

Determinants of Household Position within Chilean Wealth Households' 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 micro data from the Survey of Household Finances 2014. First, the results show that wealth is very unequal among Chilean households. In fact, 73% of wealth is owned by the richest wealth quintile. Second, we note that inheritances significantly increase the probability of belonging to a higher quintile of wealth. We also find out that housing-subsidy has a significant effect on the probability of a household being above the lowest wealth quintile. Another interesting result is that income does not have a remarkable effect to determine household position in wealth distribution, and even though it has a significant effect in the wealth position of a household, the relationship between these two variables is weak. Finally, we observe that as age rises, the probability of moving up in the distribution of wealth increases.

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1 Introduction

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

In general, the literature has studied household wealth according to two lines of research both within and across countries. The first has analyzed the distribution of wealth, and the second 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 principal 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. From it, Caju (2013) examines the structure, distribution and components of household wealth. 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

¹The 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.

²The 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.

explained away by differences in age, working status, household structure, education or income. 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 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 in Chilean households.

A second line of research that has been fostered in recent years is the study of the determinants of wealth accumulation. Leitner (2015) researches 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 inheritance, 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. Using different sources of information, Piketty (2014) focuses on wealth and income inequality in some European countries and in the United States since the 18th century. The author argues that the rate of capital return in developed countries is persistently greater than the rate of economic growth, and that this will cause wealth inequality to increase in the future. In addition, he highlights that inheritances are a key factor to perpetuate wealth inequality.

In the Chilean case, there are no studies analyzing the determinants of household wealth

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

accumulation. In that sense, our paper is the first to address this issue for Chile. In particular, the main contribution of our paper is the study of 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.

The paper is organized as follows. In Section 2, we describe the dataset and the classifications 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

The data for the analysis presented in this paper are drawn from the SHF 2014 managed by the Central Bank of Chile. The SHF is the first survey that provides a comprehensive sight of households' balance sheets in Chile. 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 administrative property valuation available in the sampling frame of the survey (Encuesta Financiera de Hogares, 2015b). This type of sample design is also used in the SCF from the United States (Kennickell and Woodburn, 1997) and in the HFCS from some European countries (Eurosystem Household Finance and Consumption Network, 2013).

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.⁴

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

⁴A similar procedure is used by SCF (Kennickell, 1998) and HFCS (Eurosystem Household Finance and Consumption Survey, 2013).

type of assets. As reported by Mathä et al. (2014) in a study done for some Eurozone countries, this data limitation does not seem to alter the conclusions regarding wealth.

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.

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,⁵ while non-financial assets are defined as the sum of the self-reported values of the principal residence, other real estate properties and vehicles.^{6,7}

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,⁸ vehicle debt, educational debt and other debts.⁹

Thus, the net wealth of a household is defined as the sum of assets minus debts, excluding the funds in the mandatory pension system.¹⁰ This definition of wealth is the same used by the Organization for Economic Cooperation and Development (OECD) in its analysis of wealth of member countries (OECD, 2015) and is of widespread used in the literature about household wealth.

Inheritances are the last key variable that we use in our study. We define it as a dummy variable, which is equal to one if a household declares to have inherited the principal residence or any other property. In contrast to the HFCS from the Eurozone and the SCF from the United States, it is important to highlight that the information provided by the SHF does not identify if a household inherited a business asset or a company.

In addition, we use a set of inequality measures widely used in the literature in order to delve into the characterization of wealth and income distributions (Wolff, 2010; Díaz-Giménez et al., 2011; Cowell et al., 2012; Arrondel et al., 2014). In particular, we use the Gini index, the coefficient of variation, the ratio between mean and median, and the ratio between the 90th percentile and the median.

⁵Financial 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.

⁶Other real estate properties are farm land, vacation properties, sheds, second residence, commercial premises or offices, hotel or lodging, warehouses and parking lots.

⁷The 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).

⁸Other type of formal financial institutions are department stores, the credit unions and the family allowance compensation funds.

⁹Other debt includes loans from family, pawnshop, informal lenders and some other secondary sources of funding.

¹⁰Through the paper we will use the terms wealth and non-previsional wealth interchangeably to refer to net 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. 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). 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.¹¹

Table 1: Distribution of Chilean households

Categories	Number of households in population	Proportion of households in population
Total population	4,701,109	100.0
Age of the reference person		
< 35	941,033	20.0
35 to 44	1,103,757	23.5
45 to 54	1,092,088	23.2
55 to 64	809,860	17.2
65 to 74	455,118	9.7
> 74	299,253	6.4
Housing status		
Outright owner	2,135,995	45.4
Owner with mortgage	774,590	16.5
Renter or other	1,790,524	38.1

Source: Own calculations, based on SHF 2014.

To characterize the households, we use the age of the reference person. In particular, we divided the observations into six groups: 34 years or less, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years and 75 years or more. In Table 1, we observe that about 48% of reference persons are between 35 and 54 years, while the smallest group corresponds to households with reference persons over 74 years old.

For household level information, we use the housing status, the wealth quintiles and the income quintiles. The classification of housing status divides households into three groups. The first group are those households that own their principal residence and have no outstanding mortgage debt. The second group are those households that own their principal residence but are still paying for it. The third group are those households who rent a house or those who live in a house handed over without payment. Table 1 shows that the most important group is the one where the main residence belongs to the household and is fully paid (around 45% of households), while only

¹¹For more details on the definition of the reference person, see Appendix A.

17% of households holds a mortgage loan for their main residence. Finally, the wealth quintiles are calculated according to net wealth owned by the household,¹² while the income quintiles are calculated from the household's disposable income.¹³

3 Wealth Distribution

In this section, we analyze the wealth distribution of the Chilean households. In particular, Table 2 presents a set of measures that allow us to characterize the distribution of wealth according to the different classifications described in the previous section. The first column is the percentage of households in each category. 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.

The results in Table 2 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 2 shows that the richest quintile concentrates 73% of wealth. 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 wealth¹⁴ (Carrol et al., 2014; Vermeulen, 2014; Díaz-Giménez et al., 2011). This fact shows that the strong concentration of Chilean households is consistent with the international indicators. In terms of dispersion, 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. Another interesting result is that the least wealthy 20% of households has null or negative net wealth. Specifically, 76% of households in the first quintile shows negative net wealth.

In terms of the age of the reference person, Table 2 shows that the median level of wealth grows along this variable. 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. This result is consistent with the predictions of the life cycle theory. 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, around 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

¹²Since 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.

¹³The size of the quintiles are not shown in Table 1 because each quintile represents 20% of total households.

¹⁴In fact, Davies et al (2011) show that the richest 10% of world population concentrates the 71% of global wealth.

the reference person denotes heterogeneous patterns in the accumulation of household wealth over time.

Table 2: 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) IQR corresponds to the interquartile range. (2) Median and IQR are expressed in United State dollars 2014.

Source: Own calculations, based on SHF 2014.

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) and had also been described by Martínez and Uribe (2017) for the case of Chile. From Table 2, 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 properties 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 of these groups, we find a large similarity in the distribution of wealth for homeowners who are paying and for those who have already paid for their house but, in structural terms, these groups have important differences.

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 wealth and income of Chilean households. We also characterize the distribution of both variables (share and mean) and we calculate some measures of inequality for income and wealth.

Table 3 shows the distribution of households in wealth quintiles conditional on belonging 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, except for the richest quintile. The result in Table 3 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 very similar. This result is very 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 3: 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 4 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. However, the concentration of wealth reaches 73%, while income reaches only 40%. We can also infer from Table 4 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. 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 (Martínez and Uribe, 2017). From Table 4, 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.

Table 4: Distribution of wealth and income by quintiles of wealth and income

Categories	Wealth		Income	
	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.

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 5. The first and most extended measure considered is the Gini coefficient.¹⁵ 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 allows us to infer that wealth in Chile is very unequal.¹⁶ This is also true in other countries such as Austria, Germany, and the United States, which show a Gini index above 0.70 for wealth (Arrondel et al., 2014; Díaz-Giménez et

¹⁵Since net wealth can be negative, the Gini index in this case is not bounded by 1 in the top (Chau-Nan et al., 1982).

¹⁶In general, the literature assumes that Gini index values around 0.30 correspond to low levels of inequality, while values above 0.50 represent situations of high inequality (Todaro, 1997).

al., 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 inequality is comparable to Austria and Germany¹⁷ (Arrondel et al., 2014; Sierminska and Medgyesi, 2013) and has one of the highest Gini indexes in terms of income together with the United States¹⁸ (Díaz-Giménez et al., 2011). Probably the most emblematic case in terms of inequality is Sweden, which despite being one of the most egalitarian countries in terms of income is one of the countries with the largest inequality in terms of wealth, even more than the United States (Cowell et al., 2012).

In addition, Table 5 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 90th percentile and the median, we see that households in the 90th 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.

Table 5: 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.

Therefore, all inequality measures allow us to conclude that wealth is more concentrated and worse distributed than income in the case of Chile. This relationship between wealth and income is also observed at the international level.

5 Empirical Model

In this section, we analyze some 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 the previous section holds when we control for other variables.

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

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

The generalized ordered model is defined as:

$$\Pr(y_i > j) = F(\alpha_j + \beta'_j x_i), \quad j = 0, 1, \dots, J - 1, \quad (1)$$

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:

$$\begin{aligned} \Pr(y_i = 0) &= 1 - F(\alpha_0 + \beta'_0 x_i), \\ \Pr(y_i = j) &= F(\alpha_{j-1} + \beta'_{j-1} x_i) - F(\alpha_j + \beta'_j x_i), \\ \Pr(y_i = J) &= F(\alpha_{J-1} + \beta'_{J-1} x_i). \end{aligned}$$

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 associated with this parameter 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 and the gender 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 which is also used in the HFCS conducted by the European Central Bank (Eurosystem Household Finance and Consumption Network, 2013).

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

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

²¹We use 1,000 replications in the process to estimate the standard errors, and we apply Rubin's rules (Rubin, 1987) to calculate the parameters of the imputed dataset.

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

Here, we analyze the results of the estimation of our generalized ordered logit model. The results are presented in Table 6. 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 6, 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. However, in spite of being a significant factor, several articles show that income only partially explains the wealth inequality. In fact, Leitner (2015) shows that only 11% of the wealth inequality is attributable to income.

In relation to the age of the reference person, we can see that there is 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 contrast 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 due to two reasons. The first one is that households reduce their debt and maintain their principal residence. The second one is the omission of pension savings in the survey. Both facts generate that households' wealth do not decrease once they retire.

In regards to the gender and the marital status of the reference person, both variables have a positive effect but it is only significant by the gender in the first column of Table 6. 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.

Table 6: Estimation results for the generalized ordered logit model

Variables	Wealth Quintiles			
	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***
Gender	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			

Source: own calculations based on SHF 2014; results adjusted for multiple imputation and bootstrapped standard errors with 1,000 replicas; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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 in Chilean households. A similar result is found by Mathä et al. (2014) for European countries in the HFCS, where household size has a significant effect only in some of the 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 these households represent a lower risk for the financial institutions. Therefore, we can see a positive relationship between high expected income households and mortgage loan (Encuesta Financiera de Hogares, 2015b).

Given the above, we can conclude that the financing structure at the moment that a household bought its house is an indicator of the household's wealth position today. An additional point about the variables of financing structure is that these 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 6. 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.

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 in the wealth distribution. As Piketty (2014) concludes, this result implies that inheritances could be an important factor to perpetuate the wealth inequality among households. For his part, Leitner (2015) shows that around 37% of wealth inequality is due to inheritances in European countries.

Finally, we analyze the prediction behavior of the model in order to better understand the fit. In particular, Table 7 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.²²

²²In some cases, this kind of model can predict only one category of the dependent variable, that is why this exercise must be taken with caution (Greene and Hensher, 2010).

Table 7: 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:

$$\widehat{\Pr}(y_i = j) = F\left(\widehat{\alpha}_{j-1} + \widehat{\beta}'_{j-1}\bar{x}_i + \widehat{\gamma}_{j-1}edad\right) - F\left(\widehat{\alpha}_j + \widehat{\beta}'_j\bar{x}_i + \widehat{\gamma}_jedad\right), \quad j = 0, 1, \dots, J, \quad (2)$$

where $\widehat{\alpha}_j$, $\widehat{\beta}_j$, and $\widehat{\gamma}_j$ are the estimated parameters in Table 6. The \bar{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.

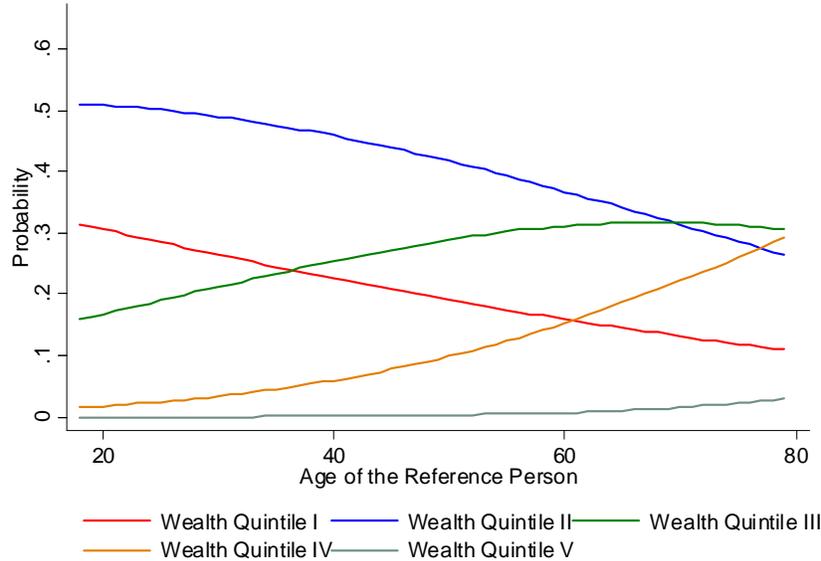
The result of the previous exercise is shown in Figure 1. The figure shows that the predicted probability of belonging to the first three wealth quintiles decreases with the age of the reference person. As the theory points out, this result is expected since as people age, they accumulate more wealth, 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.

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.

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

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



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.

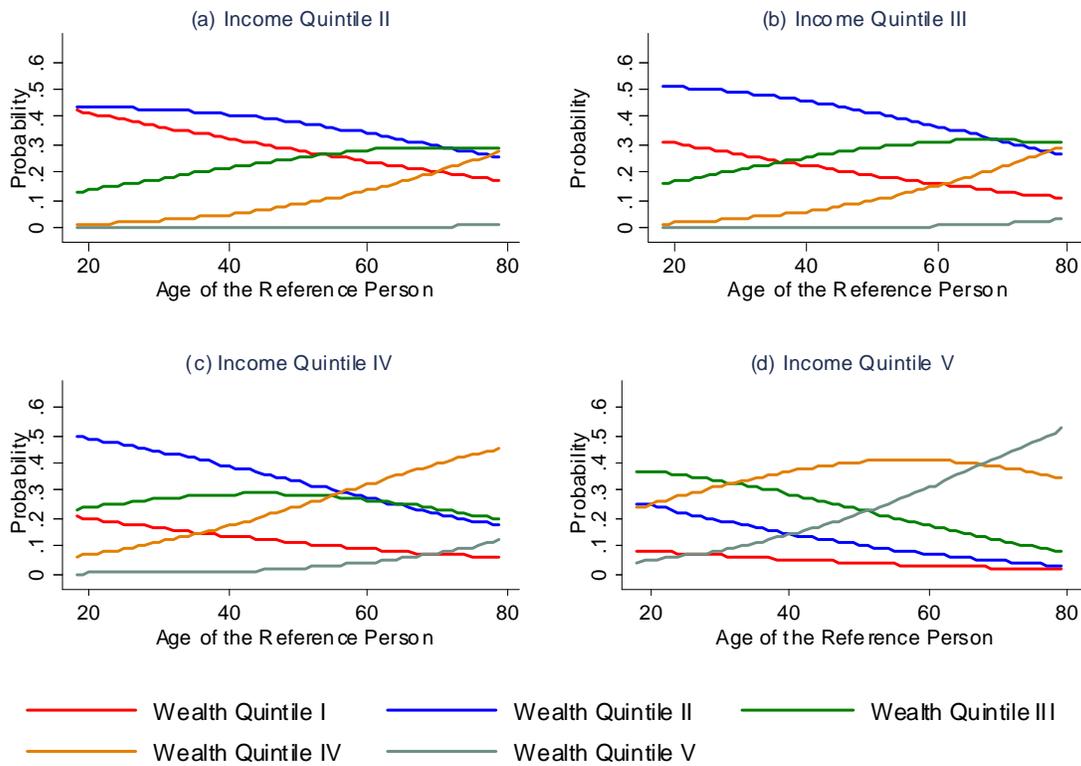
In panel (b) of Figure 2, the representative household belongs to the third income quintile. In this figure, we find a very similar pattern to those observed in panel (a). However, when the reference person is young we observe that the probability of belonging to the second wealth quintile is higher 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 wealth 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 in the highest income quintile and led by a reference person aged over 58 years have a greater probability of being in the richest wealth quintile.

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



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 8 replicates Table 3, but this time we use the wealth quintiles predicted for the model to evaluate the relationship between income and wealth. The results show that when we control for other variables, the relationship improves but remains weak. In fact, we can see that the diagonal of the matrix increases its weight with the exception of the second quintile.²⁴ In addition, we note that using the model predictions, the probability of seeing households with high income and low wealth, or vice versa, decreases.

Table 8: Joint distribution of income quintiles and model predicted values for wealth quintiles

% of household in quintiles of income	% of household predicted in quintiles of net wealth					
	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.

Therefore, the main result of Table 8 is 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, even when we control for other variables.

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. To develop this work, we use the Survey of Household Finances collected by the Central Bank of Chile.

Our results show that net wealth is highly concentrated in Chilean households. In fact, the richest wealth 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 a very unequal wealth distribution. This result is very similar to the one observed in countries such as Austria, Germany and the United States.

The result of the Gini index also evidences another interesting outcome: 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.

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

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 important to explain the wealth position of the household today.

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.

One of the most remarkable results is that receiving a property as an inheritance increases in a significant way the probability of a household being in a better position in the wealth distribution today. This result indicates that inheritances are an important way to perpetuate the wealth inequality across generations, as Piketty (2014) points out.

Finally, we show that there is a weak relationship between income and wealth in the Chilean households. 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.

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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.

²⁵United Nations (UN).