Journal of Infrastructure, Policy and Development 2024, 8(8), 4936.
https://doi.org/10.24294/jipd.v8i8.4936

Article

The link between collaborative advantage and productivity: Evidence from smallholder cocoa producers in Indonesia

Agus Syarip Hidayat[1,*], Andri Amaliel Managanta[2], Purwanto Purwanto[3], Eka Nurjati[3]

[1] Research Center for Economic of Industry, Services, and Trade, National Research and Innovation Agency (BRIN), Jakarta 12710, Indonesia
[2] Faculty of Agriculture, Sintuwu Maroso University, Poso 94619, Indonesia
[3] Research Center for Behavioural and Circular Economics, National Research and Innovation Agency (BRIN), Jakarta 12710, Indonesia
*** Corresponding author:** Agus Syarip Hidayat, agus110@brin.go.id

CITATION

Hidayat AS, Managanta AA, Purwanto P, Nurjati E. (2024). The link between collaborative advantage and productivity: Evidence from smallholder cocoa producers in Indonesia. Journal of Infrastructure, Policy and Development. 8(8): 4936. https://doi.org/10.24294/jipd.v8i8.4936

ARTICLE INFO

Received: 1 March 2024
Accepted: 9 May 2024
Available online: 29 August 2024

Abstract: Smallholder cocoa producers often experience low productivity levels, partly due to their weak collaborative advantage (CA). CA enables businesses to optimize outcomes through effective collaboration within value chains. This paper aims at examining the effect of CA pillars (trust building, resource investment, and decision synchronization) on the productivity. This paper uses primary data of 406 samples from smallholder cocoa producers in Indonesia. The data is analyzed by using CDM (Crepon Duguet Mairesse) model that divides the CA process into three stages: effort, output, and productivity. In the first stage, our model shows that having motivation to collaborate positively affects collaborative effort expenditure to develop a CA. In the second stage, the study finds that the three pillars of CA have to some degree contributes to achieving a better access to finance, superior cocoa seeds, and cocoa processing technology for smallholder cocoa producers. In the third stage, acquiring the outputs of CA leads to productivity improvement. The findings underscore the significance of intangible factors in shaping robust Collaborative Advantage (CA) and influencing productivity. This enriches CA theory, which has traditionally focused primarily on tangible factors.

Keywords: collaborative advantage; productivity; smallholder cocoa producers; access to finance; superior seeds; processing technology

1. Introduction

In an increasingly dynamic and competitive market, it is imperative for smallholder cocoa producers to build linkages with other businesses especially large enterprises to be more resilient, competitive, and sustainable. In the Indonesian economy context, smallholder cocoa producers and large cocoa processing industries have a strategic role with a workforce absorption of 1.63 million people and a foreign exchange contribution of USD 1.26 billion in 2022. Cocoa occupies the fourth largest position in Indonesia's plantation commodity exports after palm oil, rubber and coffee. However, most cocoa is exported in the form of cocoa beans and intermediate products. The importance of strengthening CA between smallholder cocoa producers and large industries cannot be separated from various macro issues in the cocoa and micro plantation sub-sectors at the cocoa smallholder producer's level. Macro-wise, Indonesia's cocoa production has decreased in the last 10 years with the highest figure achieved in 2018 of 767.3 thousand tons to 667.3 thousand tons in 2022 (BPS, 2022). Indonesia's cocoa productivity has also decreased from around 800 kg/ha in 2006 to 700 kg/ha in 2018 (Ruslan and Prasetyo, 2021). Meanwhile, on the micro side, various problems faced by Indonesian cocoa farmers include: (1) inadequate superior seeds availability; (2) low level of technical competence and technology adoption (Managanta et al., 2019; Manalu, 2018); (3) lack of post-harvest management (Manalu, 2018); (4) lack access to market and financing.

Various studies have also shown that linkage can expand access to resources, improving efficiency and productivity (Cao and Zhang, 2011; Ehrenhard and Hoffmann, 2014; Ponce et al., 2024), and lowering transaction costs (Handfield, 2002; Lin and Wu, 2014). Linkage is also a gateway to the Global Value Chain (GVC). Linkage can offer substantial reciprocal benefits to the involved parties if managed properly (Dyer, 2000; Li et al., 2015). The literature refers the term of linkage in various terminology, such as supply chain collaboration (SCC), integrated supply chain (ISC) or just referred to as networking. Dyer (2000) introduced the term collaborative advantage (CA) to describe the linkage between companies, and he outlined three fundamental principles of CA, namely inter-firm trust building, dedicated asset investment, and knowledge sharing. CA is a way for businesses to create benefits through effective collaborations in the supply chain to achieve optimal results (Cao and Zhang, 2011; Dyer, 2000; Jap, 2001; Kenis and Raab, 2020; Lin and Lin, 2016). This study will operationally define the term collaborative advantage (CA) to refer to network between companies.

Despite the recognized benefits of collaboration, there is a significant gap in literature in understanding how the partnerships can be optimized to suit the unique characteristics of small businesses such as cocoa's industry. The conceptualization of the CA pillars between small businesses and large enterprises needs to be designed by taking into account the characteristics of the small businesses themselves. The reasons are: First, small businesses face higher risks than that of large enterprises (Jüttner, 2005; Sahiti, 2019). Several small firms have neglected to incorporate this aspect into their risk management methods, namely by implementing stringent terms and conditions in their contracts with consumers and suppliers (Ellegaard, 2008). Second, smaller enterprises provide a greater amount of relational capital, which is less noticeable in large businesses (Manimala et al., 2019; Welbourne and Pardo-del-val, 2009). Third, small businesses are more sensitive to changes in the external environment (Prajogo and McDermott, 2014; Sahiti, 2019) for example increased competition as markets become more integrated. This research aims to fill this gap by developing a CA model tailored to the needs and strengths of smallholder cocoa producers, focusing on trust-building, risk-sharing, and resource allocation within collaborative networks.

By referring to the theoretical perspectives, especially relational view theory and CA model from Dyer (2000) and considering the unique characteristics of small businesses, we conceptualize CA in three main pillars, namely inter-firm trust building, resource investment, and dynamic synchronization. The novelty of this research is the formulation of the CA model that internalizes the characteristics of small businesses in cocoa industry. The proposed CA model will strengthen the foundation of trust among collaborators through collaborative risk-sharing incorporation. This model will also improve dynamic synchronization among collaborative partners within the same network. Furthermore, the inclusion of relational capital inside a resource investment framework provides a fresh viewpoint on the significance of non-monetary aspects when allocating resources among collaborative partners. This novelty will contribute to the strengthening of relational view theory.

Considering this background, the research questions of this paper are: (a) What pillars are needed to build a strong CA in the cocoa industry value chain? (b) What is the most important CA pillar that can strengthen the linkage between smallholder cocoa producers and large cocoa industry? (c) How is the influence of each CA pillar on the productivity of smallholder cocoa producers?

The remainder of the paper goes as follows. Section 2 reviews relevant literature on CA, hypothesis development, theoretical frameworks, and empirical strategy. Section 3 describes the econometric methods and data description. Section 4 discusses the result of analyzing the model of the CA process and robustness checks. Section 5 concludes, provides the contributions of this paper, identifies the limitations study, and suggests the future research.

2. Literature review and hypothesis development

While there is general agreement that the essence of cooperative advantage (CA) lies in collaboration between companies (Cao and Zhang, 2011; Dania et al., 2018; Dyer, 2000; Nyaga et al., 2010; Simatupang and Sridharan, 2005), the literature presents varying perspectives on the specific structure that CA should take.

Simatupang and Sridharan (2005), a reciprocal approach is a more suitable term for describing business collaboration. According to this method, they suggest five fundamental principles of CA: cooperative performance systems, sharing of information, synchronization of decisions, alignment of incentives, and integration of supply chain operations. Cao and Zhang (2011) also devised five CA constructs, but with distinct characteristics. The key factors include process efficiency, adaptability, business synergy, product quality, and innovative activities. The development of the CA idea was informed by theoretical frameworks such as transactional cost economics, the resources-based view (RBV), the expanded RBV, and the relational view.

The conceptualization of the pillars and components forming CA between Smallholder cocoa producers and large businesses needs to be designed by taking into account the characteristics of small businesses in Indonesia. First, small businesses face higher business risks than large companies (Jüttner, 2005; Sahiti, 2019). Many small businesses have neglected to incorporate this aspect into their risk management techniques, such as implementing stringent terms and conditions for their customers and suppliers (Ellegaard, 2008). Second, small businesses offer more relational capital, which is less noticeable in large companies (Manimala et al., 2019; Welbourne and Pardo-del-val, 2009). Third, Small businesses are more sensitive to changes in the external environment (Prajogo and McDermott, 2014; Sahiti, 2019) for example increased competition as markets become more integrated.

Considering these various theoretical perspectives, especially the relational view theory and CA model from Dyer (2000) and taking into account the unique characteristics of MSME business, we conceptualize CA in three main pillars, namely inter-firm trust building, resource investment, and dynamic synchronization.

2.1. Theoretical framework and empirical strategy

Relational view theory provides a suitable theoretical foundation for the CA model between smallholder cocoa producers and large businesses. This theory posits that a collaboration can achieve a competitive advantage by investing in specific assets, exchanging significant information and knowledge, combining scarce resources or capabilities to create unique products, and implementing effective governance mechanisms. Dyer's further exploration of this theory led to the identification of three crucial foundations of CA, namely inter-firm trust building, asset investment, and knowledge sharing.

2.1.1. Inter-firm trust building

Strengthening trust between partners in collaboration is a prerequisite for a successful CA (Dania et al., 2018; Dyer, 2000; Huxham and Vangen, 2005). The absence of trust would deter corporations from sharing knowledge and investing their assets in a collaborative effort. Trust in a partnership is contingent upon a company's belief in the dependability and honesty of their associates. Therefore, we propose three elements to support the components of strengthening inter-company trust: a) collaborative commitment; b) collaborative efficiency agreements; and c) collaborative risk sharing.

2.1.2. Resources investment

Resource investment refers to the allocation of investments by collaborative partners in the value chain with the aim of enhancing productivity in a production network. Firms should engage in three distinct forms of asset investments: geographical specialization, physical specialization, and human specialization. In this study, the resource investment component consists of three elements: a) collaborative planning; b) collaborative resource sharing; and c) collaborative relational capital (Dyer, 2000).

The significance of addressing collaborative relational capital in resources investment is linked to the working dynamics within the firm collaboration. This involves individuals from diverse backgrounds, including varying professional expertise, organizational culture, objectives, cultural norms, and values. Embedded values of collaborative relational capital are what confer its strength and influence over the dynamics of supply chain networks (Wu and Pullman, 2015). The presence of relational capital does not guarantee that collaborative members share the same values. Therefore, collective decisions can be reached by engaging in actively and timely talks among the members.

2.2. Dynamic synchronization

Dynamic synchronization refers to the process by which collaboration members can align information sharing among collaboration members and to synchronize their responses to external pressures. Pressures on external factors can come from a variety of sources, including customers, competitors, alterations in governmental policies or additional variables pertaining to macroeconomic stability, such as changes in interest rates and exchange rate volatility. In this study, the dynamic synchronization pillar consists of two elements: knowledge and information sharing, and response synchronization.

Knowledge and information sharing is defined as the process by which a company shares relevant, accurate, complete and confidential information in a timely manner with its supply chain partners (Cao and Zhang, 2011; Min et al., 2005; Sheu et al., 2006; Simatupang and Sridharan, 2005). Information sharing activities can be categorized into two types: explicit and implicit information sharing (Dyer, 2000). Explicit knowledge sharing involves the act of exchanging specific information, such as production timetables and market data. Tacit knowledge sharing pertains to the exchange of knowledge, specifically involving technical expertise in areas such as enhanced manufacturing processes, novel technologies, and advanced quality assurance techniques.

2.3. Cocoa plantation and downstream industry

Using Resource-based Industrial Policy (RBI) through the Global Production Network (GPN) framework, Neilson et al. (2020) identified that cocoa downstream processing will occur in the centre of cocoa production location. The company's strategy through NPG is intended to ensure the growth of most new investments in industrial estates that have been determined to be related to the industrial value chain that allows business partnerships. Business models that support the value chain industry in Indonesia are usually divided into 3 (three) types, namely business-supported value chain, NGO-supported value chain, and government-supported value chain (de Boer et al., 2019).

Downstream cocoa processing industry can be done in various ways. For example, in the case of Peru, the application of the Creating Shared Value (CSV) framework is carried out by strengthening production and productivity through industrial clusters that connect cocoa farmers with industry while still paying attention to social and business interests (Borda et al., 2021). Integration between sectors and regions as well as multistakeholder cooperation are essential to increase productivity, efficiency, and quality assurance in the development of agricultural downstream (Borda et al., 2021; Leksono et al., 2021; Wijaya et al., 2016).

2.4. Smallholder cocoa producers and downstream industry

To enhance the competitiveness of the cocoa industry, it is necessary to increase the added value of cocoa at the smallholder producers. The increased added value is not only at the processing cocoa beans, but it can also be applied to cocoa processing by-products such as cocoa pulp and cocoa fruit peels that can be reprocessed into nata products and cocoa fruit juice, fertilizer, and scrubs (Fauzi et al., 2019; Managanta et al., 2022; Nur Indah et al., 2021) suggests that to improve cocoa competitiveness, local institutional support is needed. It can strengthen processing facilities and increase to the capital. In addition, strengthening R&D aspects is also strategically required to improve cocoa production and quality (Purba et al., 2018; Sucipto et al., 2022).

2.5. CA and productivity

Various studies explain the benefits of CA, including reducing transaction costs, increasing efficiency and minimizing opportunism (Cao and Zhang, 2011; Ehrenhard and Hoffmann, 2014; Hidayat, 2020; Kenis and Raab, 2020). These benefits ultimately lead to improvements in company performance such as productivity, sales, and profitability.

Although many studies support the positive effects of collaboration on company performance, poorly designed collaboration can also affect firm performance (Fabbe-Costes and Jahre, 2008; Koufteros et al., 2005). Poorly designed collaboration can affect the effectiveness of product development and increase the complexity of coordinating firm decisions.

The diverse impacts of collaboration discussed above on corporate success highlight the necessity of firm capabilities in obtaining improved firm outcomes. Helfat and Peteraf (2003) mentioned two distinct categories of capabilities that serve as drivers for enhancing company performance, namely operational capabilities and dynamic capabilities.

Based on the theoretical foundation and empirical experience as above-mentioned, the following hypothesis are compiled:

Hypothesis 1: Having motivation to collaborate positively affects collaborative effort expenditure to develop a CA.

Hypothesis 2a: The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on widening access to finance.

Hypothesis 2b: The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on acquiring superior cocoa seeds.

Hypothesis 2c: The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on acquiring cocoa processing technology.

Hypothesis 3: Having a better access to finance, access to superior cocoa seeds, and access to processing technology positively affect land productivity of smallholder cocoa producers.

The hypotheses developed and the corresponding literature review serving as their foundation are presented in **Table 1** below:

Table 1. The hypothesis and its basis in literature review.

Hypothesis	Explanation	Literature Review
Hypothesis 1	Having motivation to collaborate positively affects collaborative effort expenditure to develop a CA.	Collaboration between actors in the supply chain creates an effective CA that has a positive impact on company performance (Cao and Zhang, 2011). Not only in large companies, CA also has a positive effect on the performance of MSMEs and the effect will be stronger if the ability of MSMEs is taken into account (Hidayat and Pok, 2023). Christinck et al. (2019) affirm that partner capacity plays an important role in CA. Various challenges to maintain and advance CA include: focus on farmer capacity building, long-term funding mechanism of variety/seed procurement activities, foundation of trust between farmers and partner companies.

Table 1. (*Continued*).

Hypothesis	Explanation	Literature Review
Hypothesis 2a:	The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on widening access to finance.	Power and trust play an important role in creating CA. The theory is from the idea that power and trust facilitate members of the value chain to unify their capabilities so as to create appropriate value for customers and companies (Sridharan and Simatupang, 2013). Trust building also positively affects the growth of innovation and success of the company (Kohnova and Papula, 2019). Managerial collaboration between supply chain actors has an effect on the company's financial performance which is mediated directly by company resources (Zulu-Chisanga et al., 2021). The company's financial resources and collaboration between companies positively affect the performance of MSMEs. Through the development of collaborative platforms, companies can maximize financial resources (Tran and Tron, 2023). Companies can optimize collaboration to share information and communicate effectively because it plays a major role in supply chain effectiveness and efficiency (Zaman et al., 2023). Active engagement between supply chains (dynamic synchronization) can form a superior bargaining position that contributes positively to financial returns (Cho et al., 2019).
Hypothesis 2b	The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on acquiring superior cocoa seeds.	Through institutional systems and collaboration between stakeholders, it can support quality seed innovation (Bahtiar et al., 2022). The cocoa agribusiness system is very complex because of the interrelation of technical aspects, social aspects, environmental aspects and economic aspects. Synchronization of all these aspects is very important to achieve sustainability in the cocoa agribusiness system (Nugraha et al., 2019).
Hypothesis 2c:	The CA pillars (trust building, resource investment, and dynamic synchronization) have a positive impact on acquiring cocoa processing technology.	Trust building from company leaders positively affects the success of high-technology-based start-ups (Trăpczyński et al., 2018). Building trust between supply chains contributes positively to company performance (Lew et al., 2013).
Hypothesis 3	Having a better access to finance, access to superior cocoa seeds, and access to processing technology positively affect land productivity of smallholder cocoa producers.	Access to credit has a positive impact on smallholder productivity and agricultural sector growth (Acclassato Houensou et al., 2021; Awotide et al., 2015). This condition can be interpreted that farmers with good access to credit have an effect on increasing crop productivity (Mbudzya et al., 2022). Agro-processing training programs are proven to increase income and food security at the household level (Mthombeni et al., 2022). Strong relationships between value chain stakeholders have a positive effect on the ability to sell products which in the long run affects the competitiveness of the value chain (Corsi et al., 2017).

3. Materials and methods

3.1. Research sites and data collection

This research uses qualitative and quantitative approaches (mixed methods) based on primary data. The data will be collected through field observation, survey questionnaire, in-depth interviews, and focused group discussion (FGD). The sample of this study is smallholder cocoa producers and managers of cocoa processing companies. The field research is conducted in three provinces: South Sulawesi, Central Sulawesi, and Southeast Sulawesi that contribute the most production of cocoa in Indonesia. The number of the sample from survey questionnaires is 406 respondents spread across various cocoa value chains in those three provinces. The samples at the medium and large processing industries are 10 companies. Samples at the cocoa farmers level were collected using random sampling. Meanwhile, samples at the cocoa processing industry level were collected by snowballing sampling.

3.2. Econometric methods and data description

To estimate the most important pillar in CA optimization and calculate the potential influence of CA on performance of smallholder cocoa producers, we will employ CDM (Crepon Duguet Mairesse) model. This model is widely used in research on the effect of innovation on company performance. The primary advantage of this model is its capacity to offer a comprehensive analysis of the innovation process, exploring its complexities in depth. Furthermore, it sheds light on the relationship between innovation and the success of a company, as well as the dynamic interplay between these two factors. The estimate will be modelled in three phases, namely: phase 1 of collaborative efforts to develop CA, phase 2 of CA outputs, and phase 3 of the effect of CA outputs on the productivity. Assuming normal distribution, farmers' innovative efforts in establishing CA can be formulated as follows:

$$fie_i^* = x_i\beta + \varepsilon_i \tag{1}$$

where, fie_i^* is collaborative effort to develop CA with their value chain partners, x_i is determinant vector of strong CA, and ε_i is standard error. The proxy of establishing a strong CA is collaborative effort expenditure (measured by the logarithm of the value of communication spending, transportation costs, and meeting costs with partners in one year). Vector determinants include various factors, namely, motivation to collaborate, length of experience as a cocoa farmer, the number of workers directly involved in cocoa plantations.

In phase 2 (CA outputs), the three dimensions of output will be estimated (access to finance, access to superior cocoa seeds, access to cocoa processing technology) will be tested simultaneously. Based on the predicted collaborative efforts in developing CA of Equation (1), we estimate the probability of famers to obtain the CA outputs through their CA pillars (trust building, resource investment, and dynamic synchronization) with a multivariate probit model. Therefore, the equation for each of the access outputs is determined as follows:

$$\begin{cases} procac_i = \gamma_1 fie_i^* + \delta_1 vi_i + \varepsilon_{1i} \\ marac_i = \gamma_2 fie_i^* + \delta_2 vi_i + \varepsilon_{2i} \\ finac_i = \gamma_3 fie_i^* + \delta_3 vi_i + \varepsilon_{3i} \end{cases} \tag{2}$$

where $prociv_i, machiv_i, prodiv_i$, show the probability of access to finance, access to superior cocoa seeds, access to cocoa processing technology, respectively. fie_i^* represents the predicted value of collaborative efforts in developing CA from Equation (1); $\delta_1 vi$ is a determining vector of CA pillars (trust building, resource investment, and dynamic synchronization), and error terms ε_{1i} , ε_{2i} ε_{3i} to adjust the possibility of endogeneity.

Using the value of predicted probability of three CA outputs from Equation (2), we will estimate the effect of CA on the land productivity of smallholder cocoa producers in phase three.

$$fp_i = \vartheta_1 procac_i^* + \vartheta_2 marac_i^* + \vartheta_3 finac_i^* + \vartheta_5 C_i + \varepsilon_i \tag{3}$$

where fp_i is the land productivity of smallholder cocoa producers ; The proxied of productivity is total of cocoa production per hectare per year.

$procac_{i,}^{*}, marac_i^{*}$, and $financ_i^{*}$ are probability value of access to innovation process, access to innovation product, access to finance from Equation (2); C_i is the determining vector that explains the productivity of smallholder cocoa producers, such as farmers' capability, land size, and cocoa price.

The abovementioned variables in the Equations (1)–(3) are explained in the **Table 2** and its descriptive statistic are recorded in the **Table 3**.

Table 2. Variables description.

Variables	Measurements
Collaborative effort expenditure	Expenditure on the effort to develop CA (expenses on internet, mobile phone, meeting) (in natural logarithm)
Number of employees	Employees working full time (in natural logarithm)
Farming experience	Number of years doing farming (in natural logarithm)
Motivation to collaborate	If the farmer is joining cooperatives or farmers' association, the binary value is 1; if not, it is 0.
Education attained	If the farmer has education level at least senior high school, the binary value is 1; if not, it is 0.
Access to finance	If the farmer has access to finance provided by their buyers (cooperatives, SMEs, Large enterprises), the binary value is 1; if not, it is 0.
Access to superior cocoa seeds	If the farmer has access to acquire superior cocoa seeds provided by their buyers, the binary value is 1; if not, it is 0.
Access to cocoa processing technology	If the farmer has access to cocoa processing provided by their buyers, the binary value is 1; if not, it is 0.
collaborative efficiency agreements	If the farmer and buyers have agreement on the way to improve efficiency in the farming processes, the binary value is 1; if not, it is 0.
Certification	If the farmer has at least one certification of their cocoa farming, the binary value is 1; if not, it is 0.
collaborative relational capital	If farmers build cooperation with their buyers in a family atmosphere, the binary value is 1; if not, it is 0.
Sharing fertilizer procurement	If the farmer has a sharing mechanism in procuring fertilizers with their buyers, the binary value is 1; if not, it is 0.
Sharing digital knowledge on farming	If the farmer has a sharing mechanism to share digital knowledge on cocoa farming with their buyers, the binary value is 1; if not, it is 0.
Sharing market information	If the farmer has a sharing mechanism to share opportunity to expand cocoa market information with their buyers, the binary value is 1; if not, it is 0.
Risks sharing crop failure due to pests	If the farmer has a sharing mechanism to share the risks of harvest failure due to pests with their buyers, the binary value is 1; if not, it is 0.
Farmer capability	If the farmer has ability to learn and understand new cocoa farming techniques, the binary value is 1; if not, it is 0.
Cocoa price	Price of non-fermented cocoa per Kg (in natural logarithm)
Productivity	Cocoa yield per hectare annually (in natural logarithm)

Table 3. Descriptive statistics.

Variables	Obs	Mean	Std. Dev.	Min	Max
Collaborative effort expenditure (Ln)	406	14.41	0.82	11.59	16.21
Number of employees (Ln)	406	0.82	0.33	0.00	3.00
Farming experience (Ln)	406	2.87	0.49	1.10	3.89
Motivation to collaborate	406	0.61	0.49	0	1
Access to finance	406	0.83	0.37	0	1
Access to superior cocoa seeds	406	0.71	0.45	0	1

Table 3. (*Continued*).

Variables	Obs	Mean	Std. Dev.	Min	Max
Access to cocoa processing technology	406	0.52	0.50	0	1
collaborative efficiency agreements	406	0.81	0.39	0	1
Certification	406	0.56	0.50	0	1
collaborative relational capital	406	0.75	0.43	0	1
Sharing fertilizer procurement	406	0.80	0.40	0	1
Sharing digital knowledge on farming	406	0.80	0.40	0	1
Sharing market information	406	0.87	0.34	0	1
Risks sharing crop failure due to pests	406	0.35	0.48	0	1
Farmer capability to learn new things	406	0.77	0.42	0	1
Cocoa price (Ln)	406	10.38	0.12	9.90	10.76
Productivity (Ln)	406	5.97	0.86	4.09	8.23

The dataset presents a comprehensive overview of various variables related to cocoa farming in three provinces (South Sulawesi, Central Sulawesi, and Southeast Sulawesi). The Collaborative effort expenditure (Ln) has a mean of 14.41, indicating the average logarithmic expenditure in such endeavours. With a relatively low standard deviation of 0.82, the expenditures cluster closely around the mean. The minimum expenditure recorded is 11.59, representing the lowest observed value, while the maximum expenditure reaches 16.21, signifying the upper limit of spending. Examining the workforce, the Number of employees (Ln) has a mean of 0.82, suggesting an average logarithmic count of employees engaged in cocoa farming collaborations. Farming experience (Ln) is characterized by a mean of 2.87, showcasing the average logarithmic value of farmers' experience in cocoa farming collaborations. The standard deviation of 0.49 indicates moderate variability, with a minimum experience of 1.10 and a maximum of 3.89, reflecting diverse levels of expertise among participants.

Motivation to collaborate, measured on a scale from 0 to 1, has a mean of 0.61, indicating a moderate average level of motivation. The standard deviation of 0.49 suggests considerable variability in motivational levels, with responses ranging from a minimum of 0 to a maximum of 1. Access to finance, Access to superior cocoa seeds, Access to cocoa processing technology, Certification, collaborative relational capital, sharing fertilizer procurement, sharing digital knowledge on farming, Sharing market information, Risks sharing crop failure due to pests, Farmer capability to learn new things, and other variables measured on a scale from 0 to 1. The means, standard deviations, and ranges vary across these variables, indicating the diverse nature of factors influencing collaborative cocoa farming efforts.

The descriptive statistics for Cocoa price (Ln) reveal a log-transformed mean of 10.38, reflecting the average logarithmic value of cocoa prices within the dataset. The low standard deviation of 0.12 suggests that the log-transformed cocoa prices exhibit relatively minor variability around the mean. The minimum value of 9.90 and the maximum value of 10.76 indicate a narrow range of log-transformed cocoa prices, emphasizing a degree of consistency in the pricing structure. Productivity (Ln) reflects the logarithmic measure of cocoa farming productivity, with a mean of 5.97. The standard deviation of 0.86 indicates substantial variability around the mean, showcasing diverse productivity levels among participants, ranging from a minimum of 4.09 to a maximum of 8.23. These statistics collectively provide a comprehensive overview of the collaborative dynamics in cocoa farming, encompassing motivation, resources, and productivity outcomes.

4. Results and discussion

4.1. Stage 1: collaborative efforts to develop CA

We estimate the collaborative effort model without taking into account the selection bias[1] **Table 4**. presents the outcomes of the collaborative effort in developing CA.

Table 4. Collaborative effort estimation results.

List of variables	Coef.	Robust Std. Err.	
Dependent variable: Collaborative effort expenditure			
Motivation to collaborate	0.435	0.084	***
Actively looking for market information	0.390	0.128	***
Land size	0.181	0.071	**
Education attained	−0.059	0.088	-
Farming experience	−0.102	0.082	-
Number of employees	0.074	0.121	-
Number of obs	406	-	-
F(6, 399)	7.540	-	-
Prob > F	0.000	-	-
R-squared	0.127	-	-
Root MSE	0.767	-	-

* Significance at 10%, ** Significance at 5%, *** Significance at 1%.

4.1.1. Motivation to collaborate

The results show that having motivation to collaborate, as demonstrated by joining member of cooperatives/farmers' association, has a positive impact on the drive to expand collaborative effort expenditure to develop a CA. The estimation result for the motivation to collaborate is 0.43, indicating that approximately 38% higher of communication spending for developing CA is incurred by farmers who have a mindset and motivation to strengthen collaboration, assuming all other variables are constant. We adhere to Kennedy (1981) when interpreting the coefficient dummy in a semi-logarithmic equation. The formula for calculating dummy coefficient percentage change is exp $(\beta - \frac{1}{2}V(\beta) - 1$, where β is the dummy coefficient and $V(\beta)$ is variance.

Our survey results show that out of a total of 406 respondents, there are 268 respondents (66%) who have high motivation to build CA through their activity in cooperatives, farmer associations, The Prosperous Community Economic Institute (LEM Sejahtera), government programs, or even joining farmer group cooperation with cocoa processing companies. For cooperation between farmers and cocoa processing companies, we found that the majority of the cooperation was not formally recorded in the contract, but only based on trust. Many cocoa farmers become part of the value chains of medium and large-scale companies including multinational companies. In South Sulawesi for example, many cocoa farmers are partnering with Cocoa Compound Indonesia Co, Comextra Co, Makalate Chocolate, Onuka, and Chalodo. While in Central Sulawesi, many cocoa farmers become suppliers of PT OVI and JB Cocoa. Some stated that their motivation for joining was to expand connections thereby increasing their access to cocoa financing, technology and innovation, cocoa seeds, fertilizers, markets, and so on. This benefit-seeking effort is driven by the increasing costs on farmers in running cocoa farming. The increasing costs of cocoa farming for seeds, fertilizers, and pesticides occurred in all three locations of our study.

The cost of agricultural inputs such as seeds, fertilizers, and pesticides in South Sulawesi Province tends to increase. The increasing cost of cocoa farming cannot be controlled by farmers. The government facilitates the provision of subsidized fertilizers and seed products. Farmers and partner companies/MSMEs are committed to strengthening collaboration. The production process incurs significant maintenance costs, necessitating additional labor, especially in extensive agricultural settings. These costs encompass a range of activities, including irrigation maintenance, soil and plant cultivation, the pruning of cocoa trees, and the implementation of protective measures like cocoa fruit wrapping to thwart the incursions of the cocoa pod borer (Conopomorpha cramerella).

4.1.2. Actively looking for market information

Actively looking for market information of cocoa also significantly motivates farmers to expand collaborative effort expenditure to develop a CA. This is in line with various studies in agriculture which state that having access to market information allows farmers to get various benefits, such as obtaining better price requirements from informal and formal channels (Negi et al., 2018), access to resources (Olutumise, 2022), access to technology in agricultural production (Zhang et al., 2020) and subjective welfare of farmers (Li et al., 2023).

4.1.3. Land size

Another variable that also positively affects collaborative expenditure is land size. This variable is attributed as a proxy for farming size activities. The estimated coefficient of number of employees is 0.18, indicating that a 1% increasing land size would increase collaborative effort expenditure for developing CA by about 0.18%, assuming all other variables are constant. This is reasonable considering that farmers with large land have greater needs than farmers with small land to obtain resource support in the form of planting financing, maintenance, of the cocoa, and harvesting process. Zhang and Wu (2023) confirms that reducing the agricultural production costs can be realized through the expansion of planting areas and the activeness of farmers in cooperatives through the provision of various types of agricultural facilities and infrastructure services at more affordable prices. Our data shows that the structure of land ownership in the three study locations is dominated by farmers having 1 ha and more. The percentage of farmers with land ownership of 1 ha is 48%, farmers who own more than 1 ha is 38.2%, and the rest are farmers with a land area of less than 1 ha. Managanta et al. (2018) expained that the average cocoa land area is dominated by 1 hectare and is cultivated by farmers and their families. The dry cocoa beans are then sold and the results are enjoyed by the farmer and his family, mostly for meeting daily needs and a small amount for purchasing fertilizers and pesticides.

4.1.4. Other variables

In contrast, the other three variables that relate to the characteristics of farmers (education level, farming experience, and number of employee) are not significant. Looking at the results having the motivation to collaborate, as demonstrated by joining a member of cooperatives/farmers' associations, has a favorable effect on collaborative effort expenditure in establishing a CA. Hence, hypothesis 1 is accepted.

4.2. Stage 2: CA outputs

The results of CA outputs stage are presented in **Table 5**. To consider the possibility that unobservable variables correlate with access to finance equations, access to superior cocoa seeds, and access to processing technology, we estimate this second stage as a multivariate probit using Conditional Mixed Process (CMP) analysis. Roodman (2011) suggests that CMPs provide more efficient estimation because they can simultaneously consider the complete covariance structure of a multivariate probit process.

The independent variables consist of variables representing the three pillars of CA (trust building, resource investment, and dynamic synchronization), and the dependent variables are the CA outputs (access to finance, access to superior cocoa seeds, and access to cocoa processing technology). The multivariate probit estimation results for CA outputs would be interpreted based on the average marginal effects (AME). The Wald test (X2 = 185.35, p 0.000) demonstrates that the multivariate probit equation for the CA outputs stage provides a good fit to the data.

Table 5. Estimation results for collaborative advantage outputs.

List of variables	Coef.	Std. Err.	Average Marginal Effect (AME)	Std. Err.	
Dependent variable: Access to finance					
Predicted collaborative effort	1.071	0.387	0.213	0.076	***
Collaborative efficiency agreements	0.378	0.204	0.075	0.040	*
Certification	0.408	0.204	0.081	0.040	**
Collaborative relational capital	0.358	0.188	0.071	0.037	**
Sharing fertilizer procurement	0.221	0.208	0.044	0.041	-
Sharing digital knowledge on farming	0.258	0.257	0.051	0.051	-
Sharing market information	−0.178	0.301	−0.035	0.060	-
Dependent variable: Access to superior cocoa seeds					
Predicted collaborative effort	0.772	0.352	0.193	0.087	**
Collaborative efficiency agreements	−0.095	0.205	−0.024	0.051	-
Certification	0.249	0.176	0.062	0.044	-
Collaborative relational capital	−0.276	0.188	−0.069	0.047	-
Sharing fertilizer procurement	0.718	0.181	0.180	0.043	***
Sharing digital knowledge on farming	0.604	0.231	0.151	0.056	***

Table 5. (*Continued*).

List of variables	Coef.	Std. Err.	Average Marginal Effect (AME)	Std. Err.	
Dependent variable: Access to superior cocoa seeds					
Sharing market information	0.724	0.283	0.181	0.070	**
Dependent variable: Access to cocoa processing tech					
Predicted collaborative effort	0.679	0.327	0.214	0.102	**
Collaborative efficiency agreements	−0.209	0.186	−0.066	0.059	-
Certification	0.164	0.165	0.052	0.052	-
Collaborative relational capital	−0.275	0.175	−0.087	0.054	-
Risks sharing crop failure due to pests	1.021	0.151	0.168	0.071	***
Sharing digital knowledge on farming	0.533	0.231	0.162	0.096	**
Sharing market information	0.515	0.306	0.322	0.039	*
/atanhrho_12	0.464	0.132	-	-	***
/atanhrho_13	0.715	0.134	-	-	***
/atanhrho_23	0.913	0.136	-	-	***
rho_12	0.433	0.107	-	-	-
rho_13	0.613	0.084	-	-	-
rho_23	0.723	0.065	-	-	-
Number of obs = 406 Wald test (X2) = 185.35 Prob > chi = 0.000					

* Significance at 10%, ** Significance at 5%, *** Significance at 1%.

4.2.1. Collaborative advantage outputs: Access to finance

Table 5 Shows that variables under the trust building pillar (collaborative efficiency agreement and certification), resource investment pillar (collaborative relational capital), and predicted collaborative effort expenditure positively affect access to finance output significantly. The AME of predicted effort for developing CA have the most significant contribution with coefficient value of 0.213. A doubling effort for developing CA, is estimated to raise the probability of success in widening access to finance output by 21.3%.

These results are in accordance with the findings of Subramaniam et al. (2020) which explain that collaboration between supply chain actors has a significant effect on company performance which includes social and financial aspects. Technical support and training are needed to improve the effectiveness of collaboration between stakeholders. Choi and Hwang (2015) also reported that collaboration between companies and partners will have an impact on improving financial performance. Good corporate financial performance can be created through the role of the government or private sector in investing, thus having a positive impact on sustainable development (Xu and Tan, 2020).

Farmers will also have the advantage of widening access to finance where there is agreement on efficiency with their buyers (SMEs or large enterprises). Achieving better efficiency is important to improve cost competitiveness (Cao and Zhang, 2011; Frohlich and Westbrook, 2001; Simatupang and Sridharan, 2005). On the other hand, financing constraints experienced by customers negatively impact the industry performance in general (Qiang et al., 2024). Smarter and more efficient investments are needed to develop financing infrastructure so that farmers get better access to finance (Bisbey et al., 2020). On-time and on budget delivery, better quality, and efficiency are principles that must be applied in the development of financing infrastructure so that it has a positive impact on the competitiveness of agricultural products in general (Lee et al., 2019).

By having a better price competitiveness day, the expectation of achieving good performance would be easily achieved so that the repayment ability of loan funds will be higher. In the context of empress, this efficiency is also very necessary considering the interviews results indicate that the costs of cocoa farming in South Sulawesi, Central Sulawesi, and Southeast Sulawesi have been increasing over time, particularly the costs for fertilizers, pesticides, and employees' wage. The increase in cocoa farming costs is increasingly putting pressure on farmers because it is not commensurate with the increase in cocoa production. Hence, without efficiency improvement, the cocoa yield will be unable to cover these costs of production. This result is in line with the study from Danso-Abbeam and Baiyegunhi (2020) that utilized the input-oriented DEA model to demonstrate the direct correlation between efficiency and the ability to manage production costs effectively. The results showed that when farmers have more control over inputs than outputs, making efficiency improvements becomes crucial for maintaining cost-effectiveness.

The high costs of agricultural inputs, especially fertilizers, provide a major obstacle to cocoa growing. Companies and MSMEs offer support to farmers through the provision of agricultural extension officers. For instance, major corporations offer a service known as the 'Cocoa Doctor', which is designed to assist farmers with both technical and managerial aspects of cocoa cultivation. These services assist farmers in resolving technical and managerial challenges, obtaining subsidized fertilizers, and acquiring high-quality cocoa seed variants. Hafid and McKenzie, (2012); Moriarty et al., (2014), cocoa doctors are selected based on representatives of local farmers, have high motivation to develop cocoa commodities, and are willing to teach farmers at least 100 local farmers. Cocoa doctor provides benefits in increasing knowledge and greater income. The practice of cocoa doctor is similar to the role of extension officer that support the cocoa farmer in their agricultural practice. Study on cocoa farmer in Ghana by Fosu-Mensah et al. (2022) identified a comparable situation in cocoa farmer where the absence of cocoa extension officers resulted in a lack of understanding among cocoa farmers regarding the proper usage of approved pesticides, fertilizers, and other chemicals to solve the problem in cocoa farming practices.

Having certification on cocoa farming also enhances the likelihood of success to widen access to finance outputs. The use of certified seeds has been evident to increase sustainable production, thus giving a signal to CA partners that such kind of cocoa farming are prospective to be financed. In the context of business credibility, (Yaldız et al., 2014) describe certification as a proxy of a business' quality. Our findings confirm other studies in cocoa plantations such as Adesiyan et al. (2023) who suggest that certified cocoa marketers are efficient and more productive in their business compared to uncertified ones.

Since certification could provide mutual benefits both for farmers and their collaborative partners, some cocoa processing companies facilitate the process of certification. Participation in the facilitation of product standards can increase the value of partner companies (Xiong et al., 2024). For instance, JB Cocoa, a cocoa processing company in Central Sulawesi, establishes partnerships with farmers or farmer groups and intermediary traders to ensure a sustainable and high-quality supply of dry cocoa beans by being involved in the certification program. For the company, this certification is part of lower the risk to ensure that the dry cocoa beans marketed to JB Cocoa comply with standards, and meet consumer demand for cocoa products. Two types of certificates commonly owned by cocoa farmers in the research location are Rainforest Alliance certificates and cocoa bean quality assurance certificates.

The collaboration built with buyers in a family atmosphere (collaborative relational capital) also contributes to increasing the probability of expanding access to finance. Many of the cocoa transaction have been done without formal work agreement, only relying on trust by maintaining good relations. This could occur because many of them have already known each other and there are social relations from daily interactions as fellow villagers. Wu and Pullman (2015) describe phenomena like this can occur because there are embedded values in relational capital that make trust between parties very strong, even though it is not bound by formal contracts. Semrau et al. (2016) call this pattern part of a socially supportive culture (SSC) where cooperation orientation looks more at the human orientation and low level of assertiveness. Such a kind of social bond which creates mutual trust naturally does not provide a guarantee of business within a certain period of time but is carried out as part of social interaction in social life. Zhu et al. (2023) explain that optimalization of the Company's Social Values has a positive impact on profit maximization for partner companies.

Farmers and processing cocoa companies including MSMEs in South Sulawesi are working together to guarantee the long-term viability of cocoa cultivation. In addition to typical transactions involving buying and selling, familial relationships also play a role in cooperation. Chalodo, Onuka, and other MSMEs offer training and guidance to farmers, along with greater pricing compared to those offered by intermediaries. Farmers frequently engage in partnerships with local intermediaries and small-scale businesses to secure financial backing and ensure a stable market. A different approach entails a direct partnership between farmers and small-scale firms, wherein farmers join as members of the supplier group. In the Sulawesi region, the typical price range for dry cocoa beans is between IDR 24,000 and IDR 40,000 per kg, whereas fermented cocoa is priced between IDR 50,000 and IDR 70,000 per kg. Arifin et al., (2021); Kadarisman, (2019), MSMEs can overcome capital constraints, limited human resources, and innovation. Provide assistance and coaching according to needs. Considering only two CA pillars (trust building and resource investment) that have a significant positive impact on widening access to finance, hence hypothesis 2a is partially accepted.

4.2.2. Collaborative advantage outputs: Access to superior cocoa seeds

The variables under the resource investment pillar of CA (sharing fertilizer procurement) variables under decision synchronization (sharing digital knowledge on farming and sharing market information), and predicted collaborative effort expenditure will increase the probability of success in obtaining access to superior cocoa seeds. The AME of predicted effort for sharing fertilizer procurement is 0.18, meaning that a doubling effort for sharing the fertilizers, is estimated to raise the probability of success in accessing superior cocoa seeds by 18%. This number is reasonable considering that by sharing the procurement of fertilizers, farmers and their collaboration partners could gain confidence that their cocoa plants will not lack nutrients so that the probability of getting abundant yields is very high. By haring fertilizer procurement, collaboration partners also avoid the problem of fertilizer scarcity as happened since 2022. From CA perspective, fertilizer procurement is a form of collaborative resource sharing that combines internal and external strengths to increase productivity and competitiveness (Cao and Zhang, 2011; Dyer, 2000). Partnerships with cocoa processing companies also offer other benefits to cocoa farmers, including access to superior cocoa seeds, safe pesticides, and modern farming equipment as part of CSR initiatives. This increase refers to cooperative relations in the cultivation process, raw material processing, and marketing. Bitzer et al. (2013), Wijaya et al. (2016), partnerships in the form of availability of information, cultivation materials, financial resources, services, or social support. A partnership structure that favors farmers can accelerate the spread of innovation and avoid loss of farming efficiency.

By sharing digital knowledge on farming and sharing market information, farmers' knowledge about farming techniques and market opportunities will also increase. This ultimately fosters confidence from collaboration partners to provide access to superior cocoa seeds for farmers as their collaborators. In the supply chain context, these findings are in line with the views of Min et al. (2005), Simatupang and Sridharan (2005), Mashavave et al., (2013), and Simatupang and Sridharan (2005) who mentioned that a collaborative information, communication efficiency, and knowledge sharing provide improves the ability to make better decisions and take action. Such practices occur, for example, in Central Sulawesi where PT OVI provides a superior seed nursery laboratory to ensure that the seeds handed over to farmers are certified. This laboratory will enable the production of quality cocoa seeds. Likewise, PT Cargill, JB Cocoa, and PT OVI provide online consultation services through WA groups formed with farmers. This application makes it easier for farmers to obtain information about the cultivation process for marketing. Increase knowledge and skills to optimize cocoa production. Considering only two CA pillars (resource investment and decision synchronization) that have a significant positive impact on obtaining access to superior cocoa seeds, hence hypothesis 2b is partially accepted.

4.2.3. Collaborative advantage outputs: Access to cocoa processing technology

A variable under trust building pillar of CA (risks sharing crop failure due to pests) and two variables under decision synchronization (sharing digital knowledge on farming and sharing market information), and also predicted collaborative effort expenditure have a statistically significant positive effect on the probability of access to cocoa processing technology. Sharing digital knowledge could provide mutual benefits, where one party provides added value knowledge and the other party provides access to cocoa processing equipment. This practice could reduce not only the cost of technology investment but also the cost of transactions to find appropriate technology in the markets. Leeuwis and Aarts (2011), Bliss et al. (2019), Nugroho

(2021), online forums can increase knowledge exchange between all actors in the innovation system, including marketing.

The process of sharing knowledge between farmers in Indonesia comppasses both formal and informal channels. Formal activities between farmers are held by the government (such as local and provincial agricultural agency and Bank of Indonesia) and company partners. These programs are designed to provide farmers with access to the latest agricultural research, technological advancements, and market trends. Through these meetings, farmers can exchange knowledge directly. Not only the government but also the company's partners also held meetings that brought together field extension officers and partner farmers. One of the companies in South Sulawesi, Comextra Co. formed a WhatsApp Group between field agricultural extension officers and partner farmers. This blend of formal and digital approaches reflects a modernized approach to agricultural cocoa knowledge dissemination, enhancing accessibility and efficiency.

The integration of digital technologies into knowledge-sharing practices among farmers is increasingly prevalent, particularly in regions like Southeast Sulawesi. Chiefs of LEM Sejahtera in the area utilize smartphones and digital platforms like WhatsApp groups to foster communication and collaboration among farmers. Moreover, the digital platform serves as a dynamic and accessible medium for exchanging information. Farmers can use digital media to seek advice, share experiences, and discuss challenges they face in their farming practices. This kind of active and transformational leadership is indispensable to drive the process of reviving cocoa development. Juhro and Aulia (2019) call this pattern a frugal innovation led by transformational leadership. Considering only two CA pillars (trust building and decision synchronization) significantly impacting access to cocoa processing technology, hence hypothesis 2c is partially accepted.

4.2.4. Joint probability of success

Based on the results of the CMP estimation for innovation outputs in **Table 5** we estimated the joint probability of success of the three CA outputs. The results are presented in the figures below:

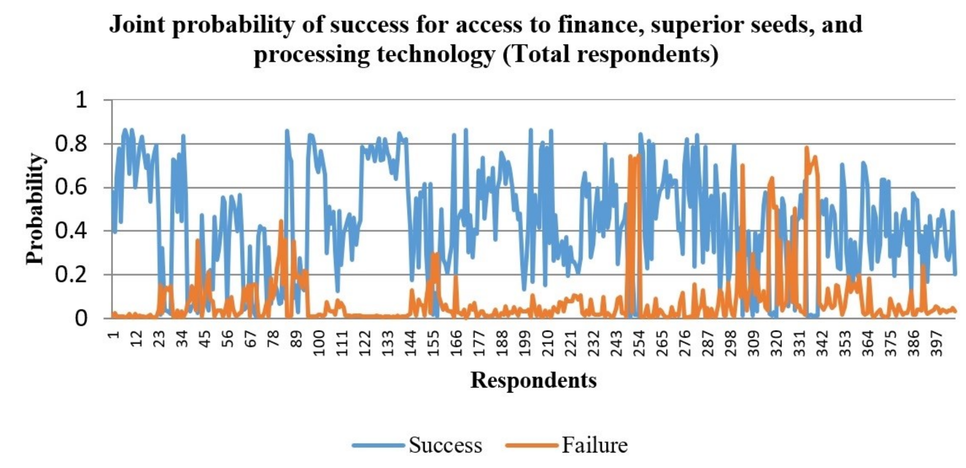

Figure 1. Probability of success and failure of obtaining the three CA outputs (Total respondents).

As shown in **Figure 1**, the average joint probability of a firm successfully obtaining all three CA outputs simultaneously is approximately 43%. Conversely, the average joint probability of failure is only 8.3%. Our findings indicate that farmers who join organizations or establish networks with their peers or cocoa processing companies have a higher joint probability of success at 48.4% compared to those who do not participate in farmer organizations or engage less actively in networking, with only 32.8% (refer to **Figure 2**). Hellin et al. (2015), Mwambi et al. (2020), that farmer organizations play an important role in providing production inputs and increasing business results.

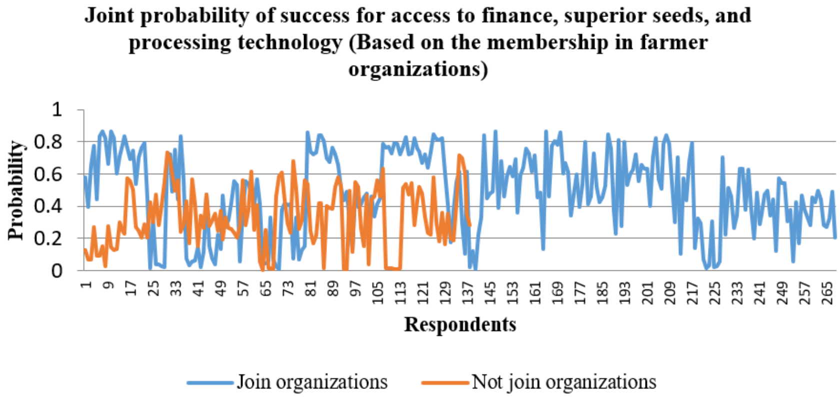

Figure 2. Probability of success of obtaining the three CA outputs (Based on the membership in farmers organizations).

4.3. Stage 3: Land productivity

The estimation results of stage three are presented in **Table 6**. This estimation reveals whether the successful output in the second stage as the effect of the three pillars of CA influences land productivity. In the estimation model, we add up three other variables (capability, land size, and cocoa price) as covariates. Capability constitutes the ability of the respondents on specific skills acquired through online learning via various social media. Meanwhile, the variable of land size is a proxy for the scale of economies, and cocoa price represents a market incentive mechanism that could attract the willingness of respondents to be involved in cocoa farming. Olesen and Bindi, (2002); Tothmihaly and Ingram, (2015), climate change and technical capability factors influence production levels. Wessel and Quist-Wessel, (2015); Padi et al., (2013) said that farmers cannot control the price of cocoa and multi-clonal planting patterns are a concern for farmers.

Table 6. Estimation results for the productivity stage.

Dependent variable: Land productivity	**Coef.**	**Robust Std. Err.**	
List of independent variables:			
Predicted probability of access to superior cocoa seeds	0.632	0.167	***
Farmer capability	0.227	0.080	**
Cocoa price	0.468	0.389	-
Land size	0.475	0.070	***

Table 6. (*Continued*).

Dependent variable: Land productivity	Coef.	Robust Std. Err.	
List of independent variables:			
R-squared	0.192		
Root MSE	0.781		
F	23.300		
Prob > *F*	0.000		
Number of obs	406		
Predicted probability OF access to cocoa processing technologies	0.552	0.159	***
Farmer capability	0.308	0.077	***
Cocoa price	0.414	0.383	-
Land size	0.486	0.070	***
R-squared	0.189		
Root MSE	0.782		
F(4, 401)	23.840		
Prob > *F*	0.000		
Number of obs	406		

* Significance at 10%, ** Significance at 5%, *** Significance at 1%.

We found that all CA outputs (the predicted probability of access to finance, access to superior cocoa seeds, and access to cocoa processing technologies) significantly affect land productivity. Among the three outputs, the predicted probability of access to superior cocoa seed is found to have the highest magnitude effects on land productivity. The estimated coefficient of 0.632 could have implied that 1% increasing the probability of access to superior cocoa seed would increase around 0.632% of land productivity. In addition to the predicted values of the three outputs, we found that farmers capability and land size are all provide significant positive effects on land productivity. It is important to pay attention to these factors to increase productivity and sustainability of cocoa businesses.

We, however, found that cocoa prices did not significantly affect productivity. In the context of this study, we cannot draw a direct conclusion that the cocoa price which is a market signal does not affect at all on cocoa productivity. The main possible reasons for this issue are twofold: First, this research uses cross-section data that only captures phenomena at the time of research without paying attention to historical price factors. At the time of the research conducted in June 2023, cocoa prices in general in Sulawesi were indeed declining. Second, price variability as presented in descriptive statistics is very low. This indicates that market failure might exist in the form of market control by large buyers which results in the market mechanism in the cocoa market not working properly. In addition, the high level of asymmetric information between farmers and buyers regarding cocoa price dynamics in the international market may also contribute to the inability to capture cocoa price fluctuations at the farmer level.

Regarding the capability variable, farmers in three provinces, South Sulawesi, Central Sulawesi, and Southeast Sulawesi have had decades of experience in cocoa farming, so they already know the appropriate cocoa cultivation techniques. However, there are various challenges in cocoa farming, both technical problems regarding the scarcity and high price of fertilizers and climate change. Climate change presents another alarming challenge for cocoa farmers. Climate change is one of the biggest threats to agricultural sustainability if we do not have the right adaptation strategy in place (Arham et al., 2024; Yuslaini et al., 2023). Not all the farmers recognize this issue as they are more concerned with the problem of cocoa pod borer. Changes in temperature and precipitation patterns may have profound effects on cocoa cultivation.

The increasing unpredictability of weather patterns, coupled with the occurrence of extreme weather events, poses a threat to the consistency and quality of cocoa production as experienced by the farmers in Sulawesi. These climatic changes can lead to critical problems, including increased susceptibility to pests and diseases, reduced pollination rates, and altered growing seasons, all of which can adversely impact crop yields. The farmers apply a planting system with a multi-clone concept, which is essential in cocoa cultivation as it significantly influences the pollination process. Based on various problems in cocoa farming, the government and partner companies should play an active role in realizing sustainable cocoa farming. This can be achieved by increasing agro-input (the use of planting materials and garden inputs, and reducing acidic soil pH with the addition of organic material). Implementing a multi-clone planting system can enhance cocoa production and improve the quality of cocoa beans. In addition, the farmers need to consider adopting a circular economy system that focuses on efficient organic waste management, energy-efficient production, and production processes to create more sustainable cocoa plantations amid the threat of climate change (Tumuyu and Marthalia, 2024).

Considering that access to finance, access to superior cocoa seeds, and access to processing technology influenced by CA pillars positively affect the productivity of smallholder cocoa producers, hence hypothesis 3 is accepted.

4.4. Robustness checks

Various methods were employed to assess the dependability of our model during the robustness tests, including the addition, removal, and modification of variables (Lu and White, 2014). For the robustness check at the stage 1 collaborative efforts to develop CA, we eliminated all covariates from the independent variables and keep the motivation to build CA as a main variable. We found that the result was significant. Meanwhile, in stage 2, CA outputs, we perform robustness checks by removing some variables and leaving the same four variables for all three equations in the multivariate probit. The four variables are predicted values of collaborative efforts to develop CA as the main variable, and the other three variables represent the three pillars of CA. The results are in accordance with the results of the initial estimate that the main variable, predicted value of collaborative efforts to develop CA significantly affects the probability of achieving all three CA outputs. Finally, for the stage 3 estimation, we conducted a robustness check by only including the predicted value of CA outputs as independent variables for land productivity, and the results all significantly affected productivity.

5. Conclusion

This research explores the link between collaborative advantage (CA) and productivity in smallholder cocoa producers in Indonesia. The proposed CA model focuses on three main pillars: inter-firm trust building, resource investment, and dynamic synchronization.

In the first stage of analysis, the model shows that having motivation to collaborate positively affects collaborative effort expenditure to develop a CA, with approximately 38% higher communication spending incurred by farmers who have a mindset and motivation to strengthen collaboration. Despite the informal nature of cooperation between farmers and cocoa processing companies, trust remains a vital component, particularly in the context of covering rising cocoa farming costs. Moving to the second stage finds that variables under resource investment (risks sharing crop failure due to pests) and variables under decision synchronization (sharing digital knowledge on farming and market information) significantly contribute to a higher probability of getting access to cocoa processing technology. Additionally, collaborative relational capital, characterized by fostering good relations with buyers, plays a pivotal role in expanding access to finance.

Transitioning to the third stage, analysis reveals significant improvements in land productivity associated with increased access to finance, superior cocoa seeds, and cocoa processing technologies. Notably, access to superior cocoa seeds exhibits the highest magnitude effect on land productivity by 0.63%. In addition, farmers' capabilities and land size also significantly contribute to productivity enhancement. Thus, the study concludes that the three pillars of Collaborative Advantage (inter-firm trust building, resource investment, and dynamic synchronization) contribute to varying degrees in achieving better access to essential resources and technologies, ultimately leading to productivity improvements.

This research contributes substantially to the literature on collaborative advantage and productivity issues by considering the unique characteristics of SMEs and their impacts on productivity. By examining collaborative relational capital as part of intangible variables within the resource investment pillar, our study complements existing literature that predominantly focuses on tangible characteristics. Furthermore, findings shed light on how synchronization of reactions to external shocks can mitigate transaction costs, thereby enhancing efficiency. We also offer practical implications for farmers and collaborative members along the value chains by proposing a collaborative framework that fosters reciprocal benefits. This implies a need for government support to strengthen collaboration among business entities across the cocoa industry's upstream to downstream lines.

While the results of this study are crucial and revealing, we have identified the constraints of this study. The use of cross-sectional data limits the ability to explore the causal relationship between collaboration efforts, outputs, and productivity, assuming simultaneous occurrence. Future research endeavors should consider employing panel data to provide a more comprehensive understanding of the results by incorporating temporal dynamics and various influencing factors. Additionally, investigating how collaboration evolves and its long-term effects on productivity would further enrich the literature in this field.

Author contributions: Conceptualization, ASH, AAM, and PP; methodology, ASH and AAM; software, ASH; validation, ASH, AAM and PP; formal analysis, ASH, AAM, PP and EN; investigation, ASH, AAM, PP and EN; resources, ASH, AAM, PP and EN; data curation, ASH, AAM, PP and EN; writing—original draft preparation, ASH, AAM, PP and EN; writing—review and editing, ASH; visualization, EN; supervision, ASH; project administration, EN; funding acquisition, ASH, AAM, PP and EN. All authors have read and agreed to the published version of the manuscript.

Data availability statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Funding: This research was funded by Bank of Indonesia under the scheme of Research Grant of Bank Indonesia (RGBI), Grant Number 25/13/PKS/BINS/2023, date 18 April 2023.

Acknowledgments: We extend our sincere gratitude to the Bank of Indonesia for funding our research. The contributions from researchers at the Bank of Indonesia Institute, which significantly enhanced the quality of our work, are deeply appreciated. Furthermore, we are thankful for the support provided by the Bank Indonesia Regional Office of South Sulawesi during our fieldwork.

Conflict of interest: The authors declare no conflict of interest.

Notes

1. There is a risk of selection bias in a simple estimation of Equation (1) because the amount of money spent on collaborative efforts can only be determined if farmers keep record of their spending. Hence, before estimating Equation (1), we use Heckman's (1979) selection model to check for selection and compensate for endogeneity. The sample selection test using Heckman's model reveals that the lambda coefficient is not statistically significant. It implies that there is no endogeneity issues in the Equation (1). The estimation results can be provided upon request.

References

Acclassato Houensou, D., Goudjo, G. G., & Senou, M. M. (2021). Access to finance and difference in family farm productivity in Benin: Evidence from small farms. Scientific African, 13, e00940. https://doi.org/10.1016/j.sciaf.2021.e00940

Adesiyan, T. F., Yesufu, O. A., & Kehinde, A. D. (2023). Impact of certification on market performance of cocoa industry in OSUN State, Nigeria. Social Sciences & Humanities Open, 8(1), 100692. https://doi.org/10.1016/j.ssaho.2023.100692

Arham, A., Salman, D., Kaimuddin, K., et al. (2023). Coffee farmers' knowledge construction about climate change. Journal of Infrastructure, Policy and Development, 8(1). https://doi.org/10.24294/jipd.v8i1.2818

Arifin, R., Ningsih, A. A. T., & Putri, A. K. (2021). The Important Role of MSMEs in Improving The Economy. South East Asia Journal of Contemporary Business, Economics and Law, 24(6), 52-59.

Awotide, B. A., Tahirou, A., Arega, A., & Victor, M. M. (2015). Impact of Access to Credit on Agricultural Productivity: Evidence from Smallholder Cassava Farmers in Nigeria. International Association of Agricultural Economists.

Ayon Ponce, G. I., Álvarez Indacochea, A. A., Salazar Moran, A. L., et al. (2024). Enhancing competitiveness in cocoa associations: An integral project management approach based on Porter's Diamond Model. Journal of Infrastructure, Policy and Development, 8(2). https://doi.org/10.24294/jipd.v8i2.2872

Bahtiar, B., Salman, D., Arsyad, M., et al. (2022). Synergy of Innovation between Hybrid Corn Seed Production and Seed Companies: A Review. AGRIVITA Journal of Agricultural Science, 44(3). https://doi.org/10.17503/agrivita.v44i3.3907

Bisbey, J., Nourzad, S. H. H., Chu, C.-Y., et al. (2020). Enhancing the efficiency of infrastructure projects to improve access to finance. Journal of Infrastructure, Policy and Development, 4(1), 27. https://doi.org/10.24294/jipd.v4i1.1175

Bitzer, V., Glasbergen, P., & Leroy, P. (2012). Partnerships of a feather flock together? An analysis of the emergence of networks of partnerships in the global cocoa sector. Global Networks, 12(3), 355–374. Portico. https://doi.org/10.1111/j.1471-0374.2011.00359.x

Bliss, K., Padel, S., Cullen, B., et al. (2018). Exchanging knowledge to improve organic arable farming: an evaluation of knowledge exchange tools with farmer groups across Europe. Organic Agriculture, 9(4), 383–398. https://doi.org/10.1007/s13165-018-0238-6

Borda, A., Morales, O., Teegen, H., et al. (2021). Addressing Sustainable Rural Development with Shared Value: A Peruvian Model from the Cacao Industry. Sustainability, 13(14), 8028. https://doi.org/10.3390/su13148028

Cao, M., & Zhang, Q. (2010). Supply chain collaboration: Impact on collaborative advantage and firm performance. Journal of Operations Management, 29(3), 163–180. Portico. https://doi.org/10.1016/j.jom.2010.12.008

Cho, W., Ke, J. F., & Han, C. (2019). An empirical examination of the use of bargaining power and its impacts on supply chain financial performance. Journal of Purchasing and Supply Management, 25(4), 100550. https://doi.org/10.1016/j.pursup.2019.100550

Choi, D., & Hwang, T. (2015). The impact of green supply chain management practices on firm performance: the role of collaborative capability. Operations Management Research, 8(3–4), 69–83. https://doi.org/10.1007/s12063-015-0100-x

Christinck, A., Rattunde, F., & Weltzien, E. (2019). Building collaborative advantages through long-term farmer–breeder collaboration. Farmers and Plant Breeding, 178–195. https://doi.org/10.4324/9780429507335-12

Corsi, S., Marchisio, L. V., & Orsi, L. (2017). Connecting smallholder farmers to local markets: Drivers of collective action, land tenure and food security in East Chad. Land Use Policy, 68, 39–47. https://doi.org/10.1016/j.landusepol.2017.07.025

Dania, W. A. P., Xing, K., & Amer, Y. (2018). Collaboration behavioural factors for sustainable agri-food supply chains: A systematic review. Journal of Cleaner Production, 186, 851–864. https://doi.org/10.1016/j.jclepro.2018.03.148

de Boer, D., Limpens, G., Rifin, A., et al. (2019). Inclusive productive value chains, an overview of Indonesia's cocoa industry. Journal of Agribusiness in Developing and Emerging Economies, 9(5), 439–456. https://doi.org/10.1108/jadee-09-2018-0131

Dyer, J. H. (2000). Collaborative Advantage. https://doi.org/10.1093/oso/9780195130683.001.0001

Ehrenhard, M., & Hoffmann, P. (2014). Better Off Alone?: SME Preferences for Joining a Cooperative Purchasing Group. Academy of Management Proceedings, 2014(1), 17748. https://doi.org/10.5465/ambpp.2014.17748abstract

Ellegaard, C. (2008). Supply risk management in a small company perspective. Supply Chain Management: An International Journal, 13(6), 425–434. https://doi.org/10.1108/13598540810905688

Fabbe-Costes, N., & Jahre, M. (2008). Supply chain integration and performance: a review of the evidence. The International Journal of Logistics Management, 19(2), 130–154. https://doi.org/10.1108/09574090810895933

Fauzi, A. A., Falah, M. A. F., & Suwondo, E. (2019). SWOT analysis and strategy formulation for cocoa small and medium enterprise development in Nglanggeran area, Gunung Kidul regency-Indonesia: the case of Taman Teknologi Pertanian. Journal of Physics: Conference Series, 1367(1), 012045. https://doi.org/10.1088/1742-6596/1367/1/012045

Fosu-Mensah, B. Y., Okoffo, E. D., & Mensah, M. (2022). Assessment of farmers' knowledge and pesticides management in cocoa production in Ghana. International Journal of Advanced and Applied Sciences, 9(3), 100-110.

Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. Journal of Operations Management, 19(2), 185-200. http://dx.doi.org/10.1016/S0272-6963(00)00055-3

Hafid, H., & McKenzie, F. (2012). Understanding farmer engagement in the cocoa sector in Sulawesi: a rapid assessment. University of Sydney and Australian Centre for International Agricultural Research, October.

Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. Industrial Marketing Management, 31(4), 367-382. https://doi.org/10.1016/S0019-8501(01)00169-9

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: capability lifecycles. Strategic Management Journal, 24(10), 997–1010. Portico. https://doi.org/10.1002/smj.332

Hellin, J., Lundy, M., & Meijer, M. (2015). Farmer Organization, Collective Action and Market Access in Meso-America. Food Policy, 34(1), 16-22. https://doi.org/10.1016/j.foodpol.2008.10.003.

Hidayat, A. S., & Pok, W. C. (2023). 14 Modelling the Collaborative Advantage of SMEs in Pursuit of Competitiveness: An Emerging Economy Case. De Gruyter Handbook of SME Entrepreneurship, 301–326. https://doi.org/10.1515/9783110747652-015

Hidayat, A., Syarip. (2020). The trinity of key competitiveness sources for SMEs in an emerging economy: credit access, innovation, and collaborative advantage [PhD thesis]. Flinders University, Australia.

Huxham, C., & Vangen, S. (2005). Managing to Collaborate: The Theory and Practice of Collaborative Advantage. New York, United States: Routledge.

Jap, S. D. (2001). Perspectives on joint competitive advantages in buyer-supplier relationships. International Journal of Research in Marketing, 18(1-2), 19-35. https://doi.org/10.1016/S0167-8116(01)00028-3

Juhro, S. M., & Aulia, A. F. (2019). New sources of growth: the role of frugal innovation and transformational leadership. Buletin Ekonomi Moneter Dan Perbankan, 22(3), 383–402. https://doi.org/10.21098/bemp.v22i3.1195

Jüttner, U. (2005). Supply chain risk management. The International Journal of Logistics Management, 16(1), 120–141. https://doi.org/10.1108/09574090510617385

Kadarisman, M. (2019). The influence of government and MUI mediations towards marketing strategy of Warteg and its impact on developing MSMEs in Jakarta, Indonesia. Cogent Business & Management, 6(1). https://doi.org/10.1080/23311975.2019.1629096

Kenis, P., & Raab, J. (2020). Back to the Future: Using Organization Design Theory for Effective Organizational Networks. Perspectives on Public Management and Governance, 3(2), 109–123. https://doi.org/10.1093/ppmgov/gvaa005

Kennedy, P. E. (1981). Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations. American Economic Review, 71(4), 801-801.

Kohnova, L., & Papula, J. (2019). Proceedings of the 10th European Conference on Intangibles and Intellectual Capital. University of Chieti-Pescara, Italy.

Koufteros, X., Vonderembse, M., & Jayaram, J. (2005). Internal and External Integration for Product Development: The Contingency Effects of Uncertainty, Equivocality, and Platform Strategy. Decision Sciences, 36(1), 97–133. Portico. https://doi.org/10.1111/j.1540-5915.2005.00067.x

Lee, M., Han, X., Gaspar, R., et al. (2019). Deriving macroeconomic benefits from public–private partnerships in developing Asia. Journal of Infrastructure, Policy and Development, 3(1), 1. https://doi.org/10.24294/jipd.v3i1.1082

Leeuwis, C., & Aarts, N. (2011). Rethinking Communication in Innovation Processes: Creating Space for Change in Complex Systems. The Journal of Agricultural Education and Extension, 17(1), 21–36. https://doi.org/10.1080/1389224x.2011.536344

Leksono, A. S., Mustafa, I., Gama, Z. P., et al. (2021). Organic cocoa farming in Indonesia: constraints and development strategies. Organic Agriculture, 11(3), 445–455. https://doi.org/10.1007/s13165-021-00351-5

Lew, Y. K., Sinkovics, R. R., & Kuivalainen, O. (2013). Upstream internationalization process: Roles of social capital in creating exploratory capability and market performance. International Business Review, 22(6), 1101–1120. https://doi.org/10.1016/j.ibusrev.2013.03.001

Li, G., Fan, H., Lee, P. K. C., et al. (2015). Joint supply chain risk management: An agency and collaboration perspective. International Journal of Production Economics, 164, 83–94. https://doi.org/10.1016/j.ijpe.2015.02.021

Li, J., Ma, W., & Gong, B. (2023). Market participation and subjective well-being of maize farmers. Economic Analysis and Policy, 80, 941–960. https://doi.org/10.1016/j.eap.2023.09.037

Lin, F.-J., & Lin, Y.-H. (2016). The effect of network relationship on the performance of SMEs. Journal of Business Research, 69(5), 1780–1784. https://doi.org/10.1016/j.jbusres.2015.10.055

Lin, Y., & Wu, L.-Y. (2014). Exploring the role of dynamic capabilities in firm performance under the resource-based view framework. Journal of Business Research, 67(3), 407–413. https://doi.org/10.1016/j.jbusres.2012.12.019

Lu, X., & White, H. (2014). Robustness checks and robustness tests in applied economics. Journal of Econometrics, 178, 194–206. https://doi.org/10.1016/j.jeconom.2013.08.016

Managanta, A. A., Sumardjo, S., Sadono, D., et al. (2019). Factors Affecting the Competence of Cocoa Farmers in Central Sulawesi Province. Jurnal Penyuluhan, 15(1). https://doi.org/10.25015/penyuluhan.v15i1.20966

Managanta, A. A., Sumardjo, Sadono, D., & Tjitropranoto, P. (2018b). Interdependence of Farmers and Increasing Cocoa Productivity in Central Sulawesi Province, Indonesia. Journal of Economics and Sustainable Development, 9(6), 98-108.

Managanta, A. A., Sumardjo, Sadono, D., & Tjitropranoto, P. (2022). Strategy to increase farmers' productivity cocoa using structural equation modeling. IOP Conference Series: Earth and Environmental Science, 1107(1), 012105. https://doi.org/10.1088/1755-1315/1107/1/012105

Manalu, R. (2019). Quality Management of Smallholder Cocoa Beans through Fermentation Technology to Gain Better Economic Value (Indonesian). Jurnal Ekonomi Dan Kebijakan Publik, 9(2), 99–112. https://doi.org/10.22212/jekp.v9i2.1006

Manimala, M. J., Wasdani, K. P., & Vijaygopal, A. (2019). Transnational entrepreneurship issues of SME internationalization in the Indian context, 1st ed. Singapore.

Mbudzya, J. J., Gido, E. O., & Owuor, G. (2022). Effect of land tenure security on agricultural productivity among small scale farmers in Kenya: a conditional mixed processes analysis. Cogent Food & Agriculture, 8(1). https://doi.org/10.1080/23311932.2022.2139805

Min, S., Roath, A. S., Daugherty, P. J., et al. (2005). Supply chain collaboration: what's happening? The International Journal of Logistics Management, 16(2), 237–256. https://doi.org/10.1108/09574090510634539

Moriarty, K., Elchinger, M., Hill, G., et al. (2014). Cacao Intensification in Sulawesi: A Green Prosperity Model Project. Office of Scientific and Technical Information (OSTI). https://doi.org/10.2172/1156964

Mthombeni, D. L., Antwi, M. A., & Oduniyi, O. S. (2022). Factors influencing access to agro-processing training for small-scale crop farmers in Gauteng province of South Africa. Agriculture & Food Security, 11(1). https://doi.org/10.1186/s40066-022-00370-9

Mwambi, M., Bijman, J., & Mshenga, P. (2020). Which type of producer organization is (more) inclusive? Dynamics of farmers' membership and participation in the decision-making process. Annals of Public and Cooperative Economics, 91(2), 213–236. Portico. https://doi.org/10.1111/apce.12269

Negi, D. S., Birthal, P. S., Roy, D., et al. (2018). Farmers' choice of market channels and producer prices in India: Role of transportation and communication networks. Food Policy, 81, 106–121. https://doi.org/10.1016/j.foodpol.2018.10.008

Neilson, J., Dwiartama, A., Fold, N., et al. (2020). Resource-based industrial policy in an era of global production networks: Strategic coupling in the Indonesian cocoa sector. World Development, 135, 105045. https://doi.org/10.1016/j.worlddev.2020.105045

Nugraha, A., Heryanto, M. A., Wulandari, E., et al. (2019). Heading towards sustainable cacao agribusiness system (a case study in North Luwu, South Sulawesi, Indonesia). IOP Conference Series: Earth and Environmental Science, 306(1), 012035. https://doi.org/10.1088/1755-1315/306/1/012035

Nugroho, A. D. (2021). Agricultural market information in developing countries: A literature review. Agricultural Economics (Zemědělská Ekonomika), 67(11), 468–477. https://doi.org/10.17221/129/2021-agricecon

Nur Indah, P., Setiawan, R. F., Hendrarini, H., et al. (2021). Agriculture supply chain performance and added value of cocoa: a study in Kare Village, Indonesia. Bulgarian Journal of Agricultural Science, 27(3).

Nyaga, G. N., Whipple, J. M., & Lynch, D. F. (2009). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? Journal of Operations Management, 28(2), 101–114. Portico. https://doi.org/10.1016/j.jom.2009.07.005

Olesen, E. J., & Bindi, M. (2002). Consequences of climate change for European agricultural productivity. European Journal of Agronomy, 16(2002), 239-262. https://doi.org/10.1016/S1161-0301(02)00004-7

Olutumise, A. I. (2022). Determinants of market participation and preference for production of pepper (Capsicum spp.) among farmers in southwest, Nigeria. Heliyon, 8(9), e10585. https://doi.org/10.1016/j.heliyon.2022.e10585

Padi, F. K., Takrama, J., Opoku, S. Y., et al. (2013). Early-Stage Performance of Cocoa Clones Relative to Their Progenitor Ortets: Implications for Large-Scale Clone Selection. Journal of Crop Improvement, 27(3), 319–341. https://doi.org/10.1080/15427528.2013.768319

Prajogo, D., & McDermott, C. M. (2013). Antecedents of Service Innovation in SMEs: Comparing the Effects of External and Internal Factors. Journal of Small Business Management, 52(3), 521–540. https://doi.org/10.1111/jsbm.12047

Purba, H. H., Syamsul Maarif, M., Yuliasih, I., et al. (2018). Product Development of Chocolate with Quality Function Deployment Approach: A Case Study in SMEs Chocolate Industry in Indonesia. IOP Conference Series: Earth and Environmental Science, 209, 012011. https://doi.org/10.1088/1755-1315/209/1/012011

Qiang, M., Dampitakse, K., & Tancho, N. (2023). Unveiling the connection among customer concentration, trade credit financing, and firm performance: A moderated mediation model. Journal of Infrastructure, Policy and Development, 8(2). https://doi.org/10.24294/jipd.v8i2.3178

Sahiti, F. (2019). The Growth of Firms in Less-Developed Countries. Springer International Publishing. https://doi.org/10.1007/978-3-030-14821-8

Semrau, T., Ambos, T., & Sascha Kraus. (2016). Entrepreneurial orientation and SME performance across societal cultures: An international study. Journal of Business Research, 69(5), 1928–1932. https://doi.org/10.1016/j.jbusres.2015.10.082

Sheu, C., Rebecca Yen, H., & Chae, B. (2006). Determinants of supplier-retailer collaboration: evidence from an international study. International Journal of Operations & Production Management, 26(1), 24–49. https://doi.org/10.1108/01443570610637003

Simatupang, T. M., & Sridharan, R. (2005). An integrative framework for supply chain collaboration. The International Journal of Logistics Management, 16(2), 257–274. https://doi.org/10.1108/09574090510634548

Sridharan, R., & Simatupang, T. M. (2013). Power and trust in supply chain collaboration. International Journal of Value Chain Management, 7(1), 76. https://doi.org/10.1504/ijvcm.2013.057344

Subramaniam, P. L., Iranmanesh, M., Kumar, K. M., et al. (2019). The impact of multinational corporations' socially responsible supplier development practices on their corporate reputation and financial performance. International Journal of Physical Distribution & Logistics Management, 50(1), 3–25. https://doi.org/10.1108/ijpdlm-01-2019-0002

Sucipto, S., Ariani, I., & Wulandari, S. (2022). Continuous Quality Improvement by Statistical Process Control Implementation in Cocoa Agroindustry. IOP Conference Series: Earth and Environmental Science, 1024(1), 012073. https://doi.org/10.1088/1755-1315/1024/1/012073

Tothmihaly, A., & Ingram, V. (2015). How can the productivity of Indonesian cocoa farms be increased? AgEcon Search, 1-33.

Transnational Entrepreneurship. (2019). In M. J. Manimala, K. P. Wasdani, & A. Vijaygopal (Eds.), Entrepreneurship and Development in South Asia: Longitudinal Narratives. Springer Singapore. https://doi.org/10.1007/978-981-10-6298-8

Welbourne, T. M., & Pardo-del-Val, M. (2008). Relational Capital: Strategic Advantage for Small and Medium-Size Enterprises (SMEs) Through Negotiation and Collaboration. Group Decision and Negotiation, 18(5), 483–497. https://doi.org/10.1007/s10726-008-9138-6

Wessel, M., & Quist-Wessel, P. M. F. (2015). Cocoa production in West Africa, a review and analysis of recent developments. NJAS: Wageningen Journal of Life Sciences, 74–75(1), 1–7. https://doi.org/10.1016/j.njas.2015.09.001

Wijaya, A., Glasbergen, P., Leroy, P., et al. (2016). Governance challenges of cocoa partnership projects in Indonesia: seeking synergy in multi-stakeholder arrangements for sustainable agriculture. Environment, Development and Sustainability, 20(1), 129–153. https://doi.org/10.1007/s10668-016-9874-8

Wu, Z., & Pullman, M. E. (2015). Cultural embeddedness in supply networks. Journal of Operations Management, 37(1), 45–58. Portico. https://doi.org/10.1016/j.jom.2015.06.004

Xiong, W., Zhao, S., Liu, Y., et al. (2023). Can participating in standards development improve enterprise performance? Evidence from China's high-tech industry. Journal of Infrastructure, Policy and Development, 8(1). https://doi.org/10.24294/jipd.v8i1.3014

Xu, L., & Tan, J. (2020). Financial development, industrial structure and natural resource utilization efficiency in China. Resources Policy, 66, 101642. https://doi.org/10.1016/j.resourpol.2020.101642

Yaldız Hanedar, E., Broccardo, E., & Bazzana, F. (2014). Collateral requirements of SMEs: The evidence from less-developed countries. Journal of Banking & Finance, 38, 106–121. https://doi.org/10.1016/j.jbankfin.2013.09.019

Yuslaini, N., Sumadinata, R. W. S., Fedryansyah, M., et al. (2023). Sustainable investment strategies in the palm oil industry in Indonesia. Journal of Infrastructure, Policy and Development, 7(3). https://doi.org/10.24294/jipd.v7i3.2288

Zaman, S. I., Khan, S. A., & Kusi-Sarpong, S. (2023). Investigating the relationship between supply chain finance and supply chain collaborative factors. Benchmarking: An International Journal. https://doi.org/10.1108/bij-05-2022-0295

Zhang, H., & Wu, D. (2023). The Impact of Agricultural Factor Inputs, Cooperative-Driven on Grain Production Costs. Agriculture, 13(10), 1952. https://doi.org/10.3390/agriculture13101952

Zhang, S., Sun, Z., Ma, W., et al. (2020). The effect of cooperative membership on agricultural technology adoption in Sichuan, China. China Economic Review, 62, 101334. https://doi.org/10.1016/j.chieco.2019.101334

Zhu, Q., Tongkong, S., & Tancho, N. (2023). Corporate social capital and enterprise performance of technology-based SMEs: The mediating role of knowledge integration ability. Journal of Infrastructure, Policy and Development, 2024(1), 2726. https://doi.org/10.24294/v8i1.2726

Zulu-Chisanga, S., Chabala, M., & Mandawa-Bray, B. (2020). The differential effects of government support, inter-firm collaboration and firm resources on SME performance in a developing economy. Journal of Entrepreneurship in Emerging Economies, 13(2), 175–195. https://doi.org/10.1108/jeee-07-2019-0105