Heterogeneous Consumer Preference for Certified Palm Oil Sustainability Attributes: Evidence From Stated Preference Survey

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Abstract

Consumers' concern on the adverse effect of the palm oil have contributed towards setting sustainability standard and certification of the palm oil. Choice experiment study was conducted to evaluate consumers' preference for sustainable palm oil supply chain model with environmental attributes. There is allegation that oil palm expansion has threatened biodiversity, and has led to increase in the emission of harmful CO_2. Certified sustainable palm oil was introduced to stimulate consumer demand for conservation graded palm oil products. We examine consumer awareness on palm oil and their heterogeneous preference for cooking oil certified by Round table on Sustainable Palm Oil. Sample of 322 consumers were surveyed in Malaysia. Respondents were found to be aware of the importance of palm oil and its contribution of to the economy. We analysed Latent Class Model with 2 classes, the 1st class are "concerned consumers" who are willing to pay up to 5% price premium increase over the present stock value of cooking oil. While 2nd class are "palm oil neutral" who are willing to pay 1%. Income level of the consumers and education were found to have

positively influenced their preference for sustainable palm value chain and environmental attributes. Thus, adoption of certification and ecolabel of the palm oil will promote sustainability, also the price premium will incentivise RSPO value stakeholders to conserve biodiversity and minimise CO_2 emission, on demand side, it will stimulate consumers to switch to the consumption of sustainable palm oil.

Keywords:

Heterogeneity, Latent Class Model, Certified Sustainable Palm Oil, Roundtable on Sustainable Palm Oil.

RESUMEN

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Palabras clave:

Guerra civil siria, Turquía, Israel, seguridad nacional, cooperación regional.

Introduction

Global increase in the demand of palm oil for food and other industrial uses, has led to expansion of and conversion of natural forest to oil palm. Such land-use change have induced deforestation, increased greenhouse gas emission the threatened biodiversity among others (Parsons et al., 2020). Palm oil has been portrayed as a controversial crop, and concern about its adverse effect, have contributed to setting its sustainability standard and certification. Conscious consumers often choose certified products to address the problem of unsustainable products, through willingness to pay price premium on such products. On the supply side, producers switch to eco-friendly production processes, to assure consumers of compliance to sustainability production process, and to earn premium (Bougherara & Grolleau, 2002; Hinkes & Christoph-Schulz, 2020). The success of sustainable palm oil lies more on the demand side, therefore, any modest increase in consumer demand for sustainable palm oil will lead to increase in the production of sustainable palm oil (Campbell-Arvai et al., 2014).

According to Cramb and Curry (2012); Sheil et al. (2009) palm oil has served as engine for stimulating economic growth, source of employment and poverty reduction among rural small-scale holders, foreign exchange earnings and source of gross domestic product growth of the producer nations. Notwithstanding, the good side of the news, palm oil was negatively perceived by consumers, based on health and food safety concerns, its effects on the environment, biodiversity, climate change, exploitation of cheap or child labour, degradation of tropical forest, displacement of indigenous people among others (Giam et al., 2016; Omar et al., 2012; Yaap, 2010). Consumers' negative perception and reaction towards food products and other consumables containing palm oil has been reported in many studies (Aguiar et al., 2018; Borrello et al., 2019; Disdier et al., 2013).

To address the issue of consumer concern and critics of oil palm especially

from European Unions and environmental non-governmental organizations, Roundtable on Sustainable Palm Oil (RSPO) was initiated in 2004 with principles as, commitment to transparency, compliance with applicable law and regulations, commitment to long term economic and financial viability, use of appropriate best practice by growers and millers, environmental responsibility and conservation of natural resources and biodiversity, responsible consideration of employees and of individual and communities by growers and millers, responsible development of new plantings, and commitment to continues improvement in key areas of activities (Boons & Mendoza, 2010). RSPO thus make it feasible for certified palm oil to became a new parameter in describing the sustainability of any product containing palm oil, especially to the consumers in the EU nations. RSPO certified products accounted to only 19% of the total palm oil related products, that means demand is significantly lagging behind, even most RSPO certified products are not labelled properly, and choosing RSPO certified palm oil is proven to be effective action to reduce the adverse effect of palm oil (Hinkes & Christoph-Schulz, 2020)

Certification and eco-labels are used to convey the degree of the sustainability of certified palm oil, and to ease consumers cognitive difficulty in the choice of their products (Borrello et al., 2019). We identify certified palm oil to mean segregated 100% certified, and mass balanced mixed certified palm oil to mean product which contains quantity of palm oil from both certified and conventional sources. To motivate consumers choice for sustainable palm oil and unveil their WTP price premium, we linked the degree of palm oil sustainability with the rationale to conserve biodiversity and reduction carbon dioxide emission, and bundled the variable into attributes in choice set.

This study conducted in Malaysia, contributes to unveil heterogeneity in consumer preference for certified palm oil sustainability attributes. The study focused on the perception of consumer on the issues related to palm oil and its sustainability. Biodiversity Conservation of biodiversity and reduction in the emission of CO_2 are used as a flagship and proxy for environment, and RSPO value chain mechanism are parameter for sustainable palm oil, certified palm oil attracts premium as a reward for compliance to RSPO principles of environmental sustainability.

Literature Review

Method use for this study, take cognizance of vertical products differentiation based on premium prices, and credence quality attributes of RSPO 100% certified and 1-99% mixed RSPO certified palm oil. These are commodified and attached to palm oil sustainability principle for conservation of biodiversity and emission of CO_2. Choice for the scenario were borne out of consumer behaviour, fore knowledge, and information for decision making.

Compared to other vegetable oils, palm oil has the lowest cost of production, relatively cheap, readily available to the consumers in Malaysia. It is been used for both cooking and non-cooking purposes. Most of the consumable goods in our

market stalls like noodles, cosmetics, soap and detergents, margarine, biscuits, chocolates, ice creams, contain substantial quantity of palm oil. Palm oil is also used in animal feeds and other industrial inputs (Noor & Hua, 2016).

Current trend in the promotion of sustainable production and consumption of agri-food products is the commodification of sustainability, choice experiment approach was often applied to set values and prices for sustainable product attributes. Choice Experiment on Sustainable level of meat attributes was reported by Van Loo et al. (2014), sustainability in coffee was reported by Ponte (2004), rubber commodity sustainability was studied by Min et al. (2018), cotton sustainability WTP was reported also by Hustvedt and Bernard (2008), fish sustainability and WTP was also surveyed by Menozzi et al. (2020), WTP for sustainable palm oil was also reported by Giam et al. (2016); Vergura et al. (2019) and also wood products with sustainable attribute (Sakagami & Sakaguchi, 2018).

LCM was applied to identify the latent segments or classes of consumers with homogeneous preferences, few studies reported using LCM to gain an insight into consumer preference for sustainable palm oil. Gassler and Spiller (2018) reported 3 different classes each characterised with particular behaviour and preference patterns, mixed RSPO compromised products were chosen by the consumers, however, all the classes equally chooses certified RSPO product. Hinkes and Christoph-Schulz (2020) study consumer preferences for cookies containing palm oil, he classified the consumers into 6 classes based on their within the class homogeneity, each class was identified with particular choice pattern, and their choice for attributes of palm oil value chain and eco-label certification stressed the presence of heterogeneity in their preferences.

Material and Methods

Discrete Choice Model

Lancaster's characteristics theory of value postulated that, goods are valued based on the characteristics of utility obtained from it by the consumer, these characteristics are bundled into attributes and their levels in choice sets (Lancaster, 1966). Conditional logit (CL) model was the primary discrete choice models, and the most commonly used discrete choice model (McFadden & Zarembka, 1974) despite promising output, and simplicity in application, it was flawed because it imposes homogenous preferences across respondents, and its assumption of independent from irrelevant alternatives (IIA), which posit that the odds ratio between two alternatives does not change even if, third alternative is added according to Hinkes and Christoph-Schulz (2020), that means probability ratio of consumer choosing between two (palm oil bundled with sustainability attributes) alternatives does not depend on the availability or attributes of the other alternatives, in essence, the IIA has been found to be restrictive, especially when the number of alternatives in the choice set is large (Cushing, 2007). Similar to our study that adopted opt out option. Also Hinkes and Christoph-Schulz (2020) posits

that, IIA is simply violated when choice attributes involved opt-out option ("no choice scenario"), rather than making randomly forced-choice, consumers are likely to opt out or chose the unattractive option in term of alternative forgone.

Models such as Mixed Logit Model (MLM) and Latent Class Model (LCM), were later developed to relax the stringent assumption of IIA pertinent to CLM and to explain the source of preference heterogeneity of the respondents without getting stucked by the IIA assumption. The MLM allows the consumers' heterogeneous preference by allowing utility parameters to vary based on random and or continuous sequence over individuals. LCM on the other hand, postulated that consumers has discrete distribution of preferences, grouping is estimated simultaneously with the choice model to identify subsets of consumers with homogeneous preferences within the class and heterogeneous preferences between the classes, the classes are known to the data but latent to the analyst, more often belonging to a particular class are estimated based on psychographic and socio-demographic variables, such as Event though, perceptions, experience, and beliefs, not than not only observed sociodemographic variables, individual preferences are affect many unobserved variables (Boxall & Adamowicz, 2002; Zhou et al., 2018).

Choice Experiment Design

Questionnaire was developed, pre tested and piloted, focus group discussion was conducted several times with sample of relevant consumers to validate the questionnaire, and reliability test was conducted using Cronbach alpha test. The attributes were carefully selected and conceived based on the outcome of the focus group discussion, and literature review. While choice set was obtained using NGENE software (ChoiceMetrics, 2018) for generating efficient design. The experimental design process generates 16 mutually exclusive sets each with levels and opt-out option scenario, the sets were later divided into 2 blocks of questions, each with 8 choice sets, other part of the questionnaire includes socio-demographic information, and questions on the consumer perception and information on palm oil related issues. Pictorial choice card was designed to presented to the consumer to enhance visual understanding of the choice scenario.

Qualitative attribute and their levels used in this study, included value chain models used by most agrobusiness industries such as RSPO. The models include segregation or identity preserved certified palm oil, which is 100% conformed to sustainability guideline designed by RSPO, mass balance or book and claim which is any palm oil quantity from 1-99% certified to have conformed to RSPO guideline designed by RSPO. Other include biodiversity conservation levels defined as high and moderate, and levels of CO_2 emission levels defined as moderate and low, consumer Willingness to Pay is translated as premium cost payed over the stock price of certified palm oil, it is measured in percentage with 3% or 5% premium price increase. In each choice set opt-out option is been included to avoid force choice and to account for consumer heterogeneity.

Table 3.1 Typical Choice set

Attributes	Alternative 1	Alternative 2	Opt-out
Palm Oil (cooking oil)	1 to 99% Mixed Certified	100% Certified	No choice
Biodiversity conservation	Moderate conservation BIO2	High conservation BIO3	No choice
Emission of CO_2 (Palm oil)	Moderate emission COE2	Low emission COE3	No choice
Cost of premium price in percentage	Up to 3% Increase on price	Up to 5% increase on price	0% increase on price
Choice option		×	

Sample of 322 consumers were interviewed in various locations from Klang Valley Malaysia, Klang Valley was selected because it is the most populous, industrialised, and the fastest growing part of the urban Malaysia (Kaffashi et al., 2016). Study area was divided using cluster sample approach where 10 locations were identified, survey process includes randomly interviewing peoples in places such as train stations, schools, household, shopping malls, hospitals, worship places, restaurants etc. Probability sampling was applied via systematic random sampling, where each consumer has equal chance to be chosen, sample is formed by choosing consumers from the population at regular interval and at random location. We start from random starting point and continuously choses the consumers, after a fixed sampling interval.

Model Specification

Assuming that a consumer n was to select his best among the sets of option J attributes of palm oil sustainability attributes in each of the $T(n)$ choice occasions, supposes a consumer n belongs to segment $s \in S$, then his utility function linked to his best option $i \in J$ can be written as:

$$U\left(\text{int} \mid s\right) = \beta_s' X_{\text{int}} + \varepsilon_{\text{int} \mid s}$$
(1)

Random utility framework has been adopted as the basis of respondent's choice and an independent-identically-distributed (IID) extreme value type 1 stochastic component of consumer's utility for his best choice. The joint probability set of choice $T(n)$ made by n is conditional on his belonging to a given class s, and the model is presented as:

$$P_{T(n)}|_s = \prod_{t(n)}^{T(n)} \frac{\exp(\beta'_s X\,\text{int}}{\sum_{j=1}^{J} \exp(\beta'_s X_{jnt}}$$
(2)

Where in the equations 1 and 2 X_{int} is a vector of observable attributes associated with alternative i and respondent n observed making a choice on occasion t, and β_s is a vector of taste parameters. By this process, preference heterogeneity sustainably certified palm oil choice of attributes across classes is captured by β_s.

Let us consider respondent's class membership likelihood function M^* that classifies respondents into one of the S latent classes based on their WTP for sustainably certified palm oil attributes. Z vector stands for vector that motivates consumer's WTP for any of sustainably certified palm oil attributes.

The membership likelihood function for respondent n and class s can be expressed: $M^*_{ns} = \lambda_s Z_n + \xi_{ns}$. IDD extreme value type 1 is assumed across respondents and classes. The probability that respondent n belongs to segment s can be expressed in Multinomial Logit form as:

$$P(s) = \frac{\exp\left(\lambda_s Z_n\right)}{\sum_{s=1}^{S} \exp\left(\lambda_s Z_n\right)}$$
(3)

Where λ_s ($s = 1,2,\dots,S$) are class-specific parameters to be estimated, a positive λ implies that variable Z_n increases the prior probability that respondent n belong to class s. The scale factor is normalized to unity. $P(s)$ sums to one across the S (to be determined) latent class with $0 \le Ps \le 1$.

Equation 4 provides a conditional choice probability of belonging to membership of a particular class s. Therefore, the unconditional joint probability of a set of choices $T(n)$ for individual n can be obtained by combining the conditional probability by means of taking the expectation over all the S classes:

$$Pr(T_{(n)}) = \sum_{s=1}^{s}\left[\left(\frac{\exp\left(\lambda_s Z_n\right)}{\sum_{s=1}^{S}\exp\left(\lambda_s Z_n\right)}\right) \times \left(\prod_{t(n)}^{T(n)} \frac{\exp\left(\beta_s X_{\text{int}}\right)}{\sum_{j=1}^{J}\exp\left(\beta_s X_{jnt}\right)}\right)\right]$$
(4)

The simple log likelihood function that is maximized to obtain the parameter λ_s and β_s is given by (where I_i is an indicator variable for the observed choice):

$$L = \sum_{n} \sum_{i \in j} l_i$$

$\ln \Pr(T(n))$ (5)

Economic values of sustainably certified palm oil attributes can be obtained when the parameters have been established using equation (6). Ratios of marginal implicit price which can be translated as marginal rates of substitution (*MRS*) between price and water attributes, the coefficient β_m gives the marginal utility of income and is the coefficient of price attribute and β_k is the coefficient of the sustainably certified palm oil attributes: (Ruto *et al.,* 2008)

$$MRS_{ks} = -\frac{\beta_{sk}}{\beta_{sm}}$$

(6)

LCM has been widely used on environmental goods (Garrod et al., 2012), benefit of environmental stewardship (Garrod et al., 2012), water quality (Kosenius, 2010), food policy (Hu et al., 2005), consumer preferences on certified sustainable palm oil (Gassler & Spiller, 2018; Hinkes & Christoph-Schulz, 2020), consumer motives and choice of ecolabel products (Liu et al., 2017).

Result and Discussion

Demographic Profiles of the Consumers

Frequency and percentage were used to estimate the demographic profile of the consumers. Age was grouped into 18-30 years are youth, 47.2% (152), and constituted the largest number of respondents, middle age are 31-45 years with frequency of 39.8% (128), and aged consumers are 46-60 years of 13% (42). Number of males are 218 (67.7%), and 104 being female (32.3%). Monthly household income starting from RM3000 constituted only 11.5%, between RM 3001 and 5000 were 6.5% (21 respondents), between RM 5001 and 7000 were 19.9% (64), and between RM 7001 and 9000 were 25.5% (82). Majority of the consumers earns high income RM 9000 and above, they constituted 36.6% (118). The level of education attained by the consumers shows 247 of the respondents attended university, which represented 76.7% of the sample, 37% attended a polytechnic or college, 23% secondary school, 13% primary, and 2% did not attend any formal school.

Consumers' Perception on the roles of Palm oil

The surveyed consumers have responded on the issues related to their positive and negative perception on the palm oil, the response was based on binary questions. Consumers were of the overwhelming opinion that palm oil has created of employment opportunity to the farmers especially the small-scale holders with 96.5% of the consumers affirming positively. Similarly, the role of palm oil in reducing rural poverty has been acknowledged by the consumers, where 87.5% of them answered affirmatively. Palm oil has increased foreign earning and volume of export, and led to rapid infrastructural development in Malaysia, this finding is in congruent with report by Yusof and Weng (2004).

On the negative perception, consumers are of the opinion that there is connection between palm oil and deforestation of natural forest, because palm oil grows mostly in

tropical forest where world most rarest species of fauna and flora are found, similarly palm oil has through its chain of supply led to increase in the emission of harmful CO_2, the percentage of consumers responds 76.4%, 76% and 59.4% respectively.

Table 4.1. Consumer Perception on Palm Oil Issues

S/N	Issues	Yes Freq (%)	No Freq (%)
1	Consumers perception that, palm oil has contributed to the creation of employment farmers	311(96.5)	11(3.5)
2	Consumers perception that palm oil has help in the reduction of rural poverty	282(87.5)	40(12.5)
3	Consumers perception that palm oil has increased Malaysian foreign exchange earning	264(81.9)	58(18.01)
4	Consumers perception that palm oil has increased the volume of Malaysian export	301(93.4)	21(6.6)
5	Consumers perception that palm oil has led to rapid infrastructural development in Malaysia	261(81)	61(19)
6	Consumers perception that palm oil has connection with the deforestation of natural forest	246(76.4)	76(23.6)
7	Consumers perception that palm oil has connection with the loss of biodiversity	245(76)	77(24)
8	Consumers perception that palm oil has connection with the increase in the emission of harmful CO_2	191(59.4)	131(40.6)

The result in table 4,1 implies most of the statements mentioned are affirmatively responded to positively, even though the statements subscribed to both negative and positive impact of palm oil on both ecology and the economy.

Fundamental issue in the LCM is the determination of the number of classes or segments in the analysis, there is no thumb of rule to determine the number of the segments needed for all study. However, many authors suggest the use of information criteria and analyst own judgement (Boxall & Adamowicz, 2002). Having examined many models with different classes, we used Akaike information criteria, the policy suitability of the model as a guide in determining the number of classes and significance levels of our parameters as suggested by Garrod et al. (2012); Ruto et al. (2008). Two classes are adopted based on the improvement in the *Pseudo R^2* from the different classes of the LCM analysed. Compared with *Pseudo R^2* of Mixed Logit Model from same study reported in Dauda et al. (2021), the result proves the presence of consumer heterogeneity of preferences and the existence of latent classes. To further establish heterogeneity between the classes 1 and 2, *Pseudo R^2* in the two classes has also improved from 49978 to 51135, which means incorporation of socio-demographic variables have improved the model.

Table 4.2 indicated that most of the consumers belong to class 1a and have homogeneous preferences for the RSPO value chain with palm oil sustainability attributes, this is similar to result of mixed logit model by Dauda et al. (2021), where RSPO value chain and conservation grade palm oil with environmental attribute was highly valued.

The overall result indicated the presence of preference heterogeneity evidenced by the differences in magnitude, significance and sign of parameter estimates same as

reported by Garrod et al. (2012). Class 1a, constituted the largest number of the consumers, that has homogeneous preferences across all the variables, except COE2 which is a choice for lowest possible level of emission. Consumers in class 2a however, has negative preferences for all the variables except RSPO2.

To further establish heterogeneity in the consumer preferences, we extended the model by including socio-demographic attributes. Class 1b in extended model indicated consumers have preferences in all the variables with the exception of COE3, however, interaction of RSPO2 with education, gender and the interaction of BIO2 with income, implies those belonging to the class are mostly male, educated and high-income earners, Similar to Gassler and Spiller (2018) that also reported gender and education as the most active socio-demographic variable that account for heterogeneity in the sustainable food consumption. However, latent class 2b member who are few did not generate any preference for the attributes, but their heterogeneity is noted in the interaction of their main attributes with BIO2 and education and income.

Table 4.2. Latent Class Model Estimation

Variables	Basic Latent Class Model 1a Concerned Consumers Coefficient (Standard Error)	Basic Latent Class Model 2a Palm oil neutrals Coefficient (Standard Error)
RSPO2	1.0739***(6.236)	6.1267*** (.513)
RSPO3	1.1606*** (5.916)	1.0414 (.013)
BIO2	1.0573*** (5.934)	4.3466 (.364)
BIO3	1.0534*** (5.426)	.4563 (.014)
COE2	.5359** (2.824)	5.1536 (.431)
COE3	-.3233 (-1.748)	.8173 (-.026)
ASC	-1.7591*** (-5.198)	-8.1227 (.130)
COST	-.2346*** (-9592)	-4.7801 (-.500)
Extended Latent Class 1b		**Extended Latent Class 2b**
RSPO2	1.5612***(5.322)	4.8540 (1.594)
RSPO3	1.4031*** (5.865)	3.9917 (.695)
BIO2	1.2998*** (2.321)	1.7541 (.560)
BIO3	1.4031*** (5.280)	3.9208 (.682)
COE2	.4048** (1.928)	2.6855 (.888)
COE3	-.2494 (1.277)	2.4508 (.424)
ASC	-2.1962***(-5.731)	-1.5803 (-.184)
COST	-.2027*** (-7.427)	-2.9977***(-7.238)
RSPO2*EDU	-.4272** (-2.628)	-.6392** (-2.864)
BIO2*GEN	-.7954*** (-2.344)	.4346 (-.807)
BIO2*EDU	.0759 (.364)	-.9972** (-2.732)
BIO2*INC	.9592*** (4.345)	.3248* (2.146)
Summary Statistic	**Basic Latent Class**	**Extended Latent Class**
Number of observations	2576	2576
Log-likelihood (L(β))	-1408.222	-1373.485
Log Likelihood, No coeff (L(0))	-2824.5322	-2824.5322
Pseudo R2	50143	51375
Adjusted R2	49978	51135
Percentage of class membership	73% class 1a	27% class 2a
	68% class 1b	32% class 2b

Significant at***1% significant at**5% significant at*10%

The study was carried out to estimate the percentage of premium price the consumers are Willing to Pay on stock of cooking oil (palm oil), that will guarantee improvement in the RSPO value chain processes linked with the conservation of biodiversity and low emission of CO_2. Consumer preference for RSPO certified palm oil will support sustainable production and consumption of palm oil and will address the problems associated with oil palms expansion. Mean Willingness to Pay was presented in the table… based on the marginal rate of substitution of the attributes, the figures are presented in percentages. Except for reduction in the emission of COE which receives lower percentage of price premium, all the variables are valued and have attracted appreciable price premium.

Table 4.3 Mean Willingness to Pay Price Premium Percentage for various Attributes

	Basic CLM 1a	**Basic CLM 2a**	**Extended CLM 1b**	**Extended CLM 2b**
Attributes	MWTP%	MWTP%	MWTP%	MWTP%
RSPO2	4.93***	1.78	7.56***	1.61
RSPO3	5.86***	.58	6.27***	1.33
BIO2	5.68***	.58	6.77***	.58
BIO3	4.30***	.62	5.49***	1.30
COE2	1.40	1.80	1.95*	.89
COE3	-.42	.68	-1.20	-.30

Discussion

Consumers survey indicated that consumers has perceived that palm oil has contributed to the creation of employment among farmers, and also has minimised rural poverty due to the cultivation of palm oil, in same vein, palm oil has been acknowledged to have contributed to Malaysia foreign earnings, increase in the volume of export and rapid infrastructural development, this is similar to finding by Yusof and Weng (2004). However, on the other hands, consumers perception of palm oil as driver of deforestation that caused loss of biodiversity and increases harmful CO_2 emission has been acknowledged by the consumers, similar to the findings reported by Austin et al. (2017); Eisner et al. (2016).

Consumers heterogeneous preference of palm oil based products on information has been reported in Hinkes and Christoph-Schulz (2020), other study reported palm oil value chain preference of consumer like (Gassler & Spiller, 2018). They use LCM in order to minimise the stringent assumption of IIA pertinent to CLM and assumption of the heterogeneity of preferences across all the consumers pertinent to MLM. LCM in this study grouped the consumers into two classes, and each class has a peculiar homogeneous preferences within the class, class 1 constituted the highest number of respondents that are influenced to choose certified palm oil because of their high level of education and income, however, class 2 are indifferent in their choice of certified palm oil, because they are few in number and with low level of income and education.

Consumers in class 1 expresses higher marginal rate of substitution for RSPO3 compared to RSPO2, and BIO3 compared to BIO 2 in the models that

incorporated other socio-demographic variable, the consumers pattern of choice was coherent because, they have had homogeneous preference and their choice was based on their level of income and education.

Conclusion and Policy Implication

There is improvement in heterogeneity of consumer preferences between the two classes both for simple and extended CLM, though, within the class there is homogeneity of preference, this has justified reason for classifying consumers into two classes, based on the roles played by their socio-demographic background. Classes 1 are noted with coherent preference choice of both segregation and mass balance value chain, high and moderate conservation of biodiversity and indifference towards the emission of CO_2, as evidenced by the interaction of RSPO value chain with education. Biodiversity with gender, income and education, class 2 are not interested in the choice of RSPO certified palm oil. Müller et al. (2012) opined that consumers more often prepare intermediate options for price and or quality, than highest possible options, this coherent to our finding which explain the reason for the consumer choice and WTP more premium on RSPO2 than RSPO3, and BIO2 than BIO3 also COE2 than COE3.

Marginal rate of substitution between the variables indicated movement from lower to higher level, consumers are ready to pay price premium on the certified palm oil which promises conservation of biodiversity and reduction of harmful CO_2 emission. The premium will serve as a compensation and incentive to the RSPO members who complied to the principles of sustainability, because the burden of the certification has fallen more on the supply chain members. Such action will incentivise the consumers to choose RSPO certified products.

The policy implications of this study may avail the consumer with knowledge and awareness on the green consumerism and choice of green economy. Malaysia can introduce price premium on the certified palm oil and its by-products, this will enable the palm oil industry introduces sustainability principle in the palm oil, Stakeholders can earn premiums on certified products, by adopting adopt product differentiation as reported in Gassler and Spiller (2018), they should also the advocates for palm oil sustainability information targeting youths and low-income earners.

Thus, adoption of certification and ecolabel for certified palm oil, will be a marketing tool for green consumerism and will usher in the setting of sustainability standard. Also, the price premium will incentivise RSPO value stakeholders to conserve biodiversity and minimise CO_2 emission. The finding will also enable strengthen the campaign for the acceptance of sustainable palm oil instead of campaign for the boycott of palm oil or campaign for only palm oil free-product.

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