

Does the decision to participate in the labour market affect people's subjective well-being?

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Abstract

This article provides evidence regarding the potential effect of labour participation on life satisfaction. To take into account possible endogeneity in the decision to participate in the labour market, a two-stage least squares estimation is carried out. Hence, an excluded instrument is used for the decision to participate, where the existence of a weak instrument is rejected. Then, to take into account the ordinal nature of the dependent variable, an ordered probit model with a binary endogenous explanatory variable is estimated. This method makes it possible to jointly estimate all the parameters of the model. The results, which are robust to the presence of endogeneity in the decision to participate, show that labour participation does not have an impact on life satisfaction. Regarding the rest of the explanatory variables included in the model, the results are in line with previous empirical evidence.

Keywords

Employment, labour market, workforce, quality of life, measurement, social surveys, econometric models, Chile

JEL classification

I31, I39, J39

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I. Introduction

In recent years, interesting evidence has emerged regarding subjective well-being in Chile. This is due to the incorporation of questions on subjective well-being in surveys, and to growing interest among researchers (Loewe and others, 2014; Montero and Rau, 2015; Montero and Vásquez, 2015; Montero and Rau, 2016; Montero and Miranda, 2020; Montero, Vargas and Vásquez, 2021). There have been several hypotheses regarding the origin of the social unrest of 2019, and rising popular discontent with the country's development conditions was identified as one possibility (Rojas and Charles-Leija, 2022). This has generated increasing interest in different means of approximating the population's level of well-being, to complement the traditional objective development indicators (MSDF, 2021).

Chile is an interesting country to analyse in this regard, as its notable development during the past 30 years has resulted in a significant reduction in the poverty rate (MSDF/UNDP, 2020). However, despite rapid economic growth, access to quality goods and services has not been entirely homogeneous, and persistent inequality (in various dimensions) has led to growing discontent among the population. Thus, it is important to conduct a more detailed analysis to identify the determinants of subjective well-being, in order to generate empirical evidence that complements the design, monitoring and evaluation of public policies.

This article relies on the very innovative Social Well-being Survey, which was conducted in 2021 with the aim of understanding the determinants of subjective well-being. The main objective is to estimate the effect of labour participation on life satisfaction. In principle, one could anticipate a positive effect, in that entry into the labour market allows for more comprehensive personal development, thus expanding future prospects; all of the above would translate into experiencing higher life satisfaction. Conversely, people who do not participate in the labour market would be more restricted, opting for second-order life paths. Nevertheless, and considering the neoclassical model of the labour market, one could equally hypothesize that because people are optimizing their individual preferences on the basis of their individual restrictions, there should be no significant difference in terms of well-being between the two groups. In effect, each person maximizes his or her utility in accordance with his or her constraints, thereby achieving the highest possible level of well-being. For some people, greater well-being may come from active participation in the labour market, while for others, maximization may lead to a decision not to participate.

This question poses a methodological challenge: the decision to participate in the labour market could be endogenous and depend on certain variables, for example personality traits, being the head of the household or having to care for people. Moreover, some of these variables could themselves be determinants of life satisfaction, in which case there is an endogeneity problem: correlation between the model error and the labour participation variable render direct estimates unreliable. In order to take into account the possible endogeneity of labour participation, a two-stage least squares (2SLS) estimation is carried out; having good instruments are critical in this regard. Then, because the dependent variable is ordinal, an ordered probit model with a binary endogenous explanatory variable is estimated.

The resulting estimates show that the decision to participate in the labour market does not have a statistically significant effect on life satisfaction. Thus, public policies that are designed to increase labour participation should aim to facilitate access to higher household income while recognizing that the effect on subjective well-being is negligible. People report being equally satisfied with their lives —keeping everything else constant— regardless of labour market participation.

For the other variables included in the model, the results obtained are similar to those previously identified in the literature. Monetary income has decreasing marginal utility and reference group income has a negative impact on life satisfaction (Card and others, 2012; Montero and Rau, 2016), while the proxy variable for personality traits has a significant effect on life satisfaction (De Neve and others, 2012).

The following section presents a review of the available empirical evidence. Section III presents the methodology utilized. Section IV presents the data used and the results obtained, and section V presents the conclusion.

II. Empirical evidence

There is ample evidence regarding the determinants of life satisfaction, especially for developed countries. It is known, for example, that income has a positive but decreasing impact on life satisfaction. However, evidence on other dimensions, such as years of schooling, has been mixed: in developing countries, a positive effect is shown, while for developed countries, negative effects are sometimes found.¹ For instance, using panel data for Australia, Kristoffersen (2018) finds evidence of a positive effect of schooling on subjective well-being but also shows that the effect is sometimes neutralized by people's current circumstances.

Regarding evidence more directly related to the objective of this article, Frijters, Hasken-De New and Shields (2004), using panel data for Germany, show that participation in the labour market has a positive effect on life satisfaction. In other words, satisfaction increases as a person's employment status improves.

In contrast, Gerdtham and Johannesson (1997) find evidence suggesting that, in Sweden, being unemployed negatively affects life satisfaction. Furthermore, they find that the negative impact is stronger than that of other negative factors (such as being widowed). Also for Sweden, Korpi (1997) presents evidence suggesting that for young people, unemployment has a negative effect on well-being. In addition, "manpower programmes" are placed in an intermediate position, above those who are unemployed but below those who have a job. However, Björklund (1985), also using data for Sweden and employing panel data to control for fixed effects, provides evidence that unemployment does not have a significant impact on mental health.

It is worth highlighting the work of Ochsen and Welsch (2012), who investigate the welfare effects of labour market institutions — specifically, how they are differentiated by sociodemographic subgroup. Using data for 10 European countries for the period 1975–2002, the authors find that more employment protection and a higher benefit replacement rate significantly increase the subjective well-being of the average citizen.

The role of endogeneity is important in the identification of factors that affect the subjective well-being of people. The previous approach can be extrapolated to other variables that could also be endogenous to satisfaction. For example, Ruseski and others (2014) examined the possible endogeneity between sports participation and well-being. A priori, it should be intuitive that physical activity increases satisfaction owing to the feeling of happiness that it produces. However, the endogeneity in this case may be due to the existence of a "sports predisposition". This means that engaging in sports is not random: individuals who do so might be genetically healthier or simply more predisposed to open-air social activities. Both cases are included in an unobservable variable that could also be correlated with the variable of interest.

For Chile, some studies have been carried out to identify the effects of part-time work and the income of the reference group on job satisfaction. For example, Montero and Rau (2015), using country data, evaluate the effect of part-time work on the job satisfaction of women in Chile. Their results show that women who work part time are not less satisfied than those who work full-time. This is unlike evidence for developed countries, which shows that women in part-time employment experience greater job satisfaction (Booth and Van Ours, 2008).

¹ Such results may seem counterintuitive, but they are in fact consistent with the idea that education is associated with higher expectations regarding life circumstances. Thus, education can be associated with greater subjective well-being only to the extent that the ability to meet expectations is improved.

With the aim of evaluating in more detail the effect of the reference group income on job satisfaction, Montero and Vásquez (2015), using data from the first National Survey on Employment, Work, Health and Quality of Life (2009/10), estimate the effect of the reference wages on the job satisfaction of Chilean workers. The authors' estimates control for a variable that measures personality traits, following the methodology proposed by Van Praag, Frijters and Ferrer-i-Carbonell (2003) to take into account the role of the unobservables. Montero and Vásquez (2015) conducted a semi-non-parametric estimation of extended ordered probit models in order to identify the determinants of job satisfaction. Their results show that a 10% increase in the reference group wage would need to be compensated for by a 24.9% increase in the own wage to give the same level of job satisfaction. This shows the enormous importance of the reference group wage for job satisfaction.²

Most recently, Montero and Miranda (2020), again for the working population, analyse the domains of life satisfaction using the two-layer model of Van Praag, Frijters and Ferrer-i-Carbonell (2003). Their results show that the most important domains for Chilean workers are family life, leisure, health and work.

To the best of our knowledge, no evidence has been produced that shows the relationship between labour participation and life satisfaction in Chile. This article, therefore, seeks to provide such evidence. Given that the international evidence is mixed, it is worth investigating the effect in question and providing background information for developing economies.

III. Methodology

For the purposes of conceptualizing the discussion, consider the following model:

$$w_i = x_i' \beta + \alpha p_i + u_i \quad (1)$$

where w corresponds to the subjective well-being of the individual, x represents a set of variables that affect people's subjective well-being (e.g. age, gender, education, income and marital status), p is a dummy variable that takes the value 1 if the individual participates in the labour market, and u is a well-behaved stochastic shock.

The proposed model suffers from a problem in that it does not take into account personality traits. It is expected that personality traits are a determinant of subjective well-being and probably also affect the decision to participate in the labour market. Therefore, the model must incorporate a variable that measures personality traits (z), as follows:³

$$w_i = x_i' \beta + \alpha p_i + \gamma z_i + u_i \quad (2)$$

The problem is that we do not have a variable that measures personality traits. Therefore, the methodology proposed by Van Praag, Frijters and Ferrer-i-Carbonell (2003) is followed to build a (partial) proxy of personality traits (\hat{z}). This procedure is described below.

² For developed countries, there is mixed evidence regarding the effect of reference group income on subjective well-being. For example, Drichoutis, Nayga and Lazaridis (2010), presenting evidence for Europe, find that the income of the reference group would have a null impact on the subjective well-being of the population. Previously, Caporale and others (2009) provided evidence of a negative effect for Western European countries and a positive effect for Eastern European countries, which is consistent with the "tunnel effect" of the reference income. Senik (2004) also provides evidence for the existence of the "tunnel effect" in the Russian Federation.

³ In stricter terms, the model also fails to take into account other variables—in addition to personality traits—that could affect the decision to participate. Normally, the exclusion of these potentially relevant variables is due to the partial availability of data. For example, Powdthavee (2009) shows that, for both genders, the life satisfaction of one partner in a couple has a positive and statistically significant spillover effect on the other partner. In the econometric model, it would be useful to include the subjective well-being of the couple as an explanatory variable. Unfortunately, the Chilean survey does not provide such data.

Consider the existence of “ J ” domain satisfactions, where the determinants of each of these domains can be modelled as follows:

$$D_j = f(q_j, z) \quad (3)$$

for $j = 1, \dots, J$ and where q represents variables affecting the domain satisfaction; z represents other common unobservable variables. The first stage consists of estimating by ordinary least squares (OLS) the J equations (one for each domain) and calculating the residual vectors. The objective is to obtain the part of z that is common to all the residuals, which could be defined as the first principal component of the $J \times J$ error covariance matrix. The resulting new variable would be the instrument for z (i.e. \hat{z}). The second stage consists of incorporating this new variable —the instrument for personality traits variable— in the estimation of the equation (2). This makes it possible to obtain a (partial) proxy for personality traits.

Strictly speaking, the variable \hat{z} corresponds to a measure of unobserved heterogeneity. It is the best that can be achieved with cross-sectional data, given that the methodology proposed by Van Praag, Frijters and Ferrer-i-Carbonell (2003) is applied using panel data. It should be remembered that, in the context of panel data, one can control for the existence of fixed effects over time.⁴ Thus, although \hat{z} may be an imperfect substitute for the fixed effects, it is based on the assumption that there is an element common to all domains that codetermines both life satisfaction (w) and satisfaction with each domain (D_j). However, there may be personality traits that determine some domains more than others and that may not be fully included in this proxy variable. This suggests that the variable \hat{z} can only attenuate the endogeneity bias and that there will be other sources of endogeneity that cannot be taken into account, such as those personality traits that are not constant and that are correlated with life satisfaction and the rest of the domains —and those traits, too, could potentially be correlated with the decision to participate in the labour market.⁵

Going back to equation (2), the simplest and most direct way to estimate the parameters of this model (α , β and γ) is through OLS. However, the main disadvantage of this estimation method is that it does not take into account the ordinal nature of the dependent variable in the model (life satisfaction). This is because subjective well-being is usually measured in surveys through a question asking respondents to evaluate their life satisfaction on the basis of a Cantril scale.

In view of the above, an alternative way to estimate the parameters of this model is through an ordered probit model. Therefore, a random utility model is proposed as follows:

$$w_i^* = x_i' \beta + \alpha p_i + \gamma \hat{z}_i + \epsilon_i \quad (4)$$

where w_i^* is a variable measuring individual subjective well-being (something the econometrician does not observe), and ϵ is a well-behaved stochastic shock. In this context, what is actually observed is satisfaction with life (w), which is self-reported by the individual. The following expression shows what the econometrician observes as a function of the latent variable:

$$w = r \text{ if } c_{r-1} < w^* \leq c_r \quad (5)$$

⁴ It should be noted, however, that panel data also poses some difficulties. Indeed, Van Landeghem (2019) provides evidence regarding the existence of the panel effect with data for the United Kingdom. The panel effect describes the fact that people answer differently as they gain more experience in responding to surveys. Evidence of this effect is reported for both overall life satisfaction and domain satisfaction.

⁵ In more formal terms, one could posit the existence of the following relationship between the variable “personality traits” and the proxy:

$$z = \varphi_1 \hat{z} + \varphi_2 \hat{z}'$$

where \hat{z}' corresponds to the part of the personality traits that are not incorporated (and that complement) in z . It would be reasonable to expect that $\varphi_1 + \varphi_2 = 1$.

Thus, when $c_2 < w^* \leq c_3$, the individual reports life satisfaction equal to 3 ($w = 3$). The probabilities associated with each response are shown below:

$$Pr(w = 1) = Pr(w^* < c_1) = F(c_1 - x_i' \beta + \alpha p_i + \gamma \hat{z}_i)$$

Then, for any $w > 1$:

$$Pr(w = r) = F(c_{r+1} - x_i' \beta - \alpha p_i - \gamma \hat{z}_i) - F(c_r - x_i' \beta - \alpha p_i - \gamma \hat{z}_i)$$

And the probability for $w = R$ is:

$$Pr(w = R) = 1 - F(c_r - x_i' \beta - \alpha p_i - \gamma \hat{z}_i)$$

Lastly, the log-likelihood function is constructed as follows:

$$\log(L) = \sum_{i=1}^n \sum_{r=1}^R w_{ir} \ln \left[Pr(w_i = r) \right] \quad (6)$$

where w_{ir} is 1 if $w_i = r$, and zero otherwise. The parameters to estimate are the following: α , β , γ and the c 's.

A final problem to address has to do with the endogeneity of the decision to participate in the labour market. Indeed, it could be that the decision to participate in the labour market is influenced by individual life satisfaction; for example, individuals who are more satisfied with their lives could be more willing to participate in the labour market.⁶

To address this potential problem, it is possible to use instrumental variables to estimate equation (2) through 2SLS. This method requires at least one variable that is strongly correlated with the decision to participate but that does not affect life satisfaction. However, just like OLS, the 2SLS method does not take into account the ordinal nature of the dependent variable. Thus, it is necessary to estimate an ordered probit model with an endogenous explanatory variable (the decision to participate). The derivation of the model and the parameters to be estimated are found in annex A1.

IV. Data and results

The econometric models will be estimated using the results of the Social Well-being Survey (2021). This survey was conducted with a sample that is representative of the national population and was administered during the first half of 2021 to a subgroup of households from the National Socioeconomic Survey (CASEN). It featured a robust set of questions aimed at measuring quality of life in Chile.⁷ The survey has 12 modules: characterization, subjective well-being, education, work, income, work-life balance, social relations, civic engagement and governance, health, housing, environmental quality and physical safety.⁸

⁶ This would occur because the decision to participate (p) could be correlated with those personality traits that have not been captured by \hat{z} .

⁷ CASEN is conducted every two or three years in the country and collects information at the household level for different dimensions (e.g. employment, housing, health and income). This survey is a very important tool that allows for better targeting of social policies.

⁸ For additional information on this survey, see [online] <http://observatorio.ministeriodesarrollosocial.gob.cl/encuesta-bienestar-social>.

In order to measure subjective well-being, the survey incorporated the question “All things considered, how satisfied or dissatisfied are you with your life at the moment?”, which respondents could answer as follows: (i) totally dissatisfied; (ii) dissatisfied; (iii) indifferent; (iv) satisfied; or (v) totally satisfied. The results of this question provide the dependent variable (w) of the models to be estimated below.

Regarding the explanatory variables of the model, in addition to labour participation (p), the following were included: dummy for gender, years of schooling, age (and its square), dummies for marital status, a dummy variable for Indigenous classification, a dummy variable for immigrant, a dummy variable for residing in a rural area, a dummy variable for those who have children, number of friends, a dummy variable for participation in a church, a variable for the quality of the individual's current health,⁹ household monetary income and its square, household monetary income of the reference group, and a proxy variable for personality traits (\hat{z}).¹⁰

The monetary income of the reference group is constructed following the methodology proposed by Ferrer-i-Carbonell (2005) and implemented for Chile in Montero and Vásquez (2015) and Montero and Rau (2016); this approach consists of constructing the reference group using information from four variables: age range, level of education, gender and geographical area. The age range was divided into the following categories: 18–29, 30–44, 45–59 and 60–65 years. The level of schooling was divided into the following categories: no schooling or incomplete basic education, complete basic education, incomplete secondary education, complete secondary education, incomplete higher education and complete higher education. The geographical area was divided into North, Centre, South and Metropolitan Region. Grouping the variables for each of the categories gives a total of 192 cells. Then, we proceed to calculate the average household monetary income for every single cell that constitutes the income of the reference group.¹¹

For the purposes of this study, the following domains (D) were used in order to construct the proxy variable for personality traits (\hat{z}): D_1 , satisfaction with the educational level achieved; D_2 , satisfaction with income level; D_3 , satisfaction with social life; D_4 , satisfaction with health; D_5 , satisfaction with home; D_6 , satisfaction with local environmental situation; and D_7 , satisfaction with local safety level. Individuals must rate their level of satisfaction with each of these domains on a scale from 1 to 5.¹²

Table 1 presents the estimates made for each of the domains —see equation (3)—, which allow the vectors of the residuals, and thus the principal component, to be obtained. To carry out the OLS estimation of the model for each domain, the following explanatory variables were used: dummy for gender, age (and its square), years of schooling, dummy variable for Indigenous, dummy variable for immigrant, dummy variable for residing in a rural area, household monetary income¹³ and number of people in the household. The models also include region fixed effects. It is possible to appreciate that in all the models, there are variables that have a significant impact on the subjective evaluation of the domain. In addition, the R squared values range from 2.3% to 20.4% —reasonable, considering that the data are drawn from a cross section.

Table 2 presents the descriptive statistics of the main variables of the model. The sample comprises people aged 18–65. The first thing that can be noticed is that there is a slight yet statistically significant difference in favour of those who participate in the labour market in terms of life satisfaction. Average life satisfaction is 3.8 on a scale from 1 to 5.

⁹ Corresponds to a self-reported score ranging from 1 to 7.

¹⁰ Household monetary income and household monetary income of the reference group are in thousands of Chilean pesos.

¹¹ This strategy allows the reference group to be built exogenously. It would be very interesting to have self-reported information regarding who people are being compared to. So far, for Chile, this type of information is not available.

¹² (i) Totally dissatisfied; (ii) dissatisfied; (iii) indifferent; (iv) satisfied; (v) totally satisfied.

¹³ In thousands of Chilean pesos.

Table 1
Determinants of domain satisfaction: OL

	D_1	D_2	D_3	D_4	D_5	D_6	D_7
Female = 1	-0.0466 (0.0456)	-0.292*** (0.0479)	-0.241*** (0.0477)	-0.238*** (0.0420)	0.0439 (0.0445)	-0.0418 (0.0467)	-0.105** (0.0471)
Age	0.00422 (0.0176)	0.0333* (0.0177)	-0.0238 (0.0176)	-0.0224 (0.0154)	0.0299* (0.0156)	-0.0321* (0.0169)	-0.0236 (0.0166)
Age squared	7.28e-05 (0.000189)	-0.000373* (0.000192)	0.000246 (0.000191)	9.30e-05 (0.000169)	-0.000173 (0.000170)	0.000426** (0.000184)	0.000305* (0.000182)
Years of schooling	0.134*** (0.00621)	0.0286*** (0.00738)	-0.0203*** (0.00720)	0.0289*** (0.00642)	0.0331*** (0.00676)	-0.00374 (0.00722)	-0.00311 (0.00657)
Indigenous = 1	-0.00247 (0.0707)	0.0526 (0.0676)	-0.00506 (0.0695)	-0.0670 (0.0626)	-0.211*** (0.0778)	-0.226*** (0.0700)	-0.0507 (0.0740)
Immigrant = 1	0.156* (0.0847)	-0.0809 (0.0963)	-0.0475 (0.0999)	0.102 (0.0839)	-0.265*** (0.0942)	0.402*** (0.0893)	0.566*** (0.0987)
Lives in a rural area = 1	0.198*** (0.0535)	0.152*** (0.0564)	0.0267 (0.0612)	0.0389 (0.0531)	0.127** (0.0528)	0.419*** (0.0622)	0.413*** (0.0627)
Monetary income	5.24e-08*** (1.48e-08)	1.87e-07*** (2.69e-08)	4.82e-09 (2.34e-08)	5.78e-08*** (1.53e-08)	1.00e-07*** (1.66e-08)	4.86e-08** (1.92e-08)	5.77e-08*** (1.79e-08)
Number of people in the household	-0.00241 (0.0154)	-0.0181 (0.0169)	0.0425*** (0.0155)	0.00339 (0.0143)	-0.0260* (0.0158)	0.0130 (0.0168)	-0.0254 (0.0155)
Constant	1.257*** (0.410)	1.851*** (0.407)	4.084*** (0.405)	4.068*** (0.349)	2.244*** (0.359)	3.242*** (0.391)	2.910*** (0.375)
R squared	0.204	0.105	0.023	0.076	0.070	0.055	0.088
Observations	5 999	5 999	5 999	5 999	5 999	5 999	5 999

Source: Ministry of Social Development and Family, "Encuesta de Bienestar Social", Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Estimates include region fixed effects. Standard deviations are in parenthesis. D_1 , satisfaction with education level; D_2 , satisfaction with income level; D_3 , satisfaction with social life; D_4 , satisfaction with health; D_5 , satisfaction with home; D_6 , satisfaction with local environmental situation; D_7 , satisfaction with local safety level. * 10% significance level, ** 5% significance level, *** 1% significance level.

Table 2
Descriptive statistics

Variable	All	Labour participation = 0 (1)	Labour participation = 1 (2)	Difference (1) - (2)
Life satisfaction (on a scale from 1 to 5)	3.878	3.775	3.915	-0.140***
Female = 1	0.511	0.696	0.444	0.251***
Years of schooling	12.609	11.384	13.050	-1.666***
Age	39.590	39.408	39.656	-0.247
Has partner = 1	0.420	0.394	0.429	-0.035
Indigenous = 1	0.101	0.107	0.099	0.008***
Immigrant = 1	0.069	0.040	0.080	-0.040***
Lives in a rural area = 1	0.115	0.142	0.105	0.037***
Has children = 1	0.675	0.681	0.674	0.008
Number of friends	3.273	2.945	3.391	-0.445***
Current health status (from 1 to 7)	5.485	5.349	5.534	-0.185***
Church attendance = 1	0.136	0.149	0.132	0.018***
Income	1 162.871	854 715	1 273.764	-419.049***
Reference income	1 163.581	923 545	1 249.961	-326.416***
Labour participation = 1	0.735	n/a	n/a	

Source: Ministry of Social Development and Family, "Encuesta de Bienestar Social", Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Income refers to household monetary income (in thousands of Chilean pesos). Reference income refers to household monetary income of the reference group (in thousands of Chilean pesos). * 10% significance level, ** 5% significance level, *** 1% significance level.

In line with the characteristics of the Chilean labour market, the majority of the people who do not participate are women (69.6%). In addition, with respect to gender, the sample is very well balanced (51% women).

In terms of human capital, there is a significant difference (almost two years of schooling) in favour of the population that participates in the labour market. This makes sense, as those who have invested the most in human capital seek to appropriate the associated profitability.

Regarding age, there are no differences between the two groups. Nor are there differences in terms of the incidence of the Indigenous population. Immigrants, however, account for 4% of non-participants but 8% of participants. This is in line with the considerable migration that the country has experienced in recent years, where most people who migrate do so with the hope of finding a job.

In addition, there is a difference in favour of those who do not participate in the labour market in terms of the rural population (14% compared to 10%). There are no differences between the two groups in terms of the presence of children, while relevant differences were found in terms of number of friends, health status (self-reported) and church attendance.

A difference of 49% can be seen in favour of labour market participants in terms of household monetary income. This is precisely the reason why countries design and promote policies to encourage the incorporation of the most vulnerable people into the labour market. In fact, labour market access is a foundational component of most anti-poverty programmes.

An interesting aspect to observe is the monetary income of the reference group. As can be seen, for labour market participants, the reference group income and household monetary income are similar. However, for those who do not participate, reference group income is 8% higher than household income.

Table 3 shows estimates of the econometric model presented in equations (2) and (6). Columns 1 and 2 show OLS estimates (equation (2)) and columns 3 and 4 show ordered probit model estimates (equation (6)). The models in columns 1 and 3 do not control for the proxy variable for personality traits (\hat{Z}); columns 2 and 4 do.

Table 3
Dependent variable: life satisfaction

Variables	OLS		Ordered probit	
	1	2	3	4
Labour participation = 1	0.116** (0.0474)	0.0885** (0.0443)	0.128** (0.0582)	0.101* (0.0593)
Female = 1	-0.0470 (0.0633)	-0.0392 (0.0620)	-0.0491 (0.0780)	-0.0423 (0.0826)
Years of schooling	0.0255*** (0.00805)	0.0330*** (0.00724)	0.0307*** (0.00971)	0.0436*** (0.00950)
Age	0.00394 (0.0134)	0.000903 (0.0128)	0.00233 (0.0169)	-0.00170 (0.0174)
Age squared	-4.55e-05 (0.000148)	-2.53e-05 (0.000141)	-2.38e-05 (0.000187)	3.31e-07 (0.000191)
Has partner = 1	0.114* (0.0668)	0.138** (0.0643)	0.155* (0.0847)	0.205** (0.0879)
Divorced = 1	0.0193 (0.0634)	0.0524 (0.0588)	0.0326 (0.0772)	0.0842 (0.0780)
Widower = 1	0.0406 (0.115)	0.0318 (0.123)	0.0663 (0.130)	0.0536 (0.153)
Indigenous = 1	0.00892 (0.0539)	0.0102 (0.0498)	-0.0207 (0.0676)	-0.0215 (0.0677)
Immigrant = 1	-0.213*** (0.0682)	-0.179*** (0.0653)	-0.257*** (0.0850)	-0.230*** (0.0887)

Variables	OLS		Ordered probit	
	1	2	3	4
Lives in a rural area = 1	0.0147 (0.0574)	0.0231 (0.0519)	0.0369 (0.0705)	0.0503 (0.0689)
Indigenous = 1 and lives in a rural area = 1	-0.0547 (0.109)	-0.0950 (0.0992)	-0.0623 (0.133)	-0.122 (0.132)
Female = 1 and has partner = 1	0.0390 (0.0777)	-0.0311 (0.0743)	0.0250 (0.0991)	-0.0673 (0.102)
Has children = 1	-0.0221 (0.0402)	-0.00597 (0.0384)	-0.0215 (0.0514)	-0.00423 (0.0532)
Income	0.000120*** (2.33e-05)	0.000122*** (2.06e-05)	0.000169*** (3.53e-05)	0.000185*** (3.35e-05)
Income squared	-4.67e-09*** (1.56e-09)	-3.77e-09*** (1.19e-09)	-6.19e-09** (2.46e-09)	-5.43e-09** (2.21e-09)
Reference income	-8.75e-05* (4.88e-05)	-0.000108** (4.47e-05)	-0.000107* (6.33e-05)	-0.000143** (6.27e-05)
Number of friends	0.0117*** (0.00426)	0.00613 (0.00401)	0.0167*** (0.00623)	0.00978 (0.00617)
Current health status (from 1 to 7)	0.171*** (0.0153)	0.0706*** (0.0160)	0.213*** (0.0181)	0.0925*** (0.0200)
Church attendance = 1	0.0919** (0.0444)	0.0919** (0.0416)	0.107* (0.0588)	0.115* (0.0599)
Personality traits (\hat{z})	n/a	0.230*** (0.0126)	n/a	0.320*** (0.0178)
c_1	n/a	n/a	-0.591 (0.395)	-1.480*** (0.410)
c_2	n/a	n/a	0.580 (0.394)	-0.216 (0.409)
c_3	n/a	n/a	0.955** (0.394)	0.195 (0.409)
c_4	n/a	n/a	2.568*** (0.396)	1.955*** (0.410)
Constant	2.407*** (0.319)	3.008*** (0.307)	n/a	n/a
Observations	5 999	5 999	5 999	5 999
R squared	0.117	0.225	0.0541	0.112

Source: Ministry of Social Development and Family, "Encuesta de Bienestar Social", Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Standard deviations are in parenthesis. Income refers to household monetary income (in thousands of Chilean pesos). Reference income refers to household monetary income of the reference group (in thousands of Chilean pesos). * 10% significance level, ** 5% significance level, *** 1% significance level.

The OLS estimates show that the labour participation variable has a positive and statistically significant effect on life satisfaction. That is, those who participate in the labour market have 0.116 and 0.0885 more points of life satisfaction, respectively, than those who do not participate. It should be noted that these effects even exceed the effect of schooling. This means that by participating, people obtain not only income but also a better life. Regarding the rest of the explanatory variables incorporated in the model, there are several aspects that should be highlighted. For example, the variable \hat{z} is statistically significant in the model. As expected, income has a positive but decreasing effect on life satisfaction.¹⁴

¹⁴ Using these results, you can calculate the monetary income at which the highest level of life satisfaction is reached. For Chile, it is found that a monthly household monetary income of 16,180,371 Chilean pesos is associated with the maximum level of life satisfaction. Considering the average size of households in Chile and the exchange rate at the time of writing, this translates into an annual value of US\$ 60,430 per person. This value is below that reported by Kahneman and Deaton (2010), who found that after US\$ 80,000, the income no longer has an effect on life satisfaction in the United States. However, for a correct comparison, these values should be expressed in purchasing power parity.

The effect of the monetary income of the reference group also stands out. Conceptually, the effect of the reference group on subjective well-being can be positive or negative, depending on the predominant effect: if the information effect predominates, there will be a positive impact, but if the comparison effect predominates, the impact will be negative (Senik, 2004). The estimates show that, controlling for the proxy for personality traits, the monetary income of the reference group has a negative effect on life satisfaction. The conclusion, therefore, is that the comparison effect is predominant. This result is in line with previous evidence for Chile.

With respect to the results of the ordered probit model, the interpretation of the marginal effects is not so direct. Columns 3 and 4 of table 3 show the estimated coefficients of the model ($\hat{\beta}$). At this point, it is important to discuss the interpretation of the sign of the parameter of interest, for instance $\hat{\beta}_j$. Let us assume that $\hat{\beta}_j > 0$; thus, the partial effect is negative for the first category (i.e. $w = 1$) and positive for the last category (i.e. $w = 5$). However, what happens in the middle cells (i.e. $w = 2, 3, 4$) is ambiguous and must be calculated.

The results show that the decision to participate (when controlled for \hat{z}) has a positive effect on the probability that the individual has the highest satisfaction with life ($w = 5$). However, this effect is statistically significant only at 10%. The interpretation for the rest of the explanatory variables, which have positive associated coefficients, follows the same logic. For example, a greater number of years of schooling increases the probability that the individual will report being very satisfied with life ($w = 5$). Meanwhile, immigrants (negative coefficient) are more likely to report being totally dissatisfied with life ($w = 1$). Table A2.1 shows the marginal effects of each explanatory variable for each of the categories of the dependent variable.

As already discussed, the current estimates may have an endogeneity problem to the extent that the decision to participate in the labour market (p) could depend on life satisfaction (w). In particular, it could depend on personality traits not captured by \hat{z} ,^{7,8} and therefore remain in the model error (u in equation (2)).

In order to take this possibility into account, the following is proposed. First, the model of equation (2) will be estimated through 2SLS. This requires (at least) one instrumental variable (Q) that meets two characteristics: exclusion ($cov(Q, u) = 0$) and relevance ($cov(Q, p) \neq 0$). As a second strategy, and since 2SLS does not respect the ordinality of the explanatory variable, the model proposed in equation (6) will be estimated, which will allow simultaneous estimation of all the parameters of the model.

The instrument proposed to implement the 2SLS method is a dummy variable for head of household (Q_1). The model that is developed to estimate the decision to participate will be based on the covariates of the main model (x and \hat{z}) and the excluded instruments (Q_1). This instrument should not be correlated with the part of the personality traits not taken into account (\hat{z}'), but it must be correlated with the decision to participate in the labour market.

In the context of the CASEN survey, it is the family, rather than the institution conducting the survey, that designates the head of household. In that sense, it can be concluded that it is not necessary to be employed, to be older or to have more earnings to be considered the head of household. Moreover, the head of household could be self-appointed. Therefore, being a head of household should not have an impact on life satisfaction. People who live alone are automatically designated as the head of household. This does not mean that heads of household necessarily participate in the labour market, but it does increase the probability. The conceptual suitability of the instrument having thus been justified, statistical evidence in its favour is presented below.

The first exercise that must be carried out in the context of this estimator is to evaluate the weakness of the instrument. In that regard, the weak identification test (Cragg-Donald Wald F statistic) shows that the instrument is strong ($F = 65.595$); this is an initial indication of a non-weak instrument,

but it is not enough. For greater formality, the Stock and Yogo (2005) test should be analysed. We reject the null hypothesis of a weak instrument for all levels of significance from Stock and Yogo test critical values (19.93 10% maximal IV size).

Lastly, the Anderson and Rubin test is implemented to evaluate the exclusion restriction. The test is fully robust to the presence of a weak instrument. The p -value of the test is 0.197; therefore, the null hypothesis of exogeneity of the instrument is not rejected (Andrews, Stock and Sun, 2019).

Statistical evidence in favour of the chosen instrument having been provided, the 2SLS estimator is implemented. For this, all the explanatory variables of the main model, in addition to the excluded instrument, were used as an instrument for the decision to participate in the labour market.

The 2SLS estimates appear in table 4. The first result to highlight is that participation (\hat{p}) does not have a significant effect on life satisfaction, unlike what was observed when endogeneity was not controlled for (columns 1 and 2 of table 3). Interestingly, the 2SLS results exhibit larger standard errors than OLS. In effect, the comparison between tables 3 and 4 reveals that although the coefficient associated with participation changes sign, the standard error increases from 0.0443 to 1.353. This loss of precision is common in 2SLS estimates.

The rest of the explanatory variables of the main model maintain their significance. For example, schooling has a positive effect, monetary income has a positive but decreasing effect, and reference income has a negative effect (the comparison effect predominates over the information effect), although the coefficient associated with this variable is not statistically significant.

As mentioned above, the second strategy consists of estimating the model while taking into account the ordinal nature of the dependent variable. For this, an ordered probit model with an endogenous dichotomous dependent variable (the decision to participate, p) is used. Then, equation (1A) (see annex A1) is estimated by maximum likelihood. This estimation method makes it possible to jointly estimate all the parameters of the model: those of the main equation (w) and those of the secondary equation (p). The following variables were included as determinants of labour participation: dummy for gender, years of schooling, age (and its square), dummies for marital status, a dummy variable for Indigenous classification, a dummy variable for immigrant, a dummy variable for residing in a rural area, a proxy variable for personality traits, a variable that indicates the quality of the individual's current health, a dummy variable that indicates church attendance, dummy for head of household, number of hours dedicated to caregiving, and non-labour income.

The results for the life satisfaction equation appear in the main equation column of table 5. The auxiliary equation column contains the results of the participation equation. It should be remembered that the reported coefficients do not correspond to the marginal effects of the explanatory variable.

Again, the first result that should be highlighted is that the labour participation variable (p) is no longer statistically significant in the model (even when it retains its sign). Therefore, the decision to participate in the labour market does not have an effect in terms of life satisfaction. This result is consistent with previous 2SLS estimates. The proxy for personality traits maintains its effect on life satisfaction. It should also be noted that the correlation coefficient of the errors of both models ($\hat{\rho}_{\epsilon w}$) is not statistically significant.

Table 4
Dependent variable: life satisfaction (2SLS), controlling for the potential endogeneity of the labour participation decision

Variables	
$(\hat{\rho})$	-1.509 (1.353)
Female = 1	-0.207 (0.157)
Years of schooling	0.0528*** (0.0186)
Age	0.0363 (0.0342)
Age squared	-0.000511 (0.000450)
Has partner = 1	0.241** (0.116)
Divorced = 1	0.0882 (0.0811)
Widower = 1	0.102 (0.175)
Indigenous = 1	0.0462 (0.0703)
Immigrant = 1	-0.0911 (0.105)
Lives in a rural area = 1	-0.0213 (0.0708)
Indigenous = 1 and lives in a rural area = 1	-0.0875 (0.127)
Female = 1 and has partner = 1	-0.407 (0.333)
Has children = 1	-0.0624 (0.0645)
Income	0.000191*** (6.49e-05)
Income squared	-6.45e-09** (3.11e-09)
Reference income	-7.35e-05 (6.08e-05)
Personality traits (\hat{z})	0.245*** (0.0205)
Number of friends	0.00691 (0.00452)
Current health status (from 1 to 7)	0.0827*** (0.0203)
Church attendance = 1	0.118** (0.0516)
Constant	2.861*** (0.337)
Observations	5 999
R squared	0.176

Source: Ministry of Social Development and Family, “Encuesta de Bienestar Social”, Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Standard deviations are in parenthesis. Income refers to household monetary income (in thousands of Chilean pesos). Reference income refers to household monetary income of the reference group (in thousands of Chilean pesos). The excluded instrument is a dummy variable for head of household. * 10% significance level, ** 5% significance level, *** 1% significance level.

Table 5
Dependent variable: life satisfaction, ordered probit model with a binary endogenous explanatory variable^a

Variables	Main equation (ordered probit for <i>w</i>)	Auxiliary equation (probit for <i>p</i>)
Labour participation = 1	0.163 (0.208)	n/a
Female = 1	-0.0320 (0.0860)	-0.488*** (0.137)
Years of schooling	0.0425*** (0.0107)	0.0790*** (0.00811)
Age	-0.00326 (0.0180)	0.0743*** (0.0213)
Age squared	2.03e-05 (0.000202)	-0.00104*** (0.000236)
Has partner = 1	0.203** (0.0891)	0.326** (0.134)
Divorced = 1	0.0844 (0.0782)	0.0162 (0.117)
Widower = 1	0.0519 (0.152)	0.212 (0.170)
Indigenous = 1	-0.0222 (0.0679)	0.118 (0.115)
Immigrant = 1	-0.238*** (0.0888)	0.281** (0.138)
Lives in a rural area = 1	0.0529 (0.0693)	-0.123 (0.0814)
Indigenous = 1 and lives in a rural area = 1	-0.122 (0.132)	-0.0557 (0.173)
Female = 1 and has partner = 1	-0.0560 (0.111)	-0.733*** (0.154)
Has children = 1	-0.00348 (0.0533)	n/a
Income	0.000185*** (3.35e-05)	n/a
Income squared	-5.44e-09** (2.21e-09)	n/a
Reference income	-0.000142** (6.28e-05)	n/a
Personality traits (<i>z</i>)	0.320*** (0.0181)	0.0299 (0.0209)
Number of friends	0.00974 (0.00617)	n/a
Current health status (from 1 to 7)	0.0918*** (0.0202)	0.0333 (0.0237)
Church attendance = 1	0.114* (0.0599)	0.0530 (0.0821)
Head of household = 1	n/a	0.113 (0.0703)
Number of hours dedicated to caregiving	n/a	-0.00769** (0.00372)
Non-labour income	n/a	1.85e-05 (3.16e-05)
Constant	n/a	1.052** (0.499)

Variables	Main equation (ordered probit for w)	Auxiliary equation (probit for p)
c_1	-1.468*** (0.412)	n/a
c_2	-0.203 (0.411)	n/a
c_3	0.207 (0.410)	n/a
c_4	1.966*** (0.411)	n/a
$\hat{\rho}_{\epsilon v}$	-0.0378 (0.125)	
Pseudo R squared	0.114	
Observations	5 997	

Source: Ministry of Social Development and Family, “Encuesta de Bienestar Social”, Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Standard deviations are in parenthesis. Income refers to household monetary income. Reference income refers to household monetary income of the reference group. All income is expressed in thousands of Chilean pesos. * 10% significance level, ** 5% significance level, *** 1% significance level.

^a Labour participation decision is endogenous.

The results associated with the participation equation are in line with previous evidence. In the ordered probit model, the coefficients do not correspond to the marginal effects. However, the sign of the reported coefficient determines the sign of the marginal effect —for example, that women are less likely to participate, that there is a concave profile in the relationship between participation and age (consistent with the individual's life cycle), and that schooling has a positive effect on the probability of labour market participation. As expected, the number of hours dedicated to caregiving negatively affects the probability of participation.

Another interesting result associated with the participation equation has to do with the proxy variable for personality traits (\hat{z}). The coefficient associated with this variable is not statistically significant, which means that the decision to participate depends on sociodemographic characteristics, while personality traits appear not to play a role.

In summary, the estimates provide evidence that there is a problem of endogeneity in the labour participation variable.¹⁵ Once it is controlled for this problem, the labour participation variable ceases to have a significant impact on life satisfaction. This also highlights the fact that personality traits (as represented by proxy variable \hat{z}), although important in explaining life satisfaction (w), are irrelevant in terms of the decision to participate (p). As for the rest of the variables included in the model, the results are in line with previous evidence.

V. Conclusion

In this article, we have provided robust evidence that the decision to participate in the labour market has no effect on life satisfaction. This result is interesting, first, because there is little evidence (to our knowledge) regarding this effect for developing countries, such as Chile, and second, because the available empirical evidence, which mainly pertains to developed countries, is rather mixed. One possible conclusion is that individuals optimize their preferences in accordance with their constraints. In this context, it can be noted that those individuals who optimally decide to participate in the labour market are in a similar situation, in terms of subjective well-being, to those who optimally decide not to participate.

¹⁵ However, as can be seen from the results presented in table 5, the estimated coefficient for the parameter $\hat{\rho}_{\epsilon v}$ is not statistically significant. This parameter measures the degree of correlation between the errors of both equations of the model.

To arrive at these results, an effort has been made to take into account the possible endogeneity of the decision to participate in the labour market. To that end, a 2SLS estimation was carried out, and an ordered probit model was also estimated, which allows all the parameters of the model to be estimated jointly by means of the maximum likelihood estimator.

Given its potential implications for public policy, the finding that labour participation does not have an impact on life satisfaction should be viewed with caution. Countries actively promote labour participation, as it is a powerful tool in the fight against overcoming poverty. Furthermore, monetary income is a robust variable in terms of its positive effect on subjective well-being, as has been widely observed in the happiness economics literature. For example, in Chile, there are various policy proposals aimed at increasing what has historically been a low rate of labour participation among women (Contreras and Plaza, 2010; Contreras, De Mello and Puentes, 2011; Medrano, 2009). The results presented here must therefore be kept in perspective and should complement the design of public policies, furnishing policymakers with a clear understanding of the different dimensions in which policies affect the population.

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Annex A1

Consider again the latent variable model for life satisfaction:

$$w_i^* = x_i'\beta + \alpha p_i + \gamma \hat{z}_i + \epsilon_i$$

Now, if the labour participation variable is endogenous, then it will be modelled as follows:

$$p^* = m'\delta + v$$

where p^* represents the utility associated with participating in the labour market, and m is a vector that contains the explanatory variables for said utility.

Then the econometrician observes $p = 1$ if $p^* > 0$ and $p^* = 0$ if $p^* \leq 0$. Moreover, $m = [x, \hat{z}, m_1]$ where x and \hat{z} are exogenous covariates, and m_1 are the excluded instruments. It is assumed that (ϵ, v) are independent of m_1 and distributed as a bivariate normal with mean equal to zero, $\text{var}(\epsilon) = 1$, $\text{var}(v) = \tau^2$ with correlation equal to $\rho_{\epsilon v}$. Under the assumption of joint normality, the following holds:

$$\epsilon = \theta v + e$$

with:

$$\theta = \frac{\rho_{\epsilon v}}{\tau^2}$$

From these assumptions it is possible to start building the probabilities that will be part of the function log-likelihood. Therefore:

$$\begin{aligned} Pr(w = 1 | p = 1, m) &= Pr(w | v > -m'\delta, m) \\ Pr(w = 1 | p = 1, m) &= Pr[Pr(w | v, m) | v > -m'\delta, m] \end{aligned}$$

Then, we proceed to integrate $Pr(w | v, m)$ over the density of $v | v > -m'\delta$, which is a normal truncated distribution:

$$f = (v | v > -m'\delta) = \frac{\phi(v)}{\Phi(m'\delta)}$$

Through the use of standard statistical properties, the following is known:

$$E(w | v, m) = Pr(w = 1 | v, m) = \Phi\left(\frac{c_1 - x_i'\beta - \alpha - \theta v}{\sqrt{1 - \rho_{\epsilon v}^2}}\right)$$

Thus:

$$Pr(w = 1 | p = 1, m) = P_{1,1} = \int_{-m'\delta}^{\infty} \Phi\left(\frac{c_1 - x_i'\beta - \alpha - \theta v}{\sqrt{1 - \rho_{\epsilon v}^2}}\right) \frac{\phi(v)}{\Phi(m'\delta)} dv$$

For simplicity, consider the following definition:

$$\Phi(c_j) \left(\frac{c_j - x_i'\beta - \alpha - \theta v}{\sqrt{1 - \rho_{\epsilon v}^2}} \right)$$

Thus, the rest of the probabilities are given by the following:

$$Pr(w = 2 | p = 1, m) = P_{2,1} = \int_{-m'\delta}^{\infty} [\Phi(c_2) - \Phi(c_1)] \frac{\phi(v)}{\Phi(m'\delta)} dv$$

$$Pr(w = 3 | p = 1, m) = P_{3,1} = \int_{-m'\delta}^{\infty} [\Phi(c_3) - \Phi(c_2)] \frac{\phi(v)}{\Phi(m'\delta)} dv$$

$$Pr(w = 4 | p = 1, m) = P_{4,1} = \int_{-m'\delta}^{\infty} [\Phi(c_4) - \Phi(c_3)] \frac{\phi(v)}{\Phi(m'\delta)} dv$$

$$Pr(w = 5 | p = 1, m) = P_{5,1} = \int_{-m'\delta}^{\infty} [1 - \Phi(c_4)] \frac{\phi(v)}{\Phi(m'\delta)} dv$$

Then, the exercise is replicated to build the probabilities for $p = 0$. Note the following:

$$Pr(w = 1 | p = 0, m) = Pr[Pr(w|v, m) | v < -m'\delta, m]$$

Therefore:

$$Pr(w = 1 | p = 0, m) = P_{1,0} = \int_{-\infty}^{-m'\delta} \Phi\left(\frac{c_1 - x'_i\beta - \theta v}{\sqrt{1 - \rho_{\epsilon v}^2}}\right) \frac{\phi(v)}{1 - \Phi(m'\delta)} dv$$

Again, consider the following simplification:

$$\Phi(c_j) \left(\frac{c_j - x'_i\beta - \theta v}{\sqrt{1 - \rho_{\epsilon v}^2}} \right)$$

The probabilities are given by the following expressions:

$$Pr(w = 2 | p = 0, m) = P_{2,0} = \int_{-\infty}^{-m'\delta} [\Phi(c_2) - \Phi(c_1)] \frac{\phi(v)}{1 - \Phi(m'\delta)} dv$$

$$Pr(w = 3 | p = 0, m) = P_{3,0} = \int_{-\infty}^{-m'\delta} [\Phi(c_3) - \Phi(c_2)] \frac{\phi(v)}{1 - \Phi(m'\delta)} dv$$

$$Pr(w = 4 | p = 0, m) = P_{4,0} = \int_{-\infty}^{-m'\delta} [\Phi(c_4) - \Phi(c_3)] \frac{\phi(v)}{1 - \Phi(m'\delta)} dv$$

$$Pr(w = 5 | p = 0, m) = P_{5,0} = \int_{-\infty}^{-m'\delta} [1 - \Phi(c_4)] \frac{\phi(v)}{1 - \Phi(m'\delta)} dv$$

In this way, the log-likelihood can be constructed:

$$l(\delta, \beta, \alpha, c_j, \rho_{\epsilon v}, \tau) = \sum_{i=1}^n \left[\begin{aligned} &w_{i1} p_i \ln(P_{1,1}) + w_{i2} p_i \ln(P_{2,1}) + w_{i3} p_i \ln(P_{3,1}) + w_{i4} p_i \ln(P_{4,1}) + \\ &w_{i5} p_i \ln(P_{5,1}) + w_{i1} (1 - p_i) \ln(P_{1,0}) + w_{i2} (1 - p_i) \ln(P_{2,0}) + \\ &w_{i3} (1 - p_i) \ln(P_{3,0}) + w_{i4} (1 - p_i) \ln(P_{4,0}) + w_{i5} (1 - p_i) \ln(P_{5,0}) \end{aligned} \right] \quad (1A)$$

where $w_{ij} = 1$ if $w_i = j$ and equal to zero otherwise, for $j = 1, 2, 3, 4, 5$. This is the function that is maximized to find the estimates of the population parameters.

Annex A2

Table A2.1
Marginal effects for ordered probit: life satisfaction

Variables	$P(w = 1)$	$P(w = 2)$	$P(w = 3)$	$P(w = 4)$	$P(w = 5)$
Labour participation = 1	-0.00278* (0.00169)	-0.0144* (0.00842)	-0.00713* (0.00421)	-0.00316 (0.00198)	0.0275* (0.0161)
Female = 1	0.00116 (0.00227)	0.00602 (0.0118)	0.00298 (0.00582)	0.00132 (0.00262)	-0.0115 (0.0225)
Years of schooling	-0.00120*** (0.000306)	-0.00621*** (0.00140)	-0.00307*** (0.000680)	-0.00136*** (0.000418)	0.0118*** (0.00255)
Age	4.67e-05 (0.000478)	0.000242 (0.00248)	0.000120 (0.00123)	5.31e-05 (0.000544)	-0.000462 (0.00473)
Age squared	-9.09e-09 (5.26e-06)	-4.72e-08 (2.73e-05)	-2.33e-08 (1.35e-05)	-1.03e-08 (5.97e-06)	8.99e-08 (5.20e-05)
Has partner = 1	-0.00562** (0.00248)	-0.0291** (0.0126)	-0.0144** (0.00625)	-0.00639** (0.00318)	0.0556** (0.0239)
Divorced = 1	-0.00231 (0.00216)	-0.0120 (0.0112)	-0.00594 (0.00550)	-0.00263 (0.00249)	0.0229 (0.0212)
Widower = 1	-0.00147 (0.00419)	-0.00764 (0.0217)	-0.00378 (0.0108)	-0.00167 (0.00480)	0.0146 (0.0415)
Indigenous = 1	0.000590 (0.00186)	0.00306 (0.00964)	0.00151 (0.00478)	0.000670 (0.00215)	-0.00583 (0.0184)
Immigrant = 1	0.00633** (0.00250)	0.0328*** (0.0127)	0.0162*** (0.00629)	0.00719** (0.00333)	-0.0626*** (0.0240)
Lives in a rural area = 1	-0.00138 (0.00191)	-0.00716 (0.00982)	-0.00354 (0.00488)	-0.00157 (0.00215)	0.0137 (0.0187)
Indigenous = 1 and lives in a rural area = 1	0.00334 (0.00367)	0.0173 (0.0188)	0.00857 (0.00932)	0.00380 (0.00421)	-0.0330 (0.0358)
Female = 1 and has partner = 1	0.00185 (0.00282)	0.00960 (0.0146)	0.00475 (0.00721)	0.00210 (0.00325)	-0.0183 (0.0278)
Has children = 1	0.000116 (0.00146)	0.000602 (0.00759)	0.000298 (0.00375)	0.000132 (0.00166)	-0.00115 (0.0145)
Income	-5.07e-06*** (1.10e-06)	-2.63e-05*** (4.93e-06)	-1.30e-05*** (2.50e-06)	-5.76e-06*** (1.69e-06)	5.01e-05*** (9.01e-06)
Income squared	1.49e-10** (6.31e-11)	7.73e-10** (3.17e-10)	3.83e-10** (1.58e-10)	1.69e-10** (7.99e-11)	-1.47e-09** (6.00e-10)
Reference income	3.92e-06** (1.81e-06)	2.03e-05** (9.09e-06)	1.01e-05** (4.44e-06)	4.45e-06** (2.02e-06)	-3.88e-05** (1.69e-05)
Number of friends	-0.000269 (0.000172)	-0.00139 (0.000883)	-0.000689 (0.000437)	-0.000305 (0.000203)	0.00266 (0.00167)
Current health status (from 1 to 7)	-0.00254*** (0.000621)	-0.0132*** (0.00287)	-0.00652*** (0.00148)	-0.00289*** (0.000973)	0.0251*** (0.00544)
Church attendance = 1	-0.00315* (0.00169)	-0.0164* (0.00861)	-0.00809* (0.00424)	-0.00358* (0.00205)	0.0312* (0.0163)
Personality traits ($\hat{\beta}$)	-0.00880*** (0.00116)	-0.0456*** (0.00302)	-0.0226*** (0.00182)	-0.01000*** (0.00253)	0.0870*** (0.00458)
Observations	5 999	5 999	5 999	5 999	5 999

Source: Ministry of Social Development and Family, "Encuesta de Bienestar Social", Santiago, 2021 [online] <https://datasocial.ministeriodesarrollosocial.gob.cl/portalDataSocial/ebs>.

Note: The sample comprises individuals aged 18–65. Standard deviations are in parenthesis. The marginal effect was calculated at the average value of the explanatory variables. Income refers to household monetary income (in thousands of Chilean pesos). Reference income refers to household monetary income of the reference group (in thousands of Chilean pesos). * 10% significance level, ** 5% significance level, *** 1% significance level.