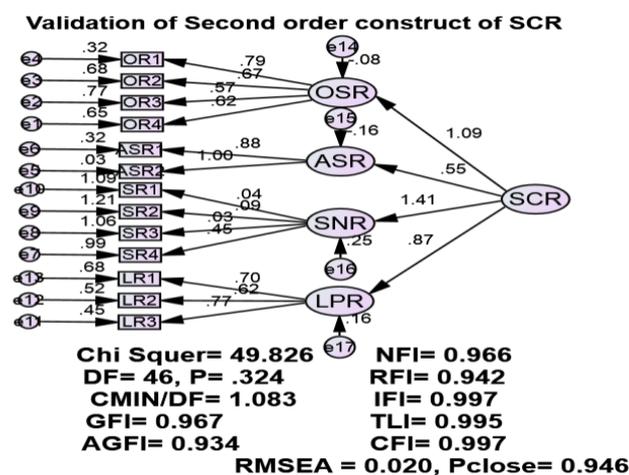
From the results of AMOS estimation, the fit statistics of second order construct of supply chain management practice show that Chi-square = 175.35, DF= 149, x<sup>2</sup>/df= 1.177, GFI = 0.951 > 0.90 (good fit), AGFI = 0.875 < 0.90 (marginal fit), NFI = 0.971 > 0.90 (good fit), RFI

= 0.932 > 0.90 (good fit), IFI = 0.996 > 0.90 (good fit), TLI = 0.989 > 0.90 (good fit), CFI = 0.995 > 0.90 (good fit) and the RMSEA = 0.029 < 0.08 (good fit), can be concluded that the second order model is valid and reliable. In addition to this, the standardized coefficients strategic supplier partnership is 0.67, customer relationship with estimate value of 0.60, and 0.54 for level of information sharing, 0.58 for internal lean and 0.90 for information quality this indicated that all constructs are statistically significant at  $P < 0.001$ . Hence, the higher order latent construct in figure 3 below presented that supply chain management practice can be statistically measured by supplier partnership, customer relationship, internal lean practice, and information sharing and information quality.

#### 4. 4.2. Confirmation of supply chain responsiveness as 2<sup>nd</sup> order constructs

Similar to (SCM) in this study the researcher measure supply chain responsiveness using four constructs specifically assembly responsiveness, supplier network responsiveness, operation system responsiveness, logistic process responsiveness and supplier network responsiveness. Accordingly, the supply chain responsiveness as second order construct was confirmed with structural equation modeling using AMOS 23, to determine whether a higher-order factor model is appropriate for supply chain responsiveness latent variable.

Figure 2. Supply chain responsiveness as 2<sup>nd</sup> order constructs



Source: AMOS result, 2021

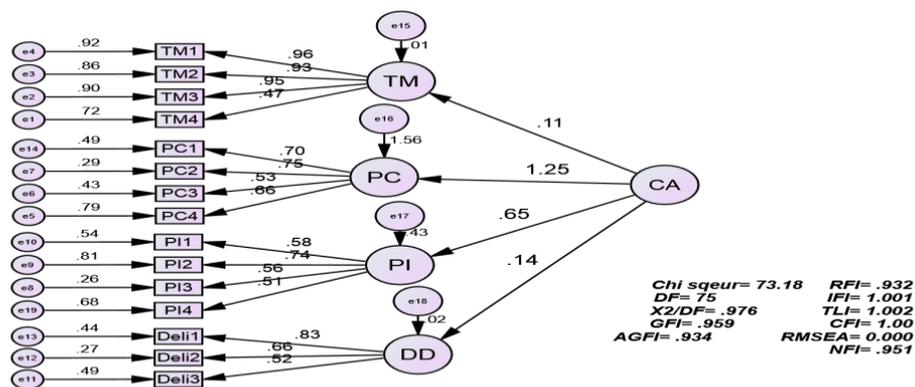
As the results of AMOS estimation, illustrated in the above figure demonstrated that the standardized estimate indicated that the fit statistics of second order construct of supply chain

responsiveness show that Chi-square = 49.826, DF= 46, CMIN/DF=1.083, GFI = 0.967 > 0.90 (good fit), AGFI = 0.934 > 0.90 (good fit), NFI = 0.966 > 0.90 (good fit), RFI = 0.942 > 0.90 (good fit), IFI = 0.997 > 0.90 (good fit), TLI = 0.995 > 0.90 (food fit), CFI = 0.997 > 0.90 (good fit) and the RMSEA = 0.020 < 0.08 (good fit) with the PCLOSE value of 0.946 (insignificant) and p- value of 0.324 > 0.05(insignificant) , can be concluded that the second order model is valid and reliable. In addition to this, the standardized coefficients of estimate of each indicator on supply chain responsiveness were 1.09 for operation system responsiveness, 0.55 for assembly responsiveness, 1.041 for supplier network responsiveness and 0.87 for logistic process responsiveness. This indicated that all constructs are statistically significant at  $P < 0.001$ . Hence, the higher order latent construct in supply chain responsiveness can be statistically measured by its indicator adopted in this study such as assembly responsiveness, operation system responsiveness, supplier network responsiveness and logistic process responsiveness.

### 4.3. Confirmation of 2<sup>nd</sup> order construct of competitive advantage

In this study the latent variable supply chain responsiveness was conceptualized as a high order model composed of four constructs, namely time to market, price or cost, product innovation and delivery dependability. Structural equation modeling using AMOS 23 was used to determine whether a higher-order factor model is appropriate for Competitive advantage

**Figure 3. Competitive advantages as second order construct**



**Source: Amos result, 2021**

As the results of AMOS estimation, the fit statistics of second order construct of Competitive advantage show that Chi-square = 73.18, CMIN/DF= .976, GFI = 0.959 > 0.90 (good fit), AGFI

= 0.934 > 0.90 (good fit), NFI = 0.951 > 0.90 (good fit), RFI = 0.932 > 0.90 (good fit), IFI = 1.00 > 0.90 (good fit), TLI = 1.002 > 0.90 (good fit), CFI = 1.00 > 0.90 (good fit) and the RMSEA = 0.000 < 0.08 (good fit) with the PCLOSE value of 0.996 and p- value of 0.538 > 0.05 , can be concluded that the second order model is valid and reliable. In addition to this, the standardized coefficients of estimate of Competitive advantage is 0.11 for time to market, 1.25 for price or cost, 0.65 for product innovation and 0.14 for delivery dependability this indicated that all constructs are statistically significant at  $P < 0.001$ . Hence, the higher order latent construct based on the above figure assured that Competitive advantage can be statistically measured by supply chain management practice.

**Table 4 3. Summary of Validation of SCMP, SCR and CA as 2<sup>nd</sup> order construct**

Fit index Variable s	X <sup>2</sup>	X <sup>2</sup> /D F	GFI	AGF I	NFI	RFI	IFI	TLI	CFI	RMSE A
SCMP	175.3 5	1.177	0.95 1	0.875	0.97 1	0.93 2	0.99 6	0.98 9	0.99 5	0.029
SCR	49.82 9	1.083	0.96 7	0.934	0.96 6	0.94 2	0.99 7	0.99 5	0.99 7	0.020
CA	73.18 3	0.976	0.95 9	0.934	0.95 1	0.93 2	1.00 1	1.00 2	1.00 0	0.000

**Source: SPSS AMOS result 2021**

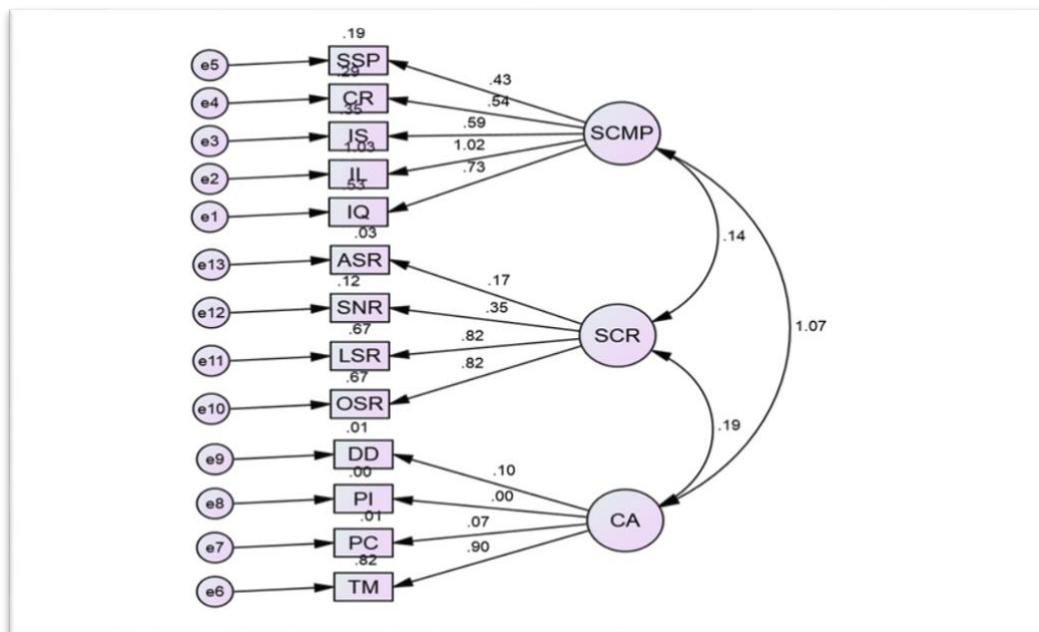
Generally the above table summarizes the second order construct of the three latent variable, supply chain management practice, supply chain responsiveness and Competitive Advantage in summarized manner. Accordingly, the higher order latent construct in supply chain management practice can be statistically measured by its indicator adopted in this study such as(customer relationship, supplier partnership, internal lean practice information sharing and information quality) supply chain responsiveness by adopted indicators like assembly

responsiveness, operation system responsiveness, supplier network responsiveness and logistic process responsiveness and Competitive advantage can be statistically measured by the adopted indicators, time to market, delivery dependability, product innovation and price or cost.

#### 4.5. SEM measurement model analysis

after confirmation of the second order constructs in order to verify how well the measured indicators representing the constructs, 53 purified specific questions or measurement items and 13 indicators or dimensions under eight constructs were tested in CFA using AMOS 23. Naturally, there are many model fit indexes computed by AMOS software hence analyzing and interpreting all these indexes would be mystifying practitioners (Alavi, 2018). Of course, Hu & Bentler(1999) also noted that the most frequently used statistical procedures to evaluate the measurement model in SEM are Chi-square ( $\chi^2$ ), square multiple correlations ( $R^2$ ), degree of freedom (DF), factor loading ( $\lambda$ ), critical ratio (t-value) and model fit indices:

**Figure 4. Measurement model analysis**



**Source: Amos result, 2021**

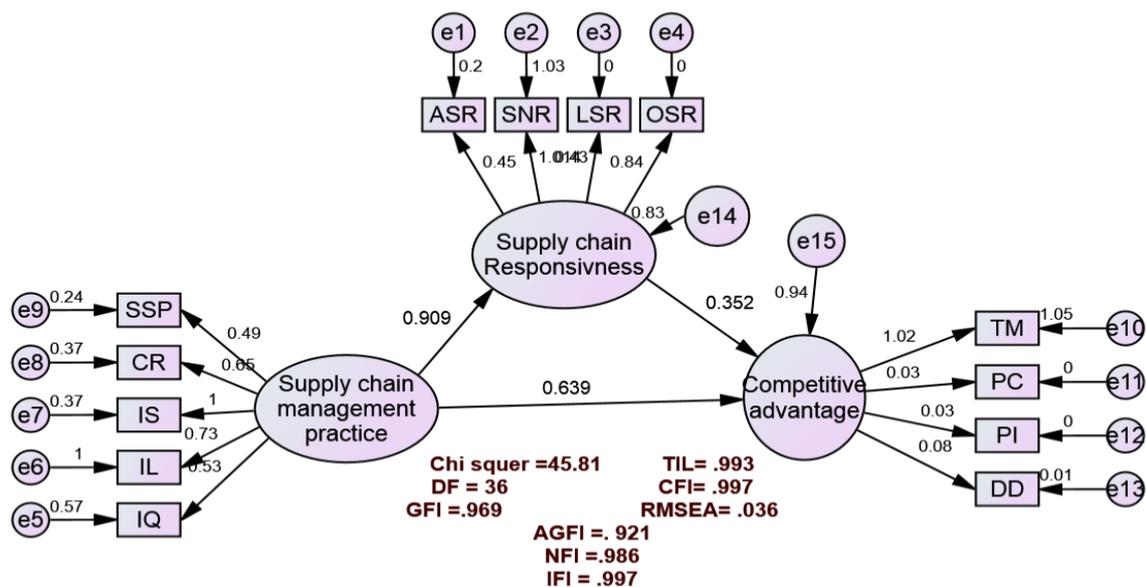
As a result, of the measurement model analysis the  $\chi^2$  result of this study measurement model is 45.851 with 36 degree of freedom. The P -value was  $P < 0.001$  which is statistically significant or less than a 1 in 100 chance of a type one error. Due to  $\chi^2$  sensitivity to sample

size, it is not easy to gain a good sense of fit solely from the  $\chi^2$  value (Hu & Bentler, 1999). Therefore, subsequently the researcher look at several other fit indices of the measurement model including normed chi-square (CMIN/DF), factor loading ( $\lambda$ ), t-value, square multiple correlation ( $R^2$ ) and model fit index. Also the other absolute fit static is the normed  $\chi^2$  which is 1.274. This value is obtained the  $\chi^2$  value divided by DF (CMIN/DF) = (45.851/36 = 1.274).

#### 4.6. Structural Model Path Analysis

The structural model path analysis involves the estimation of presumed causal relations among observed variables (Garson 2008). In SEM, relationships between variables are referred to as path coefficients and are depicted by single-headed arrows. Much like the CFA model, the circle or oval shapes represent the latent variables, supply chain management practice, supply chain responsiveness and competitive advantage of in the current study case while measurement items are represented by rectangles. Adjacent to measurement items in circular shapes are measurement errors and the unidirectional arrows between latent variables are used to convey the causal relations. The path diagram for the model structure is presented as follows:

Figure 6, the path analysis diagram



**Source: Path Analysis Result 2021**

Based the conceptual framework and the above path diagram illustrated that there is direct relationship between Supply chain management practice with competitive Advantage, Supply chain management practice with supply chain responsiveness and Supply chain responsiveness with competitive Advantage. On the other, there is also indirect relationship between supply chain management practice and competitive Advantage through the supply chain responsiveness. In this path analysis the researcher identify the direct and indirect effect of each explanatory variable on the mediating and outcome variable was analyzed and illustrated as follows:

**Table 4. Unstandardized Total, Direct and Indirect effect of SCMP, SCR on CA**

Items	Unstandardized Total Effect			Unstandardized Direct Effect			Unstandardized Indirect effect		
	SCMP	SCR	CA	SCMP	SCR	CA	SCMP	SCR	CA
<b>SCR</b>	0.427	.000	0.000	0.427	0.000	0.000	0.000	0.000	0.000
<b>CA</b>	1.450	1.134	0.000	0.966	1.134	0.000	0.484	0.000	0.000

**Source: AMOS result, 2021**

The above table illustrates the unstandardized total, direct and indirect effect between constructs independent and dependent variables. Accordingly, , the unstandardized total effect of supply chain management practice on supply chain responsiveness and competitive advantage as well as supply chain responsiveness on competitive advantage were (Beta = 0.427, Beta = 1.45 and Beta = 1.134) respectively. In the same vein the unstandardized direct (unmediated) effect of supply chain management practice on supply chain responsiveness and competitive advantage as well as supply chain responsiveness on competitive advantage were (Beta = 0.427, Beta = 0.966 and Beta = 1.1.134) respectively. Finally the unstandardized indirect (mediated effect of supply chain management practice on competitive advantage was (Beta= 0.484).

**Standardized effect**

In most inferential statistics analysis standardized coefficient of effect is take in to consideration to make estimation or generalization because the result is after shrinkage of variable and it indicated the exact result of the regression. Accordingly we summarize the

standardized total, direct and indirect effect of independent variable on the outcome variables as follows.

**Table 4 5. The Standardized Total, Direct and Indirect Effects of SCMP and SCR on CA**

Item	Standardized Total Effect			Standardized Direct Effect			Standardized Indirect effect		
	SCMP	SCR	CA	SCMP	SCR	CA	SCMP	SCR	CA
SCR	<b>0.909</b>	0.000	0.000	<b>0.909</b>	0.000	0.000	0.000	0.000	0.000
CA	<b>0.960</b>	<b>0.352</b>	0.000	<b>0.639</b>	<b>0.352</b>	0.000	<b>0.320</b>	0.000	0.000

Source: AMOS result of CFA and Estimate, 2021

Based on the above summary table the study concludes that standardized: total, direct and indirect effect of the dependent variables supply chain management practice on the mediating variable supply chain responsiveness and competitive advantage as well as the standardized direct effect of supply chain responsiveness on competitive advantage is discussed.

**Table 8. Path coefficient values of mediation effect**

Path of relationship (hypothesis)	Direct effect	Indirect effect
SCMP ---→ CA	0.639	0.320
SCMP ----→ SCR	0.909	
SCR ----→ CA	0.352	

Source: AMOS result, 2021

## HYPOTHESIS TEST

This section depicts the hypothesis test of the effect of supply chain management practice on competitive advantage and supply chain responsiveness as well as supply chain responsiveness on competitive advantage in the studied food processing industries in Ethiopia. Therefore, the developed hypothesis was tested based on the structural model analysis the first level of estimate indicated under the regression weight and standardized regression Weight.

**Table 4 6. Standardized Regression Weights: (Group number 1 - Default model)**

Hypothesis			Estimate	S.E.	C.R.	P
SCR	<---	SCMP	0.909	0.068	6.298	***
CA	<---	SCR	0.352	0.157	7.242	***

CA	<---	SCMP	0.639	0.080	12.056	***
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**Source: AMOS result 2021**

Based on (table 10) the standardized estimate of supply chain management practice on competitive advantage and supply chain responsiveness was (b= 0.639 at p- value of sig. = 0.000 and b= 0.909 at p- value of sig. = 0.000) respectively. Similarly the standardized regression estimate value of the effect of supply chain responsiveness on competitive advantage was (b= 0.352 at p- value of sig. = 0.000). This implies that the estimate or effect of the dependent variable on dependent and mediating variables was statistically significant at 0.001.

**H1:** *Supply chain Management practice has positive and significant Effect on Competitive Advantage of Ethiopian food processing industry.*

This hypothesis is tested with structural equation model with the path analysis and the result revealed that Supply chain management practice (SCMP) has statistically significant and direct influence on competitive advantage (CA) of food processing firms in Ethiopia supported by coefficient value ( Beta = 0.639, p- value = 0.000). Accordingly, the researcher accepts the alternative hypothesis in turn reject the null hypothesis.

**H2:** *Supply chain Management practice has positive and significant Effect on Supply Chain Responsiveness of Ethiopian food processing industry*

Based on the result of path analysis result this hypothesis was tested. Accordingly the supply chain management practice (SCMP) has statistically significant and positive effect on the supply chain responsiveness (SCR) evidenced with the (Beta= 0.909 with p- value 0.000). Therefore, the alternative hypothesis is accepted in turn the null hypothesis was rejected.

**H3:** *Supply chain responsiveness has significant influence on Competitive Advantage of Ethiopian food processing industry.*

This hypothesis is tested based on the structural equation model particularly by the path analysis result and it is found that supply chain responsiveness (SCR) has statistically significant direct influence or effect on competitive advantage evidenced by the beta coefficient (Beta = 0.352, p- value 0.000). This implies that any simple improvement on the supply chain responsiveness specifically assembly responsiveness, logistic process responsiveness, supplier

network responsiveness and operation system responsiveness can improve or enhance competitive advantage on the study area by 35.2%.

**H4:** *Supply chain Management practice has significant indirect influence on Competitive Advantage of Ethiopian food processing industry through supply chain responsiveness.*

Finally this hypothesis is tested according to the standardized path analysis result from the structural equation model and it demonstrated that supply chain management (SCM) practice have indirect and statistically significant influence on competitive advantage evidenced by (Beta = 0.320, p- value of 0.000). This implies that improvement of supply chain management (SCM) practice can improve the competitive advantage through improving supply chain responsiveness (SCR).

**Table 7. Summary of the hypothesis test**

HYPOTHESIS	DECISION
<b>H1:</b> Supply chain Management practice has positive and significant Effect on Competitive Advantage of Ethiopian FPI.	Accepted
<b>H2:</b> Supply chain Management practice has positive and significant Effect on Supply chain responsiveness of Ethiopian FPI.	Accepted
<b>H3:</b> Supply chain responsiveness has significant direct influence on Competitive Advantage of Ethiopian FPI	Accepted
<b>H4:</b> Supply chain Management practice has positive Effect on Competitive Advantage through Supply chain responsiveness of Ethiopian FPI.	Accepted

**Source:** *Path Analysis result, 2021*

**Regression equation based on the standardized direct and indirect effect**

According to the above table and figure that illustrate the effect of independent and mediating variable on the outcome variable the researchers develop the equation for structural model regression equation as follows:

$CA = \beta_0 + 0.639 * SCMP + e$ .....	(equ. 1)
$CA = \beta_0 + 0.352 * SCR + e$ .....	(equ. 2)
$SCR = \beta_0 + 0.909 * SCMP + e$ .....	(equ. 3)
$CA = \beta_0 + 0.639 * SCMP + 0.320 * SCR + e$ .....	(equ. 4)

## 5. DISCUSSION

The main finding of this study assured that supply chain management practice directly affect the supply chain responsiveness and competitive advantage of Ethiopian food processing industry. In the same vein supply chain responsiveness has direct effect on the competitive advantage. Furthermore, supply chain management practice has significant indirect effect on competitive advantage through the mediating role of supply chain responsiveness.

As the result of this study shows in the estimated effect in the path diagram analysis of the structural equation modelling illustrated that supply chain management practice (strategic suppliers partnership customer relationship, internal lean practice and information quality) has statistically significant positive influence on the supply chain responsiveness of the food processing firms supply chain supported by the ( $b= 0.909$  with  $p$ - value 0.000). This means that one step improvement on the supply chain management practice of the firms manager can improve the firms responsiveness by 90.9 %. This finding was consistent with and supports the argument of (Martin and Grbac, 2003; Handfield and Nichols, 2002) and consistent with the research finding of (Ashish A. Thatte, et.al, 2013; Nur Atiqah Binti Zahari Azar, 2015; Kerwin Salvador P. et.al, 2017).

Supply chain management practice has positive and direct effect of ( $b= 0.639$ ,  $p$ - value = 0.000) 63.9% on competitive advantage. This implies that any improvement of Supply chain management practice (strategic supplier's partnership, Customer relationship, and internal lean practice, level of information sharing and information quality) can improve the competitiveness of the food processing firms by the value 63.9% this means that improvement on supply chain management practice can increase the competitive advantage of food processing firms by 63.9%. This finding is consistent with the researchers (Suhong Lia., et.al, 2004; Ashish A. Thatte, et.al, 2013; Somuyiwa, Adebambo 2013; S.K. Chadha, S.K. Sharma and Maninder, Singh, 2018 and Siahaan T, Nazaruddin, Sadalia I. 2020) on their research done in developed countries and different business sectors conclude that supply chain management practice has significant relationship and influence in improving the competitive advantage of firms over their competitors in changing market or business environment. Furthermore, and this finding supported the idea of stakeholder theory -- common place angle located in the stakeholder literature is that corporations initiate for coordinating stakeholder interests (Busse et al., 2017). Because of their cooperative nature, organizations are inclined to form coalitions with

stakeholders (strategic suppliers, customers, wholesalers and retailers) to achieve common objectives (Axelrod et al., 1995) this relationship in turn enhances the firm's responsiveness to the changing and fluctuating customer demand and operate without any interruption of the firms operation.

With regard to the effect of supply chain responsiveness on competitive advantage, as the current study revealed that supply chain responsiveness has positive and statistically significant effect of (Beta = 0.352, p- value 0.000) on the competitive advantage of food processing firms. This indicated that if the food processing firm's one step improves their supply chain responsiveness to the changing and increasing food market in Ethiopia particularly assembly responsiveness, supplier network responsiveness, operation system responsiveness and logistic process responsiveness can improve the competitive advantage of the firms by 35.2%. This finding supports the finding of (Ashish A. Thatte 2007;Inda Sukati, and et.al, 2012; Ashish A. Thatte, et.al, 2013; Dr. Kamel Mohammad Al-Hawajreh and Dr. Murad Salim Attiany 2014;Nur Atiqah Binti Zahari Azar, 2015).

Finally, in relation to the indirect effect of supply chain management practice on the competitive advantage through supply chain responsiveness the finding illustrated that supply chain management practice has positive and statistically significant effect of (Beta = 0.320, p-value =0.000) on competitive advantage. as a result any improvment on the supply chain management practice can improve the competitive advantage by 32.0% through an improvement of the firms responsiveness. This finding supported the finding of (Nur Atiqah Binti Zahari Azar, 2015, Suhong Lia, et.al, 2004; Ashish A. Thatte, et.al, 2013; Somuyiwa, Adebambo 2013;S.K. Chadha, S.K. Sharma and Maninder, Singh, 2018 and Siahaan T, Nazaruddin, Sadalia I. 2020).

## 6. CONCLUSION

The aim of this study was to examine the indirect impact of supply chain management (SCM) on competitive advantage with supply chain responsiveness as mediator. The analysis result based on H1 affirmed that the supply chain management practice (SCMP) has a positive and statistically significant influence on competitive advantage. Likewise based on H2 the supply chain responsiveness has a positive and significant effect on competitive advantage. Moreover

H3 asserted that supply chain management practice (SCMP) has a significant effect on supply chain responsiveness finally H4 result indicated that supply chain management practice (SCMP) has a significant indirect effect on competitive advantage through supply chain responsiveness.

### **6.1 Contribution of the study**

The contribution of this study is twofold first, the finding of this study propose and develop new literature on the relation between supply chain management practice and competitive advantage through supply chain responsiveness in developing country like Ethiopia. Second the finding of this study paramount important for practitioners to make decision to improve the firms supply chain responsiveness and in turn enhance the competitiveness of the firms. On the other hand this study was conducted in only the food processing industry specifically food complex and edible oil factories and bread bakery company as plc. And share companies) of Ethiopia. Therefore, future research is required on similar topic in other industries and other developing countries.



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