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Determinants of Household Position within Chilean Wealth Household's Distribution*

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Abstract

This paper analyzes the distribution of net wealth, its relationship with income and the factors that influence the household position within the wealth distribution in Chile. The research draws on microdata from the Survey of Household Finances 2014. We de.ne net wealth as the difference between assets and debts without considering pension wealth. The results show that wealth is unequally distributed among Chilean households. In fact, 73% of wealth is owned by the richest quintile. In addition, we show that to finance partial or totally the main residence with a subsidy has a significant effect on the probability of a household being above the lowest wealth quintile and that inheritances significantly increase the probability of belonging to a higher quintile of wealth. In terms of income we show that, even though it has a significant effect in the wealth position of a household, the relationship between income and wealth is weak.

Resumen

Este documento estudia la distribución de riqueza neta, su relación con el ingreso y los factores que influyen en la posición de los hogares en la distribución de riqueza en Chile.
El estudio utiliza información de la Encuesta Financiera de Hogares 2014. Definimos riqueza neta como la diferencia entre activos y pasivos sin considerar los fondos de pensiones del hogar. Los resultados muestran que la riqueza neta está desigualmente distribuida entre los hogares chilenos. De hecho, 73% de la riqueza se concentra en el quintil más rico. Además, mostramos que la utilización de subsidios para financiar parcial o totalmente la vivienda principal tiene un efecto significativo sobre la probabilidad de que un hogar esté sobre el quintil más bajo de riqueza y que recibir una propiedad como herencia aumenta significativamente la probabilidad de pertenecer a los quintiles de riqueza más altos. En relación al ingreso, mostramos que, aunque este tiene un efecto significativo en la posición en la distribución de riqueza, su relación con la riqueza es débil en el corte transversal.

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1 Introduction

The emergence of new sources of information about the balance sheet of households and the publication of several articles that find an increase in the wealth inequality in the last decades has encouraged the study of wealth distribution (Wolff, 2010; Jantti, 2008; Brandolini et al., 2004). In addition, the publication of "The Capital in the Twenty-First Century" by Piketty (2014) and the results of the "Commission on the Measurement of Economic Performance and Social Progress" led by Stiglitz at al. (2009) have given an important stimulus to research about household wealth.

In general, the literature has studied household wealth according to two lines of research. One has analyzed the distribution of wealth, and the other one has studied the determinants of wealth accumulation.

Related to the study of wealth distribution, using the balance sheet information of households from the Survey of Consumer Finances (SCF) conducted by the US Federal Reserve Board, Kennickell (2003), Díaz-Giménez et al. (2011) and Wolff (2010) study the wealth distribution of US American families. All authors observe a high concentration of wealth within the richest 20% of households in different waves of the survey. In the case of Canada, Brzozowski et al. (2010) analyze the distribution of income, consumption and wealth over the past 30 years using different sources of information.[1] Their main result is that wage and income inequality has intensified during the last 30 years, and that wealth inequality has remained fairly stable and fairly high since 1999.

In the case of Europe, the Household Finance and Consumption Survey (HFCS) led by the European Central Bank (ECB) has been used. Caju (2013) examines the structure, distribution and components of household wealth for countries in the HFCS. The author concludes that net wealth is more unevenly distributed than income and that there are significant disparities between Eurozone countries. Using the same survey, Sierminska and Medgyesi (2013) compare the inequality of wealth and income between countries in the Eurozone and decompose the wealth in order to identify the factors that determine this inequality. The main result of their paper indicates that there are large differences not only in terms of wealth level but also in terms of wealth inequality among the countries analyzed. Meanwhile, Kontbay-Busun and Peichl (2015) examine the joint distribution of income and wealth at the top tail of 15 Eurozone countries' distributions. Their results show a weak correlation between income and wealth.

Based on the Luxembourg Wealth Study Database (LWS),[2] Cowell et al. (2012) examine the differences in the distribution of household wealth according to several economic and demographic characteristics for countries like Finland, Italy, Sweden, the United Kingdom and the United States. The authors note that the differences in wealth distribution between countries cannot be explained away by differences in age, working status, household structure, education or income.

[1] The Canadian surveys used by the authors are the Survey of Familiar Expenditure, the Survey of Households Spending, the Survey of Consumer Finances, the Survey of Labour and Income Dynamics, and the Survey of Financial Securities.

[2] The Luxembourg Wealth Study consists of harmonised national data on topics like wealth, income and labour markets for 10 countries: Austria, Canada, Cyprus, Germany, Finland, Italy, Norway, Sweden, the United Kingdom and the United States.

Using the same survey, Jantti et al. (2008) develop a study of the joint distribution of income and wealth for households in Canada, Germany, Italy, Sweden and the United States. In particular, they note that net wealth and disposable income of households are highly - but not perfectly - correlated within each country.

In the case of Chile, few studies have been developed to analyze wealth distribution. For instance, Cox et al. (2006) study the concentration of assets and debts in Chilean households using the Social Protection Survey 2004. The authors find a strong concentration of these two variables in households with higher incomes. Meanwhile, Bauducco and Castex (2013) compare the distribution of wealth between Chile and the United States using the financial survey for each country.[3] The authors find a more unequal income distribution in Chile but a greater wealth inequality in the United States. Martínez and Uribe (2017) study the distribution of net wealth and its components across Chilean households based on the SHF 2011-12. The authors find a high concentration of wealth in the richest quintile of the population; they also conclude that wealth distribution is more unequal than income distribution, and that there is no strong relationship between wealth and income.

A second line of research that has been fostered in recent years is the study of the determinants of wealth accumulation. Leitner (2015) studies the sources of inequality in households' gross, net and real estate gross wealth across eight Eurozone countries based on the HFCS. The main result is that dispersion in bequest and inter-vivos transfers obtained by households has a remarkable effect on wealth inequality. Using the same survey, Fessler and Schürz (2015) examine the role of inheritances, income and welfare-state policies in explaining differences in household wealth within and between Eurozone countries. The main result is that social services provided by the state are substitutes for private wealth accumulation and partly explain the observed differences in the level of net wealth of households across European countries. Arrondel et al. (2014) study the relationship between wealth and income distribution of households for 15 European countries using the HFCS. They conclude that to belong to the upper income deciles or to have received gifts or inheritances increases the probability of being in a higher wealth decile. Mathä et al. (2014) provide an in-depth analysis of factors contributing to the accumulation of household wealth across Eurozone countries using the HFCS. The results reveal large differences in wealth within these countries. The main factors behind these differences are home ownership, property price dynamics and intergenerational transfers. Meanwhile, Pfeffer and Griffin (2015) study the determinants of extreme fluctuations in wealth in the United States using the Panel Study of Income Dynamics 2005 and 2007. The authors conclude that the initial wealth is a good predictor of future fluctuations, and that a large part of these fluctuations may be associated with assets portfolio.

In the Chilean case, there are no studies analyzing the determinants of household wealth accumulation. In that sense, our paper is a contribution about this issue for Chile. In particular, we study the determinants of the household's position in the wealth distribution. For this purpose, we estimate a generalized ordered logit model using as the dependent variable the wealth quintile of a household. In addition, we analyze if the weak relationship between income and wealth found by Martínez and Uribe (2017) remains when we control for other variables.

[3] For Chile, the authors use the Survey of Household Finances (SHF) 2007, while they use the SCF 2007 for the United States.

The paper is organized as follows. In Section 2, we describe the dataset and the clasiffications used across the paper. In Section 3, we analyze the wealth distribution of Chilean households. In Section 4, we study the relationship between the distribution of wealth and income. In Section 5, we describe the empirical model, and in Section 6 we analyze the results of the estimation. Section 7 presents our concluding remarks.

2 Data

For this paper, we use the microdata comes from the SHF 2014 managed by the Central Bank of Chile. This is a cross-sectional survey and provides a comprehensive sight of households' balance sheets. In particular, the survey provides data on income, assets and debts, along with the socio-demographic characteristics of the Chilean households and their members. This survey has an urban national representativeness and its fieldwork was between July 2014 and February 2015. During that period, 4,502 Chilean households were interviewed. In order to better capture the behavior of households with the highest participation in financial markets, the sample design of the SHF oversampled the richest 20% of households in the population, its group is defined according to the assessed value available in the sampling frame of the survey (Encuesta Financiera de Hogares, 2015b).[4]

When we analyze the results of household surveys, we must take into account some issues. First, the SHF is a self-reported survey. This implies that the collected data may be subject to a measurement error, which is not necessarily systematic. Second, it should be noted that although the SHF tries to sample the entire population, it is likely that extremely wealthy households refuse to respond. In fact, Eckerstorfer et al. (2015) present evidence that rich households are less likely to participate in surveys about household wealth based on the SCF data. This low participation of the richest households might have an impact on the shape of the upper tail of the wealth distribution. Finally, since the data collected by the SHF is given voluntarily, it is difficult to collect complete information in all items of the survey. In order to solve the item non-response problem, the SHF carries out a multiple imputation process.[5]

It is worth mentioning that the SHF does not collect information on mandatory pension funds for each household member. Because of that, our measure of wealth does not incorporate this type of assets. Martínez and Uribe (2017) show that the exclusion of mandatory pension funds has a negative effect in the wealth inequality for Chilean households.

The main variables that we use in our work are income, assets, debts, net wealth and inheritances of households. In the case of household income, we use the monthly disposable income, which refers to the total sum of labor income, pension income, income from financial investments and other incomes that are not included in the previous categories.

[4] This sample design is also used in the SCF from the United States (Kennickell and Woodburn, 1997) and in some countries from the HFCS (Eurosystem Household Finance and Consumption Network, 2013).

[5] A similar procedure is used by SCF (Kennickell, 1998) and HFCS (Eurosystem Household Finance and Consumption Survey, 2013).

Regarding assets, they are the sum of financial and non-financial assets of a household. Financial assets are defined as the sum of the amount invested in assets with variable return plus the amount invested in assets with fixed return,[6] while non-financial assets are defined as the sum of the self-reported values of the main residence, other real estate properties and vehicles.[7,8]

On the other hand, debts are the sum of mortgage and non-mortgage debt of households. Mortgage debt includes the debt of the principal residence and other properties, while non-mortgage debt includes consumer debt in banks and other type of formal financial institutions,[9] vehicle debt, educational debt and other debts.[10]

Thus, the net wealth of a household is defined as the sum of assets minus debts, excluding the funds in the mandatory pension system.[11] This definition of wealth is the same used by the Organization for Economic Cooperation and Development (OECD) in its analysis of wealth for member countries (OECD, 2015) and is of widespread used in the literature about household wealth.

The results that are shown hereinafter are expressed in United States dollars of 2014. The statistical unit for the analysis of wealth distribution is the household.[12] Our results are presented following the guidelines propose by the "OECD Guidelines for Micro Statistics on Household Wealth" (OECD, 2013). This guide classifies households according to the information of the reference person and to the household level information.[13]

3 Wealth Distribution

In this section, we analyze the wealth distribution of the Chilean households. The Table 1 characterizes the wealth distribution. In particular, the first column shows the percentage of households in each cetegory. The second column shows the percentage of household with negative wealth, and the third column displays the proportion of wealth in each category. Finally, fourth and fifth columns show the median and the interquartile range of wealth distribution, respectively.

[6] Financial assets are the sum of the following categories: stocks, mutual funds and other investment funds, currency and deposits, savings accounts, voluntary individual life insurance and private pension funds, net equity in own unincorporated enterprises and other assets.

[7] Other real estate properties are farm land, vacation properties, sheds, second residence, commercial premises or offices, hotel or lodging, warehouses and parking lots.

[8] The reported value for the principal residence and other real estate properties is obtained from the question: "*If you sell this property today, what do you think would be its value? (residence plus land)*" in the questionnaire of the SHF (Encuesta Financiera de Hogares, 2015a).

[9] Other type of formal financial institutions are department stores, the credit unions and the family allowance compensation funds.

[10] Other debt includes loans from family, pawnshop, informal lenders and some other secondary sources of funding.

[11] Through the paper we will use the terms wealth and non-previsional wealth interchangeably to refer to net household wealth.

[12] The SHF defines a household as a group of individuals who live in the same home and share the same budget (single-person households are also considered). This definition is very similar to the one used in the SCF and the HFCS (Bricker et al., 2014; Eurosystem Household Finance and Consumption Network, 2013).

[13] For more details on the definition of the reference person, see Appendix A.

The results in Table 1 indicate that the median household has a net wealth of around 31,000 dollars, and 15% of households shows a negative level of wealth. Regarding the wealth quintiles, Table 1 shows that the richest quintile concentrates 73% of wealth.[14] This result describes a strong concentration of wealth among Chilean households, which is comparable to countries like Austria, Germany, and the United States, where the richest 20% holds over 70% of household wealth[15] (Carrol et al., 2014; Vermeulen, 2014; Díaz-Giménez et al., 2011). In terms of dispersion within wealth quintile, we note that the first 4 quintiles show low dispersion in wealth, while the richest quintile shows large heterogeneity for this measure. This result evidences that the largest differences in wealth are concentrated among the wealthiest households in the population.

In terms of the age of the reference person, Table 1 shows that the median level of wealth grows along this variable, even over 65 years old. This is due to our wealth measure does not include pension wealth. We also observe that the proportion of wealth grows with the age of the reference person during her working life but it starts to decrease once the reference person reaches the age of retirement. Moreover, we note that wealth is concentrated (24%) in the group where the reference person is aged between 55 and 64 years. Meanwhile, the group with the lowest wealth is represented by households whose reference person is younger than 35 holding only 8% of wealth, and has the highest proportion of households with negative wealth. Indeed, 25% of this group have more debts than assets. This percentage decreases with the age of the reference person until turning 65 years, and, thenceforth, the proportion of households with negative wealth falls below to 10%. In terms of dispersion, we observe a large heterogeneity in wealth stocks in the groups where the reference person is older than 54. In fact, this dispersion reaches its peak in the group led by the reference person aged over 74 years. This growth in the dispersion across the age of the reference person denotes heterogeneous patterns in the accumulation of household wealth over time.

In terms of the housing status, the results show that households who have already paid for their principal residence concentrate 71% of wealth and represent 45% of total households. A similar situation is observed in countries such as Finland, Italy, the United Kingdom and the United States (Cowell et al., 2012). From Table 1, we also highlight that 37% of households that do not own the property where they live shows negative net wealth.

Finally, we note a similar median level of wealth among households who are the outright owners of their property and for those who are still paying for it. This result seems counterintuitive because owners without mortgage should show a level of wealth higher than those who are still paying for their home. However, this is not so because some portion of outright owners obtained their property through social programs, which implies that the value of those proporties is low. Besides the latter, households who own such properties have a low capacity to generate income, which prevents them from further accumulating wealth over time. Meanwhile, the group of households that are still paying for their house shows a low level of wealth because some of them are in the early years of their mortgage loan. Therefore, given the composition of each group, we

[14] Since the cut point for the first wealth quintile is zero and around 8% of households have zero wealth, it was necessary to generate a random assignment of households with zero wealth in order to balance the number of households between the first and second quintiles.

[15] In fact, Davies et al (2011) show that the richest 10% of world population concentrates the 71% of global wealth.

find a large similarity in the distribution of wealth but, in structural terms, these groups have important differences.

Table 1: Distribution of net wealth in Chilean households

Categories	% Household	% of household with negative wealth	Wealth proportion	Wealth median	Wealth IQR
Total population	100.0	15.3	100.0	30,890	72,758
Household wealth quintile					
I	20.0	76.4	0.0	-630	2,698
II	20.0	0.0	1.8	5,075	9,447
III	20.0	0.0	8.4	30,923	11,038
IV	20.0	0.0	17.0	61,239	22,463
V	20.0	0.0	72.8	169,558	178,872
Age of the reference person					
< 35	20.0	25.3	8.1	5,256	38,678
35 to 44	23.5	16.6	20.3	27,332	61,710
45 to 54	23.2	14.0	22.6	33,870	71,694
55 to 64	17.2	10.3	23.5	47,548	89,376
65 to 74	9.7	7.3	14.1	51,903	88,645
> 74	6.4	9.2	11.3	58,727	94,543
Housing status					
Outright owner	45.4	0.3	70.8	55,395	74,488
Owner with mortgage	16.5	6.9	22.6	50,343	79,595
Renter or other	38.1	36.8	6.6	0	6,492

Notes: (1) The total population is equal to 4,701,109. (2) IQR corresponds to the interquartile range. (3) Median and IQR are expressed in United State dollars 2014.
Source: Own calculations based on SHF 2014.

4 Relationship between Wealth and Income

The relationship between wealth and income is one of the most studied in the literature about wealth. The high concentration of wealth and income distributions, and that wealth is worse distributed than income, are well documented facts (Piketty, 2014; Arrondel et al., 2014; Díaz-Giménez et al., 2011). In this section, we study the relationship between wealth and income and show some measures of inequaly for each variable for Chilean households.

Table 2 shows the distribution of households in wealth quintiles conditional on beloging to a specific income quintile. Our main result is that the relationship between wealth and income is

not strong. This means that belonging to a particular income quintile does not determine the belonging to a particular wealth quintile in the cross-sectional data, except for the richest quintile. The result in Table 2 indicates that the 80% of households with the lowest income shows a high degree of homogeneity in wealth, since the probability of being in the first four wealth quintiles is similar. This result is similar to that found by Arrondel et al. (2014) for European countries using the HFCS, and by Martínez and Uribe (2017) for Chile using the SFH 2011-12.

Table 2: Joint distribution of income and wealth across household quintiles

% of households in quintiles of income	% of households in quintiles of net wealth					
	I	II	III	IV	V	Total
I	24.7	21.8	26.9	16.5	10.1	100
II	24.7	19.9	23.5	22.5	9.3	100
III	24.5	24.5	22.7	18.3	10.0	100
IV	15.7	20.2	16.6	25.2	22.4	100
V	10.4	13.7	10.2	17.5	48.2	100

Source: Own calculations based on SHF 2014.

To deepen the above results, in Table 3 we characterize the distributions of wealth and income by quintiles for each of these variables. In terms of wealth quintiles, the results show that wealth and income are concentrated in the richest quintile of the population. The proportion of wealth in this quintile reaches 73%, while the proportion of income reaches only 40%. We can also infer from Table 3 that, while there is an increase of the median wealth for the first three quintiles, their median level of income does not show a large variation. This may be because these quintiles concentrate a large proportion of households whose employed members are located in the middle and the lower ranges of wages and salaries.

When we analyze the income quintiles, we note that even though the lowest quintile holds only 3% of the total income, it has a proportion of wealth similar to the second and third quintile. Using the SHF 2011-12, Martínez and Uribe (2017) show that this result is mainly explained by a high proportion of the reference persons over 65 years in the first income quintile, who own their main residence and have a low level of debt. From Table 3, we can also observe that the highest income quintile holds 47% of the wealth and 58% of the income. However, the concentration of wealth in income quintiles is less severe than the one observed in wealth quintiles.

To conclude this section, we examine some measures of inequality of income and wealth distributions. The results for the different measurements are shown in Table 4. The first and most extended measure considered is the Gini coefficient.[16] In the case of wealth, the index reaches a value of 0.74, which is consistent with the fact that the richest 20% of Chilean households concentrates the 73% of non-previsional wealth. This result shows that wealth in Chile is unequally distributed. This is also true in other countries such as Austria, Germany, and the United States, which show a Gini index above 0.70 for net wealth (Arrondel et al., 2014; Díaz-Giménez et al.,

[16] Since net wealth can be negative, the Gini index in this case is not bounded by 1 in the top (Chau-Nan et al., 1982).

2011). For income, the Gini coefficient reaches a value of 0.54. This result implies that wealth is worse distributed than income. It is worth mentioning that this outcome is not particular to Chile. In fact, Jantti et al. (2008) point out that in many cases the wealth inequality ranking of countries differs considerable from the rank in terms of income inequality. Comparing our results to those of the United States and countries from the Eurozone, we detect that the patterns of income and wealth inequality are very similar to the ones observed in Chile. In particular, we note that Chile's wealth inequality is comparable to Austria and Germany [17](Arrondel et al., 2014; Sierminska and Medgyesi, 2013) and has one of the highest Gini indexes in terms of income together with the United States[18] (Díaz-Giménez et al., 2011).

Table 3: Distribution of wealth and income by quintiles of wealth and income

	Wealth		Income	
Categories	Proportion	Median	Proportion	Median
Total population	100.0	30,890	100.0	1,338
Household wealth quintile				
I	0.0	-630	13.6	1,083
II	1.8	5,075	14.9	1,254
III	8.4	30,923	13.5	1,052
IV	17.0	61,239	17.9	1,373
V	72.8	169,558	40.0	2,821
Household income quintile				
I	11.6	21,489	3.3	405
II	10.5	24,046	7.4	824
III	10.9	20,060	11.9	1,343
IV	20.3	42,011	19.5	2,156
V	46.8	86,209	57.9	4,689

Note: Median is expressed in United State dollars 2014.
Source: Own calculations based on SHF 2014.

In addition, Table 4 shows that the coefficient of variation indicates a greater dispersion in the distribution of wealth (2.24) than in the distribution of income (1.55). Regarding the ratio between the mean and the median in each distribution, we note that the ratio for wealth is higher than the ratio for income, which indicates that wealth distribution is more concentrated than income distribution towards higher values. Regarding the ratio between the 90^{th} percentile and the median, we see that households in the 90^{th} percentile of the distribution have almost six times the median level of household wealth and almost four times the median level of household income. Therefore, wealth shows a more skewed and unequal distribution than income.

[17]Both countries, Austria and Germany, register a Gini coefficient of wealth equal to 0.76. These results correspond to 2010-2011 (Arrondel et al., 2014).

[18]The United States registers a Gini index of income of 0.58. These results correspond to 2007 (Díaz-Giménez et al., 2011).

Table 4: Inequality measures of income and wealth

Variables	Gini Index	Coefficient of Variation	Mean/Median	P90/P50
Income	0.54	1.55	1.69	3.50
Wealth	0.74	2.24	2.37	5.49

Source: Own calculations based on SHF 2014.

5 Empirical Model

In this section, we analyze many factors that influence the position of households in the wealth distribution. For this purpose, we estimate the generalized ordered discrete model where the dependent variable is the household wealth quintile. In addition, we use the prediction of the model to test if the relationship between income and wealth presented in Table 2 holds when we control for other variables.

The generalized ordered model is defined as:

$$\Pr\left(y_i > j\right) = F\left(\alpha_j + \beta_j' x_i\right), \quad j = 0, 1, ..., J-1, \tag{1}$$

where j represents the categories of the dependent variable, and x_i is a vector that contains control variables without a constant term. As opposed to the standard ordered discrete model, the generalized model does not impose the parallel lines assumption between categories of the dependent variable, which gives more flexibility to the estimation (Williams, 2006; Greene and Hensher, 2010). Then, the probability of being in each category is determined by:

$$\begin{aligned}
\Pr\left(y_i = 0\right) &= 1 - F\left(\alpha_0 + \beta_0' x_i\right), \\
\Pr\left(y_i = j\right) &= F\left(\alpha_{j-1} + \beta_{j-1}' x_i\right) - F\left(\alpha_j + \beta_j' x_i\right), \\
\Pr\left(y_i = J\right) &= F\left(\alpha_{J-1} + \beta_{J-1}' x_i\right).
\end{aligned}$$

The generalized ordered model estimate $J-1$ binary regression models, where each one is defined as in (1). Thus, $\beta_j > 0$ indicates that higher values of the explanatory variable increases the probability of being over category j (Williams, 2006).

In our model, the control variables include the income quintile, the financing structure of housing when the house was bought, the number of household members, a dummy that shows if at least one member of the household is retired, a dummy indicating if the household received a property as inheritance, and the age, the marital status (married) and the gender (male) of the reference person of the household. In relation to the financing structure for the main residence, we control for 3 dummies: housing-subsidy, housing-mortgage, and housing-own resources. The housing-subsidy dummy variable indicates if the main residence was financed partially or entirely with a subsidy. The housing-mortgage dummy shows if a household financed its principal residence with a mortgage loan either completely or partially. Finally, the housing-own resources dummy indicates if a household financed its principal residence by saving either a down payment or the

total purchase.[19] Given that we do not have the past information of households, we use these dummy variables as *proxies* of the past economic condition of a household, which allows us to characterize the wealth accumulation pattern of each household over time.

Since the SHF is a complex survey and has missing values, we use the imputed version of the survey to maximize the observations included in our estimations.[20] Moreover, the estimations are made using population weights, which adds additional complexity to estimate the standard errors of the parameters. To solve this issue, we use the bootstrap procedure proposed by Rao and Wu (1988).[21] We use 1,000 replications in the process to estimate the standard errors, and we apply Rubin's rules (Rubin, 1987) used in the Eurosystem Household Finance and Consumption Network (2013) to calculate the parameters of interest.

6 Results

In this section, we analyze the main results that arise from the model estimation, and we develop some additional exercises to understand in depth the effect of some factors in the household position within the wealth distribution.

6.1 Results of the model estimation

In this part, we analyze the results of the estimation of the generalized ordered logit model. The results are presented in Table 5. Each column shows the parameters associated with being over the wealth quintile defined in the top of each column. For example, the first column displays the parameters related to the probability of being over the first wealth quintile. The second column shows the parameters associated with being over the second wealth quintile, and so on.

In the results of Table 5, we show that the income quintile increases the probability of going up in the wealth distribution in a significant way, with the exception of the second income quintile in the first and fourth wealth quintiles. In addition, we see that in each category, the estimated coefficients increase along the income distribution. In general, the significant effect of income in household wealth is very common in the literature. In fact, Leitner (2015) shows that income is a significant factor to explain the stocks of household wealth in European countries that participate in the HFCS. Based on the same survey, Fessler and Schürz (2015) and Arrondel et al. (2014) show that the position in the income distribution has a positive and significant effect in the position of wealth distribution, and Mathä et al. (2014) find a positive and significant effect of income in the median wealth level of households.

[19] We do not use interaction terms between these dummy variables because this generates groups with small size for estimations.

[20] The SHF uses a chained-equation procedure to impute the missing values and produces 30 imputed databases for the analysis.

[21] The bootstrap procedure proposed by Rao and Wu (1998) is also used in the HFCS conducted by the European Central Bank (Eurosystem Household Finance and Consumption Network, 2013).

In relation to the age of the reference person, we find a positive relationship between the position in the wealth distribution and the age. This result is very common in the literature considering that as the age of the reference person increases, this household has been able to generate more savings and, therefore, they have accumulated more wealth (Arrondel et al., 2014; Fessler and Schürz, 2015). However, in constrast with what the life cycle theory predicts, we do not see a negative relationship between age and wealth after the reference person retires. This might be explained due to older households reduce their debt and maintain their principal residence and the omission of pension wealth in the survey.

Table 5: Estimation results for the generalized ordered logit model

	Wealth Quintiles			
Variables	I	II	III	IV
Income quintile II	0.277	0.513**	0.562***	0.215
Income quintile III	0.567**	0.650***	0.659***	0.593**
Income quintile IV	0.906***	1.061***	1.305***	1.302***
Income quintile V	1.437***	1.980***	2.237***	2.537***
Age of reference person	0.0122**	0.0206***	0.0277***	0.0290***
Male	0.290*	0.0716	0.149	-0.0666
Married	-0.0522	-0.00603	-0.0511	0.170
Separated or divorced	0.169	0.0305	-0.0464	0.107
Household size: 1 to 2	0.999***	0.453	0.447	0.766**
Household size: 3 to 4	0.692**	0.339	0.297	0.415
Household size: 5 to 6	0.807**	0.630*	0.348	0.647
Retired at household	0.109	0.733***	0.616***	0.297*
Housing-subsidy	2.928	1.659***	-0.0202	-0.655***
Housing-own resources	2.744***	2.602***	1.874***	1.586***
Housing-mortgage	0.666**	1.518***	1.104***	0.674***
Inheritance	4.211	3.367***	2.408***	1.899***
Constant	-1.899***	-3.877***	-4.810***	-5.961***
Sample size (n)	4,502			
Population	4,701,109			
Pseudo R^2	0.33			

Notes: (1) Estimation using multiple imputation; (2) Bootstrapped standard errors with 1,000 replicates of population weights;
(3) ***p<0.01, **p<0.05, *p<0.1.
Source: Own calculations based on SHF 2014

In regards to male and married variables of the reference person, we find that they have a positive effect but it is only significant by the gender in the first column of Table 5. One hypothesis to explain these results is the relative homogeneity in these aspects across wealth quintiles in Chile. Unlike our case, Leitner (2015) shows that a married reference person has a positive impact in the wealth stock of the household. Also, Fessler and Schürz (2015) show that a female reference person has a negative impact in the position of the household in the wealth distribution. Meanwhile,

Mathä et al. (2014) find a positive and significant effect over the median wealth level if the reference person is a male, and they find a mixed effect of marital status. Previous results reflect that there is not a clear effect of the gender and the marital status of the reference person in the household position within the wealth distribution.

Household size has a positive effect on the probability of households to rise in the wealth distribution, but this effect is significant only in the first wealth quintile for all household sizes. The non-significant effect of household size could be attributed to the similar household structure of all wealth quintiles. A similar result is found by Mathä et al. (2014) using the HFCS, where household size has a significant effect only in some countries.

In relation to the presence of a retired person in the household, we find that this variable has a positive and significant effect of being over the second wealth quintile. In the literature, the results show a positive and significant effect when the reference person is retired (Mathä et al., 2014) or the interviewee is retired (Fessler and Schürz, 2015), which is in line with our results.

The variables of financing structure of the house purchase show a mixed effect in the household position within the distribution of wealth. First, we find that the housing-subsidy variable has a positive and significant effect in the probability of being over the second wealth quintile, but this variable has a negative and significant effect in the probability of being over the fourth wealth quintile. This result is explained by the fact that public policies focused on encouraging housing tenure have been successful in increasing the wealth stock in the most vulnerable households. This result is a novel outcome in the literature and it is interesting for developing countries that apply similar policies.

For the housing-own resources variable, we see that this variable increases in a significant way the probability of a household improving its position in the wealth distribution. This result shows that households that are capable of saving enough money to partially or fully finance the house purchase have a high probability of being in the wealthiest quintiles in the future.

In the case of the housing-mortgage dummy, we find that this variable has a positive and significant effect to explain the position of households in the wealth distribution. The explanation of this effect is related to the fact that households with mortgage are those with a high expected income, and then with a higher capacity to accumulate wealth. Therefore, we can see a positive relationship between high expected income households and mortgage loan (Encuesta Financiera de Hogares, 2015b).[22]

When we analyze the variable of having received a property as inheritance, we observe that it has a positive and significant effect of being above the second wealth quintile. This result is similar to that found by Arrondel et al. (2014) and Fessler and Schürz (2015) for European countries in the HFCS, where inheritances have a positive and significant effect over the household's position

[22] The financing structure of the house purchase also capture (in some way) the effect of housing tenure across households. It is worth mentioning that we conducted an exercise that includes a dummy variable of housing tenure and, although the magnitude of the parameters changed, the sign and the significance remained similar to what we observed in Table 5. Therefore, in the model that we present in this paper, we exclude the housing tenure variable to avoid the possible endogeneity that could emerge with its inclusion.

in the wealth distribution. In fact, Leitner (2015) shows that around 37% of wealth inequality is due to inheritances in European countries, while Piketty (2014) points out that inheritances are an important factor to explain the wealth inequality.

Finally, we analyze the prediction behavior of the model in order to better understand the fit. In particular, Table 6 compares the wealth quintile predicted by the model with the wealth quintile of each household in the data. The results show that the model correctly predicts between 45% and 51% of the cases in each wealth quintile. In addition, we see that wrong predictions tend to group around the diagonal of the matrix. This implies that even though the model does not correctly predict all cases, this does not generate extreme wrong predictions.

Table 6: Comparison of model predicted and effective values of wealth quintiles

% of households in quintiles of wealth	% of households predicted in quintiles of wealth					
	I	II	III	IV	V	Total
I	49.1	45.5	1.1	2.9	1.5	100
II	25.6	50.8	14.4	8.3	1.1	100
III	2.8	17.2	44.3	29.2	6.6	100
IV	1.0	8.9	28.4	46.4	15.3	100
V	0.5	4.8	12.5	34.8	47.3	100

Source: Own calculations based on SHF 2014.

6.2 Analysis of Estimated Probabilities

To deepen the study of determinants of wealth distribution, we analyze the effect of the age of the reference person on the predicted probability of belonging to a specific wealth quintile. For that purpose, we estimate the probability of being in each quintile j as:

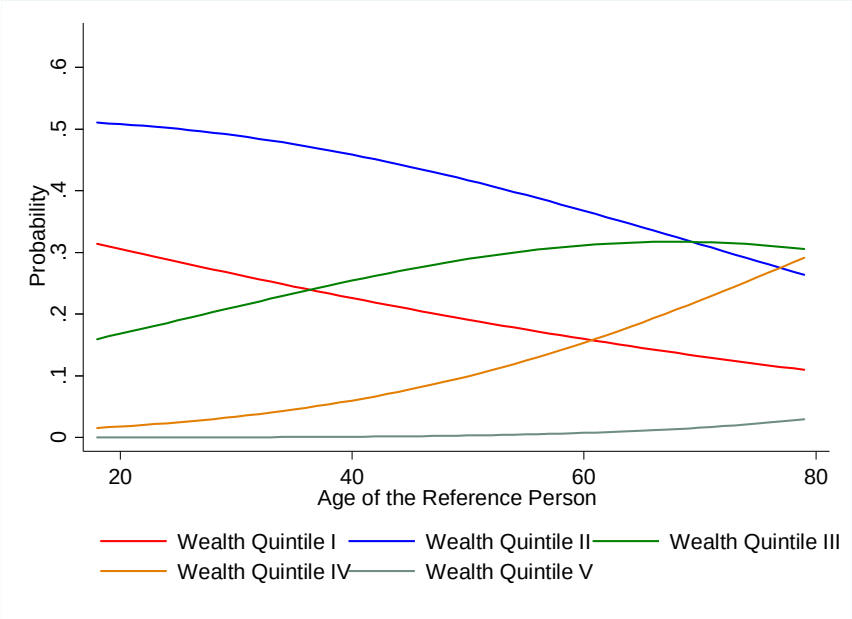
$$\widehat{\Pr}\left(y_i = j\right) = F\left(\widehat{\alpha}_{j-1} + \widehat{\beta}'_{j-1}\overline{x}_i + \widehat{\gamma}_{j-1}age\right) - F\left(\widehat{\alpha}_j + \widehat{\beta}'_j\overline{x}_i + \widehat{\gamma}_j age\right), \quad j = 0, 1, ..., J, \qquad (2)$$

where $\widehat{\alpha}_j$, $\widehat{\beta}_j$, and $\widehat{\gamma}_j$ are the estimated parameters in Table 5. The $\overline{x_i}$ is a vector that includes the characteristics of a representative household. This representative household belongs to the third income quintile,[23] has three or four members, financed the house using its own resources plus a mortgage loan, and its reference person is a married man.

The result of the previous exercise is shown in Figure 1. The figure shows that the predicted probability of belonging to the first three wealth quintiles decreases with the age of the reference person. As the theory points out, this result is expected since as people age, they accumulate more wealth, and therefore, the probability of being in a lower wealth quintile decreases. Figure 1 also shows that the probability of being in the fourth wealth quintile increases with the age of the reference person for the representative household.

[23] We choose this quintile because it is in the middle of the income distribution.

Figure 1: Estimated probability of being in a given wealth quintile as a function of the age of the reference person



In addition, we can see that the probability that the representative household belongs to the fifth wealth quintile almost does not change through the age of the reference person. This result implies that there is some mobility between the first and the fourth wealth quintile by the representative household, but the probability that it reaches the richest quintile is quite low.

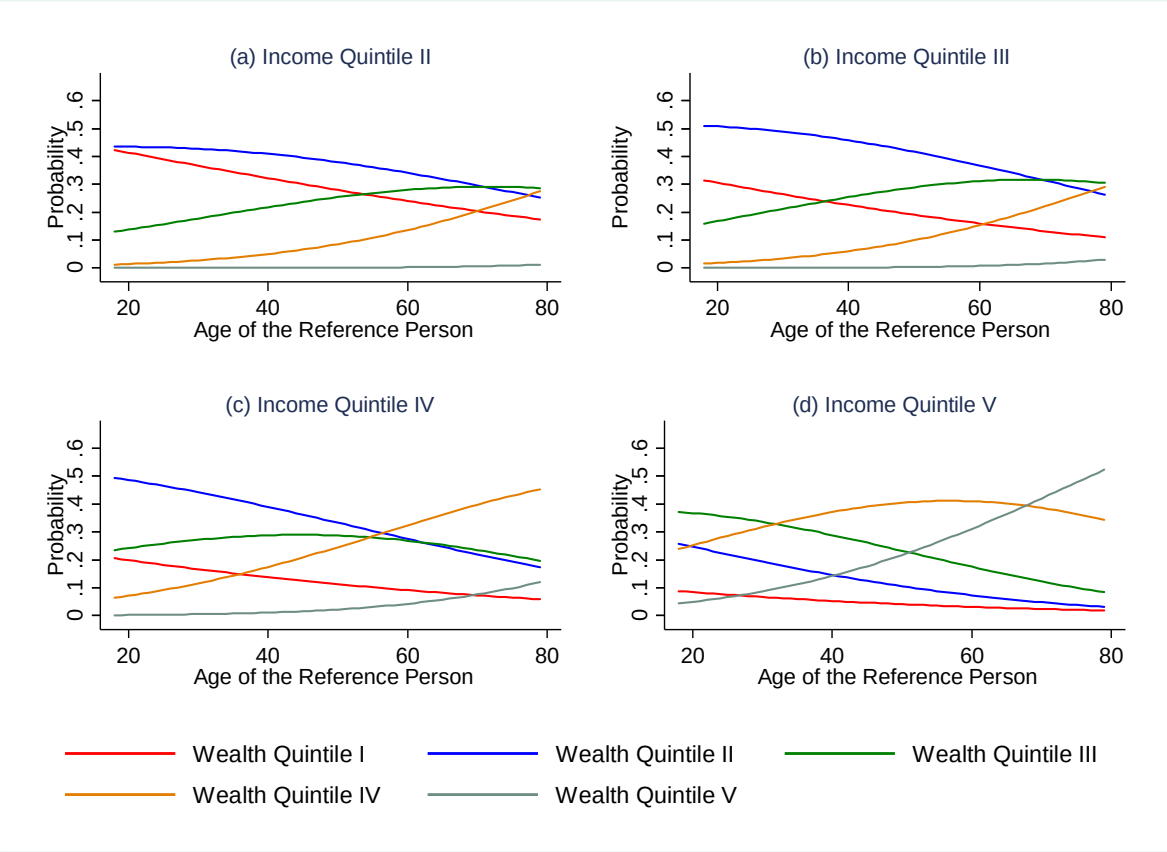
In Figure 2, we carried out the same exercise displayed in Figure 1, but now the income quintile varies in each panel of the figure. In panel (a) we show the predicted probability for a representative household, which belongs to the second income quintile. The results indicate that the probability of being in the two lowest wealth quintiles decreases with the age of the reference person, while the probability of being in the third or the fourth wealth quintile increases rapidly from age 40. For the richest quintile, the predicted probability does not change with the age of the reference person and its level is very low. This implies that is very unlikely that a low-income household belongs to the richest quintile according to the model.

In panel (b) of Figure 2, the representative household belongs to the third income quintile. In this figure, we find a very similar pattern to those observed in panel (a). However, when the reference person is young we observe that the probability of belonging to the second wealth quintile is higher for households in the third income quintile than for households in the second one.

The panel (c) of Figure 2 shows the predicted probability for the representative household in the fourth income quintile. In this figure, as in the previous ones, we find that the probability of being in the two lowest wealth quintiles decreases with the age of the reference person. Nevertheless, in this case, the probability of belonging to the third wealth quintile increases up to 55

years old and then decreases. This is so because of the households in the fourth income quintile and led by a reference person over 55 years of age have a high probability of being in the richest quintiles, which could represent some movility across wealth quintile with the age.

Figure 2: Estimated probability of being in a given wealth quintile as a function of the age of the reference person across income quintiles



In panel (d) we show the predicted probability of a representative household in the fifth income quintile. In this case, we find that the probability of belonging to the lowest wealth quintile is low regardless age of the reference person. Compared with other panels, this probability is the lowest among all income quintiles. In particular, the probability of being in the lowest wealth quintile is lower than 10%. Furthermore, we can observe that the probability of belonging to the fourth wealth quintile increases up to 58 years old and then decreases. As in the previous case, this result is explained because the households led by a reference person aged over 58 years in the highest income quintile have a greater probability of being in the richest quintile due to a greater accumulation of wealth over time.

To sum up, the results of the figures show that the age of the reference person is a very important factor to determine the household's position in the wealth distribution. In general, we

find that as the age of the reference person rises, the probability of being in a higher wealth quintile increases. We also note that while the household's income increases, there is a low probability of belonging to the lowest wealth quintile. As we showed in Figure 2, the probability of being in the lowest wealth quintile goes from 30% in the second income quintile to 6% in the highest income quintile for a household led by a person who is 30 years old. In addition, between the second and the fourth income quintiles we see that there is some homogeneity in the patterns of the predicted probability of belonging to a specific wealth quintile through the age of the reference person. This implies that, even though the income has a significant effect in the probability of belonging to each wealth quintile, these differences are not so important for these groups.

Finally, Table 7 replicates Table 2, but this time we use the wealth quintiles predicted for the model to evaluate the relationship between income and wealth. The results show that even though the income is a significant factor to explain the household's position in the wealth distribution, the relationship between these two variables remains weak in the cross-section, even when we control for other variables. In fact, the diagonal of the matrix increases its weight, with the exception of the second quintile.[24] This result shows that income only partially explains the wealth inequality. In fact, Leitner (2015) shows that only 11% of the wealth inequality is attributable to income.

Table 7: Joint distribution of income quintiles and model predicted values for wealth quintiles

% of household in	% of household predicted in quintiles of net wealth					
quintiles of income	I	II	III	IV	V	Total
I	30.8	13.9	34.5	19.4	1.4	100
II	30.2	14.6	25.2	28.5	1.6	100
III	14.6	37.9	22.7	22.4	2.5	100
IV	2.5	35.2	13.8	37.1	11.3	100
V	0.9	25.8	4.3	14.0	55.1	100

Source: Own calculations based on SHF 2014.

7 Conclusions

In this paper, we characterize the wealth distribution in the Chilean households and study the factors that influence household position in the wealth distribution using the SHF 2014 collected by Central Bank of Chile.

Our results show that net wealth is highly concentrated in Chilean households. In fact, the richest quintile accumulates 74% of total wealth. This level of concentration is similar to the level observed in Austria or Germany, which are the European countries with the most concentrated wealth distribution. In addition, we show that the Gini index for wealth in Chile is 0.74, which implies an unequal wealth distribution. This result is similar to the one observed in countries

[24] The result in the second quintile might be explained by the reallocation of household with zero wealth between the first and the second wealth quintile.

such as Austria, Germany and the United States. The comparison with Latin American countries is not posibble due to lack of information for other countries.

We also show that wealth is more unequal than income. This result is very common in the literature related to wealth distribution. In fact, European countries and the United States show the same relationship between income and wealth.

Regarding the factors that influence the household's position in the wealth distribution, we find that the age of the reference person and the household income increase the probability of being in a higher wealth quintile. We also show that the financing structure at the moment the household bought its house is significant to explain the household's position in the wealth distribution today. This result reflects that the past economic conditions of a household are useful to partially control for heterogeneous patterns of wealth accumulation.

Another important result is that housing-subsidy has a significant effect on the probability that households are above the first wealth quintile, but this variable affects negatively the probability of a household being above the fourth wealth quintile. This implies that the public policies oriented to encourage housing tenure have had an important effect in wealth stocks of vulnerable Chilean households. This is a novel result in the literature because the analysis of wealth distribution in developing countries is quite limited.

In relation to the inheritance, the results show that receiving a property as an inheritance increases the probability of a household being in a better position in the wealth distribution today.

In terms of the relationship between wealth and income, we show that this is weak. Although income has a significant effect on household position within the wealth distribution, we do not find the position in the income distribution to be a good predictor of the position in the wealth distribution.

Finally, we mention some challenges for future reasearch about wealth distribution. First, a panel dimension would be useful to study not only the current distribution, but also the heterogeneous patterns in wealth accumulation. Second, the inlcusion of pension wealth would be beneficial since this type of wealth is the most important asset for some households in Chile.

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Appendix

A Household reference person

The household reference person was selected according to the criteria presented in the 2011 Canberra Group Handbook on Household Income Statistics.[25]

To identify the household reference person, the following criteria were applied sequentially to all household members, in order listed below, until a single person was identified:

1. One of the partners in a registered or de facto marriage, with children aged 0-17 years.
2. One of the partners in a registered or de facto marriage, without children aged 0-17 years.
3. A single parent with children aged 0-17 years.
4. The person with the highest income.
5. The oldest person.

For example, in the case of three persons all aged 18 years or more and none of them in a registered or de facto marriage, the person with the highest income would be selected as the reference person. If two of them were married, the partner with the highest income would be selected as the reference person. If the income of the partners were equal, the oldest partner would be selected as the reference person.

For households where it was not possible to identify a reference person according to the above criteria, we adopted an additional criterion:

6. Person self-reported as head of household.

[25] United Nations (UN).

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