Does cost accounting system contributes in supply chain operations?

Abd. Wahab Hasyim[a*] and Abdullah W. Jabid[b]

[a]Faculty Of Economics and Business, Khairun University Ternate, Indonesia
[b]Faculty Of Economics and Business, Khairun University Ternate, Indonesia

C H R O N I C L E

A B S T R A C T

Indonesian agriculture sector has a major contribution in the nation's economy. However, due to decrease in supply chain performance, the overall performance is declining which affect negatively on Gross Domestic Product (GDP). The contribution of Indonesian agriculture sector in GDP is declined to 84110 IDR Billion in the second quarter of 2018 from 84577.50 IDR Billion in the first quarter of 2018. The supply chain is one of the responsible factors of this issue. Therefore, to address this problem, the objective of the current study is to investigate the role of cost accounting system (CAS) on supply chain operations by considering the internal and external contingent factors. Moreover, the moderating role of legal obligations was also examined. In rare cases, some studies formally documented the effect of CAS on supply chain operations. Managerial employees of agricultural firms were selected to collect the necessary data and 150 questionnaires were distributed among them. Results of PLS-SEM show that CAS had a significant positive contribution in supply chain operations. Better implementation of CAS in agriculture firms had the ability to boost the performance. Moreover, other factors such as firm size, product diversity and competition also had a significant effect on CAS implementation. In this survey, legal obligations moderated the relationship between firm size and CAS. Finally, this study is beneficial for agriculture firms to enhance their performance by using better supply chain strategies through CAS.

1. Introduction

Cost accounting system (CAS) has received less consideration in the agriculture industry during the past few years (Fatah, 2013). It is one of the systems, which provides a platform to survive in the industry by reducing the cost and increasing profit margins (Ogundana et al., 2017). Various emerging economics are facing issues in the implementation of CAS due to worldwide competition (Nze, et al. 2016; Biondi et al., 2017; Kimengsi & Gwan, 2017; Chowdhury, et al. 2018), particularly Indonesia is facing the issue to implement CAS in the agriculture industry. Due to the improper implementation of CAS the supply chain activities are not working efficiently, and the overall performance of Indonesian agriculture sector is decreasing day by day. As the supply chain has a significant role in every industry (Castorena, et al. 2014; Dim & Ezeabasili, 2015; Wang & Lu, 2016; Hameed et al.,

2018; Hameed et al., 2018). The agriculture sector is most significant to cope economic crises (Purnama, 2014; Ahmad, et al. 2016; Nazal, 2017; Girik Allo et al., 2017; Taqi et al., 2018). However, the performance of Indonesian agriculture sector is declining. Indonesian agriculture sector has a major contribution in nations economy (Yunus, 2017), however, due to decrease in supply chain performance, the overall contribution is declining which effect negatively on gross-domestic-product (GDP). It is also mentioned by Zaki (2004) that the performance of agriculture is decreasing. Therefore, Indonesia must spend in agriculture R & D. However, as it is shown in Fig. 1, the contribution of agriculture spending of Indonesia is below than other countries.
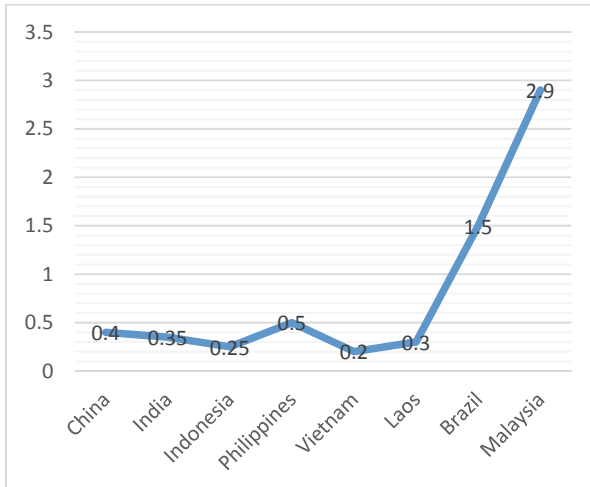

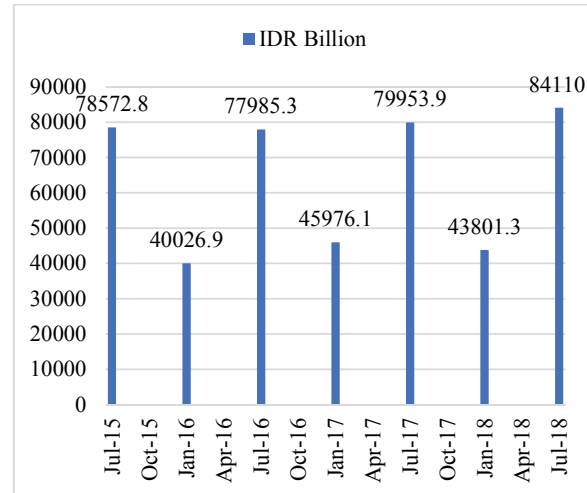**Fig. 1.** Indonesia Agriculture Share to GDP   **Fig. 2.** Recent Indonesian GDP from Agriculture
Source: Agriculture Science and Technology Indicators (ASTI) database, World Bank staff calculations,
STATISTICS INDONESIA (2018) TRADINGECONOMICS.COM

Moreover, Indonesian agriculture share in GDP is below the industry. According to Zaki (2004), agriculture sector is contributing less as compared with the industry and service sector. However, if we review the most recent performance of Indonesian agriculture sector, then we come up with the results that its performance is not consistent and sudden ups and downs, which create the uncertainty in GDP contribution. Fig. 3 shows the agriculture sector contribution in GDP from 2015 to the last quarter of 2018. GDP from Agriculture in Indonesia declined to 84110 IDR Billion in the second quarter of 2018 from 84577.50 IDR Billion in the first quarter of 2018. GDP contribution from Indonesian Agriculture has averaged 68616.26 IDR Billion approximately from 2010 to 2018 and attained maximum growth of 88067.70 IDR Billion in the first quarter of the year 2017, shown in Fig. 2 and a record low of 37282.50 IDR Billion in the fourth quarter of 2012. However, these issues can be resolved through better supply chain management activities with the help of proper implementation of CAS. Higher performance in 2017 can be traced back through better CAS system and supply chain effectiveness. Therefore, the main research question is: What is the contribution of CAS and supply chain operation to boost the performance of Indonesian agriculture sector? In this process, various internal and external contingent factors also effect on agriculture supply chain operations through CAS. Prior studies have tried to relate the use of CASs to many contextual variables categorized into external as well as internal variables (Haldma & Lääts, 2002).

Most important internal factors include; firm size and product diversity, however, external factors include; the intensity of competition (Abdel-Kader & Luther, 2008; Al-Omiri & Drury, 2007). Apart from external and internal factors, another factor namely; legal obligations also impacts on CAS practices (Argilés & Slof, 2003) which has an influence on supply chain activities. Legal obligations are based on government rules and regulations. Therefore, the objective of the current study is to investigate the role of CAS on supply chain operations by considering the internal and external contingent factors. Moreover, the sub-objectives of the current study are as follows;

1. To identify the role of contingent external factors in CAS,
2. To identify the role of contingent internal factors in CAS,
3. To identify the role of CAS in effective management of supply chain operations,
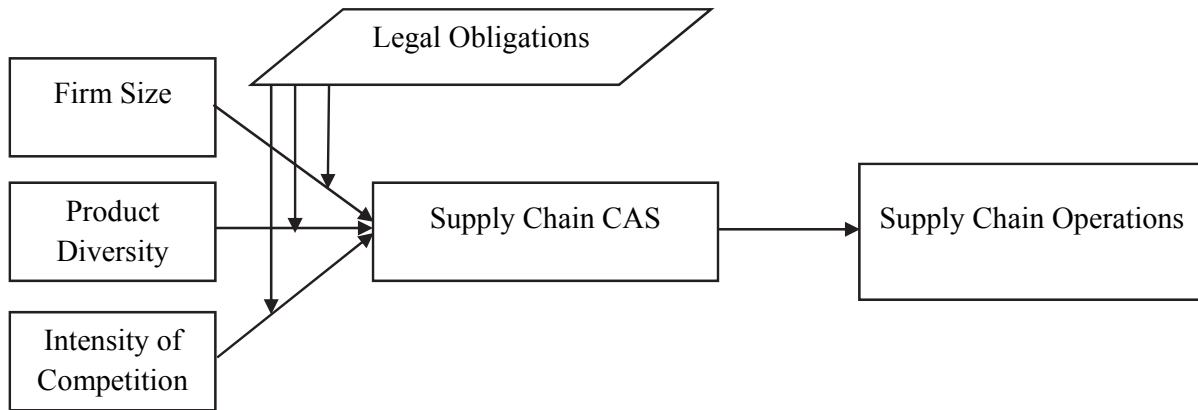4. To identify the moderating role of legal obligations.

Fig. 3. Theoretical Framework showing that how CAS contribute to supply chain operations

2. Literature Review

CAS is the most suitable to enhance supply chain operations, particularly in agriculture firms. To settle on different choices in the business environment, cost information is required. Cost accounting systems give suitable cost information that helps with settling on the correct choice or picking the most profitable choice from the accessible options. Zaki (2004) expressed that cost accounting gives valuable cost information to agricultural firms identified with helping them to make examinations between the costs and profits and to utilize these estimations according to the plans. Agricultural firms can utilize cost information to set items' costs and decide the cost of each item independently; likewise, cost information is utilized to get ready financial statements accurately. Cost accounting systems are administrative instruments that expect to accomplish certain destinations, for example, supply chain operations, giving cost information to basic leadership, cost control, and deciding item costs. CASs can create vital information for leaders, aid the planning of financial reports, and help the senior administration in any business association to complete its capacities (Wijewardena & De Zoysa, 1999; Haldma & Lääts, 2002; Szychta, 2002; Solomon et al. 2014; Jaya & Verawaty 2015; Angbre, 2016; Tanoos, 2017; Adusei, 2018).

The Institute of Cost and Works Accountants (ICWA) defined CAS as "the process of accounting for cost from the point at which expenditure is incurred to the establishment of its ultimate relationship with cost centers and cost units. In its widest usage, it embraces the preparation of statistical data, the application of cost control methods and the ascertainment of the profitability of activities carried out or planned." This cost accounting system has significant influence on supply chain activities.

Cost accounting system is generally based on five elements. These elements include; input measurement, inventory evaluation, various methods of cost accumulation, assumptions of cost flow and recording interval capability. All these elements have a significant relationship with the supply chain. These steps insurance the timely availability of goods, which facilitates supply chain operations. Indonesia is the world's major manufacturer of palm oil and a leading global provider of other high-value commodities such as cocoa, rubber as well as coffee. Indonesia is rich in productive land ideal for growing a various range of crops for both exports as well as domestic consumption. However, this sector is declining due to various issue in the supply chain. As the supply chain/ logistic industry has a major role in any industry (Hameed et al., 2018).

Indonesian agriculture sector is important for the economy of the country. According to a survey, Indonesia has various major crops such as Palm Oil, Rubber, Cocoa, Coffee, Tea, and Sugar. These crops have significant contribution in GDP. Table 1 shows these crops and their productions. Cocoa has major production as compares with other and reached up to 988,000 MET in 2010. Following by the Coffee with 709,000 MET production. However, the supply chain is important to usefully supply these outputs in final shape to the market in which CAS help in supply chain operations.

Table 1
Agricultural output of major plantations crops (2010)

Palm oil	20 m MET
Rubber	2.85 m MET
Cocoa	988,000 MET
Coffee	709,000 MET
Tea	150,342 MET
Sugar	2.3 m MET

Source: Ministry of Agriculture, Statistics Indonesia

Therefore, this study is one of the attempt to build a model to facilitates agriculture sector of Indonesia through CAS and supply chain. Different studies were conducted on CAS (Abdul Majid & Sulaiman, 2008; Al-Omiri & Drury, 2007; Carolina & Susanto, 2017; Foong & Anak Teruki, 2009; Welsch, Liao, & Stoica, 2001).

2.1 Internal and External Factors

It is evident from the literature that firms' size is a reason to use CASs (Abdel-Kader & Luther, 2008; Pavlatos & Paggios, 2009). Firm size can be checked by various estimations; for example, Abdel-Kader and Luther (2008) estimated firm size in the light of the aggregate resources and Pavlatos and Paggios (2009) estimated firm size in based on the yearly turnover. Huge firms are probably going to have a significant amount of assets and production technology which requires CAS. Large firms require CAS to use their sources more efficiently as well as allocate costs to products more precisely (Argilés & Slof, 2003). They guaranteed that extensive firms need to utilize CASs, to designate the indirect costs to every item in a proper way. Argilés and Slof (2003) presumed that expansive agricultural firms will create a larger number of items than little ones by utilizing more machines and technology. Such agricultural firms apply CASs to allocate those costs. Thus, it is hypothesized that;

H₁: There is a relationship between firm size and CAS.

Creating a few kinds of products utilizing similar machines requires the utilization of CASs to decide each product cost independently (Fatah, 2013) since the products will demolish distinctive amounts of the company's assets (Bhukuth et al., 2018). As indicated by various specialists, product diversity influences the association's administration to choose which sort of costing frameworks to utilize. An examination led by Abernethy et al. (2001) concentrated on the relationship between product diversity and CAS outline. The analysts found a positive relationship between product diversity and the decision of costing framework. If the firm has a high level of product diversity, sophisticated costing frameworks are appropriate for this production framework. In any case, if the firm has a low level of product diversity, non-refined costing frameworks are more proper. Agricultural firms that have immense measures of capital and deliver numerous sorts of products need to utilize CASs to designate the assets fittingly and to decide each product cost independently. In this manner, below hypothesis is proposed:

H₂: There is a relationship between product diversity and CAS.

Moreover, the level of competition is one of the critical variables that lead firms to utilize CASs (Ning, 2005). Competition alludes to firms that deliver nearly similar products and offer those products in a similar market. Firms that work in a monopoly can offer their products at any value they need, and at any quality, while firms that work in a competitive environment need to decrease their product costs to

have the capacity to set focused costs. Executing CASs will help those firms diminish their product costs (Szychta, 2002). However, in this situation, enterprise risk management (Hameed et al., 2017) and political influence cannot be neglected (Maqbool et al., 2018).

Mia and Clarke (1999) asserted that the power of competition is thought to be one of the elements that impact the utilization of costing frameworks. Different scientists have discovered a positive relationship between the cost framework's advancement and the level of competition (Al-Omiri & Drury, 2007). Therefore, below hypothesis is proposed.

H3: There is a relationship between the intensity of competition and CAS.

Moreover, in cost accounting, supply chain management (SCM) is a management tool which can be used to improve ordering, manufacturing, and inventory processes. CAS system is important for sustainable supply chain management system (Marota et al., 2017). In cost accounting, the majority of the costs are distributed for production in one part (Kouřilová & Plevková, 2013). In CAS this cost separates the material cost into production cost and waste material; it relies on whether the material will wind up on the capacity, process or transportation which support supply chain process. CAS is created in light of the fact that in regular cost accounting, the capability of straightforward data about the material's stream and vitality including the administration supporting choice identified the productivity of material. In regular cost accounting framework, the cost of material and vitality lost generally are not tallied. In this mechanism, operations of the supply chain are easy to handle. Since the material costs turn into the prevailing costs that can be distributed specifically to production cost. Thus, the organization administration will specifically center to diminish it and increases the supply chain operations accuracy through CAS. Thus, it is hypothesized that;

H4: There is a relationship between CAS and supply chain operations.

Finally, legal obligations affect the utilization of CASs in the government sector. The research sample comprised of the agricultural firms in the government sector; in this way, the scientist trusts that if the government set laws to diminish the sponsorships and power firms to distribute budgetary reports, firms will utilize CASs to acquire the information expected to plan money related reports and deal with the accessible assets in a suitable way (Vazakidis et al., 2010).

Different analysts have asserted that an absence of legal commitment influences the utilization of CASs in agricultural firms. For example, Vazakidis et al. (2010) guaranteed that European ranchers would not distribute budgetary explanations due to an absence of legal commitment. Geiger and Ittner (1996) found that government offices that have administrative necessities for cost accounting information tend to utilize expand CASs to meet these prerequisites. Hence, following hypotheses are proposed;

H5: Legal obligations moderates the relationship between firm size and CAS.

H6: Legal obligations moderates the relationship between production diversity and CAS.

H7: Legal obligations moderates the relationship between intensive competition and CAS.

3. Research Method

A questionnaire is a method for recording as well as collecting information (Kirakowski, 2000). A questionnaire allows researchers to access a large number of targeted participants, which means that information can be collected from a large number of people and the findings can be expressed in numerical terms (Abdel-Kader & Luther (2008). Therefore, a questionnaires survey was used to collect the data. As method selection is one of the crucial stages which is based on the nature of objectives and research problem (Ul-Hameed et al., 2018), thus, the cross-sectional research design was selected and quantitative research approach was preferred.

The sample size was selected based on Hair et al. (2006) instructions. According to him, each item should represent through 5 questionnaires. In the current study, total variables are 6 and each has five items. Therefore, this study has a total of 30 items to collect the responses from agriculture companies' staff. Therefore, the sample size should be 150. Managerial employees of agriculture firms were selected to collect the data. One hundred and fifty (150) questionnaires were distributed among the managerial employees of agriculture firms. All these questionnaires were distributed by self-visit. From one hundred and fifty (150) questionnaires total one hundred and twenty-four (124) were returned. Moreover, the area cluster sampling techniques were used to collect the data. This is one of the suitable techniques while collecting data from a wide area. When the population is spread on a wide area the area cluster sampling is suitable (Hameed et al., 2018). By making the clusters, few cluster were selected randomly to collect the data.

4. Data Analysis and Findings

4.1 Missing Value and Outlier

Before analyzing the data, the missing value was treated. For this purpose, SPSS was used. In this analysis, 11 missing values were found. Firm size found 4 missing values, the intensity of competition found 3 missing values and legal obligations found 4 missing values. Frequency option was used to overcome this issue. Moreover, outlies were examined. In this study outliers are extreme values above 5 and below 1. However, it is found that the current study has no outlier to resolve.

4.2 Multicollinearity

To access the multicollinearity, Tolerance and VIF value were considered. Tolerance values for all the constructs were more than .10, demonstrating that there was no multicollinearity problem in collected data. The VIF value is the inverse of the tolerance value; if the VIF value is more than 10, it indicates multicollinearity. However, in this study, it is less than 10.

Table 3
Values of Tolerance and VIF

Model	Collinearity Statistics	
	Tolerance	VIF
Firm Size	0.851	1.041
Intensity of Competition	0.736	1.003
Product Diversity	0.862	1.221
Legal obligation	0.765	1.741
CAS	0.801	1.023

4.2 Structural Equation Modelling

Structural Equation Modelling (SEM) was performed through Smart PLS 3. In the first part of analysis reliability and validity were assessed. This is an essential requirement before hypotheses testing. According to Hair et al. (2010), factor loading should be above 0.5. Composite reliability and AVE should be above 0.7 and 0.5 respectively to achieve convergent validity. Fig. 4 shows factor loading, and Table 4 shows all results.

Moreover, the discriminant validity is shown in Table 4. Discriminant validity was examined by the square root of average variance extracted (AVE). From Table 5 it is shown that discriminant validity is achieved.
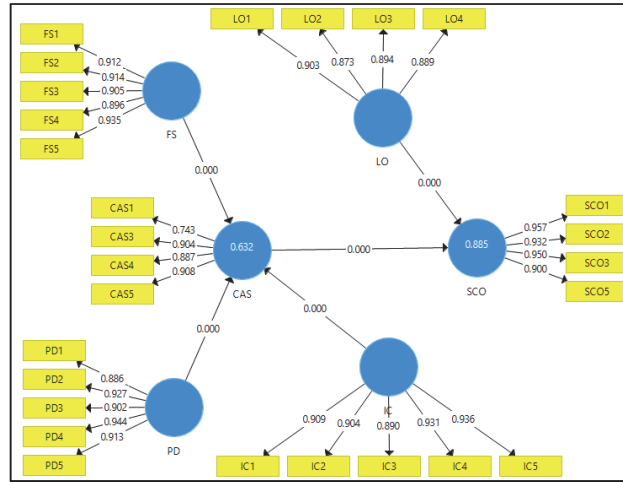
Fig. 4. Measurement Model Assessment

Table 4

Internal Consistency, Convergent Validity, composite reliability, and AVE

Construct	Indicators	Loadings	Cronbach's alpha	Composite Reliability	AVE
Firm Size (FS)	FS1	.912	.912	.935	.800
	FS2	.914			
	FS3	.905			
	FS4	.986			
	FS5	.935			
Product Diversity (PD)	PD1	.896	.923	.947	.821
	PD2	.927			
	PD3	.902			
	PD4	.944			
	PD5	.913			
The intensity of Competition (IC)	IC1	.909	.917	.932	.811
	IC2	.904			
	IC3	.890			
	IC4	.931			
	IC5	.936			
CAS	CAS1	.743	.870	.897	.795
	CAS2	.904			
	CAS4	.987			
	CAS5	.908			
Legal Obligations (LO)	LO1	.903	.916	.9154	.817
	LO2	.873			
	LO3	.894			
	LO4	.889			
Supply Chain Operations (SCO)	SCO1	.957	.954	.964	.854
	SCO2	.935			
	SCO3	.950			
	SCO5	.900			

Table 5

Discriminant validity

	CAS	FS	IC	LO	PD	SCO
CAS	**0.863**					
FS	0.764	**0.912**				
IC	0.787	0.907	**0.915**			
LO	0.804	0.662	0.695	**0.890**		
PD	0.757	0.901	0.911	0.634	**0.915**	
SCO	0.816	0.684	0.747	0.819	0.698	**0.935**

PLS-SEM was used to test the hypotheses. T-value and p-value were considered to accept or reject the hypotheses. Table 6 and Fig. 5 show the results of the structural model. According to the results, three direct hypotheses are accepted. Because H_1, H_3, and H_4 have t-value above 1.96 and p-value below 0.05. However, H_2 was reject having t-value 0.940.

It indicates that firm size and competition has a significant positive relationship with CAS. The companies having big size are more likely to use CAS. On the other hand, the companies having more competition are also like to use CAS. Moreover, CAS has increased the supply chain operation in Indonesian agriculture firms. Moreover, all variables have small effect size (f^2) as shown in Table 6.

Table 6

Direct hypotheses Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	F^2
$CAS \rightarrow SCO$	0.467	0.470	0.066	7.100	0.000	0.025
$FS \rightarrow CAS$	0.241	0.230	0.117	2.058	0.040	0.036
$IC \rightarrow CAS$	0.478	0.486	0.136	3.523	0.000	0.069
$LO \rightarrow SCO$	0.496	0.494	0.065	7.613	0.000	0.980
$PD \rightarrow CAS$	0.094	0.098	0.100	0.940	0.348	0.023

Table 7 shows the R-square value which is 0.855. In indicates that all the variables namely, firm size, product diversity, competition, legal obligations, and CAS has the ability to explain 85.5% variance in supply chain operations.

Table 7

R-square

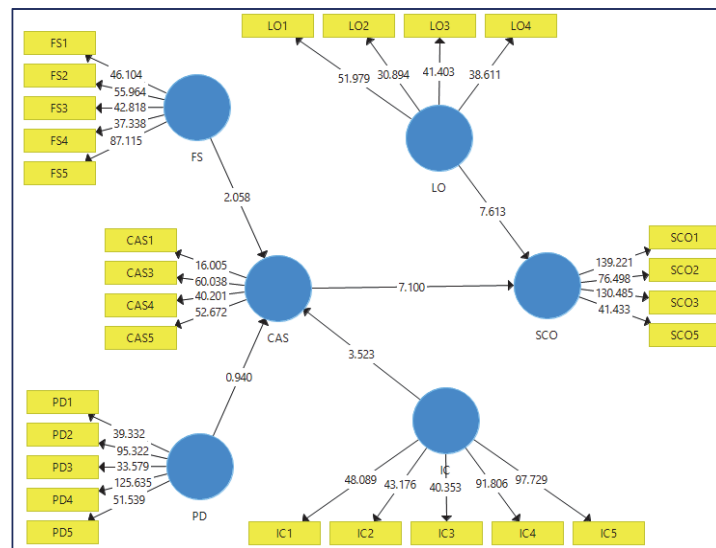| Dependent Variable	R-square (R^2)
Supply Chain operations	0.855

**Fig. 5.** Structural Model Assessment

Moreover, the moderation effect is shown in Table 8. Moderation effect was also examined by considering the t-value and p-value. PLS bootstrapping was used in this process. According to the results of the study, it was revealed that the moderation effect between firm size and CAS was significant. However, moderation effect in case of product diversity and intensity of competition was insignificant.

Table 8
Moderation Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
FS× LO → CAS	0.560	0.563	0.116	4.752	0.000
IC× LO → CAS	0.208	0.206	0.136	1.509	0.109
PD×LO → CAS	0.084	0.088	0.071	1.180	0.215

Fig. 6 shows the direction of the moderation effect. It is evident that the moderation effect strengthens the positive effect of firm size on CAS. An increase in legal obligations would increase the positive effect of firm size on CAS which has a significant effect on supply chain operations.
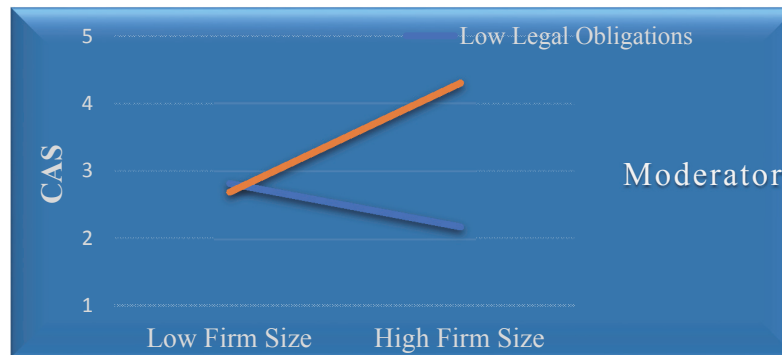
Fig. 6. Moderation Effect

5. Conclusion

Indonesian agriculture sector has significant contribution in GDP. However, nowadays, the performance of the agriculture industry is decreasing due to inferior supply chain practices. Therefore, this study is one of the attempts to boost supply chain through CAS. In sum, CAS has the ability to boost supply chain activities which will automatically enhance the performance of Indonesian agriculture sector. Better CAS system increases the efficiency and effectiveness among these companies. However, various internal and external factor cannot be neglected. Internal factors such as firm size and product diversity effect the implementation of CAS. In the case of external factor like competition, the companies working in the intense competition are required to adopt CAS. Better CAS system can help to survive in competition. Finally, government legal obligations have also the influence on CAS implementation. The companies having big size are more likely to adopt CAS as compared to small size companies.

Interested researcher is invited to examine the effect of open-innovation to boost CAS and supply chain activities. As external and internal knowledge can be beneficial to bring new ideas. Moreover, the introduction of other internal, as well as external factors, can strengthen the framework of the current study.

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