Effects of Institutional Setting on Value Estimates of Stated Preference Surveys in Developing Economies: A Discrete Choice Experiment on Conserving Biodiversity in The Cape Floristic Region

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Abstract

The use of stated preference surveys for the valuation of environmental goods in developing countries has to take into account that there is substantial public distrust towards the institutions providing the environmental goods under valuation. Thus, high protest responses and low value estimates may indicate rejection or protest against the institutional setting of the survey design, rather than the dislike or low welfare effects of these goods. In this context, we investigate the effects of institutional trust on value estimates by examining the performance of three different institutions – government, conservation NGO and farmers – in a case study aimed at eliciting preferences for conserving different types of biodiversity within orchards in the Cape Floristic Region – a biodiversity hotspot in South Africa threatened by the expansion and intensification of agriculture. We find that institutional trust has an effect on preferences and willingness-to-pay, with farmers leading to the highest level of trust and value estimates, followed rather closely by a conservation NGO and, with some distance, by the government with the lowest trust level and value estimates. In terms of preferences for biodiversity conservation, our results show that respondents prefer measures to conserve endangered and endemic species over measures primarily aimed at providing the ecosystem services of pollination and pest control.

Keywords: Biodiversity Hotspot. Institutional distrust. Ecosystem services. Economics. Endangered species. Payment vehicle. Western Cape

1. Introduction

Stated preference (SP) surveys are widely used for valuation of non-market environmental goods such as biodiversity conservation and ecosystem services provision, and have become an important aid for decision-making with the value estimates (preferences, willingness-to-pay – WTP) being used to deliberate on the provisioning of environmental goods. One concern related to the use of SP surveys, however, is whether they are incentive-compatible – i.e., whether respondents are truthful about their preference revelation in a SP survey, and the resultant value estimates can be considered valid. A set of survey design assumptions for a truthful preference revelation have been identified in the literature (Carson and Groves 2007; Johnston et al. 2017; Mariel et al. 2021; Vossler et al. 2012). Salient among them is the selection of a mechanism through which payments would be made – the payment vehicle.

Incentive-compatible payment vehicles should be perceived by respondents to be non-voluntary, realistic, reliable and relevant (Johnston et al. 2017; Mariel et al. 2021; Zawojska et al. 2019). This implies that the payment vehicle should have sufficient coverage of the surveyed population (Hassan et al. 2018) and should be acceptable to a sufficient proportion of the population to be representative (Johnston et al. 2017). Moreover, it should incorporate an institution that would be responsible for collecting the payments and implementing the policy (Kassahun et al. 2021; Oehlmann and Meyerhoff 2017). Thus, the selection of a payment vehicle depends heavily on the institutional setting of the study area (Hassan et al. 2018; Kassahun et al. 2020; Mariel et al. 2021).

Several empirical studies have demonstrated that commonly used payment vehicles – for example, income and property tax (Jacobsen et al. 2012; Vedel et al. 2015), utilities bills (Zawojska et al. 2019), or entrance fees (Campos et al. 2007) – are generally incentive-compatible in the context of developed countries. However, their application in developing country settings has often proven to be erroneous, with many studies reporting high protest responses (cf. Abramson et al. 2011; Chen and Hua 2015; Kassahun et al. 2016; Meginnis et al. 2020; Whittington and Pagiola 2012). The inadequacy of these payment vehicles may be related mainly to the high level of public distrust towards the institutions providing the environmental goods to be evaluated in most developing countries. In a conceptual study, Oh and Hong (2012) demonstrated that there is a strong positive relationship between public trust in the government as a provider of environmental goods and WTP; and that, in the event that public distrust is rife, the value of a project can be underestimated.

So far, only a handful of SP studies have empirically investigated the effects of institutional trust on value estimates in the context of developed countries (Oehlmann and Meyerhoff 2017; Remoundou et al. 2012) and in developing country settings (Birol and Das 2012; Chen and Hua 2015; Kassahun et al. 2021). Interestingly, studies in developed countries have found no significant relationship between institutional trust and value estimates (Oehlmann and Meyerhoff 2017; Remoundou et al. 2012). Studies in developing countries, on the other hand, have found that prevailing institutional distrust had a negative impact on value estimates and attracted high protest responses (cf. Birol and Das 2012; Chen and Hua 2015; Kassahun et al. 2021; Nthambi et al. 2021). Although few in numbers, these empirical studies clearly demonstrate that institutional setting matters for an incentive compatible SP survey.

Our study contributes to these few studies on the effect of institutional trust on value estimates in a developing country setting. We investigate institutional trust using a discrete choice experiment (DCE) survey addressing biodiversity conservation within agricultural landscapes of the Cape Floristic Region (CFR) in South Africa. The CFR is a biodiversity hotspot with high level of endemism (Manning and Goldblatt 2012); but also, it is the largest fruit producer in South Africa (one of the world’s top 10 pome fruit exporters) (Hortgro 2019). In this context, the survey’s experimental design includes measures for conserving biodiversity such as flower strips (to improve biological pest control and pollination) and set-aside natural vegetation patches (to provide habitat for endemic and endangered species) in the orchards. Additionally, the design also includes a payment vehicle – increase in price of fruits – and, most importantly in the context of this paper, a setup of three potential institutions that would manage the funds for the biodiversity conservation programme, namely, the government, farmers, and a conservation NGO. Also, we use debriefing questions to further inquire about perceived institutional trust and drivers of institutional distrust. We estimate a set of discrete choice models to unveil how perceived institutional trust affects respondents’ preference revelation and WTP for biodiversity conservation measures, and to analyse how perceived institutional trust affects respondent’s disposition to choose a given alternative across different choice sets.

To the best of our knowledge, our study is the first to investigate the drivers of institutional distrust. Previous studies did not inquire into the drivers of institutional distrust (Birol and Das 2012; Chen and Hua 2015) or simply assumed that public distrust is corruption-driven (Kassahun et al. 2021; Nthambi et al. 2021). Additionally, our study sheds light on the important determinants of institutional distrust, and shows how the importance of different drivers of institutional distrust differs across the population. Finally, our study provides insights into the difference in trust between public and private institutions in a developing country setting. To the best of our knowledge, only one DCE study (Nthambi et al. 2021) has hitherto investigated trust between public and private institutions. However, whereas Nthambi et al. (2021) interview farmers our survey targets the general population. This enables us to investigate how institutional trust varies across different segments of the population and assess how it affects their preferences and WTP for biodiversity conservation measures. Findings from this study may be of importance to choice modellers working on SP surveys in developing countries, where many SP studies do not specify the institutional setting and payment vehicle at all (see Nthambi et al. 2021; Whittington and Pagiola 2012 for further discussion on this issue).

Our research also contributes to the literature on public preferences for biodiversity conservation in agricultural landscapes. While there has been an increase in studies demonstrating the importance of different measures for enhancing biodiversity within orchards from the field of conservation ecology (Birkhofer et al. 2019; Gaigher et al. 2015; Ratto et al. 2021; Theron et al. 2020), studies with an economic perspective are scarce (Ratto et al. 2021). From a broader perspective, our study provides insights into public preferences as to whether policies should prioritise measures for ecosystem services provisioning or for protecting endangered and endemic species. Typically, studies which value biodiversity in agricultural landscapes focus either on endangered species (Wätzold et al. 2008) or on ecosystem services such as pollination or pest control (Moreaux et al. 2023; Mwebaze et al. 2018), but rarely on both.

2. Study Design

2.1. Data Collection

The survey aimed at eliciting preferences of the Western Cape residents for biodiversity conservation in the agricultural landscapes (orchards) of the CFR. The empirical data was collected via an online DCE survey conducted by a market research company during November 2021. Following a pilot survey with 50 respondents, a representative sample of 528 respondents from the adult population of the Western Cape Province was collected based on age, gender and income. The sample consisted of 49% male and 51% female respondents, which is comparable to the province statistics. Also in line with the province statistics, 51% and 49% of respondents were above 35 years and below, respectively. The average annual income was aproximately R30,000, which is also in accordance with province statistics.

2.2. Case Study Description

The CFR is globally recognised for its exceptionally diverse and distinct *fynbos* biome and is one of the world's 34 biodiversity hotspots – yet threatened by an alarming biodiversity loss (Manning and Goldblatt 2012). Although covering a relatively small area of 90,760 km^2, the CFR has an estimated 9,383 species of vascular plants (Manning and Goldblatt 2012). When compared to the rest of the continent, CFR's flora accounts for 46% of the entire Southern Africa's vascular plants, and 23% of the total flora occurring in Africa (Cowling et al. 1996; Manning and Goldblatt 2012). Furthermore, 70% of plants species occurring in the region are considered endemic (Manning and Goldblatt 2012).

Despite its exceptional ecological value, the CFR is also an important agricultural area. It is mostly located within the Western Cape Province, which is South Africa's biggest fruit producer – accounting for 78.6% and 47.7% of the country's apple orchards and vineyards, respectively (Greeff and Kotzé 2007). The fruit industry plays an important role in the economy of South Africa. During the 2018/2019 season, for instance, the industry total gross value was estimated to be around R18.2 billion[1] (DALRRD 2020) and provided over half a

[1] Equivalent to EUR 1.1billion using average exchange reference rate of 2019 (European Central Bank – https://www.ecb.europa.eu)

million jobs (Hortgro 2019). Fruit production in South Africa is dominated by intensive conventional practices (Manrakhan and Addison 2014), with alternative practices such as organic production being marginally practiced (Arvidsson et al. 2020; Birkhofer et al. 2019). Intensive agricultural production is the major cause of biodiversity loss in the CFR. The area converted into agricultural fields comprises over a third of the total land surface of the CFR, with only around 17% of the original extent of the primary natural vegetation of the CFR left (Rouget et al. 2003). The continuous transformation of natural vegetation for intensive fruit cultivation and the adverse impacts associated with it pose a major threat to CFR ecosystems (Gaigher et al. 2015; Rouget et al. 2003).

2.3. Discrete Choice Experiment

A DCE survey was designed with a set of attributes related to biodiversity conservation measures in the orchards and the institutional setting. The identification of relevant attributes was informed by expert opinions from ecologists, experts in fruit production, and pertinent literature. The attributes and their associated levels were tested for relevance and clarity to the general public in a pilot survey.

Four attributes were considered (Table 1): (i) *pesticide use*, (ii) *farmland diversity*, (iii) *who manages the funds*, and (iv) *increase in price of fruits*. For the *pesticide use* attribute, three levels were defined: intensive, reduced, and no-pesticides. While intensive use of pesticides represented the status quo, reduced and no-pesticides use were improvement to the current levels of pesticide application in the orchards. For the *farmland diversity* attribute, four levels were used: fruit trees only, fruit trees plus natural vegetation, fruit trees plus flower strips, and fruit trees plus flower strips plus natural vegetation. Fruit trees only depicted the current dominant agricultural use in the orchards, whilst the other three levels represented more diversified uses. While fruit trees plus natural vegetation focused on creating habitat for endangered and endemic species, fruit trees plus flower strips aimed at provisioning of ecosystem services (biological pest control and pollination). Fruit trees plus flower strips plus natural vegetation represented a combination of the two previous levels. The attribute *who manages the funds* had the following levels: the government, a conservation NGO, and farmers. All non-cost attribute-levels were illustrated with pictograms in addition to a detailed description so as to enhance the visualisation of different levels to respondents. The cost attribute *increase in price of fruits* consisted of six cost levels varying from 50cents/kg to 20Rand/kg.

Table 1 Overview of the attributes and the respective levels used in the survey

Attributes	Description	Levels
Pesticide use	Amount of pesticide applied in the orchards	Intensive (status quo) Reduced No-pesticide
Farmland diversity	Agricultural landscape composition (diversification)	Fruit trees only (status quo) Fruit trees + Flower strips Fruit trees + Natural vegetation Fruit trees + flower strips + natural vegetation
Who manages the funds	Institution responsible for managing the funds for biodiversity conservation	Government Conservation NGO Farmers
Costs[ab]	Increase in price of fruits (apple, pears and peaches) Rand/Kg	0.5, 1, 2, 5, 10, 20

[a] At the time of the study, the price for apples was 20 Rand/Kg in Western Cape Province. We used this price to set the upper bound of the cost vector (See Mariel et al. 2021 for recommendations on how to set levels of the cost vector).

[b] At the time of the study, R17.714 (South African Rand) were equivalent to EUR 1.

A Bayesian efficient choice experimental design, which aimed at minimising the D_b*-error* criterion for the mixed multinomial logit (MMNL) model – (hereinafter "mixed logit"), was created using the Ngene 1.2 software for both pilot and final surveys (for an overview of different experimental design strategies see e.g., Rose et al. 2011). The expert judgement approach (Bliemer and Collins 2016) was used to generate priors for the pilot survey; whereas for the final survey, parameter estimates from the pilot survey were used as priors.

The design was composed of 18 choice tasks split into three blocks. Respondents were randomly assigned to a block containing six choice tasks, with each task being made of three SP-alternatives (*programme A, programme B, programme C*) and a status quo (*no programme*). The status quo alternative was always placed at the right-hand side of the choice task and comprised the current levels of pesticide use (intensive) and farmland diversity (fruit trees only), as well as no-cost (no increased price of fruits). The SP-alternatives, on the other hand, involved changes to the current levels of pesticide use and farmland diversity, the funds' managing institution, and a cost level. Figure 1 shows an example of a choice task.

	Programme A	**Programme B**	**Programme C**	**No programme** (No Nature Conservation)
Pesticide Use	No Pesticide	No Pesticide	Reduced	Intensive
Farmland Diversity	Fruit Trees and Natural Vegetation	Fruit Trees, Flower Strips and Natural Vegetation	Fruit Trees and Flower Strips	Fruit Trees Only
Who Manages the Funds	Conservation NGO	Farmers	Government	No Funds Raised
Costs (Rand/Kg) **Increase in Price of Fruit**	**1 Rand/kg**	**2 Rand/kg**	**50 Cents/kg**	**0 Rand/kg**

Fig. 1 An example of a choice task

2.4. Experimental Setup for Institutional Setting and Payment Vehicle

A detailed description of the institutional setting and payment vehicle was provided to respondents in the survey in addition to the description of the attributes related to biodiversity conservation measures. Respondents were informed that the replacement of the status quo practices by measures aimed at conserving biodiversity in the orchards would likely reduce fruit production. Therefore, the implementation of the programme would require that compensation payments be made to farmers for potential losses of earnings. Hence, a mechanism for raising, managing, and distributing the funds to farmers would need to be established. Respondents were then informed that there were three possible ways in which the compensation mechanism could be implemented. (i) a tax would be imposed on three main fruits produced in the province (apples, pears and peaches), and the levied amount would be channelled to *government* organisations responsible for nature conservation, which would then manage the funds and pay the farmers. (ii) fruit retailers, in coordination with a *conservation NGO*, could increase the price of fruits and transfer the collected funds to a conservation NGO, which in turn would manage and distribute the funds to farmers. (iii) fruit retailers would coordinate with *farmers* to raise funds; increase the price of fruits for this purpose, and transfer the resultant amount of money directly to farmers. The description of the institutions managing the funds included examples of organisations that are familiar to respondents so as to increase credibility and realism of the institutional setting – which is essential for incentive compatibility of the survey (Johnston et al. 2017; Mariel et al. 2021). Respondents were then explicitly informed that the implementation of the programme meant that they would incur additional costs due to increased price, and were cautioned to carefully consider their household income and the costs of the alternatives when stating their choices.

2.5 Perceptions of Institutional Trust and Payment Vehicle Appropriateness

Respondents' perceptions of the payment vehicle appropriateness and trust in institutions were elicited subsequent to DCE. Following the suggestion in Morrison et al. (2000), the following debriefing question was used to inquire about payment vehicle appropriateness: *"Do you think the option used to raise funds (increase in price of fruits) is appropriate?"* A five-point Likert response scale was provided (from *"Extremely inappropriate*" to *"Extremely* *appropriate"*). To inquire about the institutional trust, the following question was asked: *"Which organisation would you trust the most in the efficient management of the funds for nature conservation?"* The response options were given as follows: "*The government", "Conservation NGO"*, and "*Farmers*".

To investigate the drivers of institutional distrust, respondents were asked to state the extent to which they perceived *corruption, reputation, working relationship with farmers,* and *expertise* to be important in relation to the institution managing the funds. To this end, four statements (one for each driver) were provided in the survey as follows: (1) corruption – *"The organisation managing the funds should not be corrupt or have corrupt officials*", (2) reputation – *"The organisation managing the funds should have a reputation for excellent management of funds for nature conservation",* (3) relationship with farmers – *"The organisation managing the funds should have a good working relationship with the farmers",* and (4) expertise – *"The organisation managing the funds should have expertise in nature conservation and farming"*. A five-point Likert response scale was provided for each (from*"Not at all important" to "Extremely important"*).

3. Econometric Approach

3.1. General Specifications

To analyse the empirical data, we use different model specifications of the mixed logit model, which is based on the conventional random utility framework (McFadden 1974). Under the framework, the key assumption is that individuals choose alternatives that generate the greatest expected amount of utility to them. More concretely, the utility U_{nti} that an individual *n* derives from choosing alternative *j*, among a set of alternatives (programmes) in a given choice task *t*, is defined as having a deterministic V_{ntj} and a random ε_{ntj} components; such that:

$$U_{ntj} = V_{ntj} + \varepsilon_{ntj} = \alpha_j + \beta'_n X_{ntj} + \varepsilon_{ntj} \quad (1)$$

Where β'_n denotes the marginal utility associated with the programme's attributes for individual *n*. X_{ntj} represents the vector of attributes of programme *j* within the choice task *t*. While α_j denotes the alternative specific constants (ASC), which represent the average unobserved effects on utility of an alternative, and can be estimated up to *J-1* only. The random component ε_{ntj}, which captures idiosyncrasies affecting the utility and not observed within V_{ntj}, is assumed to be independently and identically distributed (IID) type-1 extreme value (EV1). As such, the choice probability of an individual *n* can be represented (for the simple multinomial logit – MNL model) as follows:

$$P_{ntj} = \frac{\exp(\alpha_j + \beta'_n X_{ntj})}{\sum_{j=1}^{J} \exp(\alpha_j + \beta'_n X_{ntj})} \quad (2)$$

The term β'_n can be further developed in order to derive a more advanced model – a mixed logit model. While the MNL model assumes that all parameters are deterministic, the mixed logit model allows for random parameters (following a certain statistical distribution) to be estimated. The specification of the mixed logit model is conducted by assuming that the (multivariate) random parameters have a continuous distribution over the sampled individuals. Thus, the vector of sensitivities of individual *n* can be written as follows (Greene 2012; Greene and Hensher 2007):

$$\beta_n = \beta + \Delta Z_n + \Gamma v_n \quad (3)$$

Where Z_n denotes a set of socio-economic characteristics – e.g., age, income class, gender– of an individual *n* that have influence on the mean of preference parameters. The term V_n depicts the vector of random variables, with means and covariates equal to zero, and known variances. By specifying the preference parameters in this way, the mixed logit model allows for the accommodation of both: observed heterogeneity – embodied in the ΔZ_n term, and the unobserved heterogeneity – reflected in the Γv_n term. The constant vector β, the matrix of parameters Δ, and the diagonal matrix Γ, depict structural parameters that the model seeks to estimate. Using this description, the choice probability in (2) can be rewritten as follows (Greene 2012; Hensher et al. 2015; Train 2009):

$$P_{ntj} = \int \left(\frac{exp(\alpha_j + \beta_n X_{ntj})}{\sum_{j=1}^{J} exp(\alpha_j + \beta_n X_{ntj})} \right) f(\beta | \Omega) d\beta \quad (4)$$

Where $f(\beta|\Omega)$ denotes the multivariate probability density function of the preference parameters with a pre-specified distribution.

3.2. Accounting for Correlated Random Parameters

A major advantage of mixed logit model, compared to any other model for discrete choice data analysis, is that it allows for accommodation of a considerable variety of model specifications (Greene 2012; McFadden and Train 2000; Train 2009). In this paper, where we use data from SP survey (i.e., panel data), the model can be adapted to account for the fact that preferences vary across respondents, however remain constant for the same respondent (Revelt and Train 1998; Train 2009). Under the panel specification, in lieu of assuming some distribution across n and t, the marginal utility term allows for distribution across n only (for a detailed description of the panel specification see e.g., Hensher et al. 2015; Revelt and Train 1998; Train 2009). Another model specification used in this paper allows for analysis of covariance between random parameters of the institutions managing the funds and the payment vehicle. Rather than assuming uncorrelated parameters, this particular specification recognises there may be unobservable effects within the dataset that are correlated across the choice situations. The model accounts for the correlation by allowing the diagonal matrix Γ in (3) to be a full (unrestricted) lower triangular Cholesky matrix, such that the unrestricted covariance matrix of the random parameters (for *farmers*, *conservation NGO*, and *costs*) is $\boldsymbol{\Sigma=\Gamma\Gamma'}$ – with $\boldsymbol{\Sigma}$ containing all non-zero off-diagonal elements (see Hensher et al. 2015; Train 2009, for further details).

3.3. Accounting for Substitution Patterns Across Alternatives

While the mixed logit model specifications above allow for random parameter estimation, preference heterogeneity uncovering, and correlation between random parameters, they do so by assuming that respondents treat all alternatives the same, and that ε_{ntj} captures any residual heterogeneity not accounted for in V_{ntj}. However, in a situation where the SP survey contains a status quo alternative within the choice-sets, respondents may treat the status quo alternative systematically differently from the SP alternatives. The systematic differential treatment may arise, *inter alia*, due to respondents having to choose between an actual (currently existing) option and hypothetically constructed (non-experienced) SP alternatives, or as a result of the status quo alternative being held constant across the choice sets, whereas the experimental design endows SP alternatives with variations (e.g., Cooper et al. 2012). In such cases, it is plausible that the SP alternatives are more highly correlated among themselves than they are to the status quo alternative. The inter-alternative correlation would imply the existence of shared error components among the SP alternatives, whose utility possess some sort of covariance (Greene and Hensher 2007; Train 2009). To account for this, we also estimate an extended mixed logit model with error components, as promoted by Greene and Hensher (2007). The error components in this specification are typically normally distributed random effects with zero mean and a standard deviation, so that the model estimation entails using dummy variables to group together the correlated SP alternatives in a nest-like structure, as opposed to associating different attributes (parameters) (Greene and Hensher 2007; Train 2009). Following Greene and Hensher (2007), we accommodate the error component in the utility structure as follows:

$$U_{ntA} = \alpha_a + \beta'_n X_{nta} + \varepsilon_{nta} + W_{nsp}, \quad (5)$$

$$U_{ntb} = \alpha_b + \beta'_n X_{ntb} + \varepsilon_{ntb} + W_{nsp}, \quad (6)$$

$$U_{ntc} = \beta'_n X_{ntc} + \varepsilon_{ntc} + W_{nsp}, \quad (7)$$

$$U_{ntsq} = \alpha_{sq} + \beta'_n X_{ntsq} + \varepsilon_{ntsq} \quad (8)$$

Where $W_{nsp} \sim N(0, \sigma)$ is the error component associated exclusively with SP alternatives (A, B, C).

3.4. Model Estimation

We estimated six (panel) mixed logit model specifications in total, starting from a base model and extending it to the most complex model. The base model (Model 1) comprises ASCs and random parameters, Model 2 – contains Model 1 plus added layers of observed heterogeneity around the mean of random parameters, Model 3 – consists of Model 2 plus error component for nest of SP-alternatives, Model 4 – model with correlated random parameters, Model 5 – is composed of model 3 plus WTP estimates, and Model 6 – WTP estimates derived from conditional random parameters. Given that the mixed logit model in (4) is an open-form discrete choice model, we estimated the above models using simulated maximum likelihood estimation with 1,000 standard Halton sequences draws. The starting-values for the parameter estimates were derived from MNL models – estimated before running the mixed logit models. Throughout our models, we estimated the ASCs as non-random parameters while all attributes were specified with random parameters. With the exception of Model 4 (correlated random parameters) – where a normal distribution is used, all random parameters were estimated with constrained triangular distribution so as to ensure that the parameters have a sign that is behaviourally plausible and the same across all respondents (Greene and Hensher 2007; Hensher et al. 2015; Train 2009). All models were estimated in Nlogit version 6 software.

4. Results

4.1. Descriptive Statistics

Of the total 528 respondents who participated in the final survey, five chose the *no programme* option on at least half of the choice tasks, with one respondent having chosen it in all six choice tasks. The analysis of debriefing questions suggest there to be no protest answers; therefore, they were included in the data analysis. Regarding the perceived payment vehicle appropriateness, we find that the majority of respondents (approximately 60%) consider the payment vehicle to be appropriate (i.e., extremely/somewhat appropriate), whereas 19% perceive it to be inappropriate (i.e., extremely/somewhat inappropriate) and 21% neither inappropriate nor appropriate. This result suggests that overall respondents view the *increase in price of fruits* as a realistic and acceptable payment vehicle for biodiversity conservation in the CFR.

In relation to respondents' perceived institutional trust, we find that trust differs across the three institutions: 67 respondents (12.7%) indicate to trust the government, 205 (38.8%) trust a conservation NGO and 256 (48.5%) trust the farmers with efficient management of funds for biodiversity conservation. We tested the significance of trust differences using Chai squared test of equal proportions (α=0.01), and find that the difference in trust proportions among the three institutions is highly statistically significant.

Figure 2 shows the results on the importance attached to the four drivers of institutional distrust. Overall, the great majority of respondents appear to attach high importance to the four drivers, as demonstrated by high frequency values associated with very/extremely-important scale-points. A comparison of frequencies among the four drivers suggest that corruption is of paramount importance to respondents, with 94.5% of them indicating that it is very/extremely important that the institution managing the funds is not corrupt or has corrupt officials. Expertise in conservation and farming, on the other hand, has the lowest score with 88.2% respondents viewing it as a very/extremely important aspect for the institution managing the funds, which is still a very high number.

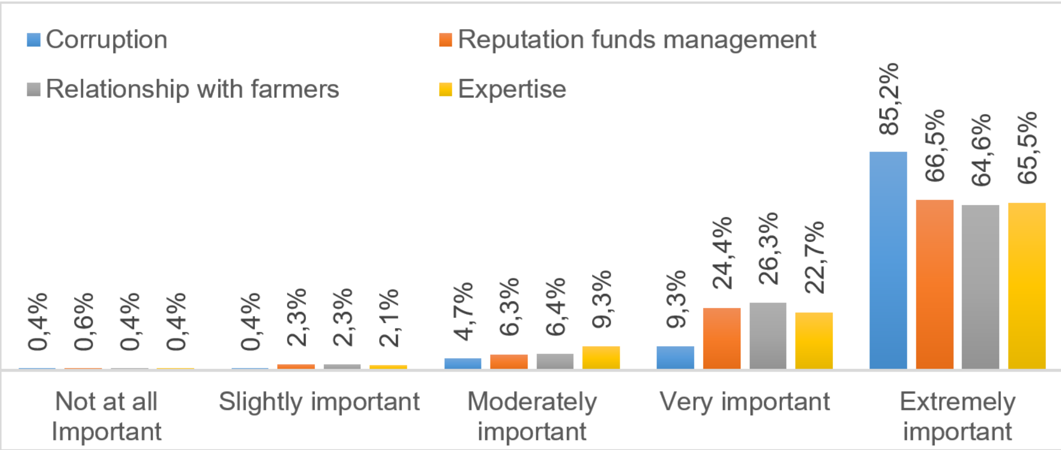

Fig. 2 Perceived importance of drivers of institutional distrust

4.2. Determinants of Perceived Institutional Distrust

To investigate factors that potentially affect the perceived importance of the drivers of institutional distrust, we estimate four (binary logit) random effects models whereby, for each model, one driver of institutional distrust is used as a dependent variable. Within the model, the dependent variable equals one if the Likert-scale response is *very/extremely-important*, and zero otherwise. The results of the four models are presented in Table 2.

Across all the models, there appears to be a strong relationship between trust in either the farmers or a conservation NGO and the four drivers, with the model – *relationship with farmers* – exhibiting larger effects for both. Individuals working in the public sector and those unemployed are less likely to attach higher importance to corruption. While both groups' perceptions are similar on corruption, they exhibit contrasting perceptions regarding the relationship with farmers, with individuals in the public sector more likely to attach higher importance to relationship with farmers and the unemployed less likely to do so. Both white and black respondents are more likely to attach higher importance to corruption; however, their perceptions differ with regard to reputation and good working relationship with farmers. Black respondents are less likely to find reputation and good working relationship with farmers important, whereas white respondents are more likely to believe that the relationship with farmers is of paramount importance. Household language matters less than the other variables.

Table 2 Results of random effects models on perceived institutional distrust

	Corruption	Reputation	Relationship with farmers	Expertise
Trust_farmers	0.8101***	0.9884***	1.6451***	0.5481***
	(0.1094)	(0.0892)	(0.0899)	(0.0828)
Trust_NGO	2.0722***	0.9475***	1.5885***	0.7311***
	(0.1433)	(0.0917)	(0.0922)	(0.0866)
Age (older)	1.3795***	0.9205***	1.2137***	0.7809***
	(0.1012)	(0.0738)	(0.0791)	(0.0635)
Female	0.6917***	0.7605***	0.5951***	0.4703***
	(0.0907)	(0.0692)	(0.0709)	(0.0594)
University degree	-0.8032***	-0.4718***	-0.7774***	-0.2446***
	(0.0908)	(0.0699)	(0.0724)	(0.0609)
Middle Income Class	0.2185**	0.8464***	0.5692***	0.1528**
	(0.1026)	(0.0817)	(0.0813)	(0.0748)
High Income class	0.6359***	0.2147**	0.6616***	0.0893
	(0.1455)	(0.0985)	(0.1102)	(0.0937)
Bigger households	0.6953***	0.0063	0.5025***	0.0907
	(0.0895)	(0.0693)	(0.0718)	(0.0604)
Public sector	-0.2864**	0.2022**	0.7389***	0.1213
	(0.1214)	(0.1026)	(0.1223)	(0.0933)
Unemployed	-0.3955***	-0.0652	-0.5043***	-0.3788***
	(0.1087)	(0.0851)	(0.0825)	(0.0708)
Countryside	-1.2556***	-0.3251***	-0.5904***	-0.7194***
	(0.1065)	(0.0986)	(0.0984)	(0.0812)

English (1st language)	0.0133	0.0753	-0.0719	-0.3191***
	(0.0944)	(0.0715)	(0.0740)	(0.0639)
White	0.3567***	0.0809	0.2308**	-0.0694
	(0.1146)	(0.0937)	(0.0952)	(0.0775)
Black	0.8164***	-0.1433*	-0.2895***	-0.0597
	(0.1190)	(0.0839)	(0.0880)	(0.0762)
High Apple	-0.9232***	-0.1171*	-0.1653**	0.0379
consumption	(0.0911)	(0.0660)	(0.0691)	(0.0580)
Constant	1.4067***	0.6079***	0.3599**	1.2665***
	(0.1795)	(0.1373)	(0.1414)	(0.1262)
LL at convergence	*-2187.3516*	*-3490.0101*	*-3237.1924*	*-4355.2298*
LL (0)	*-2696.1796*	*-3860.3486*	*-3860.3486*	*-4584.2400*
McFadden's Pseudo R^2	*0.1887*	*0.0969*	*0.1614*	*0.0499*
Chi^2 [15](P=0.000)	*1017.6559*	*740.6770*	*1246.3123*	*458.0205*
AIC/N	*0.348*	*0.553*	*0.513*	*0.690*

***, **, *: significance at 1%, 5%, 10% levels, respectively. Standard errors are in parentheses

4.3. Parametric Results

Table 3 reports the parametric results of the Model 2 – random parameters with heterogeneity, and Model 3 – random parameters with heterogeneity plus the error component for nest of SP-alternatives (as the base model – Model 1 – has a relatively low overall goodness of fit we deferred its results to the Appendix). For both models, all estimated random parameters are statistically significant and have the expected sign. The status quo constant is negative and significant, suggesting that respondents tend to choose more the SP alternatives and prefer that the conservation programme (in its different forms – as shown in the SP alternatives) is implemented other than maintaining the status quo, *ceteris paribus*.

For the *pesticide use* attribute, we find that respondents have higher preference for "no-pesticide" use compared to "reduced pesticide" use. The parameter for "intensive pesticide" use is negative, indicating that it negatively affects respondents utility. Parameter estimates for *farmland diversity* indicate that the most diverse landscape composition – orchard with "flower strips and natural vegetation" – generates the highest marginal utility for respondents. Orchard with "natural vegetation" is preferred to "flower strips" – that is, respondents prefer protecting endangered and endemic species to improving ecosystem services. For the attribute describing the institutional setting, we find that respondents prefer that "farmers" manage the funds rather than "conservation NGO". The results also shows that the "conservation NGO" is preferred to "government". The results of the marginal utilities of the three institutions, combined with the results of the analysis of institutional trust, suggest that institutional trust has indeed an effect on respondents' choices. Turning to the cost attribute, we find that the mean is significant and negative, implying that respondents are negatively affected by an increase in the price of fruits.

To investigate differences in preferences across the sampled population, as suggested by highly significant standard deviations of random parameters, we add in layers of observed heterogeneity on the random parameters of institutions and the cost attribute. In line with our expectations, we find that population grouping is a statistically significant source of influence on preference heterogeneity for the attribute level "farmers", reducing the marginal utility associated with farmers for black respondents, and increasing the marginal utility of farmers for white respondents. Similarly, employment sector also has an influence on preference heterogeneity, with those working in the public sector having reduced marginal utility for farmers. Although the population grouping and employment sector have an influence on "farmers", they are both non-significant for "conservation NGO". When we incorporate observed heterogeneity around the mean of the cost attribute, we find that income and the amount of apple consumption (purchasing) influence respondents' cost sensitivities. In accordance with economic theory, the marginal disutility associated with increased fruit price reduces as the income increases, *ceteris paribus*. Respondents with high apple consumption, on the other hand, appear to be more sensitive to increases in price of fruits, exhibiting a larger marginal disutility for the cost attribute.

Turning to the unobserved heterogeneity associated with SP alternatives, we find that the error component is statistically significant. This result is in accordance with previous studies (e.g., Cooper et al. 2012) and suggests the existence of a substitution pattern whereby respondents are more likely to substitute among the SP alternatives than between an SP alternative and the status quo alternative. The comparison of Model 2 and Model 3 shows that the inclusion of error component in Model 3 – i.e., accounting for the substitution patterns among the SP alternatives – improves the model's overall goodness of fit (from 0.1993 for Model 2 to 0.2067 for Model 3) and efficiency (parameters in Model 3 have generally smaller standard errors and larger means).

Table 3 Parameters estimates for the mixed logit (Model 2) and error components logit (Model 3)

	Model 2	Model 3
Mean		
Aasc	- 0.0580 (0.0554)	-0.0562 (0.0505)
Basc	0.1522*** (0.0508)	0.1545*** (0.0481)
SQasc	- 2.7311*** (0.1188)	- 4.2818*** (0.3230)
No pesticide use	0.1843*** (0.0377)	0.1843*** (0.0356)
Reduced pesticide use	0.1703*** (0.0411)	0.1746*** (0.0368)
Intensive pesticide use	- 0.3546	- 0.3589
Fruit trees + flower strips + natural vegetation	0.2027*** (0.0387)	0.2043*** (0.0373)
Fruit trees + natural vegetation	0.1499*** (0.0436)	0.1488*** (0.0484)
Fruit trees + flower strips	0.0876** (0.0439)	0.0912** (0.0393)
Fruit trees only	- 0.4645	- 0.4443
Farmers	0.4295*** (0.0563)	0.4308*** (0.0444)
Conservation NGO	0.1701*** (0.0540)	0.1726*** (0.0420)
Government	- 0.5996	- 0.6034
Cost (increase in price of fruits)	- 0.0747*** (0.0080)	- 0.0769*** (0.0072)
Heterogeneity around mean		
Farmers x black	- 0.2779*** (0.0807)	-0.2778*** (0.0731)
Farmers x white	0.1448* (0.0804)	0.1471** (0.0632)
Farmers x public sector	-0.1751* (0.0998)	- 0.1739* (0.0917)
Conservation NGO x black	- 0.0031 (0.0723)	- 0.0058 (0.0653)
Conservation NGO x white	0.0318 (0.0726)	0.0317 (0.0623)

Conservation NGO x public sector	0.0061 (0.0896)	0.0050 (0.0846)
Cost x high-income class	0.0263*** (0.0082)	0.0275*** (0.0079)
Cost x high Apple consumption	- 0.0210** (0.0082)	- 0.02253*** (0.0081)
Standard deviation		
No pesticide use	0.1843*** (0.0377)	0.1843*** (0.0356)
Reduced pesticide use	0.1703*** (0.0411)	0.1746*** (0.0368)
Fruit trees + flower strips + natural vegetation	0.2027*** (0.0387)	0.2043*** (0.0373)
Fruit trees + natural vegetation	0.1499*** (0.0436)	0.1488*** (0.0484)
Fruit trees + flower strips	0.0876** (0.0439)	0.0912** (0.0393)
Farmers	0.4295*** (0.0563)	0.4308*** (0.0444)
Conservation NGO	0.1701*** (0.0540)	0.1726*** (0.0420)
Cost (increase in price of fruits)	0.0747*** (0.0080)	0.0769*** (0.0072)
Error component for SP-alternatives		2.0259*** (0.2060)
LL at convergence	- 3516.2969	- 3484.1191
LL (0)	-4391.7805	- 4391.7805
McFadden's Pseudo R^2	0.1993	0.2067
Chi^2 [K](P= 0.000)	1750.9673	1815.3229
AIC/N	2.232	2.212
Number of parameters (K)	19	20

***, **, *: significance at 1%, 5%, 10% levels, respectively. Standard errors are in parentheses

4.4. Effects of Institutional Setting on Payment Vehicle

We investigate the unobserved correlated effects between the random parameters of institutions and the payment vehicle using the Cholesky matrix. For the sake of brevity, we defer the results of parameters' mean and standard deviation as well as diagonal values of the Cholesky matrix to the appendix, and show instead the correlation matrix (Table 4) and covariances of the three random parameters (Table 5). Nonetheless, we note that Model 4 is statistically significant (Chai squared – 1809.1354 with 17 degrees of freedom and pseudo-R^2 – 0.2059) and the mean and standard deviation of the three random parameters under investigation are statistically significant. The correlation matrix in Table 4 and covariances of random parameters in Table 5 suggest there to be a positive correlation between the institutions ("farmers" and "conservation NGO") and the payment vehicle (*increase in price of fruits*) random parameters. This positive relationship is stronger between "farmers" and *increase in price of fruits* than between "conservation NGO" and *increase in price of fruits*, as suggested by the magnitude of the respective covariances. As noted by Hensher et al. (2015), a positive covariance of two random parameters implies that, for the same individual, larger marginal utilities on one parameter are generally associated with larger marginal utilities on the second parameter. Hence, the covariance 0.0185 suggests that respondents with larger marginal utilities for "farmers" are likely to have also larger marginal disutilities for *increase in price of fruits*. Similarly, the covariance 0.0059 implies that individuals with larger marginal utilities for "conservation NGO" are likely to have also larger marginal disutilities for *increase in price of fruits*. These results demonstrate that respondents with higher marginal utilities for trusted institutions ("farmers" and "conservation NGO") are more inclined to accept larger values of the cost attribute.

Table 4 Model 4 – correlation matrix

Correlation Matrix	Farmers	Conservation NGO	Increase in price of fruits
Farmers	1.0000	-0.1255	0.3162
Conservation NGO	-0.1255	1.0000	0.0611
Increase in price of fruits	0.3162	0.0611	1.0000

Table 5 Model 4 – covariances of random parameters

Covariances of Random Parameters	Mean	Standard Error
Conservation NGO : Farmers	-0.0542	0.0692
Increase in price : Farmers	0.0185**	0.0086
Increase in price : Conservation NGO	0.0059	0.0103

***, **, *: significance at 1%, 5%, 10% levels, respectively

4.5 Marginal WTP

In Table 6, we report the results of the mean WTP estimates as well as the associated standard deviations and the 95% confidence intervals derived from the error components logit models with unconditional parameter estimates (Model 5) and conditional parameter estimates (Model 6). The results of the mean WTP estimates for both models are very similar to one another and their interpretation leads to the same conclusions. These results are in accordance with previous studies (e.g., Hensher et al. 2015) where WTP estimates from unconditional distributions showed to be equivalent to those from conditional distributions.

The negative sign of the means for the status quo levels “intensive pesticide” use and “fruit trees only”, and the “government” suggest that these levels are undesirable from societal point of view. For the desirable levels, respondents are willing to pay more for “no-pesticide” use than “reduced pesticide” use; and, to diversify the orchards, they are willing to pay more for the combination “flower strips plus natural vegetation” than either “flower strips” or “natural vegetation”. When we compare WTP for “flower strips” and “natural vegetation”, we find that WTP for conserving endangered and endemic species (“natural vegetation”) is higher than WTP for ecosystem services provision (“flower strips”). The results of the WTP for the institutions show that respondents are willing to pay more to have either “farmers” or “conservation NGO” managing the funds, rather than the “government”. In accordance with marginal utilities reported in Table 3, these results also demonstrate the influence of perceived institutional trust on WTP estimates, with the most trusted institution – “farmers” – exhibiting the highest WTP.

Table 6 WTP estimates for unconditional (Model 5) and conditional (Model 6) distributions

	Model 5 (Unconditional)		Model 6 (Conditional)	
	Mean (SD)	95% confidence interval	Mean (SD)	95% confidence interval
No pesticide use	3.1184 (2.8715)	-2.6245; 8.8614	2.3130 (2.5129)	-2.7128; 7.3389
Reduced pesticide use	2.8052 (2.1839)	-1.5626; 7.1730	1.3721 (3.5025)	-5.6330; 8.3771

Intensive pesticide use	-5.7935 (3.2278)	-12.2490; 0.6620	-3.9020 (5.3547)	-14.6113; 6.8073
Fruit trees + flower strips + natural vegetation	3.2904 (2.6455)	-2.0007; 8.5815	3.0315 (2.3176)	-1.6037; 7.6668
Fruit trees + natural vegetation	2.5940 (2.3153)	-2.0366; 7.2247	2.2416 (2.0360)	-1.8304; 6.3137
Fruit trees + flower strips	1.6436 (1.9578)	-2.2719; 5.5592	1.0083 (1.7429)	-2.4775; 4.4941
Fruit trees only	-7.2628 (3.3610)	-13.9848; -0.5408	-6.5060 (4.8591)	-16.2241; 3.2122
Farmers	6.3087 (3.8192)	-1.3297; 13.9471	4.7517 (5.9851)	-7.2185; 16.7219
Conservation NGO	2.8507 (2.3912)	-1.9316; 7.6330	1.8512 (3.5251)	5.1990; 8.9014
Government	-8.0933 (4.2392)	-16.5717; 0.3852	-7.2682 (6.3699)	-20.0082; 5.4717

WTP estimates are in South African Rand (ZAR) per kilogram of fruits (apples, pears, and peaches). Standard deviations (SD) are in parentheses

5. Discussion and Conclusions

The aim of this paper was to investigate the effects of institutional setting on the value estimates of SP surveys administered in a developing country context. To this end, we analysed three potential providers of environmental goods, namely the government, a conservation NGO, and farmers in a DCE concerned with biodiversity conservation in the CFR in South Africa. The three institutions were incorporated in the institutional setup of the survey's experimental design, which also included measures for biodiversity conservation. Furthermore, the survey contained debriefing questions that inquired into respondents' perceived institutional trust, including the drivers of institutional distrust.

We find that differences in institutional trust are statistically significant for the three institutions, with “farmers” commanding the highest level of trust, followed rather closely by “conservation NGO”, and – with some distance – by “government” with the lowest level. These results translate into highest WTP for “farmers” and lowest WTP for “government”; with the WTP estimates for “conservation NGO” being relatively closer to those of “farmers” compared to “government”. Similar to Nthambi et al. (2021), our results highlight the difference in institutional trust between private and public institutions, with the former exhibiting higher levels of trust. These findings are important for the debate on using SP surveys in developing country settings, as they confirm that institutional trust severely affects parameter estimates and WTP (Birol and Das 2012; Chen and Hua 2015; Kassahun et al. 2021; Nthambi et al. 2021). Thus, in a setting where different providers of an environmental good are available as a realistic option, a cautious selection of the institutional setting should take into account the public’s institutional trust.

A novel contribution of this paper to the literature is the analysis of drivers of institutional distrust. While previous studies did not inquire into the drivers of perceived institutional distrust (Birol and Das 2012; Chen and Hua 2015) or simply assumed that public distrust is corruption-driven (Kassahun et al. 2021; Nthambi et al. 2021), we investigated four potential drivers of institutional distrust. Our results shows that corruption is the most important but not the sole driver of institutional distrust; lack of reputation for management of funds, of working-relationship with stakeholders (farmers), and of expertise are also drivers of distrust in our study area.

Moreover, the results of the binary models demonstrate that perceptions of institutional distrust are segmented across the sampled population, with population grouping and employment sector being the key determinants. Population grouping and employment sector also have an effect on preferences in our study area, as demonstrated by our parametric results. Therefore, taking into account these socioeconomic variables (for instance during analysis of the data from the pilot survey) can greatly help in the selection of institutions that command high trust among respondents for the final SP survey. Furthermore, adding layers of heterogeneity on the models not only is beneficial for survey design, but also helps in the communication of the survey’s results to policy makers – whose hesitance in using the results of SP surveys to deliberate on policies hinges, *inter alia*, on whether the value estimates truly capture the socioeconomic heterogeneity of the population (Welling et al. 2023). One caveat about population grouping is that the results may be context dependent. Our study area is demographically more heterogeneous compared to many regions accross developing countries, and population group considerations have shown to have an effect on a variety of issues in South Africa such as interpersonal trust (Meiring and Potgieter 2017). So, the effects of population grouping on institutional trust might be weak (or non-significant) in a different context – for example, in regions which are demographically more homogenous.

A short comment may be in order regarding selection of institutional setting and the purpose of SP surveys. Considerations about the institutional setting should depend on the purpose of the SP survey to be undertaken. If the purpose is purely to evaluate the benefits of an environmental good, irrespective of the concrete implementation context, the institutional setting that provides the least distortions in the WTP due to institutional distrust should be prioritised. However, if the purpose of SP survey is to contribute to a concrete policy decision, the choice of the institution should reflect the institutional policy context to the extent possible. We conclude that, in the context of developing countries, the selection of institutional setting depends on the survey's purpose, and that this purpose needs to be clearly communicated in scientific publications so as to facilitate the understanding and evaluation of the results, as well as their use for policy advice.

Finally, this study contributes to the research on preferences for biodiversity conservation in agricultural landscapes. Whereas research typically focuses either on preferences for endangered species conservation or on ecosystem service provision (Moreaux et al. 2023; Mwebaze et al. 2018; Wätzold et al. 2008), our study allows for a comparison of preferences between the two aspects of biodiversity conservation. We find that there is a higher willingness to contribute towards protecting endangered and endemic species than for ecosystem services provisioning. While a detailed explanation of this finding is beyond the scope of our study, a possible explanation might be that respondents consider the provision of ecosystem services such as pollination and biological pest control to be (to a great extent) farmers' responsibility, whereas the conservation of endangered species is more a responsibility of the general public.

More specifically with respect to the orchards in the CFR, the economic prespective provided in this paper complements that of ecological studies which advocate for a reduction in agrochemical inputs (Birkhofer et al. 2019; van Schalkwyk et al. 2020) and diversification of the agricultural landscapes – through set-aside natural vegetation patches (Gaigher et al. 2015; Theron et al. 2020) and added floral resources (Ratto et al. 2021). The results show that there is public support for these measures and willingness to contribute towards biodiversity conservation within the orchards in the CFR.

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Appendix

See Tables 7, 8, 9

Table 7 Summary statistics of the socio-economic variables

Variable	Category	Mean	Standard deviation
Age		36,85	13,70
Gender	*Female*	0,51	0,50
Education	*University degree*	0,41	0,49
Income (rand/year)	*Middle Income Class(20.000-300.000)*	0,57	0,50
	High Income class (>300.000)	0,25	0,43
Household size		3,84	1,60
Employment sector	*Private sector*	0,47	0,50
	Self-Employed	0,22	0,41
	Public sector	0,12	0,32
	Unemployed	0,19	0,40

Residence	*Countryside*	0,11	0,31
Household 1st Language	*English*	0,60	0,49
	isiXhosa	0,12	0,32
	Afrikaans	0,23	0,42
Population grouping	*Coloured*	0,44	0,50
	White	0,29	0,45
	Black	0,25	0,43
Fruit Consumption (Kg/Month)	*Apple*	4,62	3,73
	Pears	2,46	2,81
	Peach	3,30	3,17

The categories of the following variables were dummy coded (1 if yes, 0 otherwise): gender, education, income, employment sector, residence, household first-language and population grouping. The fruit consumption variable represents the average monthly purchasing amounts of apples, pears, and peaches as reported by the respondents.

Table 8 Base mixed logit model with random parameters and asc's

	Model 1
Mean	
Aasc	-0.0519 (0.0551)
Basc	0.1536*** (0.0504)
SQasc	-2.7058*** (0.1175)
No pesticide use	0.1793*** (0.0372)
Reduced pesticide use	0.1611*** (0.0406)
Intensive pesticide use	-0.3404
Fruit trees + flower strips + natural vegetation	0.1929*** (0.0383)
Fruit trees + natural vegetation	0.1398*** (0.0431)
Fruit trees + flower strips	0.0878** (0.0436)
Fruit trees only	-0.4205
Farmers	0.3730*** (0.0345)
Conservation NGO	0.1708*** (0.0352)
Government	-0.5438

Increase in price of fruits	-0.0494*** (0.0046)
Standard deviations	
No pesticide use	0.1793*** (0.0372)
Reduced pesticide use	0.1611*** (0.0406)
Fruit trees + flower strips + natural vegetation	0.1929*** (0.0383)
Fruit trees + natural vegetation	0.1398*** (0.0431)
Fruit trees + flower strips	0.0878** (0.0436)
Farmers	0.3730*** (0.0345)
Conservation NGO	0.1708*** (0.0352)
increase in price of fruits	.04939*** (0.0046)
LL at convergence	*-3543.8900*
LL (0)	*-4391.7805*
McFadden's Pseudo R^2	*0.1931*
Chi^2 [11](P= 0.000)	*1695.7809*
AIC/N	*2.244*

***, **, *: significance at 1%, 5%, 10% levels, respectively. Standard errors are in parentheses

Table 9 Results of Model 4 – mixed logit with correlated random parameters of institutions and payment vehicle

	Model 4
Mean	
Aasc	-0.0784 (0.0574)
Basc	0.1375** (0.0551)
SQasc	-2.7387*** (0.1242)
No pesticide use	0.1889*** (0.0421)
Reduced pesticide use	0.1782*** (0.0389)
Intensive pesticide use	-0.3671
Fruit trees + flower strips + natural vegetation	0.2381*** (0.0413)
Fruit trees + natural vegetation	0.1841*** (0.0475)
Fruit trees + flower strips	0.0843* (0.0465)

Fruit trees only	-0.5065
Farmers	0.3995*** (0.0445)
Conservation NGO	0.2234*** (0.0410)
Government	-0.6229
Increase in price of fruits	-0.0545*** (0.0055)
Diagonal values in Cholesky matrix	
Farmers	0.6044*** (0.0587)
Conservation NGO	0.4279*** (0.0606)
increase in price of fruits	0.0551*** (0.0086)
Standard deviations	
Farmers	0.6044*** (0.0587)
Conservation NGO	0.4313*** (0.0577)
Increase in price of fruits	0.0585*** (0.0093)
LL at convergence	-3487.2128
LL (0)	-4391.7805
McFadden's Pseudo R^2	0.2059
Chi^2 [17](P= 0.000)	1809.1354
AIC/N	2.212

***, **, *: significance at 1%, 5%, 10% levels, respectively. Standard errors are in parentheses. Random parameters are normally distributed

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