Competing Explanations for Indonesian Smallholder Participations in Sustainability Coffee Certifications

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Abstract
The literature provides four competing explanations for farmer participation in sustainability standards and certification schemes: socio-demographic, economic, attitudinal, and institutional. However, little is known about the relative importance of these explanations. Knowledge about the relative importance is believed to lead to more effective standard implementation and smallholder inclusion. Up to now researchers provide different explanations for participation, and this paper aims to contribute to the literature by bringing some order in the current explanations. To assess the importance of the explanations mentioned in the literature, we collected questionnaire-data from Indonesian coffee smallholders in the producing provinces of Aceh and Lampung, including 160 coffee farmers registered with global certification schemes (i.e. Rainforest Alliance, Utz certified, 4C, and Fair Trade), and uncertified farmers. The data were analysed with binary logistic regression. The results indicate that from the four competing explanations, the economic explanation is the most important, followed by the socio-demographic, institutional, and attitudinal explanations. Within the economic explanation, the prospect of a price premium and the prospect of increased productivity can be considered the most important motivations behind farmers' participation. However, the prospect of increased productivity was only prevalent among farmers participating in 4C and Fairtrade. Utz and Rainforest Alliance farmers did not expect their productivity to increase through certification prior to their participation in the schemes. Given these results, we conclude that it is difficult to establish a blue print for participation for all type of farmers.
Keywords: sustainability certification, coffee certification, binary logistic regression, farmer participation, explanation for participation, Indonesia

1. Introduction

Since the last two decades, we can observe a steady growing number of private sustainability standards and certification schemes to address sustainability issues in the coffee sector (Glasbergen and Schouten, 2015). These schemes are commonly initiated by Northern-based businesses and NGOs and govern the production of coffee in the South (Bitzer and Glasbergen, 2015; Bitzer, Glasbergen, and Arts, 2013; Arifin, 2010). These certification schemes do not only regulate production and processing methods related to better environmental and social conditions, but also aim to open opportunities for better market access, improve competitiveness of Southern farmers, improve rural livelihoods, and contribute to poverty alleviation (Hoffmann and Grothaus, 2015).

Various certification schemes with many sustainability claims exist and compete with each other, in the coffee sector (Reinecke, Manning, and Von Hagen, 2012). Although participation is voluntary, the standards and certification schemes gradually put more pressure on the coffee markets and induce a change in the way production at the local level is managed. The standards and certifications have become de facto market requirements for suppliers of developing countries to be able to enter international markets (Bitzer, Glasbergen, and Arts, 2013). The specific characteristics and conditions of the countries where the certification schemes are implemented can influence the adoption of the certifications (Manning et al., 2012). In the South, Indonesia is a country with a significant coffee producing sector characterized by a large number of small farmers (i.e. around 4 million smallholders) who share 1.27 million hectares of coffee land across the country (Wahyudi and Jati, 2012). Some of the leading coffee certification schemes are active in Indonesia, such as Utz certified, 4C, Rainforest Alliance (RA), and Fair Trade (FT). However, as only 7% of the exported Indonesian coffee is certified (SCP, 2014), the certification adoption rate can be considered very low (around a few per cent of the Indonesian smallholders).

Although farmers may benefit from certification, they are often hesitant to join the programs, as this requires them to change their behaviour and agricultural practices. Furthermore, participation in certification changes the relationships with other actors, such as local traders or middlemen (Wahyudi and Jati, 2012). These changes are often regarded as a sensitive issue in the Indonesian context where social relations are an important element within the social structure and need to be preserved. Through changes in the social structure and daily practices, the implementation of the certification schemes can therefore affect the whole network of actors in the Indonesian coffee value chain.

In this context, and given the discussion about (potential) benefits in the literature (Subervie and Vagneron, 2013; Becchetti and Costantino, 2008; Rueda and Lambin, 2013), it is important to develop knowledge about farmers' decisions to participate in the certification schemes. However, up to now researchers provide

different explanations for participation. We observe that these explanations can be clustered into four dominant ones: socio-demographic, economic, attitudinal, and institutional explanations.

This paper aims to contribute to the discussions about motivations to participate by bringing some order in the current explanations. We particularly aim to answer the question of the relative importance of the various explanations. Therefore, we reformulated the explanations into hypotheses and connected variables to each of them, which were further operationalized in relevant items. These items were used to develop structured questionnaires, which were filled-out in personal interviews with farmers in Indonesia. In the next section, we present the hypotheses based on a literature review. In section three and four we describe our methods (operationalization of the hypotheses, binary logistic regression and an overview of our respondents) and present our results. Section five contains conclusions and a reflection.

2. Explanations for smallholder participation in sustainability coffee certification: a review of the literature

The literature on farmer participation in sustainability certification schemes is rather rich of explanations. Based on a review of this literature, we can distinguish at least four categories of explanations.

The first category refers to economic motivations. Loconto and Dankers (2014), for example, observed in their review of the impact of voluntary standards on market participation in developing countries that prospects for higher profitability will influence whether or not smallholders participate in certified value chains. Ibnu et al. (2015) found that poor coffee farmers in Indonesia have a high expectation of the tangible economic benefits of the certification programmes through a price premium. Rueda and Lambin (2013) showed that the promise of a premium was the reason why 60% of certified Colombian coffee farmers in their research decided to join the program; while 96% referred to economic benefits as increased productivity and better quality coffee beans (Rueda and Lambin, 2013).

Based on the results of these studies we formulate the following hypothesis:

Farmers who perceive that joining certification is ideally needed for obtaining a price premium, increased productivity and quality are likely to join certification programs.

The second category refers to social-demographic characteristics of the farmers. First, there is some evidence that farm size is positively correlated with participation in certifications (Loconto and Dankers, 2014). Second, research on coffee farmers in Africa showed that certification seems to be particularly attractive for farmers for whom coffee is their main source of income, and who depend less on other crops or off-farm activities to gain their income (Hoebink et al., 2014). Third, research among different categories of farmers in different countries (e.g., Sri Lanka, Rwanda) indicates that farmers who are younger and better educated are generally regarded more receptive to a wider range of practices and the adoption of new technologies (Illukpitiya and Gopalakrishnan, 2004; Mujawamariya, D'Haese, and Speelman, 2013).

Based on the results of these studies we formulate a second hypothesis:

Farmers who are younger and better educated, own larger farms, and for whom coffee is their main source of income, are likely to join a certification program.

The third category refers to attitudinal explanations. First, we found evidence suggesting that risk-taking farmers in developing countries are more likely to adopt new conservation practices compared to farmers who prefer to play it safe (De Graaff et al., 2008; Hoebink et al., 2014) . Second, we found that a pro-active attitude towards seeking information can be positively correlated to participation in certification. Kessler (2006), for example, found that Bolivian farmers' pro-active attitude in seeking information corresponds to their willingness to change, to improve, and to participate in conservation adoption and investment programs. The third type of attitude that is acknowledged to play a role in certification adoption refers to the attitude towards the environment. According to Nuva et al. (2013) and Rueda and Lambin (2013), certified Colombian and Indonesian coffee farmers have a relatively positive attitude towards the environment. Besides, they were found to express concerns regarding the substantial use of agrochemical substances and the limited use of organic input, and shade trees for enhancing biodiversity in coffee plantations. As these farmers may have had a positive environmental attitude prior to joining certification already, and as this may be an explanatory factor for participation, we decided to include this variable in the hypothesis. Based on the findings of these attitudinal studies we formulate the third hypothesis:

Farmers with a risk-taking attitude, who pro-actively seek information, and who have a positive attitude towards the environment are likely to participate in coffee certifications.

The fourth and last category refers to institutional explanations. Empirical studies have positively linked the existence of producer associations (or farmer groups) to the abilities of Brazilian and Indonesian coffee farmers to participate in certification schemes (Nuva et al., 2013; Pinto et al., 2014). These authors specifically refer to farmer groups' roles in organising collective work and group farming systems, in their contribution in overcoming individual limitations such as capital shortcomings, or a lack of knowledge or skills, to explain the positive link between membership of a farmer group and participation in certification (Nuva et al., 2013; Pinto et al., 2014). Next to farmer groups, cooperatives are also found to play important roles in connecting farmers to coffee

certification schemes in Brazil and Indonesia (Nuva et al., 2013; Pinto et al., 2014). More specifically, the cooperatives' technical support, coordination in buying up coffee beans, and their role in the provision of information are believed to positively contribute to farmer's participation in certification schemes (Nuva et al., 2013). Third, and following Nuva et al. (2013), the distance of farmer's households to cooperatives is believed to correlate negatively to farmer's participation in certification.

Based on the previous studies, and following the fact that the Indonesian KUBEs (*Kelompok Usaha Bersama*) have the same institutional set-up and roles as cooperatives in other developing countries (see Ibnu et al., 2015 for more information), we formulate a fourth hypothesis:

Farmers who are institutionally embedded in well-functioning farmer groups and cooperatives or KUBEs, and who live relatively close to cooperatives or KUBES[1] are likely to join certification programs.

3. Methodology
The operationalization of the hypotheses

We designed the questions for both certified and uncertified farmers based on the operationalization of the variables in the hypotheses (see Table 1). All the questions can be found in Appendix A.

Table 1. Operationalization of the variables

Explanation	Variable	Operationalization	Unit of measurement
Economic	Price premium	Prospect of price premium	A five-point-likert scale
	Increased productivity	Prospect of increased productivity	
	Improved quality	Prospect of increased quality	
Socio-demographic	Dependency on other sources of incomes	● Income from other crops and off-farm activities	Rupiah
	Coffee as main source of income	● Income coffee minus incomes from other crops and off-farm activities.	Value 1 if the income is positive, and value 0 if negative.
	Farm size	Farm size	Hectare
	Age	Age	Years
	Education	Education	Years
Attitudinal	Environmental concerns	● Environmental farm management ● Reducing chemical inputs ● Increasing organic input ● Increasing shade trees	A five-point-likert scale
	Taking risk	● Taking opportunities ● Avoidance/ playing it safe	A five-point-likert scale
	Seeking information	● Pro-actively seeking information ● Increasing knowledge by discussion	A five-point-likert scale
Institutional	Embeddedness in well-functioning farmer groups	● Regular meetings ● Collective actions ● *Arisan*/ community gatherings ● *Gotong royong*/ communal work ● Collecting, processing and bargaining	A three-point-likert scale
	Embeddedness in well-functioning KUBES	● Information provision ● Facilitation/ support in buying and contacting ● Increase market access ● Support in managing finances	
	Presence of near-by Cooperative or KUBE	Distance between farmer's household and KUBE	Kilometres

The economic benefits were measured through the prospects of price premium, productivity, and quality. We asked the certified farmers whether the three prospects drove their decisions to participate in the standards. In contrast, we asked the uncertified producers whether they do not join the certifications because they lack confidence in the realization of the prospects.

Coffee as main source of income is, following the earlier presented hypothesis on socio-demographic

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[1] KUBEs are joint business groups consisting of different producer groups that partner with a certificate holder and transport the coffee beans to the roasting companies or exporters after cleaning and drying the coffee beans.

explanations, also considered as a variable in this study. We operationalized this variable by measuring the magnitude of coffee income relative to non-coffee income (i.e., income that farmers obtain from selling other crops like banana, avocado, pepper and orange and doing off-farm activities). We calculated the relative magnitude by subtracting the non-coffee income (in Rupiah) from the coffee income (in Rupiah), and gave value 1 if the income from coffee is larger than the non-coffee income, and value 0 if the opposite is true. An important conceptual difficulty in measuring this variable relates to the fact that the current coffee income is probably influenced by the impacts of certification, whereas we basically want to measure the coffee- and non-coffee income before joining certification. We further measured the variables of age and education in years, and farm sizes in hectares.

The attitudinal explanation was measured by evaluating the farmers' perceptions of ideal conditions in the case of environmental perception, and the reality of their practices in the case of seeking information and taking risk. This way of measuring enabled us to evaluate the respondents' attitude if they are given a similar situation or choice. The current literature shows that certified farmers, prior to their decision to participate in coffee certification, tend to be more concerned about the environment than conventional farmers (Rueda and Lambin, 2013). As we acknowledge that being concerned about the environment does not necessarily go together with the execution of conservation practices (for example because of budget constraints) we measured perceptions of the environment in an ideal situation. More specifically, the variable on environmental concerns is operationalized through asking how the ideal management of the farm would look like, and whether the use of chemical inputs, organic inputs and shade trees should ideally be lowered (chemical inputs) or increased (organic input and shade trees) even if this lowers profits. Literature on the attitude towards risk and seeking information explicitly refer to actual behaviour. The attitude towards risk was measured through asking whether farmers easily take opportunities and whether they prefer to play it safe. We also asked the certified farmers whether they joined certification because they had the opportunity to do so, and we asked the uncertified farmers whether they would consider certification adoption whenever there is an opportunity. Seeking information was measured in two questions: one focusing on the general idea of seeking information, and one question on gaining information through pro-actively discussing with others.

The institutional explanation was operationalized by asking the farmers whether they are part of farmers groups, cooperatives or KUBEs and whether they believe that these groups function well in terms of organizing periodic informal meetings to discuss farming-related issues; sharing knowledge and information; organizing collective actions to buy farm inputs (e.g. fertilizers, seeds, and tools); sharing costs (e.g. to buy hulling coffee machine); organizing community gatherings (*arisan)*; organizing *gotong royong* (i.e. a form of communal work or mutual aid) to build terraces, drain terraces, and ridges; supporting in post-harvest activities to collect, process, and control the quality of coffee harvests; and representing the members in bargaining with cooperatives or KUBEs.

For the Cooperative or KUBE we added functions related to the provision of information about coffee certification programs, markets and new technologies. Also their roles in contacting extension agents or experts from universities to give advice, trainings, seminars or workshops were included in the questionnaire. Cooperatives and KUBEs have further roles to improve the market access to exporting firms, provide a better market option than selling to conventional markets, manage the financial savings of members, give credits or loans to its members, and pay farmers on time. Finally, we measured the distance between a farmer's household and a KUBE.

Binary logistic regression

The strength of an explanation is determined by the relative importance of the variables in explaining the decision to participate or not. To measure the variables' relative importance we used a binary logistic regression model with two categorical dependent variables or outcomes (farmers who are certified and therefore took the decision to participate, and uncertified farmers who decided not to participate) (Adrian, Norwood, and Mask, 2005; Allison, 1999; Babatunde et al., 2010; Clancy et al., 2011; Edwards-Jones, 2006; Strano and Colosimo, 2006). Binary logistic regression models are considered a strong and robust method for predicting categorical outcomes influenced by a set of independent variables which have different scales of measure (O'Connell, 2006; Strano and Colosimo, 2006). The advantage of a logistic regression model over a common ordinal regression model is that the former is developed through a nonlinear transformation of the outcomes. It allows in other words to eliminate assumptions of homoscedasticity and normality of errors, which is considered an important weakness of an ordinary linear regression model (O'Connell, 2006).

To evaluate the economic and the attitudinal explanations, we used a five-point-Likert-scale, ranging from 1 (strongly disagree) to 5 (strongly agree). For the institutional explanation, we used a three-point scale ranging from 0 (institutions do not fulfil the mentioned roles), through 1 (institutions sometimes fulfil the mentioned roles) to 2 (institutions fully fulfil the mentioned roles). For the socio-demographic explanations, we measured all items, except for the earlier explained "coffee as main source of income" on a scale level.

To analyse our data, we follow a two-step approach. First, we run individual regressions for the four explanations. Each regression is independent from the other regressions. This allows us to analyse the influence of each explanation on participation individually. In the second step, we select all variables from the four explanations, and include them in a simultaneous (full) regression model. Afterwards, we compare the results of

the two steps, and reformulate the new and final hypotheses. Differences in the results between the two steps indicate the presence of other explanatory variables for participation, and/or the existence of mutual influences between the independent variables. In the first step, a variable can mistakenly be interpreted as an explanatory factor for participation whereas it is directly influenced by another variable that, on its turn explains both participation and the wrongly assumed variable.

The certified farmers participated in different certification schemes. We used the One Way Anova test to analyse potential differences in answers among schemes. The relative strength of each explanation is determined by the B coefficient of the variables in the regression model which have a P-value of 0.05 or lower, and the sign of the coefficient (positive or negative) show the directions of the influences of the variables to the farmer participations. We summed the B-values of the individual, significant variables to obtain an overall B value per explanation. To explain the strength of the combined explanations we calculated the pseudo R square, which is considered similar to R square in an ordinary regression, for variables that significantly explain participation. The pseudo R squared calculations consist of Cox & Snell R Square and Nagelkerke R Square and approximate how much of the variation in the dependent variables can be explained by the model (Archer, Lemeshow, and Hosmer, 2007) and has a value between 0 and 1. Generally, the bigger the pseudo R square the better the model in explaining certification participations. We also use the so-called Hosmer and Lemeshow Test which is a statistical measure for goodness of fit (GoF) that should be larger than 0.05 to conclude that the model fits the data well. We also determined multicollinearity in the logistic regression solution by examining the standard errors for the b coefficients. A variable with a standard error larger than 2.0 indicates that the variable has a multicollinearity problem with other independent variables and will therefore be excluded in the further analysis (Allison, 1999).

Respondent selection and characteristics

We interviewed coffee farmers in Aceh (i.e., Bandar District) and Lampung (i.e., Tanggamus and West Lampung Districts) provinces. In Indonesia, Aceh and Lampung are known as significant coffee producing regions where the farmers cultivate Arabica and Robusta coffee respectively. The Arabica farmers in the Bandar District mostly participate in the Fair Trade (FT) scheme, whereas the Robusta producers joined Rainforest Alliance (RA), Utz certified, and 4C certifications. The competition among the schemes in the regions was low as only one scheme was present in each village. The farmers were randomly selected in various sub-districts and villages. We interviewed 80 certified and uncertified farmers, resulting in 160 respondents in total. From each scheme, we interviewed 20 farmers (see Table 2). The uncertified farmers live in the neighbouring villages of the certified producers and most of them have at least some knowledge about certification from their KUBEs or cooperatives.

Table 2. Sample sizes and respondent distributions

Distribution of respondents groups	Distribution of respondents based on their participation in certification schemes
1. Certified farmers = 80 respondents 2. Uncertified farmers = 80 respondents	1. Fair Trade (FT) = 20 respondents 2. 4C = 20 respondents 3. Utz = 20 respondents 4. Rainforest Alliance (RA) = 20 respondents

4.   Explanations for the Indonesian smallholders to participate in sustainable coffee certification

In this section, we present the results of the binary regressions for individual (the first step) and all explanations (the second step).

The binary logistic regression for individual explanations

Table 3. The results of individual binary logistic regressions

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)
Socio-demographic						
Step 1 Non-coffee incomes	-.091	.023	16.072	1	.000*	.913
Coffee income minus non-coffee income	20.635	9110.757	.000	1	.998	9.158E8
Farm size	1.085	.296	13.463	1	.000*	2.960
Age	-.001	.020	.004	1	.949	.999
Education	.025	.082	.097	1	.756	1.026
Constant	.668	1.379	.235	1	.628	1.951
Economic						
Step 1 Prospect of price premium	1.475	.256	33.260	1	.000*	4.372
Prospect of productivity	.664	.177	14.121	1	.000*	1.943
Prospect of quality	.193	.218	.780	1	.377	1.212
Constant	-7.919	1.459	29.477	1	.000	.000
Attitudinal						
Step 1 Environmental attitude	-.169	.184	.847	1	.357	.844
Taking opportunity	.218	.217	1.011	1	.315	1.244
Avoiding 'playing it safe'	.557	.119	22.115	1	.000*	1.746
Seeking information	.083	.203	.167	1	.683	1.086
Discussion to increase knowledge	1.010	.303	11.112	1	.001*	2.746
Constant	-8.925	3.932	5.152	1	.023	.000
Institutional						
Step 1 Embeddedness in well-functioning farmer Group	-.025	.090	.079	1	.778	.975
Embeddedness in well-functioning Cooperative/KUBE	.412	.111	13.844	1	.000*	1.510
Distance to cooperative/KUBE	-.918	.211	18.903	1	.000*	.399
Constant	.877	.856	1.049	1	.306	2.403

*. Significant at the cut value 0.05

Table 3 presents the results of the individual regressions. The results indicate that only a few variables from each explanation significantly influence the decision to participate in certification. These findings have several implications:

The first implication refers to the hypothesis of the socio-demographic explanation. We found that farm size and non-coffee income indeed explain the decision to participate. As indicated by the coefficient B value in Table 3, farm size has a positive influence on the participations, whereas non-coffee income has a negative (i.e., reverse) effect. This means that the farmers who own larger farms and are less dependent on non-coffee income are likely to join a certification program. All other variables mentioned in the hypothesis do not significantly influence the decision to participate. The Anova results (see Table 4) further reveal that the positive relation between farm size and participation can particularly be explained by the Fair Trade (FT) farmers whose farms are significantly larger than those of the farmers participating in the other schemes (P-value= 0.00) and the uncertified farmers. The FT farmers own an average farm size of 2.75 hectares, whereas 4C, Utz certified, Rainforest Alliance (RA), and uncertified producers averagely have farm sizes of 1.38, 1.41, 1.66, and 1.59 hectares respectively. Therefore, we conclude that farm size only seems to (partially) explain the participation of FT farmers.

Table 4. The Bonferroni test results of One Way Anova for multiple comparisons of certification schemes

Dependent Variable	(I) Schemes	(J) Schemes	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Non coffee income	Uncertified	4C	15.79588*	4.83153	.013	2.0368	29.5550
		UTZ	17.17538*	4.83153	.005	3.4163	30.9345
		FT	4.92288	4.83153	1.000	-8.8362	18.6820
		RA	17.89288*	4.83153	.003	4.1338	31.6520
Farm size	FT	4C	1.37500*	.25737	.000	.6421	2.1079
		UTZ	1.33750*	.25737	.000	.6046	2.0704
		RA	1.08750*	.25737	.000	.3546	1.8204
		Uncertified	1.15781*	.20347	.000	.5784	1.7373
Prospect of price premium	Uncertified	4C	-1.53750*	.25019	.000	-2.2500	-.8250
		UTZ	-1.88750*	.25019	.000	-2.6000	-1.1750
		FT	-1.53750*	.25019	.000	-2.2500	-.8250
		RA	-1.13750*	.25019	.000	-1.8500	-.4250
Prospect of productivity	Uncertified	4C	-1.06250*	.30535	.007	-1.9321	-.1929
		UTZ	-.86250	.30535	.054	-1.7321	.0071
		FT	-1.21250*	.30535	.001	-2.0821	-.3429
		RA	-.66250	.30535	.316	-1.5321	.2071
Avoiding 'playing it safe'	Uncertified	4C	-1.58750*	.44856	.005	-2.8649	-.3101
		UTZ	-1.98750*	.44856	.000	-3.2649	-.7101
		FT	-1.58750*	.44856	.005	-2.8649	-.3101
		RA	-1.48750*	.44856	.011	-2.7649	-.2101
Distance to cooperatives/KUBEs	Uncertified	4C	1.01250*	.23749	.000	.3362	1.6888
		UTZ	1.93750*	.23749	.000	1.2612	2.6138
		FT	.58750	.23749	.144	-.0888	1.2638
		RA	.68750*	.23749	.043	.0112	1.3638

*. The mean difference is significant at the 0.05 level.

The second implication relates to the economic hypothesis. The findings reveal that while the prospect of quality does not seem to play a role, the prospects for price premium and productivity do play important roles in the decisions to participate. The prospect of a price premium is even the most important explanation for farmer participation (with a B value of 1.475). The Anova test indicates that all certified farmers had a high expectation about the price premium prior to certification (average mean score=3.98); the uncertified farmers, however, do not really believe in this price premium (mean score = 2.46, p-value = 0.00). In terms of the prospects for increased productivity, Utz certified and RA certified farmers do not significantly differ from the uncertified respondents. This implies that the prospect of increased productivity was particularly important for 4C and FT farmers in their decision to participate in certification.

The third implication refers to the attitudinal explanation. The results show that more discussion and a risk-taking attitude are positively related to the participation decisions. Environmental attitude and opportunistic behaviour, however, do not significantly influence these decisions. All certified farmers have a significantly more positive attitude toward risk-taking than uncertified producers. This finding is supported by the Anova test which reveals that the certified farmers significantly stronger avoid to 'play it safe' (significant at p-value = 0.05). Since the variable was measured by asking four similar questions (see appendix A) to the whole respondents, we summed-up the scores to obtain average mean score of 12.575 and 10.912 for the certified and uncertified farmers respectively. Hence, farmers with a risk-taking attitude and who are active in increasing knowledge through discussions are likely to participate in sustainable coffee certifications.

The final implication relates to the institutional explanation. Interviews revealed that most farmers join farmer groups. The regression outputs however indicate that embeddedness in well-functioning farmer groups does not significantly influence the farmer's decision to participate. Embeddedness in well-functioning cooperatives/KUBEs however, and the distance to these cooperatives/KUBEs do significantly influence the farmer's decision to participate. The Anova test shows that the distance to cooperatives/KUBEs does not significantly differ between FT farmers and uncertified producers. For the other certified farmers there are significant differences with the uncertified farmers. This means that distance matters in the decision to participate, but not for the FT farmers. Thus, farmers embedded in well-functioning cooperatives/KUBEs and who live relatively close to the organizations are likely to join certification programs (the latter with the exception of FT farmers).

Table 5 reveals that each explanation individually is a good fit to explain participation. This is shown by

Hosmer and Lemeshow Test, which shows that every regression has a level of significance that is higher than 0.05, indicating that each part of the regression model fit well with the data; thus, confirming the individual-model fit. The regressions also confirm that each explanation can independently explain (part of) the decision to participate. As shown by the Cox & Snell R Square/ Nagelkerke R Square in Table 6, the economic explanation has the strongest influence (41.9%/55.9%), followed by the socio-demographic (33.1%/44.2%), the institutional (28.9%/38.6%), and the attitudinal explanation (26.1%/34.7%).

Table 5. Hosmer and Lemeshow Test for individual regressions

Step	Explanation	Chi-square	Df	Sig.
1	Socio-demographic	9.560	8	.297
1	Economics	7.737	8	.460
1	Attitudinal	10.749	8	.216
1	Institutional	2.148	8	.976

Table 6. Pseudo R square for individual regressions

Step	Explanation	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	Socio-demographic	157.437	.331	.442
1	Economics	134.790	.419	.559
1	Attitudinal	173.514	.261	.347
1	Institutional	167.178	.289	.386

Full logistic binary regression

The full regression covers all variables, except for coffee income minus non-coffee income. Instead of a multicollinearity problem, the variable was excluded because of two reasons. First, because it perfectly correlates to itself but has zero correlations with other independent variables in the regression (see Appendix B) which means that "coffee as main source of income" cannot be a (powerful) explanation for participation. Second, because the variable has a large standard error (see Table 3) indicating that the sample may not accurately estimate the population. Table 7 presents the results of the full logistic regression.

Table 7. The results of full logistic binary regression

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)	explanatory strength
Step 1ª Socio-demographic							
Non Coffee income	-.107	.029	13.395	1	.000	.898*	6
Farm Size	1.730	.558	9.606	1	.002	5.642*	2
Age	-.033	.043	.595	1	.441	.968	
Education	.177	.150	1.392	1	.238	1.194	
Economics							
Prospect of price premium	1.830	.447	16.731	1	.000	6.235*	1
Prospect of productivity	.777	.316	6.039	1	.014	2.175*	4
Prospect of quality	.114	.308	.136	1	.712	1.121	
Attitudinal							
Environmental attitude	.222	.382	.338	1	.561	1.249	
Taking opportunity	-.321	.428	.565	1	.452	.725	
Avoiding 'playing it safe'	.544	.193	7.943	1	.005	1.722*	5
Seeking information	-.230	.320	.515	1	.473	.795	
Discussion to increase knowledge	.834	.557	2.243	1	.134	2.303	
Institutional							
Embedded in well-functioning Farmer Group	.353	.191	3.403	1	.065	1.423	
Embedded in well-functioning Cooperative/KUBE	.218	.167	1.692	1	.193	1.243	
Distance to cooperative/KUBE	-.905	.416	4.733	1	.030	.404*	3
Constant	-20.606	9.259	4.954	1	.026	.000	

*.   Significant at the cut value 0.05

The table shows that the full regression reduces the number of significant variables from 8 to 6. The variables that are no longer significant are "discussion to increase knowledge" and "embeddedness in well-functioning cooperatives/KUBEs". This reveals that these two variables are too strongly influenced by the other variables, and are mistakenly considered as an explanation for participation. The other, significant variables do not only explain variation in participation, but also variation in the extent to which farmers actively discuss and how they evaluate their Cooperative/ KUBE. The variables that significantly explain participation are farm size, non-coffee income, the prospect of price premium, the prospect of productivity, avoiding 'playing it safe', and distance

to cooperative/KUBE.

Table 7 shows that a model that considers simultaneous interactions between variables from all explanations and integrate them in a full logistic regression is fitter, stronger, and more accurate in explaining participation in certification than an analysis of variables from each explanation individually. The full regression namely improves the goodness of fit of the model, from an average of 0.487 to 0.868 (Table 8). Also, the simultaneous regression is more powerful in explaining the decision to participate as the Cox & Snell R Square/ Nagelkerke R Square increased from an average of 0.325/0.434 to 0.608/0.811 (Table 9). Lastly, the simultaneous regression has high classification accuracy that reaches 90.6% (see Table 10).

Table 8. Hosmer and Lemeshow Test for the simultaneous logistic regression

Step	Chi-square	df	Sig.
1	3.879	8	.868

Table 9. Pseudo R square for the full logistic regression

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	71.802	.608	.811

Table 10. The comparison of classification accuracy between full and individual regressions

Model		Observed		Predicted Participation		Percentage Correct
				uncertified	certified	
Step 1ᵃ	Full regression	Participation	uncertified	70	10	87.5
			certified	5	75	93.8
		Overall Percentage				90.6
Step 1ᵃ	Individual regression	Socio-demographic	Participation	uncertified	48	32	60.0
			certified	7	73	91.3
		Overall Percentage				75.6
Step 1ᵃ		Economics	Participation	uncertified	62	18	77.5
			certified	14	66	82.5
		Overall Percentage				80.0
Step 1ᵃ		Attitudinal	Participation	uncertified	58	22	72.5
			certified	16	64	80.0
		Overall Percentage				76.3
Step 1ᵃ		Institutional	Participation	uncertified	57	23	71.3
			certified	19	61	76.3
		Overall Percentage				73.8

a. The cut value is 0.50

If we look at the relative importance of the variables explaining the decision to participate in certification schemes, we see that the prospect of a price premium is the most important variable (B=1.830), followed by the farm size (B= 1.730), distance to the cooperative or KUBE (B=-0.905), the prospect of increased productivity (B=0.777), avoidance of "playing it safe" (B=0.544), and non-coffee income (B=-0.107). This implies that, from the four presented explanations, the economic explanation is the most important one with a total B value of 2.607, followed by the socio-demographic explanation with a B value of 1.837, the institutional explanation (B= 0.905), and the attitudinal explanation (B= 0.544). This means that participations in the sustainability standards are influenced by farm size, non-coffee income, risk-taking attitude, and distance to cooperative or KUBE, however, the main reasons for the farmers to join the standards are their expectations for obtaining a price premium and increasing productivity.

Our results lead to a reformulation of the earlier defined hypotheses:

H1:   Farmers who own larger farms and who are less depend on non-coffee income are likely to join sustainability coffee certifications. The large farm size is particularly powerful to explain participation in the FT scheme.

H2:   Farmers who perceive that joining certification is ideally needed for obtaining a price premium and to increase productivity are likely to join sustainability coffee certifications.

H3:   Farmers with a risk-taking attitude are likely to join sustainability coffee certifications.

H4:   Farmers who live relatively close to cooperatives or KUBES are likely to join sustainability coffee certifications. Distance seems to play a less important role to explain the decisions to participate in FT.

81.1% of the variation in Indonesian smallholder participation in coffee certifications can be explained by the variables in our full regression model. This means there are more variables that play a role in farmer's decision to participate in certification schemes. Preliminarily, and based on the interviews with the farmers, we argue that these variables may include the influence of relatives and middlemen, as well as the cosmopolitan level of the smallholders. Advice from relatives, fellow farmers, families, and neighbours may significantly influence

the farmers' decision to participate. Next, as farmers often borrow money from the middlemen, they are expected to sell their coffee to these middlemen to pay their debts. This type of relationship may have a strong effect on the farmer's decision to participate in certifications. The cosmopolitan level refers to the profundity of experiences that the farmers have regarding people and things from outside their neighbourhood, and also reflects the amount of information they receive from the outside. For example, frequent visits to other towns, markets, and other farms, as well as listening the radio and watch television may increase the cosmopolitan level or exposure to outside information, which may positively influence the attitude towards external certification schemes and the decision to participate.

Conclusion

The Indonesian coffee sector is characterized by a large number of smallholders and various Northern-based sustainability standards and certification schemes. Despite the scheme's potential contribution to a more sustainable coffee production, most Indonesian coffee smallholders do not participate in these certifications. Current literature offers competing explanations regarding the decision of farmers to participate in coffee certifications. With our analysis, we contribute to this literature by evaluating the relative importance of the explanations from the perspective of Southern producers, particularly Indonesian smallholders.

Our results reveal that economic motivations are the strongest explanatory factor behind farmer participation in certification, followed by the socio-demographic explanation, the institutional explanation, and the attitudinal explanation. Within the economic explanation, the prospect of a price premium is crucial in a farmer's decision to join certification.

The results reveal differences between certified and uncertified farmers in their motivation to join certification or not. The certified farmers for example, had a significant higher expectation about the receipt of a price premium and increased productivity (i.e., economic explanation) compared to the uncertified farmers. Likewise, certified farmers were found to have a significantly more positive attitude towards risk-taking than uncertified producers. Some variables such as farm size and distance to cooperative/KUBE are only significantly different between the certified FT farmers and uncertified producers.

We also found that some explanatory variables for joining certification differ among the schemes. For example, UTZ and RA farmers did not expect their productivity to be increased through certification, whereas other certified farmers decided to join certification partly because of their expectation for a higher productivity. Such differences make it difficult to develop a blue print for explaining participation.

Our results may have some implications for certification practices. First, while the prospect of a price premium turned out to be vitally important for a farmer's decision to participate, our interviews revealed that certified farmers do not always receive a price premium for their certified coffee. In the cases they did receive a price premium, the price differential with non-certified coffee is very small (also see Astuti et al., forthcoming). This not only discourages the uncertified farmers to join, but also demotivates the certified producers to stay in the programs. If challenges regarding the receipt of a price premium cannot be solved, it may be hard to include more farmers in the certification schemes and certification might even lose its relevance to farmers over time. Second, participation in FT certification is more difficult for smallholders who own smaller plots and who live further away from KUBEs. From a sustainability point of view however, targeting the most vulnerable smallholders (with often very small plots and struggling to survive economically) may be prioritized over the relatively larger smallholders. Third, it is remarkable that UTZ certified, and RA farmers did, prior to being certified, not expect their productivity to increase through certification. As is shown by Astuti et al. (forthcoming), coffee certification does however lead to significantly higher productivity for Indonesian farmers. This raises questions on the information and communication strategies of certification schemes towards prospectively certified farmers. Our results indicate that is it not unlikely that different schemes adopt different communication strategies, influencing the farmer's decision to adopt.

Finally, we reflect on the limitations of our study. First, our decision not to analyse prospective farmers (but farmers who made a decision to adopt or not in the nearby past) may have offered challenges for farmers to access their memories regarding past decisions accurately. Also, the possible effects of certification on the farmer's explanations for participation cannot be entirely ignored. Next, we have seen that 81% of farmers' decisions to participate can be explained by the variables in our model. This means there are more variables that play a role in farmer's participation decisions. However, to include more variables, and to add more rigour to our method it would be essential to increase the number of respondents significantly. Future studies should also consider variables that may significantly influence farmer participation (e.g., buyer preferences, pre-existing buyer–farmer relations, and farmer organizational structures) through affecting selection mechanism for smallholder inclusion in certification.

Acknowledgements

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Appendix A. Variable, operationalization and question item

	variable	operationalization	question item
Economic	Price premium	Prospect of price premium	• I do not join certification because it cannot promise financial benefits (real) • I joined certification for obtaining financial benefits (real)
	Increased productivity	Prospect of increased productivity	• I believe that joining certification can improve coffee productivity. (ideal) • I joined certification for improving my productivity (real)
	Improved quality	Prospect of increased quality	• I believe that joining certification can improve coffee quality.(ideal) • I joined certification for improving the quality (real)
Socio-demographic	Coffee as main source of income	• Coffee income (Rupiah) • Income from other crops (Rupiah) • Off-farm income (Rupiah)	• What are the prices for your coffee (per KG)? How many kilogram coffees per harvest? • What are the other crops that you cultivate? How many kilograms per harvest? What are the prices for them? • What are your off-farm activities? How much money do you gain from the activities?
	Farm size	Farm size in hectares	What is the size of your farm?
	Age	Age in years	What is your age in years?
	Education	Education in years	How many years did you follow formal schooling?
Attitudinal	Environment	• Environmental farm management • Reducing chemical inputs • Increasing organic input • Increasing shade trees	• Ideally, I reduce the use of chemical inputs, even if it lowers profit. • Ideally, I increase the use of organic input even if it lowers profit. • Ideally, I increase shade trees, even if it lowers profit. • I believe that I can sustain my farm by managing it in an environmentally friendly way
	Taking risk	• Taking opportunities	• Certification program is ideally followed when there is an opportunity. • I joined certification because I had the opportunity
		• Avoidance/ playing it safe	• Before implementing new farming practices I see the other farmers try them. • I implement new farming practices before other farmers try them • I am cautious about adopting new ideas, programs and practices • I try new ideas, programs, and practices in my farm rather than "play it safe."
	Seeking information	• Pro-actively seeking information	• I put a high effort to seek information. • I wait for information to come to me.
		• Increasing knowledge by reading	• I increase my knowledge by reading about farming practices
		• Increasing knowledge by discussion	• I increase my knowledge by having discussions with other farmers/friends.
Institutional	Embeddedness in well-functioning farmer groups	• Regular meetings • Collective actions • *Arisan*/ community gatherings • *Gotong royong*/ communal work • Collecting, processing and bargaining	• Group organizes periodic informal meeting to discuss farming-related issues and to share knowledge and information. • Group organizes collective actions, for example collectively buying farm inputs (e.g. fertilizers, seeds, and tools), and sharing cost (e.g. to buy hulling coffee machine) • Group organize community gathering *arisan* or alike to strengthen the emotional bond of members • Group encourages members to help one another, for example, by organizing *gotong royong* (i.e. a form of communal work or mutual aid) to build terrace, drain terrace, and ridge in coffee plantations • Group collects, processes and controls the quality of coffee harvests, and represents its member to bargain with cooperative or KUBE
	Embeddedness in well-functioning KUBES	• Information provision • Facilitation/ support in buying and contacting • Increase market access • Support in managing finances	• Cooperative or KUBE provides information (e.g. coffee certification program, new technology, and market information) clearly and transparently • Cooperative or KUBEs facilitate farmers to buy fertilizers, seeds, tools and other farm inputs • Cooperative or KUBE facilitate farmers to improve knowledge and skills, for example, by contacting extension agents or universities to give advices, training, seminar and workshop • Cooperative or KUBE improved market access • Cooperative or KUBE is a better market option than selling to intermediaries or conventional markets • Cooperative or KUBE manage financial saving of members • Cooperative or KUBE give credit or loan to its members • Cooperative or KUBE pay farmers on time
	Presence of near-by Cooperative or KUBE	Distance between farmer's household and KUBE in KM	How far your house location from cooperative/ KUBE (in KM)?

Appendix B. Correlation among variables in individual regressions

Correlation Matrix

Socio-demographic

		Constant	Noncoffee income	Coffee income minus noncoffee income	Farm size	Age	Education
Step 1	Constant	1.000	-.294	.000	-.053	-.789	-.629
	Non-coffee incomes	-.294	1.000	.000	-.666	.077	.013
	Coffee income minus non-coffee income	.000	.000	1.000	.000	.000	.000
	Farm size	-.053	-.666	.000	1.000	.117	-.101
	Age	-.789	.077	.000	.117	1.000	.189
	Education	-.629	.013	.000	-.101	.189	1.000

Economic

		Constant	Prospect of price premium	Prospect of productivity	Prospect of quality
Step 1	Constant	1.000	-.674	-.572	-.582
	Prospect of price premium	-.674	1.000	.216	-.014
	Prospect of productivity	-.572	.216	1.000	.031
	Prospect of quality	-.582	-.014	.031	1.000

Attitudinal

		Constant	Environmental attitude	Taking opportunity	Avoiding play it safe	Seeking information	Discussion to increase knowledge
Step 1	Constant	1.000	-.805	-.079	-.381	-.280	-.283
	Environmental attitude	-.805	1.000	-.094	-.046	.051	-.042
	Taking opportunity	-.079	-.094	1.000	-.036	-.092	-.011
	Avoiding 'playing it safe'	-.381	-.046	-.036	1.000	.062	.158
	Seeking information	-.280	.051	-.092	.062	1.000	-.174
	Discussion to increase knowledge	-.283	-.042	-.011	.158	-.174	1.000

Institutional

		Constant	Embeddedness in well-functioning farmer group	Embeddedness in well-functioning cooperative/ KUBE	Distance to cooperative/ KUBE
Step 1	Constant	1.000	-.581	-.490	-.693
	Embeddedness in well-functioning farmer group	-.581	1.000	-.015	.141
	Embeddedness in well-functioning cooperative/ KUBE	-.490	-.015	1.000	.024
	Distance to cooperative/ KUBE	-.693	.141	.024	1.000