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Factors and socio-economic aspects that influence willingness to pay (WTP) for Peruvian organic quinoa

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ABSTRACT

This study analyzes the factors and socio-economic aspects involved in willingness to pay (WTP) for organic quinoa in Peru. The primary data were collected between September 2020 and August 2021 in the Lima Metropolitan area. A binomial logistic, probit and gamma model were conducted. The main outcomes identified by the logit and probit models showed that (i) a counterintuitive sign in the attitude factor with respect to conventional quinoa, (ii) ethnic identity and (iii) women and people with higher education have more probability of WTP. Despite the general raised awareness of the need for good health and the perception of quinoa being a quality functional food, the health construct was non-significant in the model. The gamma model showed that monthly family expenditure and quinoa consumption had a significant effect on WTP.

Keywords: COVID-19; organic quinoa; theory of planned behavior; socio-economic factors; Top Lima and Modern Metropolitan Lima.

1 Introduction

The COVID-19 pandemic increased the perceived importance of a healthy and balanced diet as a shield against current and future diseases (Borsellino et al., 2020; Encalada-Añazco et al., 2021; WHO, 2021; Jian et al., 2023), During the COVID-19 pandemic, eight out of ten Ibero-American consumers were spending more on healthy food than before the pandemic (Financial Food, 2021). In Peru, more than 70% of Peruvians stated that they are more conscious of the food they consume (El Peruano, 2020). Current knowledge encourages the consumption of quinoa by all people, especially those who are more vulnerable to COVID-19, like children and the elderly (Hussain et al., 2021). Quinoa (*Chenopodium quinoa Willd.*) is from the Andean region of South America and has now become a popular worldwide food due to its healthy attributes (Instituto Interamericano de Cooperación para la Agricultura [IICA], 2015). The nutritional quality of quinoa as a whole grain meets the growing expectations of consumers regarding healthy diets (FAO-ALADI, 2014; Muziri et al., 2021), as it is an amino-acid complete product that is easy to digest, which makes it stand out when compared to other staple foods such as wheat, corn or rice (Hernández et al., 2020). Quinoa contains all the protein amino acids that are essential for human nutrition (Vega-Galvez et al., 2010), including lysine, threonine and methionine (MINAGRI, 2017), which makes it comparable to milk protein (Hussain et al., 2021). It also contains fiber, minerals, phenolics, saponins, phytosterols (Li et al., 2018) and vitamins, and it is effective in reducing total cholesterol (Yao et al., 2014).

Consumers in developing countries are also becoming more aware of organic products due to improvements in the quality of life and a perceptual shift from traditional foods towards health-conscious foods. One of the reasons for the growing demand for organics is the increasing number of consumer concerns about the lack of healthiness and safety of conventional food production (Van Loo et al., 2013). Despite this fact, the number of consumers who buy organic food on a frequent basis is quite low (Al-Swidi et al., 2014). In emerging markets such as the case of Peru, consumers such as Peruvians have little faith in the mandatory food safety regulations as they are less strict than in developed countries (Wongprawmas and Canavari, 2017). Overall, most consumers in developing countries are not willing to pay a price premium above 10-20%, which means that demand for organically grown food drops sharply with premiums above 20% (Hamzaoui-Essoussi and Zahaf, 2012). Nonetheless, some customers who are concerned about the environment and health are willing to pay a premium price for organic food (Meixner et al., 2023) that can range from 5 to 250% depending on the country, product and socio-demographic factors (Van Loo et al., 2013).

Studying the willingness to pay (WTP) for Peruvian organic quinoa and identifying the factors that impacted on the propensity to purchase this product during the pandemic is considered our contribution to the current literature because many consumers became increasingly aware of maintaining good health (Hernández et al., 2020) and boosting the immune system (Borsellino et al., 2020). This study is particularly relevant in a country where quinoa is regarded as a national food product that is regularly consumed. The framework used for the study provides a thorough examination of the various factors that influence consumer behavior, which encompasses attitudes, subjective norms, and perceived behavioral control. Furthermore, it considers not only the broader contextual elements of health consciousness and cultural values/identity but also socio-economic attributes. Therefore, the objective of this study is to analyze the factors and socio-economic aspects involved in the WTP for organic quinoa in Peru in the context of changes in the perspectives of health during the COVID-19 pandemic. To our knowledge, this is the first quantitative study conducted in these regions that focuses on WTP for organic quinoa and the monthly expenditure that individuals are willing to allocate to this product and also the first study that combines concepts from the theory of planned behavior (TPB) and the socio-economic characteristics that became apparent during the COVID pandemic. This empirical approach contributes to a better understanding of consumers' expectations and behaviors regarding organic quinoa consumption in the context of increased concerns about maintaining good health.

The remainder of this article is organized as follows: the second section presents a literature review on the subject, the third section explains the methodological approach adopted in this research, the fourth section describes the results and discussion points, and the last section presents the main conclusions and policy recommendations derived from the main findings.

2 Literature Review

2.1 Extended Theory of Planned Behavior (TPB) and Willingness to Pay (WTP) for Organic Quinoa

Even before the COVID-19 pandemic and the associated focus on good health, organic foods were perceived by consumers as being environmentally friendly and healthier than conventional (non-organic) foods because their production does not utilize antibiotics, growth hormones, pesticides, chemical fertilizers or growth regulators (Hamzaoui-Essoussi and Zahaf, 2012; Van Loo et al., 2013; Lee et al., 2020). Willingness to pay (WTP) can be defined as the maximum price a buyer is prepared to pay for a given product. Consumers assign a high value to safer food, which is reflected in their WTP a premium price for organic products (Wongprawmas and Canavari, 2017). Meixner et al. (2023)

highlight that a price premium, which is an indicator of consumer demand for a certain product, is reflected in WTP for novel food such as organic products, as they possess additional ethical characteristics such as animal welfare, biodiversity, or fair prices paid to producers. However, the current basic level of food safety in the market might not fully satisfy this consumer need. This discrepancy between perceived value and available options underscores the importance of understanding both WTP and the monthly expenditure individuals are willing to allocate for organic quinoa consumption (Katt and Meixner, 2020). Various studies conducted on consumer WTP for organic food have undertaken analyses from a wide variety of focal points, ranging from country-specific to differences in the effects of organic labels and between organic and local food WTP (Krystallis and Chryssohoidis, 2005; Hamzaoui-Essoussi and Zahaf, 2012; Wongprawmas and Canavari, 2017; Katt and Meixner, 2020). Nonetheless, most of the previous studies on WTP were conducted in the EU and the US, and they revealed that consumers have more than one motive for buying organic foods (Hamzaoui-Essoussi and Zahaf, 2012). However, there have been very few studies about consumers' WTP in emerging markets (Wongprawmas and Canavari, 2017).

Based on the precautionary principle alone, choosing to consume organic quinoa appears to be an entirely rational decision (Higuchi and Maehara, 2021). This choice reflects a growing trend among consumers who prioritize health and environmental considerations (Hamzaoui-Essoussi and Zahaf, 2012). Given this trend, it is worth considering the role of consumers' rationality in their decision-making. One of the most important assumptions of the theory of planned behavior (TPB) is that consumers are rational in their decision-making processes and their actions, and therefore, cognitive approaches can be used to anticipate behaviors (Ajzen, 1991; Lee and Yun, 2015). This theory presumes that the likelihood of a certain behavior is a function of a human being's conscious intention to perform it (Scholderer and Grunert, 2001). This, in turn, is assumed to be a weighted average of three conceptually independent variables: (i) attitude towards the behavior, which is determined by beliefs about its outcomes and their evaluation and entail consideration of the outcomes of performing that behavior; (ii) subjective norms (or social norms), which are determined by beliefs about the expectations of others (perceived social pressure) and motivation to acquire a behavior (Ajzen, 1991); and (iii) perceived behavioral control, which is determined by self-efficacy and beliefs about the controllability of facilitating conditions, past experience and inhibitory factors or anticipated difficulties (Ajzen, 1991). Previous research studies have placed significant emphasis on the TPB to explore customers' intentions to buy green foods (Auza and Mouloudj, 2021). For instance, one study focused on why organic vegetables and fruits receive higher premium values than meat products (Krystallis and Chryssohoidis, 2005).

The integration of the extended TPB with consumers' WTP for organic quinoa has received notable attention in contemporary research. Understanding these dynamics is crucial for elucidating the complexities of consumer decision-making regarding organic quinoa consumption. As highlighted by Higuchi and Maehara (2021), the TPB establishes that consumer behavior is influenced by conscious intentions that are shaped not only by socio-demographic factors related to the consumers but also by attitudes towards the behavior, subjective norms, and perceived behavioral control. Furthermore, the dimensions of health, including considerations of nutritional value and well-being, as well as cultural identity play relevant roles in shaping consumer preferences and behaviors, as emphasized by previous empirical results (FAO-ALADI, 2014; Nosi et al., 2020).

Regarding the health factor, according to FAO-ALADI (2014) and Nosi et al. (2020), the demand for healthy food increases at higher income levels. For example, Park et al. (2007) mention that the "health-aimed stage" correlates income with an increased consciousness of the effect of food on human health, which means that the attainment of beauty and healthy living has a direct association with class level in society (Muziri et al., 2021). Finally, cultural values may influence WTP (Katt and Meixner, 2020). Organic quinoa is not just a healthy food but also has ethnic characteristics associated with cultural traditions among Latin-American consumers (FAO-ALADI, 2014; Hernández et al., 2020). The concept of ethnic identity involves a self-identification process of language, religion, values, moral affairs, and behavior that takes place at a personal level in relation to a given social group that shares similar values (or cultural values or affairs) (Romo and Gil, 2012) and differentiates themselves from other ethnic groups (Carrus et al., 2009). Ethnic identity is increasingly recognized as being crucial to the psychological well-being of members of a certain ethnic group (Peña-Lévano et al., 2020). Moreover, a sense of national identity can shape consumption behavior (Carvalho et al., 2019). However, this ethnic identity may constitute an underlying bias on WTP studies, making it difficult to perform comparisons using cross-country results (Katt and Meixner, 2020).

2.2 Socio-economic characteristics, Willingness to Pay (WTP) and monthly expenditure allocation

Several studies have revealed significant influences of socio-economic characteristics on consumers' behavior towards food (Rivaroli et al., 2020; Encalada-Añazco et al., 2021). There have been many reviews of the socio-economic variables used in the literature to study the influence of numerous factors on the behavior of specific groups of consumers (Füsun-Tathdil et al., 2009). Moreover, income level seems to influence the choice of location, and the quantity of craft food consumed (Rivaroli et al., 2020) as it is an essential determinant of willingness of the propensity to purchase organic food (Al-Swidi et al., 2014; Nandi et al., 2017; Wongprawmas and Canavari, 2017). As a result, the quantity and frequency of consumption are related to consumer level of income (Encalada-Añazco et al., 2021). Specifically, quinoa

is in high demand by consumers with higher incomes who are often well-informed about health trends and foods that promote a healthy lifestyle (Encalada-Añazco et al., 2021).

There is evidence that the demographic characteristics of age, gender, education, and income influence consumers' attitudes and purchasing behavior towards superfoods (Encalada-Añazco et al., 2021), specifically craft food (Rivaroli et al., 2020). For instance, Hjelmar (2011) suggests including demographic characteristics as explanatory variables to describe a typical organic food consumer. In the specific case of quinoa consumption, intake is influenced by the socio-demographic characteristics of consumers, including those who belong to a regional location, and the price of the product (Ayala-Macedo, 2003). Socio-demographics also have broad effects on the monthly expenditure that consumers are willing to allocate and purchase intentions towards organic food items (McFadden and Huffman, 2017). Most of the research on consumer-related factors that influence their WTP has frequently examined the influences of socio-demographic variables, including age, gender, income, and education (Krystallis and Chryssohoidis, 2005; Katt and Meixner, 2020).

Ardebili and Rickertsen (2022) indicate that previous studies demonstrate the primary role of socio-demographic variables in consumer choice and decision-making regarding seafood and food in general. They also emphasize the significance of socio-economic attributes and the importance of intrinsic attributes, which aligns with the findings of other studies. For instance, attributes related to seafood consumption influence frequent consumers to be willing to pay a premium (Ardebili and Rickertsen, 2022). This theoretical perspective also enables researchers to explore the multifaceted motivations underlying consumers' willingness to pay premiums for organic quinoa.

3 Materials and Methods

3.1 Data

Given the relevance of high-income levels and appreciation for health trends to the consumption of healthy food, this research focused on the case study of consumers living in Top Lima and Modern Metropolitan Lima, who are aware of the nutritive qualities of Andean crops. This area comprises 12.9% of the population of Lima, the capital of Peru. On average, this group has the highest levels of education and income in the city (Ipsos Apoyo, 2021), and their cognition and knowledge significantly affect their choice of purchasing healthy and safe organic food (Jiang et al., 2023). In 2019, the socio-economic level known as "A" (upper class) was 1.8% of the total Peruvian population (the current population is approximately more than 33 million), and in 2021, this percentage had decreased to 1%. The "B" population group (upper-middle class) in 2019 was approximately 10.5% of the Peruvian population, and in 2021 it had decreased to 9% (Ipsos Apoyo, 2021). According to the Peruvian classification, the A and B socio-economic sectors have more access to communication and technology, therefore those consumers are highly informed and motivated to care about their health and nutrition. For instance, in a survey conducted in 2013 in Lima, the Peruvian capital, and Callao, the country's leading port city, 85.4% of households declared they consumed quinoa (Andina, 2013).

Data from 170 completed interviews were collected between September 2020 and August 2021 (during the COVID-19 pandemic) in the area known as Top Lima and Modern Metropolitan Lima, Peru. The survey was conducted online in non-probabilistic conditions: an online purposive sample was conducted (Barratt et al., 2014; Meltzer et al., 2017) that considered only purchase decision-makers and quinoa consumers aged between 20 and 75. It was emphasized that participation in the study was anonymous and incentives were not offered. Given the absence of stimulus, the motivation to deliberately respond to the survey more than once was reduced. A higher proportion of women than men were interviewed, as in many households in Lima women oversee food purchasing. In addition, the substantial proportion of respondents with a technical or university degree was due to the higher level of education and income of citizens of Top Lima and Modern Metropolitan Lima. The overall descriptive statistics are shown in Table 1.

The questionnaire consisted of a set of questions (based on the TPB) about motivational factors for quinoa consumption that were measured on 5-point Likert scales from 1 (Totally disagree) to 5 (Totally agree). Measures of attitude, subjective norms, perceived behavioral control, ethnic identity and health were included in the questionnaire. Items on motivations that affect quinoa consumption were originally drawn from Verbeke and Vackier (2005), Mitterer-Daltoé et al. (2013), Carrillo et al. (2011), and Ragaert et al. (2004), and were used in a previous study conducted by Higuchi and Maehara in 2021. The scales were originally published in English and then translated into Spanish. To check the validity of the translations, the questionnaire was then translated back to English (Carrillo et al., 2011; Higuchi and Maehara, 2021). Table 2 shows the dimensions and measures used for the operationalization of the structural model. In addition, the survey included a set of socio-demographic and quinoa shopping behavior questions.

Table1.
Socio-demographic characteristics of quinoa consumers in Top Lima and Modern Metropolitan Lima.

Socio-demographic characteristics	(n = 170)	%
Gender		
Women	121	71.00
Men	49	29.00
Marital status		
Single/divorced/widowed	43	25.00
Married/cohabiting	127	75.00
Single household		
Lives alone	7	4.00
Not alone	163	96.00
Highest educational level		
Finished primary school	2	1.00
Finished secondary school	11	6.00
Technical education	28	16.00
Incomplete university	15	9.00
Finished university	78	46.00
Masters/Ph. D.	36	21.00
Household members		
1-3 members	52	31.00
4-6 members	107	63.00
7-9 members	11	6.00

Table 2.
Scales used for analysis.

Dimension	Item	Definition	Origin
Attitude (3 items)	A2 – Eating quinoa is wholesome. A4 – Eating quinoa is safe. A5 – Eating quinoa is nutritious.	Refers to the degree to which a person has a favorable or unfavorable evaluation of the behavior.	Verbeke & Vackier (2005)
Subjective norms (3 items)	SN6 – Doctors and nutritionists think that I should eat quinoa. SN8 – I buy quinoa to provide healthy meals to my family. SN9 – I buy quinoa to provide nutritious meals to my family.	Refers not only to social pressure but also to personal feelings or moral obligation or responsibility to act certain ways.	Verbeke & Vackier (2005)
Ethnic identity (4 items)	C1 – Quinoa consumption is part of Peruvian traditions. C2 – I'm interested on the culture of native communities in Peru. C3 – I'm proud that the quinoa has a Peruvian origin. C4- I'm proud of being Peruvian.	Critical component of the self-concept. It is crucial to the psychological well-being of members of a certain ethnic group.	Phinney (1992)
Perceived control behavior (4 items)	PBC9 – Quinoa is easy to prepare. PBC10 – I am familiar with quinoa consumption. PBC11 – I have a lot of experience buying quinoa. PBC15 – I am familiar with quinoa preparation.	Self-efficacy and beliefs about the controllability of facilitating and inhibitory factors.	Verbeke & Vackier (2005)
Health (3 items)	H4 – Eating quinoa makes me strong. H6 – Eating quinoa stimulates brain development. H7 – Eating quinoa prolongs life.	Refers to the inherent role of diet in well-being. To understand consumers' behavior and ability to provide food that contributes to their well-being, studies about the role of diet in health are necessary.	Carrillo et al. (2011), Ragaert et al. (2004)

3.2 Methods

Lockie et al. (2004) and Steptoe et al. (1995) note that while the scales have high internal reliability, there are also strong enough correlations between some scales to suggest that collapsing them into a smaller number of factors may be appropriate. Thus, we first used confirmatory factor analysis (CFA) through the unweighted least squares (ULS) method to obtain the main factors that influence quinoa consumption.

Kirsten et al. (2017) argue that the choice of analytical technique or method has an impact on the interpretation of consumer preferences and consumers' WTP. Thus secondly, the main models we used for identifying the factors involved in the WTP for organic quinoa in the study sample, which were based on the TPB variables and the socio-economic characteristics that became apparent during the COVID-19 pandemic, were the logistic and probit binomial analyses specified below (equations (1) and (2), respectively) (Bilder and Loughin, 2014; Agresti, 2015):

$$\pi_i = \frac{\exp(\beta_0+\beta_1 x_{i1}+\cdots+\beta_p x_{ip})}{1+\exp(\beta_0+\beta_1 x_{i1}+\cdots+\beta_p x_{ip})}, \quad (1)$$

$$\pi_i = \Phi\left(\beta_0 + \beta_1 x_{i1} + \cdots + \beta_p x_{ip}\right). \quad (2)$$

where π_i denotes the probability of the i-th consumer's WTP for organic quinoa. We consider p explanatory variables $x_{i1}, \ldots, x_{ip}$, each of which is measured for the i-th consumer, in addition to the regression parameters $\beta_0, \ldots, \beta_p$. Furthermore, $\Phi(\cdot)$ is the standard normal cumulative distribution function. In addition, consumption frequency in all the models presented was explained by a set of demographic factors or socio-economic factors (Nandi et. al., 2017).

The summary statistics of the independent socio-economic variables used in the models are described in Tables 3 and 4.

Table 3.
Summary statistics of the quantitative socio-demographic factors of the sample

Variable	Description	Min.	Max.	Mean	S.D.*
	n = 170 quinoa consumers				
TQCONS	Time spent by the interviewee consuming quinoa (in years)	0	58	14.90	17.70
MQCONS	Monthly consumption of quinoa in the interviewee's household (in grams)	84	5000	956.50	909.30
QEXPEND	Monthly family expenditure on quinoa consumption in the interviewee's household (in soles)	2	250	30.00	28.60
EDUCATION	Number of years the interviewee spent studying	6	20	15.90	2.70
AGE	Age of the interviewee (in years)	20	75	49.80	8.70
	n = 105 quinoa consumers				
Monthly monetary WTP for organic quinoa	Interviewee's willingness to pay for organic quinoa expressed in terms of expenditure (in soles)	2	50	10.70	9.30

Table 4.
Summary statistics of the qualitative socio-demographic factors of the sample

Qualitative factors			
Variable	**Description**	**Frequency (n = 170)**	**Percent (%)**
Gender	0 = Male	49	28.80
	1 = Female	121	71.20
WTP for organic quinoa	0 = No	63	37.10
	1 = Yes	107	62.90

On the other hand, the variable monthly monetary WTP for organic quinoa can be considered a continuous and non-normally distributed dependent variable. In this scenario, the use of generalized linear models (GLMs) that fit the

variable distribution more closely, following a data-driven modelling approach, is an appropriate alternative to achieve a higher accuracy in predictions with respect to the transformation of the variable and adjustment of the zero values to avoid issues using the ordinary least squares (OLS) estimation (Gregori et al., 2011; Glick et al., 2014).

Thus, a log-gamma regression was considered to assess the impact of explanatory factors on the monthly expenditure individuals are willing to allocate to organic quinoa consumption, which is specified below (equation (3)).

$$\mathcal{L} = \sum_{i=1}^{n} \left\{ \frac{\frac{y_i}{\exp(x_i'\boldsymbol{\beta})} + x_i'\boldsymbol{\beta}}{-\phi} + \frac{1-\phi}{\phi} ln y_i - \frac{ln\phi}{\phi} - ln\Gamma\left(\frac{1}{\phi}\right) \right\}, \quad (3)$$

where y_i represents the monthly WTP expenditure for organic quinoa for the ith-consumer, ϕ is the dispersion parameter, $x_i'\beta$ is the linear combination of covariates and their associated coefficients for the i-th consumer and $\Gamma(\cdot)$ denotes the gamma function. Using a log-link gamma model, we obtain a log-rate of the response. Consequently, considering k covariates, a unit change in the explanatory variable x_k leads to a $100 \times (\exp(\beta_k) - 1)$ percent change in the mean of the monthly WTP expenditure for organic quinoa, assuming all other variables remain constant (Inchausti, 2022).

Exclusively for the gamma model, a subsample of 105 consumers of quinoa who are WTP for organic quinoa who expressed the monthly expenditure they are willing to allocate to organic quinoa consumption and responded more than zero nuevos soles/kg was considered for the analysis. The analyses were performed using R software.

4 Results and Discussion

In the first phase, CFA was performed to detect the loading of each item and the relationship with the factor (see Appendix 1). The CFA included 14 Likert items with the aim of exploring the structure of all belief variables in the data. Table 5 (Appendix 2) shows the constructs of the three models obtained from the method for ULS.

The Kaiser-Meyer-Olkin (KMO) was 0.96 and the Bartlett's test statistics were significant (χ^2=4596.10; df. 153; p-value < 0.01). The Cronbach's alpha (α) test measures internal consistency and indicates how closely related a set of variables is as a group (Field et al., 2012). All the constructs presented an α value higher than 0.9, which is regarded as excellent.

4.1 Extended TPB, WTP and monthly expenditure individuals are willing to allocate to organic quinoa consumption

Previous studies have found that if consumers are not sure that the food products they purchase are indeed organic, they are unwilling to pay anything more than standard prices (Krystallis and Chryssohoidis, 2005). Moreover, the premiums that consumers are willing to pay vary depending on the type and magnitude of the factors that affect it according to the organic food category (Krystallis and Chryssohoidis, 2005). This difference can be explained by the consumers' knowledge and awareness about agricultural organic products. Normally, the attitude factor positively influences the intention to consume organic products. For instance, Nosi et al. (2020) support the notion that attitude is the most crucial variable in determining consumers' organic quinoa purchase behavior.

The results of the analyses undertaken in this study using logit and probit models showed that for socio-demographic factors and those derived from the TPB related to the WTP for organic quinoa, the attitude construct is significant but negative (p<0.10). This result is consistent with that of Shen et al. (2022), who found that a positive attitude towards organic food is insufficient to stimulate its purchase, as most customers are unwilling to pay a hefty premium price over conventional products (Jiang et. al., 2023) and consider other factors, such as lack of convenience (Chen, 2007), due to limited availability in retail outlets. In this Peruvian quinoa case, Peruvians have likely experienced the positive attributes of conventional quinoa and may therefore think that the conventional quinoa product has enough good characteristics so there is no justification for them paying more for organic quinoa.

Quinoa is perceived as a traditional product, and it has been shown that many traditional foods have the characteristics of functional foods that help to improve health/prevent illness (Rojas-Rivas et al., 2020). However, despite the general raised awareness of the need for good health and the perception of quinoa being a quality functional food, the health construct was non-significant in the model (p>0.10) (Table 6, Appendix 3). It is possible that Peruvian consumers take the health characteristics of organic quinoa for granted, and they do not expect to pay extra. This result is somewhat similar to that reported by Chen (2007), who found that the health food choice motive does not contribute to consumers' attitudes to organic foods. Further, Nandi et al. (2017) mention that high proportions of respondents are not willing to pay a premium price for organic products even though organics are healthier and do contribute to their health. One of the possible explanations for these consumer attitudes in the current study is that quinoa is easily found in the Peruvian market, and because it is available and health-conscious consumers in Peru believe that conventional quinoa is nutritious enough, they do not feel they need to pay more for organic quinoa.

The results showed that consumers who are proud of being Peruvian and their culture are willing to pay more for what they perceive to be high-quality food ($p<0.05$). These ethnic foods are often viewed as being particularly fit to satisfy consumers' demands because of their high quality and their supposed authentic linkage with the culture of reference. Thus, what people eat can become a symbol of who they are, as consumers symbolically use food products to define their relations to other people, to their group of reference, and to social reality in general (Carrus et al., 2009). During the pandemic, consumers showed a higher preference and more support for local products that are more readily available (Jiang et al., 2023). Moreover, the inclusion of "country of origin" and "traditional methods of production" variables are part of the quality, security and trust, which are important factors in defining WTP for most organic food categories (Krystallis and Chryssohoidis, 2005). In the Peruvian context, consumers may identify the support of local farmers, considered on the one hand as a socially responsible behaviour that motivates consumers and on the other an expression of strong ethnocentric tendency in quinoa-related matters as the Canadians, Germans, or Greeks towards certain food products (Hamzaoui-Essoussi and Zahaf, 2012). Higuchi and Maehara (2021) verified the influence of the Peruvian image and pride on local consumers' behaviour towards quinoa consumption.

Conversely, the analysis using a gamma model to assess the influence of variables from the TPB on the monthly expenditure individuals are willing to allocate to organic quinoa consumption revealed that none of the variables were significant in the model. Despite the anticipation that these variables might impact on the amount of money individuals are willing to spend on organic quinoa, the results suggest that other unaccounted factors may be influencing this spending decision. This finding underscores the complexity of consumer behavior and suggests the need for further exploration into the factors that influence their WTP for this specific product.

4.2 Socio-economic characteristics, WTP and the monthly expenditure individuals are willing to allocate to organic quinoa consumption

Krystallis and Chryssohoidis (2005) and Nandi et al. (2017) mention that demographic characteristics can impact on the WTP and it is expected that education would be reasonably homogeneous within small residential areas (Hanley and Morgan, 2008), which is the case of Top Lima and Modern Metropolitan Lima. The years of education of the respondent are a significant variable influencing the WTP for organic quinoa as shown in Table 6, Appendix 3 ($p< 0.01$), which is consistent with the results of Nandi et al.'s (2017), but contrary to McFadden and Huffman's (2017) outcomes.

Regarding gender, as the primary dietary decision-maker in Peruvian families, women's purchasing attitudes are important (Krystallis and Chryssohoidis, 2005; Nandi et al., 2017). This is especially significant for women who have the role of mother, caretaker of the family, and who want to provide the best food for their family (Jiang et al., 2023). The results ($p< 0.10$) found that women were more prone to consume quinoa on a daily to weekly basis. This is in line with the results reported by McFadden and Huffman (2017), who indicated thatin the United States, women were WTP US$0.19 to US$0.24 higher organic-"natural" premiums than men.

Likewise, the results for the monthly quinoa consumption and the monthly household expenditure of quinoa variables in the gamma model (Table 7, Appendix 4) show that both have an impact on the monetary amount related to the WTP for organic quinoa in the gamma model ($p<0.10$). Usually, quinoa is eaten in the homes of all socio-economic strata once a day on average (Ayala-Macedo, 2003). It can be said that the frequency of quinoa consumption is related to the monthly expenditure individuals are willing to allocate to organic quinoa consumption. Katt and Meixner (2020) mention that familiarity and involvement with a product such as quinoa was shown to have a significant positive effect on the monetary amount related to the WTP for organic quinoa. Moreover, the presence of children in the family has an important influence on switching to a healthier diet (Hamzaoui-Essoussi and Zahaf, 2012).

Monthly family expenditure on quinoa consumption (in nuevos soles) has a positive effect on the monetary amount allocated to the WTP for organic quinoa in the gamma model (Table 7, Appendix 4) ($p<0.05$). This may be due to the expectations that if a person is already buying conventional quinoa - which is not cheap in Peru - and has enough experience of its consumption, then the consumer would be willing to pay extra to buy a better product (organic quinoa). On the other hand, the monthly consumption of quinoa in the interviewee's household (in grams) has a negative effect on the monthly expenditure individuals are willing to allocate to organic quinoa consumption (Table 7, Appendix 4). This can be related to the number of members of the family. The greater the quantity of quinoa consumed in grams due to a larger number of people to feed, the lower the likelihood of expenditure on organic quinoa, which means larger families who consume larger quantities of the product are not willing to pay three and five times more for organic quinoa over conventional quinoa. Nandi et al. (2017) also found in their study in India that as the family size increased, there was less expenditure on organic fruit and vegetables. It is well known that organic quinoa comes in smaller packages to maintain a competitive price, and these smaller quantities may not be enough to feed a large family.

5 Conclusions

This study explored factors derived from the TPB and socio-demographic characteristics that impacted on the WTP for organic quinoa consumption during the COVID-19 pandemic in the Top Lima and Modern Metropolitan Lima areas in Peru. The main results of the logit and probit models of this study for the first objective showed that (i) a counterintuitive sign in the attitude factor with respect to conventional quinoa, (ii) ethnic identity, and (iii) women and consumers with higher education have more probability of WTP for organic quinoa. Despite the general raised awareness of the need for good health and the perception of quinoa being a quality functional food, the health construct was non-significant in the model. The main outcomes drawn from the gamma model analysis showed that the monthly family expenditure on quinoa consumption (in nuevos soles) has a positive effect on the monthly expenditure allocated to organic quinoa consumption. On the other hand, the monthly consumption of quinoa in the interviewee's household (in grams) has a negative effect on the monetary amount allocated to the WTP for organic quinoa.

Specific recommendations can be made from the findings of this study. First, that organic quinoa marketing campaigns such as "eat local, eat Peruvian organic quinoa," which have been promoted by the government, should be reinforced to improve the food security of Peruvians to enhance the nutrition and health of the population and support Peruvian farmers, especially from the highlands where the quinoa is produced without pesticides. Bolivia, for instance, has created their trademark called "real quinoa" (in Spanish quinoa real), which characterizes a quinoa that grows under special conditions on the Bolivian plateau, including that it is organic. Second, more organic farmers' markets should be fostered among the A and B socio-economic strata in Lima to ensure accessibility and convenience and to have spaces to enhance knowledge and education about the agricultural products' origin, which will promote the cultural and ethnic identity not only to women but also to whole families, especially to children through learning games. Third, organic quinoa suppliers should increase advertising investment and carry out more publicity regarding the quality, safety, health and environmental attributes of organic quinoa on websites, billboards, and public places such as their stalls at the farmers markets. These activities will communicate the added value of their organic quinoa products, which can justify the higher prices. Finally, because of the origin and the high nutrition of organic quinoa, it is recommended to target young children in public campaigns, such as introducing organic quinoa into canteens at schools and universities.

The main limitation of this study is that the results are valid only for customers interviewed in Top Lima and Modern Metropolitan Lima. In addition, due to restrictions during the pandemic, data were collected through an online survey. Another limitation is that the sample respondents represented the viewpoint of highly educated people about their WTP for organic quinoa, and it is quite possible that people with a lower level of education perceive organic quinoa consumption in a different way. Therefore, these findings cannot be generalized to all Peruvian consumers. Similar studies in different geographical zones should be undertaken to broaden the scope of this research and, therefore, increase the knowledge of consumer behavior. Additionally, other factors such as fairness throughout quinoa production that respect farmers' human rights and ethics, animal welfare and environmental and resources protection should be considered to measure factors directly related to organic products. Researchers are also encouraged to use the results of this study as a basis for similar research on different products in a post-COVID-19 era.

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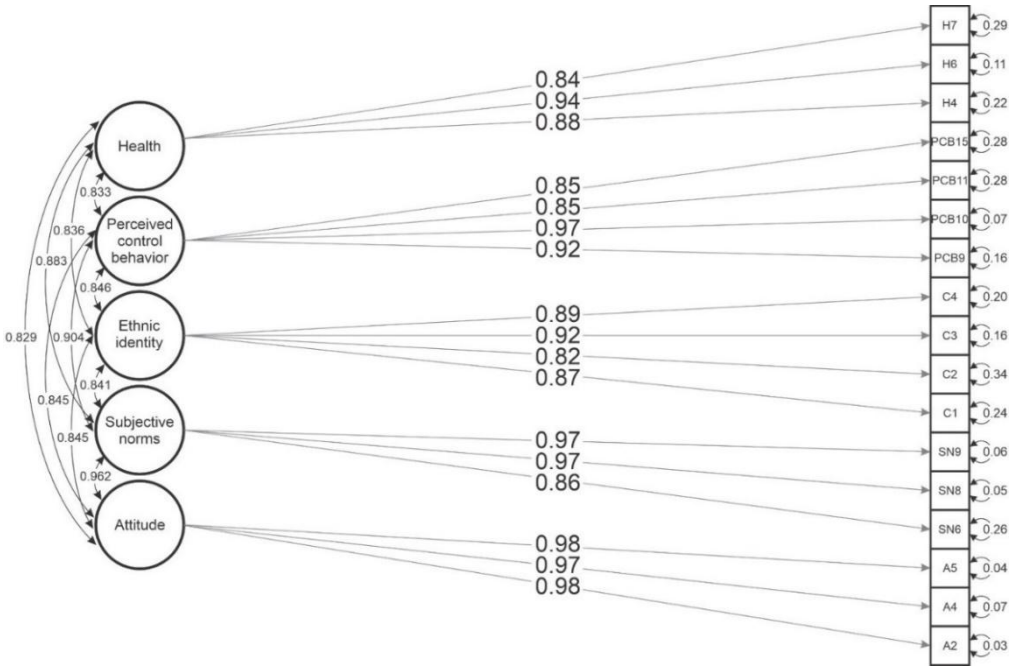
Appendix 1

Path diagram of the four-factor model resulting from the confirmatory factor analysis (CFA). Squares represent observed items, ellipses depict latent variables (factors), and the parameters in the black arrows are standardized loadings.



Appendix 2. Results of CFA models (Table 5).

Factor/ítems	Mean	Estimate	Std. Err	z-value	P(>|z|)	Std. lv	Std. all
Attitude							
A2	4.3	1.21	0.10	11.74	< 0.01 ***	1.21	0.98
A4	4.2	1.20	0.10	12.47	< 0.01 ***	1.20	0.97
A5	4.3	1.22	0.10	11.66	< 0.01 ***	1.22	1.22
Subjective norms							
SN6	3.9	1.04	0.09	11.63	< 0.01 ***	1.04	0.86
SN8	4.1	1.18	0.09	12.55	< 0.01 ***	1.18	0.97
SN9	4.2	1.19	0.10	12.45	< 0.01 ***	1.19	0.97
Cultural values							
C1	3.9	1.03	0.09	11.40	< 0.01 ***	1.03	0.87
C2	3.6	0.93	0.08	12.07	< 0.01 ***	0.93	0.82
C3	4	1.13	0.08	13.59	< 0.01 ***	1.13	0.92
C4	4.2	1.09	0.10	10.59	< 0.01 ***	1.09	0.90
PBC							
PBC9	3.9	1.10	0.10	11.49	< 0.01 ***	1.10	0.92
PBC10	4	1.17	0.09	13.84	< 0.01 ***	1.17	0.97
PC11	3.5	1.02	0.07	15.31	< 0.01 ***	1.02	0.85
PBC15	3.6	1.00	0.07	13.69	< 0.01 ***	1.0	0.85
Health							
H4	3.8	1.05	0.08	12.42	< 0.01 ***	1.05	0.88
H6	3.7	1.11	0.07	15.29	< 0.01 ***	1.11	0.94
H7	3.6	0.93	0.08	12.01	< 0.01 ***	0.93	0.84

Appendix 3. Results of logistic and probit regression models (Table 6).

Models	Logistic regression					Probit regression				
Variables	**β**	**S.D.**	**Z-value**	**P > |z|**	**O.R. [95% C.I.]**	**β**	**S.D.**	**Z-value**	**P > |z|**	**O.R. [95% C.I.]**
Intercept	-4.22	1.58	-2.66	0.01 ***	0.01 [0.00 - 0.06]	-2.53	0.94	-2.69	0.01 ***	0.08 [0.04 - 0.17]
Health	-0.28	0.53	-0.52	0.60 [N.S.]	0.76 [0.49 - 1.18]	-0.17	0.32	-0.53	0.59 [N.S.]	0.85 [0.65 - 1.10]
Attitude	-1.72	1.00	-1.72	0.09 *	0.18 [0.08 - 0.41]	-1.07	0.60	-1.77	0.08 *	0.34 [0.21 - 0.57]
Subjective norms	1.44	1.35	1.06	0.29 [N.S.]	4.22 [1.36 - 13.07]	0.91	0.82	1.12	0.26 [N.S.]	2.50 [1.26 - 4.94]
Cultural identity	1.29	0.56	2.29	0.02 **	3.62 [2.27 - 5.80]	0.78	0.33	2.34	0.02 **	2.17 [1.65 - 2.87]
PBC	-0.74	0.64	-1.15	0.25 [N.S.]	0.48 [0.28 - 0.82]	-0.47	0.39	-1.21	0.23 [N.S.]	0.63 [0.45 - 0.87]
TQCONS	0.02	0.01	1.99	0.05 **	1.01 [1.01 - 1.03]	0.01	0.01	1.99	0.05 **	1.01 [1.01 - 1.02]
MQCONS	0.00	0.00	-1.05	0.30 [N.S.]	0.99 [0.99 - 1.00]	0.00	0.00	-1.04	0.30 [N.S.]	0.99 [0.99 - 1.00]
QEXPEND	0.00	0.01	0.47	0.64 [N.S.]	1.00 [0.99 - 1.01]	0.00	0.00	0.44	0.66 [N.S.]	1.00 [0.99 - 1.01]
Gender_1	0.72	0.40	1.79	0.07 *	2.06 [1.47 - 2.88]	0.44	0.24	1.82	0.07 *	1.56 [1.27 - 1.91]
EDUCATION	0.20	0.07	2.74	0.01 ***	1.22 [1.15 - 1.30]	0.12	0.04	2.79	0.01 ***	1.13 [1.09 - 1.12]
AGE	0.02	0.02	0.87	0.39 [N.S.]	1.02 [1.00 - 1.04]	0.01	0.01	0.90	0.37 [N.S.]	1.01 [1.00 - 1.02]

Note.- *** 0.01, ** 0.05, * 0.10, [N.S.] non-significant, S.D.: standard deviation. For logistic regression, the modified Park test results obtained were χ^2=0.39 and p-value=0.5348.

Appendix 4. Results of gamma regression model (Table 7).

Variables	β	R.S.D.	t-value	P > |t|
Intercept	2.71	0.68	3.97	<0.01 ***
Health	0.26	0.21	1.27	0.21 [N.S.]
Attitude	-0.44	0.39	-1.13	0.26 [N.S.]
Subjective norms	0.39	0.55	0.72	0.48 [N.S.]
Ethnical identity	-0.11	0.21	-0.52	0.61 [N.S.]
PBC	-0.19	0.26	-0.75	0.46 [N.S.]
TQCONS	0.00	0.00	-0.15	0.88 [N.S.]
MQCONS	0.00	0.00	-1.76	0.08 *
QEXPEND	0.01	0.00	2.40	0.02 **
Gender_1	0.23	0.17	1.35	0.18 [N.S.]
EDUCATION	0.01	0.03	-0.44	0.66 [N.S.]
AGE	-0.01	0.01	-1.00	0.32 [N.S.]

Note.- *** 0.01, ** 0.05, * 0.10, [N.S.] non-significant, R.S.D. : robust standard deviation.