



Blueberry consumption and healthy lifestyles in an emerging market

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Abstract

Aim of study: This study focuses on the preference for and consumption habits of blueberries (*Vaccinium corymbosum* L.) in an emerging market. The objective is to analyze the determinants of blueberry consumption in Chile and evaluate to what extent traditional factors, such as income and price, are more determinant than other attitudinal factors and lifestyles.

Area of study: The Biobío Region (Chillán City), the second most important region in Chile.

Material and methods: A face-to-face survey is applied to a random stratified sample. The survey collected information on adoption of healthy lifestyles, knowledge of blueberries as a natural functional food, some sociodemographic characteristics, and traditional economic factors. A Heckman model is estimated by the Maximum Likelihood.

Main results: Results suggest that higher blueberry consumption is positively associated with the adoption of healthy lifestyles, a higher self-perception of healthy habits, and the recognition of blueberries as a natural functional food. The nutritional status reflected that people with a lower body mass index consume fewer blueberries. Finally, traditional factors, such as income and price, are showed to be more influential on blueberry consumption than attitudinal and lifestyle factors.

Research highlights: Chilean consumers perceive blueberries as a healthy product, which can contribute to adopt healthier lifestyles. Domestic markets should be supplied with higher quality product taking into account that the demand is price inelastic. Branding and packaging with functional claims could be an efficient strategy to increase domestic consumption.

Additional keywords: Chile; Heckman model; healthy lifestyles; natural functional food.

Abbreviations used: BMI (Body Mass Index); CNCs (Chronic Noncommunicable Diseases); HLS (Healthy Lifestyles); OLS (Ordinary Least Squares); WHO (World Health Organization).

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Introduction

Increasing demand and consumption of healthy and functional foods is one of the most significant current world trends. The world market for functional foods is growing annually at 10% and estimated in US\$ 150 billion yearly (Granato *et al.*, 2010).

The concept of functional food originated in Japan in the 80s, and its meaning has varied throughout the world (Lau *et al.*, 2013) because no clear international regulation exists as to its definition or classification (Brown & Chan, 2010). According to Pravst (2012), there is a certain consensus for defining functional food

as: i) an unmodified natural food, ii) food in which a component has been improved through cultivation or biotechnology, iii) food to which a component has been added to provide benefits, iv) food in which a component has been eliminated through technology, v) food in which a component has been replaced by another beneficial component, vi) food in which a component has been modified, vii) food in which the bioavailability of a component has been modified, and viii) a combination of any of the abovementioned definitions.

Increasing demand for functional foods is due to the growing interest of the population to acquire products

in the market that contribute to health and wellbeing, and thus reduce the risk of chronic noncommunicable diseases (CNCDs) such as overweight, obesity, cardiovascular diseases, cancer, and diabetes (Barreiro-Hulé, 2007; Kearney, 2010). The CNCDs are currently identified as a very important public health problem worldwide (Beaglehole *et al.*, 2011; Singhal, 2016) because they occur cross-sectionally in both low- and middle-income countries as well as in the most important world economies, such as the USA and China, and cause 63% of total annual deaths (Ezzati & Riboli, 2013; Hunter & Reddy, 2013; Xu *et al.*, 2013; WHO, 2017).

This public health problem, as well as its consequences, could be partially prevented by adopting healthy lifestyles (HLS), which are behavior patterns beneficial for human health (Alwan, 2011). Natural functional foods appear in this context; they are characterized as having properties that go beyond nutrition and hunger satisfaction and contribute to people's physical and mental wellbeing (Olagnero *et al.*, 2007; Granato *et al.*, 2010; Bigliardi & Galati, 2013; Goetzke & Spiller, 2014).

The blueberry (*Vaccinium corymbosum* L.) is considered as a very relevant natural functional food that has been widely studied by the scientific community with respect to its phenolic composition (Norberto *et al.*, 2013). Different properties have been highlighted such as antioxidant, anti-inflammatory, neuroprotective action, and activity against cancer, contributing to people's health as well as properties preventing diseases such as atherosclerosis, neurodegenerative disorders, and diabetes (Routray & Orsat, 2011).

Despite the recognized importance of blueberries for people's health, there is a gap in the literature referring to research from a consumer perspective to incorporate this fruit in the regular diet. In Chile, a study conducted in adolescents residing in the Biobío Region showed that 3 out of every 10 adolescents consume blueberries; however, its consumption was not reported as being within the 10 most consumed fruits at a national level (Araneda *et al.*, 2015).

Notwithstanding the abovementioned, the many properties of this fruit have impacted world production, which has significantly increased in recent times by approximately 120%, going from approximately 300,000 tons in 2008 to 657,000 tons in 2017 (USHBC, 2018). The main producing regions are North America (58%), followed by South America (26%) and Europe (10%) (González, 2013). Currently, 90% of global blueberry production is concentrated in 10 countries led by the USA with 257,000 tons in 2016. As for exports, these are concentrated in only

five countries: Chile, the USA, Canada, Argentina, and Spain, which account for 90% of world exports.

Chile has positioned itself in recent years as a relevant world player for both blueberry production and export. Chile ranks second in the world with 20% of the production, which has increased by 1,107% between 2004 and 2016 (Brazelton & Young, 2017). It is also the leading exporter with 110,351 tons in 2017, an increase of 1,092% between 2004 and 2017. Eighty-three percent of exports are destined to North America (66%), Europe (22%), and Asia-Pacific (12%) (Chilean Blueberry Committee [CBC], 2017a). The Biobío Region (second most important region in Chile in terms of economics and population), accounts for almost 30% of the total cultivated area in the country, and 91% of local blueberry production is exported (CBC, 2017b).

The USA is the most important consumer with 358,270 tons per year (Oficina de Estudios y Políticas Agrarias [ODEPA], 2013; USHBC, 2016; Brazelton & Young, 2017). Consumption in Chile has grown at increasing rates and part of the production is destined for the domestic market, from 1,200 tons in 2004 to 33,918 tons in 2016, and apparent consumption increased by 2,727% in the same period (CBC, 2017c). This could be partly explained by the population's growing interest in consuming healthy food that is recognized for its multiple health benefits (Hu *et al.*, 2011).

A dynamic world market contrasts with the scarcity of research studies focused on analyzing the variables that influence the purchase and consumption of blueberries worldwide. Most of the few existing articles in the literature were developed in the USA and Canada. Available studies can be classified in three groups: i) studies focused on analyzing the determinants of fresh blueberry purchase and consumption (Gilbert *et al.*, 2014; Girgenti *et al.*, 2016), ii) those focused on developing the industry of blueberry and processed blueberry-based products (Carew *et al.*, 2005; Hu *et al.*, 2009; 2010; 2011), and iii) research studying market trends and consumer perception of blueberry-based functional beverages (Corbo *et al.*, 2014; Kim & Kwak, 2015). With the exception of Schnettler *et al.* (2011), studies have yet to be conducted in emerging markets, such as the Chilean market, which are relevant for blueberry production, export, and consumption. The present study aims to contribute knowledge about the determinants of blueberry consumption. Therefore, the objective of the present study was to analyze the determinants of blueberry consumption in Chile and evaluate to what extent traditional economic factors, such as income and price, are more determinant than other more attitudinal and lifestyle factors.

Material and methods

To meet the objective of the present study, a specifically designed survey was applied to a representative sample in the Biobío Region, which is the second most populated region in Chile and the first for blueberry production. Before applying the questionnaire, pre-test and pilot questionnaires were applied to 30 and 80 people, respectively, allowing us to improve question wording, section order and structure, and eliminate some questions. The respondents declared that they participated in household purchase decisions and were over 18 years of age. A total of 344 participants were selected from a sample that was stratified for sex, age, and residential sector. Information to stratify the sample was obtained from the National Statistics Institute of Chile (INE, 2012).

The survey was divided into three sections. The first section characterized the buyer as well as his/her blueberry consumption habits. The second section was addressed to measure healthy lifestyles (HLS) of participants. Respondents also had to indicate their weight expressed in kilograms and height in meters to determine the nutritional status measured by the body mass index (BMI). They were also consulted about their self-perception about adopting healthy habits. The third section included some sociodemographic questions (age, sex, civil status, education, and occupation) and traditional economic factors (income, price, and budget). The field work was conducted between May and June 2015. Table 1 lists the sampling characteristics.

One of the novelties of the present study is the measurement of the HLS. Criteria established by the World Health Organization (WHO) were used, and the available literature points out that the HLS is a variable consisting of multiple factors, some of which are: i) a well-balanced diet (considered the easiest to adopt and most widely studied in the literature), ii) engaging in physical activity, iii) smoking prevention, and iv) alcohol prevention (WHO, 1999). The adoption of HLS must consider a balanced diet (Lichtenstein

et al., 2006; WHO, 2015a) that incorporates fruit, vegetables, fish, and legumes. Research studies report that physical activity is necessary when HLS are adopted as it contributes to decreasing the probability of developing CNCDS (WHO, 2010; Sallis *et al.*, 2012; Dart *et al.*, 2016). The literature indicates that smoking is not part of HLS; it is considered as a risk factor for CNCDS and one of the main causes of death worldwide (Glantz & Gonzalez, 2012; WHO, 2015b). Excessive alcohol consumption generates harmful effects on people's health (Parry *et al.*, 2011; WHO, 2014), with the exception of red wine, because its moderate consumption helps reduce the probability of suffering cardiovascular disease (Hansel *et al.*, 2010; Ronksley *et al.*, 2011). Therefore, both smoking and excessive alcohol consumption are considered as risk factors for CNCDS and mortality.

In this study, participants were asked for the dimensions that make up HLS. Questions related to diet were categorized in four items of foods recognized as being healthy, such as fruit, vegetables, dairy and meat, and fish and seafood; one item related to fast food consumption was also included, which consisted of foods high in salt content, saturated fats, and added sugars, such as hot-dogs, hamburgers, and French fries. Table 2 illustrates the HLS factors and their respective categories and significance. The HLS scale ranges between 0 and 8 points where 0 is the lowest score (null adoption) and 8 is the maximum score (high adoption).

Some variables suggested in the literature have also been used to measure health and HLS determinants. The first variable is nutritional status calculated as the individual's BMI and classified as normal (BMI between 18.5 and 24.9), overweight (BMI between 25.0 and 25.9), and obesity (BMI greater than 30.0). The second variable is people's self-perception about adopting healthy habits (Monteagudo *et al.*, 2014).

Ten questions were included to learn the reasons for blueberry consumption; respondents were asked to make a hedonic evaluation of each reason for consuming blueberries using a 7-point scale where 1 is the

Table 1. Sampling characteristics.

Items	Background information
Universe	People from different census districts (cd) in the city of Chillán (cd1, cd2, cd3, cd13, cd14, and cd15) over 18 years of age
Sample size	344 participants
Error	e = 5.35%
Level of significance	95.5% (Z = 2)
Pre-test and pilot questionnaire	30 and 80 questionnaires, respectively
Field work	Downtown at the exit of the shopping mall and different city supermarkets
Survey application date	May to June 2015

Table 2. Factors that determine the adoption of healthy lifestyles (HLS) based on World Health Organization (WHO, 2015a) recommendations.

Factors	Categories	Values	Frequency	Significance
Food	Fast food consumption	0	≥ 1 per week	Unhealthy
		1	Never	Healthy ^a
	Vegetable consumption	0	≤ 3 per week	Unhealthy
		1	Every day	Healthy ^a
	Fruit consumption	0	≤ 3 per week	Unhealthy
		1	Every day	Healthy ^a
	Dairy product consumption	0	≤ 3 per week	Unhealthy
1		Every day ^b	Healthy ^a	
Meat, fish, and seafood consumption	0	≤ 3 per week	Unhealthy	
	1	Every day ^c	Healthy ^a	
Physical activity	Engaging in physical activity	0	< 2 per week	Unhealthy
		1	≥ 2 per week	Healthy ^a
Smoking	Smokes	0	No	Healthy
		1	Yes	Unhealthy ^a
Alcohol consumption	Frequency of alcohol consumption ^d	0	> 40 mL daily	Unhealthy
		1	Never	Healthy ^a

^aRecommendation established by the WHO. ^bDairy product consumption should be balanced and low fat. ^cCorresponds to an alternating consumption of red and white meat, fish, and seafood. ^dCorresponds to alcoholic beverages in general.

minimum score and 7 is the maximum (evaluation scale used in the Chilean educational system). A factorial analysis was performed to regroup the different reasons for consumption into a few factors. Results are shown in Table 3. Three factors were obtained that explained 58% of the variance of the original questions. The factors were defined as “health benefit”, “external reasons”, and “taste and custom”.

One third of the sample declared not to consume blueberries, so we faced a problem of zero responses. In such circumstances, estimating a demand equation by Ordinary Least Squares (OLS) leads to biased parameters. To address this issue, in this study we have adopted the Heckman’s (1979) selection model approach, which can be represented by the following two equations:

The first equation, the Participation Equation, is defined as:

$$z_i^* = w'\gamma_i + u_i \quad (1)$$

where z_i^* is a latent variable that represents blueberry consumption utility, γ_i is a vector of the individual’s characteristics, and u_i is an error term.

The second equation, the Regression Equation, or demand function, is defined as:

$$y_i = x_i'\beta + \varepsilon_i \quad (2)$$

where y_i is the quantity consumed per week by the household, which is observed only when $z_i^* > 0$, x_i is a vector of the individual’s characteristics, and ε_i is an error term. Therefore, u_i and ε_i have a normal bivariate distribution with correlation ρ . One of the main advantages of this approach, as opposed to the Tobit model, is that explanatory variables in both equations can be different.

When combining both equations so as to take into account the self-selection process, the model is expressed as (Greene, 2013):

$$E[y_i | y_i \text{ is observed}] = E[y_i | z_i^* > 0] = E[x_i'\beta + \beta_\lambda \lambda_i(\alpha_u)] \quad (3)$$

where $\beta_\lambda = \rho\sigma_\varepsilon$, $\lambda_i(\alpha_u) = -\frac{\phi(w_i'\gamma / \sigma_u)}{\Phi(w_i'\gamma / \sigma_u)}$, which corresponds to inverse Mills’ ratio¹. The parameters σ_ε and σ_u are the standard deviation of ε_i and u_i , respectively. Therefore, $\phi(\cdot)$ and $\Phi(\cdot)$ denote the density and distribution function of a normal random variable.

Equation (3) shows that the consumed quantity of blueberries can only be observed when consumption utility is positive. It also shows the relationship

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¹Ratio between the probability that an individual decides to consume blueberries and the cumulative probability of the decision of an individual in the sample.

Table 3. Factorial analysis of the reasons to consume blueberries.

Main reasons to consume blueberries	Components			Mean	Standard deviation
	Health benefit	External reasons	Taste and custom		
Because it is beneficial for health	0.76	-	-	6.10	1.66
For its high antioxidant content	0.77	-	-	5.13	2.23
Because it improves blood circulation	0.71	-	-	4.30	2.45
High fiber content	0.69	-	-	4.37	2.42
Low calorie product	0.58	-	-	4.52	2.39
I have greater purchasing power	-	0.71	-	3.09	2.32
Recommended by the doctor	-	0.77	-	2.20	2.03
I have decided to include healthy products in my diet	-	0.63	-	4.18	2.42
I like its taste and texture	-	-	0.82	5.97	1.69
My family likes to consume this fruit	-	-	0.74	4.89	2.24

Kaiser-Meyer-Olkin measure of sampling adequacy: 0.786. Chi-square: 504.376. Bartlett's sphericity test: 45 degrees of freedom; significance, 0.000. Cronbach's alfa: 0.776

between expected blueberry consumption and Mills' ratio.

If sample selection bias is omitted, a problem occurs with the omitted variable, which generates inconsistent and biased estimators (Greene, 2013). The previously described model can be estimated by maximum likelihood or a two-step method (Heckman, 1979). Estimation by maximum likelihood was chosen in the present study because, in the absence of multicollinearity, the estimator is more efficient than the one obtained by the two-step method (Hall, 1999; Leung & Yu, 2000). The explanatory variables used in the estimation of both equations are given in Table 4.

Results

Based on the data obtained from the respondents in the first section of the questionnaire, households² were classified into four categories taking into account the household weekly consumption during the blueberries season (summer): over 3 kg (23%); between 1 and 3 kg (20%), up to 1 kg (24%); and no consumption (33%). Sample characteristics for each segment as well as for the whole sample are shown in Table 5.

In relation to the adoption of HLS scale (see Table 2), 21% of the sample got the highest score (7 to 8 points), which mostly included people who consumed more blueberries per week (37%). As for the nutritional status, although 52% of the sample was overweight (41%) and obese (11%), the self-perception of healthy habits was mostly high (37%) and medium (56%).

Meanwhile, high self-perception mostly consisted of people who consumed more than 3 kg per week (32%).

Most people also recognized that the blueberry is a natural functional food with health benefits (77%), and this acknowledgment was mostly related to those who consumed blueberries in the three categories (75%). Although a large part of the sample did not know about the leadership position of the Biobío Region regarding national production (63%), most of those who did know this fact were respondents with the highest consumption level (38%).

The most relevant sociodemographic variables were related to women, who were the majority of those consuming blueberries in one of the three categories (73%); this was similar to what occurred with those with a university education (70%), a monthly income range over \$600,000 (74%), and aged between 35 and 50 (73%).

Results from the Heckman's Selection Model are shown in Table 6. As mentioned in the previous section we have assumed that consumers adopt two consecutive decisions: to consume or not blueberries (the participation equation) and, in case they decide to consume, how much they are willing to consume (the regression equation). The blueberries consumption variable was transformed in natural logs in the second equation as well as self-perception, price and budget allocated to food.

The participation equation was estimated as a probit model. As can be observed in Table 6, apart from some sociodemographic variables, main determinants for the decision to participate in the market (to buy

² The household size within the sample was 3.3, a bit over the national average, which is 3.1.

Table 4. Explanatory variables used to estimate the Sample Selection model.

Variable	Category
Blueberry consumption	Household weekly blueberries consumption during the producing season (summer).
Adoption of healthy lifestyle (HLS)	Quantitative variable that describes the level of HLS adoption by the respondents using a scale from 0 to 8.
Body mass index (BMI)	Dummy variable that takes the value 1 if the head of the household is obese or overweight, and 0, otherwise.
Self-perception of healthy habits (Self-perception)	Quantitative variable that describes the respondent's self-perception of healthy habits using a hedonic evaluation scale from 1 to 7.
Reasons to consume blueberries (Reasons)	Continuous variable that establishes three factors that group reasons for consuming the fruit: Factor 1, Health benefit; Factor 2, External reasons; Factor 3, Taste and custom.
Knowledge about blueberry as a natural functional food (Blueberry functional food)	Dummy variable that is assigned the value of 1 if the respondent knows that the blueberry is a natural functional food and 0 otherwise.
Knowledge about the region as the largest national producer (Producing region)	Dummy variable that is assigned the value of 1 if the respondent knows that the region has the highest national blueberry production and 0 otherwise.
Frozen blueberries	Quantitative variable that scores the consumption of frozen blueberries using a scale from 1 to 7.
Price	Continuous variable that describes the price paid per kg of blueberries the last time the person bought the fruit.
Food budget (Budget)	Quantitative variable that describes the person's monthly food budget in retailers.
Age (years)	Three-level categorical variable: 1) between 18 and 34; 2) between 35 and 50; and 3) over 50
Level of completed education (Education)	Dummy variable that is assigned the value of 1 if the respondent has university education and 0 otherwise.
Income level (Income)	Dummy variable that is assigned the value of 1 if the respondent has an income over 600,000 Chilean Pesos; and 0 otherwise (Exchange rate: 1 USD = 630 Chilean Pesos)

blueberries), for Chilean households, are their self-perception about following healthy habits and their the perception of blueberries as a functional food. As coefficients estimated in the participation equation only highlight the direction of the effect, in order to quantify their magnitude, we have calculated the marginal effects (Table 7). Results indicate that when self-perception of healthy habits increases by 1%, the probability of consuming blueberries increases by approximately 3.57%. For those people who identified the blueberry as a natural functional food, the probability of consuming blueberries also increased by approximately 28.6%. Something similar occurred with people who knew that the Biobío Region has the largest national production, which increased the probability of consuming the fruit by approximately 20.01%. As for the sociodemographic variables, age and income range were significant. People between 35 and 50 increased the probability of consuming blueberries by approximately 11.78%. This result differs from previous studies which found that there was a negative association between age and blueberries consumption (Hu *et al.*, 2010; 2011). However, in the latter case, the focus was on processed

blueberry products when we are dealing with fresh blueberries. Monthly income over \$600,000 increased the probability of consuming the fruit by approximately 11.14% in relation to the reference category.

Results from the second equation (the demand equation) are shown in the lower part of Table 6. It is important to note that the parameter associated with the inverse relationship of Mills' ratio (Lambda) is negative and significant, indicating there was a downward sample selection bias problem. In other words, the proportion of censored observations should be increased to balance the ratio between those who consumed blueberries and those who did not.

Results from the demand equation suggest that the demand for blueberries is positively associated to the adoption of healthy lifestyles (HLS). In fact, an increase of 1 point in the HLS scale generated an increase of the weekly consumption of blueberries by 0.06%. The BMI was also positive and significant, indicating that increasing the BMI contributed to increase also blueberries consumption. This apparently contradictory result with the previous one has to be interpreted with caution. First, the HLS scale was based on frequency of

Table 5. Sample characteristics and segments based on blueberries consumption.

Variable ^a	Categories (N)	%	Quantity consumed per week per household ^b during the season (summer)			
			> 3 kg	1 - 3 kg	< 1 kg	No
Blueberries consumption***	Yes (231)	67%	35%	30%	35%	-
	No (113)	33%	-	-	-	100%
Adoption of healthy lifestyles (HLS)***	5-8 points (73)	21%	37%	22%	18%	23%
	3-4 points (134)	39%	26%	20%	20%	34%
	0-2 points (137)	40%	14%	19%	30%	37%
Body mass index (BMI)	Normal (165)	48%	21%	21%	24%	34%
	Overweight (142)	41%	24%	17%	25%	34%
	Obesity (37)	11%	32%	27%	14%	27%
Self-perception**	High (126)	37%	32%	23%	20%	25%
	Medium (192)	56%	18%	20%	25%	37%
	Low (26)	7%	19%	8%	35%	38%
Blueberry functional food***	Yes (266)	77%	26%	23%	26%	25%
	No (78)	23%	13%	11%	17%	59%
Producing region***	Yes (127)	37%	38%	24%	20%	18%
	No (217)	63%	15%	18%	25%	42%
Sex*	Female (180)	52%	24%	23%	26%	27%
	Male (164)	48%	22%	17%	21%	40%
Education**	University (153)	44%	27%	25%	18%	30%
	High school (191)	56%	20%	16%	28%	36%
Income**	> \$ 600,000 (132)	38%	27%	26%	21%	26%
	≤ \$ 600,000 (212)	62%	21%	17%	25%	37%
Age (years)***	18 to 34 (170)	49%	21%	22%	22%	35%
	35 to 50 (101)	29%	18%	23%	32%	27%
	> 50 (73)	22%	37%	11%	16%	36%
Total n =344		100%	23%	20%	24%	33%

^a *, **, ***: $p < 0.1, 0.05, 0.01$, respectively. ^bThe average household size within the sample was 3.3.

consumption but not on quantities consumed. Second, in most countries there is a positive relationship between age and BMI. In our model, the effect of age on consumption is not relevant, indicating some collinearity with BMI.

Regarding blueberry consumption motivators, two of the three factors included in the model were positive and significant, indicating that the main reasons for blueberries consumption are associated with health benefits, either because this product is perceived as healthy or by doctors' recommendation. This result was also found in other countries like Italy (Girgenti *et al.*, 2016) or the USA market (Gilbert *et al.*, 2014). Likewise, consumers who show a strong preference for the frozen presentation consumed larger quantities of blueberries.

The demand for blueberries was price inelastic as a 1% increase in the price generated a decrease in the weekly consumption by 0.25%. Similar results were

found in the USA dealing with processed blueberry-based products (Hu *et al.*, 2009; 2010). However, Girgenti *et al.* (2016) did not find any significant relationship between price and consumption in Italy. The budget allocated to food at retailers has been used as a proxy of food expenditure. As can be shown, this coefficient is 0.28%, indicating that blueberries is a normal good (necessity), which is similar to the result found in previous studies (Nicholson & Snyder, 2008; Andreyeva *et al.*, 2010).

Discussion

The present study contributes to advancing knowledge of the factors that determine blueberry consumption in an emerging market. The proposed objective was to analyze the determinants of blueberry consumption in Chile and evaluate to what extent traditional economic

Table 6. Heckman model estimated results.

Selection equation	
Constant	-1.38 (0.42)***
ln (self-perception)	0.13 (0.07)**
Blueberry functional food	0.89 (0.18)***
Producing region	0.67 (0.16)***
Age (years)	
Between 35 and 50	0.37 (0.18)**
Over 50	0.03 (0.20)
Education	0.04 (0.17)
Income	0.31 (0.17)*
Regression equation	
Constant	1.84 (0.94)**
Healthy lifestyles (HLS)	0.06 (0.02)***
Body mass index (BMI)	0.03 (0.01)***
Factor	
Health benefit	0.11 (0.04)***
External reasons	0.06 (0.03)**
Taste and custom	0.05 (0.03)
Frozen product	0.03 (0.01)**
ln (price)	-0.25 (0.09)***
ln (food budget)	0.28 (0.15)*
Age (years)	
Between 35 and 50	-0.08 (0.08)
Over 50	-0.04 (0.10)
Lambda	-0.18 (0.11)*

SBIC: 781.1868 | AIC: 739.9299 | HQC: 756.5721
 ln: Natural logarithm; SBIC: Schwarz criterion; AIC: Akaike information criterion; HQC: Hannan-Quinn information criterion.
 *, **, ***: $p < 0.1, 0.05, 0.01$, respectively; standard error in brackets.

factors, such as income and price, are more determinant than other more attitudinal and lifestyle factors. Results suggest that in both the selection and regression equations the variables associated with attitudinal and lifestyle factors (HLS adoption, BMI, and self-perception of healthy habits) had a significant impact on the decision to consume blueberries and the quantity to be consumed. However, the impact of traditional factors, such as income and price, was greater than the attitudinal and lifestyle factors.

The literature dealing with blueberries consumption is not very large and it is mainly concentrated in developed and consuming markets. Moreover, only few studies focus on fresh blueberries while the majority analyze processed blueberry-based products or drinks. In any case, most of our findings are consistent with previous work. For instance, the expansion of the fresh blueberry market in USA and Canada is determined by a combination of factors, which include not only

socioeconomic characteristics of the population but also the perception of blueberries as a healthy fruit as well as its taste (Gilbert *et al.*, 2014). In the case of Italy, in which blueberries are considered a premium fruit and their consumption is still marginal, freshness and origin are considered the most important determinants in consumers' choices (Girgenti *et al.*, 2016). In the case of studies focusing on processed blueberry-based products, results found in the literature slightly differ from our findings, simply because consumption determinants also differ as they include specific attributes of processed products as sugar-free or organic. In any case, as in our study, price as well as sociodemographic characteristics seem to explain consumers' decisions (Hu *et al.*, 2009; 2010; and 2011). However, it is important to note that in previous works there was not any differentiation between the decision to consume and the quantity consumed, as we have carried out in this study.

The Chilean market is different from those mentioned above, as Chile is also an important producing country with an important export orientation. Chilean consumers are more aware and have a better knowledge about blueberries as they are part of their cultural and gastronomic traditions. In spite of this, the literature on this topic is very scarce, as we are aware only about the study carried out by Schnettler *et al.* (2011). Our study share some conclusions with the latter showing that economic factors, such as price, as well as consumers' sociodemographic characteristics are key factors in purchasing decisions. However, this study differs as we have also included some attitudinal variables, which were not considered before as well as in the methodological framework.

Results from this study provide useful information to be used by both policy makers and marketing managers. Chilean consumers perceive blueberries as a healthy product, which can contribute to adopt healthier lifestyles. Nowadays, still a significant share on Chilean production is exported, leaving "lower"

Table 7. Average marginal effects in the Selection equation.

Variables	
Self-perception	0.04 (0.02)**
Blueberry functional food	0.28 (0.05)***
Producing region	0.20 (0.05)***
Age (years)	
Between 35 and 50	0.12 (0.06)**
Over 50	0.01 (0.06)
Education	0.03 (0.05)
Income	0.11 (0.05)**

*, **, ***: $p < 0.1, 0.05, 0.01$, respectively; standard error in brackets.

quality blueberries for domestic consumption. However, it seems to exist an increasing demand. Public policies could incorporate blueberries in government food programs, such as the “5 A Day Program” and the “Dietary guidelines for the Chilean population” (Zacarias *et al.*, 2006). An Alliance could also be established between local producers and the National Sports Institute (IND) to promote blueberry consumption in local sports competitions to better link blueberries consumption to healthy lifestyles. On the other hand, a combination of marketing strategies implemented by producers or retail companies is necessary to promote this product. Domestic markets should be supplied with higher quality product taking into account that the demand is price inelastic. Moreover, branding and packaging with functional claims could be an efficient strategy to increase domestic consumption (*i.e.* source on natural antioxidant, high fiber content, etc.).

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