Determinants of Household Position in the Wealth Distribution in Chilean Households

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Abstract

This paper analyzes the distribution of net wealth, its relationship with income and factors that influences the household position in the wealth distribution in the case of Chile based on the Survey of Household Finances (SHF) 2014. For this purpose, we estimate a generalized ordered logit model. The general results show that wealth is very unequal among Chilean household. In fact, 73% of wealth is owned by the richest wealth quintile. In particular, estimation results show that belonging to a higher income quintile increases the probability of belonging to a higher wealth quintile. We also observed that as age increases, the probability of moving up in the distribution of wealth increases. Regarding inheritances, we note that these significantly increase the probability of belonging to the highest quintiles of wealth. Finally, we find that even though income has a significant effect in the wealth position of a household, the relationship between these two variables is weak.

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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, especially in developed countries. In addition, the publication of "The Capital in the Twenty-First Century" by Piketty (2014), the results of the commission led by Stiglitz, Sen and Fitoussi (Stiglitz, Sen and Fitoussi, 2009), and the publication of some articles that find an increase in the wealth inequality in the last decades (Piketty, 2014; Wolff, 2010; Jantti, 2006; Brandolini et al, 2004) have given an important stimulus to research about household wealth.

In general, literature has studied the inequality of wealth according to two lines of research. The first, has analyzed the distribution of wealth and its components, and the second one has studied the determinants of wealth accumulation both within and across country.

Using the balance sheet information of households from the Survey of Consumer Finances (SCF) conducted by the Federal Reserve of the United States, Kennickell (2003), Díaz-Giménez et al (2011) and Wolff (2010) study the wealth distribution for American families. All authors observed a high concentration of wealth across the richest households. In the case of Canada, Brzozowski et al (2010) analyzed the distribution of income, consumption and wealth over the past 30 years, using different sources of information. Their principal outcome is that wage and income inequality have increased during the analyzed period, and that wealth inequality has remained fairly stable since 1999.

In the case of Europe, the Household Finance and Consumption Survey (HFCS) from the European Central Bank (ECB) is used. From it, Du Caju (2013) examines the structure, distribution and components of household wealth. 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 of 15 Eurozone countries distributions. Their results indicate a weak correlation between income and wealth.

Based on the Luxembourg Wealth Study Database (LWS)[1], Cowell et al (2012) examine the differences in the distribution of household wealth according to several economic and demographic characteristics for countries like the United Kingdom, Italy, Finland, Sweden and the United States. The authors note that the differences between countries' wealth distribution cannot be explained away by differences in age, working status, household structure, education and income. Using the same survey, Jantti et al (2006) performed a study of the joint distribution of income and wealth for household in Canada, Germany, Italy, Sweden and the United States. In particular, they note that net household' wealth and disposable income are highly, but not perfectly correlated between individuals within each country.

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

In the case of Chile, few studies have been developed to analyze wealth distribution. 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 assets and debts in households with higher incomes, although they do not deeply investigated the distribution of wealth. In the case of Bauducco and Castex (2013), they compare the distribution of wealth between Chile and the United States using the Survey of Household Finances (SHF) 2007 in the case of Chile and the SCF 2007 in the United States case. The authors show a more unequal income distribution in Chile, but a greater wealth inequality for United States. In the case of Martínez and Uribe (2016), they study the distribution of wealth and its components across Chilean households and they also develop an analysis of the relationship between income and wealth based on the SHF 2011. The authors found 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. Based on the HFCS, Leitner (2016) investigates the sources of inequality in household gross, net and real estate gross wealth across eight euro area countries. The main result presented is that dispersion in bequest and inter vivos transfers obtained by household have a remarkable effect on wealth inequality that is stronger than the one of income differences. 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 observed differences in the levels of households' net wealth across European countries. In the case of Arrondel et al (2014), they aim at linking the households' wealth and income distributions for fifteen European countries also using the HFCS. They obtained that a rise in income or the event of receiving gifts or inheritances increase the probability to be in higher wealth deciles. Mathä et al (2014) provide an in-depth analysis of factors contributing to the household wealth across Euro area countries. Based on the HFCS, the results reveal large differences in wealth within the Euro area. Homeownership, property price dynamics and intergenerational transfers are the main factors driving these differences. Meanwhile, Pfeffer and Griffin (2015) study the determinants of extreme fluctuations in wealth in the Panel Study of Income Dynamics between 2005 and 2007 in the United States. 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 the Europe and 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. He also highlight that wealth is more unequal than income, and that inheritance is a factor that will perpetuate inequality of wealth.

In the Chilean case, there are not studies related to the analysis of the determinants of wealth accumulation. Then, our work is the first to research about this issue in Chile. The main contribution of our paper is the study of the determinants of the households' position within the wealth distribution, and we also analyze the relationship between income and wealth. For this purpose, we use a generalized ordered logit model and we test whether the position in the distribution of income is a good predictor of the position in wealth distribution.

The paper is organized as follows. In Section 2, we describe the dataset and the clasiffications that are going to be use across the paper. Section 3 analyzes the wealth distribution of Chilean households. Section 4 studies the relationship between the distribution of wealth and income. In Section 5, we describe the empirical model, and Section 6 analyzes 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 for the year 2014, managed by the Central Bank of Chile[2]. The SHF is the first survey that provides a comprehensive sight of balance sheet of households in Chile. In particular, the survey provides data on household's income, assets and debts, along with the socio-demographic characteristics for the Chilean households and their individual members. This survey has 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 a highest participation in the financial markets, the sample design of the SHF oversampled the richest 20% of households in the population 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 in some European countries (Eurosystem Household Finance and Consumption Network, 2013; Tiefensee and Grabka, 2014). The oversampled effect of the sample design is corrected by population weights.

When we analyze the results of households 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, 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. This definition is the same use by Leitner (2016). As reporting by Matha et al (2014) in a study done for the Euro area countries, this data limitation does not seem to alter the conclusions regarding wealth. Third, it should be noted that although the SHF tries to sample the entire population, it is likely that households with extremely high levels of wealth refuse to partipate in the survey, which might have an impact for the top of the wealth distribution. Actually, Eckerstorfer et al (2015) present evidence from the SCF, that rich households are less likely to participate in surveys about household wealth. Finally, since the data collected by the SHF is given voluntarily, it is difficult to collect complete information in all items of the survey. Nevertheless, in order to correct the item non-response problem, the SHF carry out a multiple imputation process and used population weight. The same procedure is used by SCF (Kennickell, 1998) and by HFCS (Eurosystem Household Finance and Consumption Survey, 2013).

The main variables that we use in our work are income, assets, debts, net wealth and inheritances. For income, we use the household monthly disposable income, which refers to the

[2]To see more details, see SHF, Central Bank of Chile

total sum of household labor income, pension income, income from financial investment and other incomes that are not included in the previous categories.

Meanwhile, assets are the sum of financial and non-financial assets for a household[3]. 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, while non-financial assets are defined as the sum of self-reported value of the principal residence, the total value of others real estate properties and the value of vehicle assets [4,5].

In the case of debts, they 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[6], vehicle debt, educational debt and other debts[7].

Thus, the net wealth of a households is defined as the sum of assets minus debts, excluding the funds in the mandatory pension system[8]. 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).

Finally, inheritances are the last key variable that we use in our study. We defined it as a dummy variable, which is equal one if a household declares to have inherited or be given the household 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 received an inheritance as a business assets or as a company.

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

The results that are shown herein are expressed in United States Dollar of 2014. The stadistical unit for analysis of wealth distribution is the household. The SHF defines a household as a

[3] Financial assets are the sum of the followings 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.

[4] Other property assets different to the principal residence are composed of farm land, vacation properties, sheds, second residence, commercial premises or offices, hotel or lodging, warehouses and parking lots.

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

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

[7] Other debt includes loans from family, pawnshop, informal lenders and some other sources of indebtedness less relevant.

[8] Through the paper we will use the terms of wealth or non-previsional wealth interchangeably to refer to net household wealth.

group of individuals who live in the same house and share the same budget (single-person households are also considered). This definition is very similar to that used in financial surveys in the United States and Europe (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 information concerning to the reference person and concerning to household level information[9].

Table 1: Distribution of Chilean household

Categories	Number of household in population	Proportion of household in population
Total population	4,701,109	100.0
Age of the reference person		
< 35	941,033	20.0
35 a 44	1,103,757	23.5
45 a 54	1,092,088	23.2
55 a 64	809,860	17.2
65 a 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.

Table 1 shows the characterization of Chilean households according to the age of the reference person and some other classifications regarding to household level information. In the case of the age of the reference person, we divided the observations into 6 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. Table 1 shows that about 46% of reference persons are between 35 and 54 years, while the smallest group corresponds to households with reference persons aged over 74 years.

For classifiying households, we use the housing status, wealth quintiles and income quintiles. The classification of housing status separates 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 they are still paying for it. Finally, the third group are those households who rent a house and those households living in a house given up 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),

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

while only 17% of household own their residence with mortgage debt. Finally, wealth quintile is calculated according to net wealth owned by the household[10], while the income quintile is calculated from the household disposable income[11].

3 Wealth Distribution

In this section, we analyze the wealth distribution of the Chilean households. In particular, we present a set of measures that allow us to characterize this distribution according to the different clasifications described in the previous section. In particular, Table 2 shows several measures for the net wealth distribution of household in the SHF 2014. The first column is the percentage of households in each cetegory. The second column shows the percentage of household with negative non previsional wealth, and the third column displays the proportion of wealth that is hold in each household category. Finally, fourth and fifth columns show the median and the interquartile range of wealth distribution, respectively.

In general terms, Table 2 indicates that the median household has a net wealth of around 31,000 dollars and 15% of them shows a negative level of wealth. We are going to analyze each of the categories, starting with the wealth quintiles. Table 2 shows that 73% of wealth is concentrated within the richest quintile. 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 (Carrol et al, 2014; Díaz-Giménez et al, 2011). The strong concentration observed in Chilean households is as severe as international level. In fact, Davies et al (2011) show that the richest 10% concentrate the 71% of global wealth. In terms of dispersion, we note that the first 4 quintiles show a distribution of wealth with low dispersion, while the richest quintile shows a 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 less rich 20% has null or negative levels of net wealth. In particular, 76% of households in the first quintile show a negative net wealth.

In terms of the age of the reference person, Table 2 shows that the median level of wealth grows along this variables. We also observe that the proportion of wealth grows as the reference person ages 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 in the group where the reference person is aged between 55 and 64 years. This group owns 24% of household wealth, while the group at the bottom of the distribution is represented by households with a reference person aged under 35 years holding only 8% of the wealth. This result is related to the fact that this group presents the highest proportion of households with negative wealth in the age classification. Indeed, around 25% of households led by a reference person aged under 35 years have more debts than assets. This

[10] Since the cut point for the first wealth quintile is on zero and that around 8% of households have no 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 quintile.

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

percentage decreases with the age of the reference person until she reaches the age of 65 years and henceforth it registers values below to 10% of household with negative wealth. In terms of dispersion, we observe a large heterogeneity in wealth stocks in the groups where the reference person is aged over 54. In fact, this dispersion reaches its peak in the group led by the reference person aged over 74 years. This growth on the dispersion across the age of the reference person implies heterogeneous patterns in accumulation of wealth over time.

Table 2: Distribution of household by net wealth quintiles

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 a 44	23.5	16.6	20.3	27,332	61,710
45 a 54	23.2	14.0	22.6	33,870	71,694
55 a 64	17.2	10.3	23.5	47,548	89,376
65 a 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.

According to the housing status of the household main residence. The results show that households who have already paid for their principal residence concentrate 71% of wealth and represent 45% of total households. These results indicate that residence is the main asset of households. This situation is also observed in countries such as the United Kingdom, Italy, Finland and the United States (Cowell et al, 2012) and had been also described for Martínez and Uribe (2016) for the case of Chile. From Table 2, we also highlight that 37% of households that do not own the property where they live in shows a negative net wealth.

Finally, we note a similar median level of wealth among those who are outright owner of their property and for those who are still paying for it. This result seems counterintuitive because owner without mortgage should show a higher level of wealth than those who are still paying for it. However, this result is not observed because some portion of outright owners might have obtained their property through social programs. Therefore, the value of those residences is low. Besides the latter, households who own such properties have a low capacity to generate income, which prevent them further accumulation of wealth over time. Meanwhile, the group pf household that are still paying their house shows a low level of wealth due to they are in the early years of the mortgage. 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.

4 Relationship between Wealth and Income

In this section, we study the relationship between income and wealth, specifically we analyze the joint distribution of both variables across household quintiles. To achieve this purpose, we use a matrix between income and wealth that shows the percentage of household belonging to each wealth quintile conditional in being in a specific income quintile. In addition, we characterize the distribution of both variables previously mentioned using the median wealth level and the percentage of wealth for the income and wealth quintiles. Finally, we calculate the measures of inequality for income and wealth.

Table 3 shows the joint distribution of households in wealth quintiles conditional on beloging to a specific income quintile. Our main result is that there is not a strong relationship between wealth and income for most households. This means that the belonging of a particular income quintile does not determine the belonging of a particular wealth quintile, except for the richest quintile where the probability of belonging to this quintile reaches 48% for those households that belong to the upper quintile of income. This result indicates that there is a high homogeneity of wealth in 80% of households with the lowest income. The only difference between our result and the one presented by Arrondel et al (2014) is that the bottom quintile shows a strong relationship in European countries.

Table 3: Joint distribution of income and wealth across household quintiles

% of household in quintiles of income	% of household in quintiles of net wealth					
	I	II	III	IV	V	Total
I	24.65	21.80	26.93	16.50	10.12	100
II	24.73	19.94	23.54	22.48	9.31	100
III	24.53	24.47	22.68	18.32	9.99	100
IV	15.72	20.16	16.57	25.15	22.40	100
V	10.37	13.71	10.23	17.53	48.16	100

Source: Own calculations, based on SHF 2014.

To deepen the above results, in Table 4 we characterize the distribution of wealth and income by quintiles for each of these variables. Specifically, we show the proportions and the medians for wealth and income according to both classifications.

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 for the income it reaches only 40%. Table 4 allows us to infer that while there is an increase of wealth for the first three quintiles, their median level of income does not show a large variation. This might be due to these quintiles concentrate a large proportion of households whose employed members are located at the lowest and middle wages and salary range.

When we analyze by income quintiles, we note that despite representing only 3% of income, the lowest quintile has a similar level of wealth to the third quintile. This is mainly explained by a high proportion of the reference persons over 65 years in the lowest income quintile (retirees with low level income), who show a similar proportion of wealth to the higher wealth quintiles because they own their residences and they have low level of debt. From Table 4, we can also infer that the highest income quintile hold almost half of the wealth and 58% of 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

	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.

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 more

extended measure considered is the Gini coefficient[12]. In the case of wealth, the index reaches a value of 0.73, which is consistent with previously discussed in terms of wealth concentration, where the richest 20% of Chilean households concentrate the 73% of non previsional wealth. This result allows us to infer that wealth in Chile is very unequal[13]. Although the distribution of wealth in Chile seems very unequal, this situation is also observed in other countries like the United States, Germany and Austria, which show a Gini index above 0.70 (Arrondel et all, 2014; Díaz-Giménez et al, 2011). In the case of income, the Gini coefficient reaches a value of 0.53, which indicates that wealth is worse distributed than income. However, this situation is not a particular outcome of Chile. In fact, Jäntti et al (2008) mention that in many cases the wealth inequality ranking of countries differs considerable to the rank in terms of income inequality. Comparing our results to those register in countries such as the United States and countries from the Eurozone, we detect that the patterns of inequality of income and wealth are very similar to ones observed in Chile. In particular, we note that Chile shows values of wealth inequality comparable to Austria and Germany[14] (Arrondel et al, 2014; Sierminska and Medgyesi, 2013) and has one of the highest Gini index in terms income as well as the United States[15] (Díaz-Giménez et al, 2011). Probably the most emblematic case in terms of inequality is Sweden, which despite being one of the most egalitarian 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).

Finally, the coefficient of variation shows that there is a greater dispersion in the distribution of wealth (2.54) than in income distribution (1.55). Regarding the ratio between the media and the median in each distribution, we note that in both cases this is larger than 1, which indicates that wealth distribution shows a more asymmetric and more concentrated towards higher values than income distribution. Finally, the ratio between the 90th percentile and the median, shows that households at the 90th percentile of the distribution have almost 6 times the median level of household wealth and almost 4 times the median level household income. Therefore, wealth shows a more skewed distribution 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.

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

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

[14] Both countries, Austria and Germany, register a Gini coefficient of wealth equal to 0.76. These results correspond to 2010-2011.

[15] The United States register a Gini index of income equal to 0.58. These results correspond to 2007.

5 Empirical Model

In this section, we analyze factors that influence the position of household in wealth distribution. In particular, we test if the weak relationship between income and wealth presented in the previous section maintains when we control for other variables. For this purpose, we estimate a generalized ordered discrete model to predict the household wealth quintile. Using this prediction, we replicate the Table 3 and we check if the relationship between income and wealth change using the multivariate model.

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 controls variables without a constant term. As opposed to standard ordered discrete model, the generalized model does not impose parallel lines assumption between the categories of the dependent variable, which gives more flexibility to the estimation (Williams, 2006; Greene and Hensher, 2010). 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, if $\beta_j > 0$ indicate that higher values of the explanatory variable increase the probability of being over category j (Williams, 2006).

In our model, the dependent variable is the wealth quintile of each household. 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 age, marital status and gender of the reference person of household. Related to financing structure for the main residence, we control for three dummies: housing-subsidy, housing-mortgage, and housing-own resources. The housing-subsidy variable indicates if some part of or all of the main residence was financed with a subsidy. The housing-mortgage dummy variable shows if a household financed its principal residence with mortgage either completely or partially. Finally, the housing-own resources dummy indicates if a household financed its principal residence with savings either a down payment or a total purchase. Given that we do not have past information of household, these dummy variables give us information about the economic condition of a household in the past, which can be associated to the wealth accumulation pattern of each household over time.

Since 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. Moreover, the estimations are made using population weights, which adds an additional complexity to estimate the standard errors of the parameters. To solve this issue, we use a bootstrap procedure proposed by Rao and

Wu (1988)[16]. We use 1,000 replicates in the process to estimate the standard errors, and we apply the Rubin's rules (Rubin, 1987) to calculate the parameters of the imputed dataset.

6 Main Results

In this section, we show the main results of our estimation, and we develop other exercises to understand the household position in the wealth distribution.

6.1 Estimation

In this part, we analyze the results of the estimation of our generalized ordered logit model. The results are present in Table 6. Each columns show the parameters associated of being over the specific wealth quintile. 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 of being over the second wealth quintile, and so on.

Based on the results of Table 6, we show that the income quintile increases the probability to go 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 the income in the household wealth is very common in the literature. Leitner (2015) shows that income is a significant factor to explain the stocks of household wealth in European countries that participate in the HFCS. Using the same database, Fessler and Schürz (2015) 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 explains partially the wealth inequality. Leitner (2016) shows that around 11% of the wealth inequality is attributable to income. Moreover, Arrondel et al (2014) show that income has significant effect to explain the wealth position of the richest households from European countries.

Related 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 considering that when the age of the reference person increases, this person and her household have been able to generate more savings and, therefore, they have accumulated more wealth, as the lifecycle theory predicts (Arrondel et al, 2014; Fessler and Schürz, 2015). In the Chilean case, we do not see a negative relationship between age and wealth in the last part of the cycle due to a low social mobility. This implies that households that belong to the higher wealth quintiles tend to remain in those quintiles over time. This fact is highlighted by Piketty (2014) as one of the main factors that perpetuate the wealth inequality over the years.

[16] This procedure is used in HFCS conducted by European Central Bank (Eurosystem Household Finance and Consumption Network, 2013).

Table 6: Estimation results for the generalized ordered logit model

	Generalized Order Logit			
Variables	W I	W II	W III	W 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 the SHF 2014; results adjusted for multiple imputation and bootstrapedd standard errors with 1,000 replicaste; ***p<0.01, **p<0.05, *p<0.1.

Respect to the gender and marital status of the reference person, they have a positive effect but it is not significant in the household position in wealth distribution, with the exception of gender in the first column in Table 6. One hypothesis to explain these results is the relative homogeneity in these aspects across wealth quintiles in Chile. Unlike our case, Leitner (2016) shows that a married reference person has a positive impact in the wealth stocks of households. Fessler and Schürz (2015) show that a female reference person has a negative impact in the position of the household in wealth distribution, while Mathä et al (2014) find a positive and significant effect over median wealth level if the reference person is a male, and they find a mixed effect of marital status.

Household size has positive effect in the probability of households rise in the wealth distribution. This variable increases the probability of being over the first wealth quintile in a significant way for all household size. We also find that a household with more than 4 members increase the probability of being over the second wealth quintile significantly. For the probability of being over the fourth quintile of wealth, the household size has a positive impact, but it is significant only when the household size is lower than three members. The no significant effect of household size could be attributed to the similar household structure among 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 those 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 first wealth quintile. In particular, the strongest effects are concentrated on being over the second and third 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 similar to our result.

The variables of financing structure of the house purchase show a mixed effect in the household position in the wealth distribution. First, we find that 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 shows that the public policies focus on encourage housing tenure have been successful in increasing the wealth stock in the most vulnerable households, which increases the probability of those households are in a better position in the wealth distribution. The result about the effects of subsidies in the household wealth position is a novel outcome in the literature and it is interesting for developing countries that apply similar policies. This type of analysis is not common in the literature, since countries that have financial surveys are mainly developed countries, which are not interesting in the study of such public policies.

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

In the case of housing-mortgage dummy variable, 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, which represent a lower risk for financial institutions. Therefore, we can see a positive relationship between high expected income households and mortgage (Survey of Household Finances, 2015b).

In summary, we see that the financing structure at the moment that a household bought its house is an indicator of the household 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 sing and the significant kept in the same way that we observed in Table 6. In the model that we present in this paper, we exclude the housing tenure variable to avoid the possible endogeneity that could surge with its inclusion.

Finally, we find that to have received a property as inheritance has a positive and significant effect of being in a wealth quintile higher than the second one. This result is similar to the found by Arrondel et al (2014) and Fessler and Schürz (2015) for European countries in the HFCS, where inheritances has a positive and significant effect over the household position in the wealth

distribution. This result implies that inheritances are deemed to perpetuate wealth inequality among households (Piketty, 2014; Leitner, 2016). In fact, Leitner (2016) shows that around 37% of wealth inequality is due to inheritances.

To analyze the prediction behaviour of our model, Table 7 compares the wealth quintile predicted by the model with the wealth quintil of each household in the data. The table shows that the model correctly predicts between 45% to 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. Although, Table 7 is useful to understand in a better way the fit of the model, we also must mention that sometimes this kind of model can predict only one category of the dependent variable, as shown by Greene and Hensher (2010). Therefore, this exercise must be seen with caution.

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

% of household in quintiles of wealth	% of household predicted in quintiles of net wealth					
	I	II	III	IV	V	Total
I	49.13	45.47	1.11	2.85	1.45	100
II	25.55	50.75	14.35	8.29	1.06	100
III	2.76	17.18	44.26	29.17	6.63	100
IV	1.01	8.92	28.38	46.36	15.34	100
V	0.53	4.82	12.51	34.84	47.30	100

Source: Own calculations, based on SHF 2014.

6.2 Estimated probability

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

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

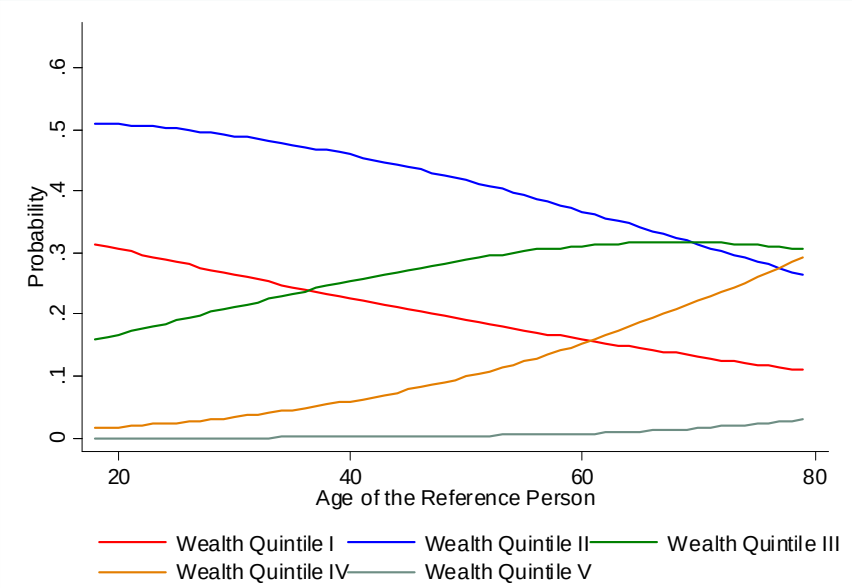
where $\widehat{\alpha}_j$, $\widehat{\beta}_j$, and $\widehat{\gamma}_j$ are the estimated parameters in the (2) model. The $\overline{x}$ is a vector that includes the characteristics of a representative household. This representative household belong to the third income quintile[17], has 3 or 4 members, financed the house using own resources and 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 quintiles decreases. Also, the figure shows that the probability of being in the fourth wealth quintile increases with the age of the

[17] We choose this quintile since it is in the middle of the wealth distribution.

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 according to 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 to be in a given wealth quintile as a function of age of the reference person



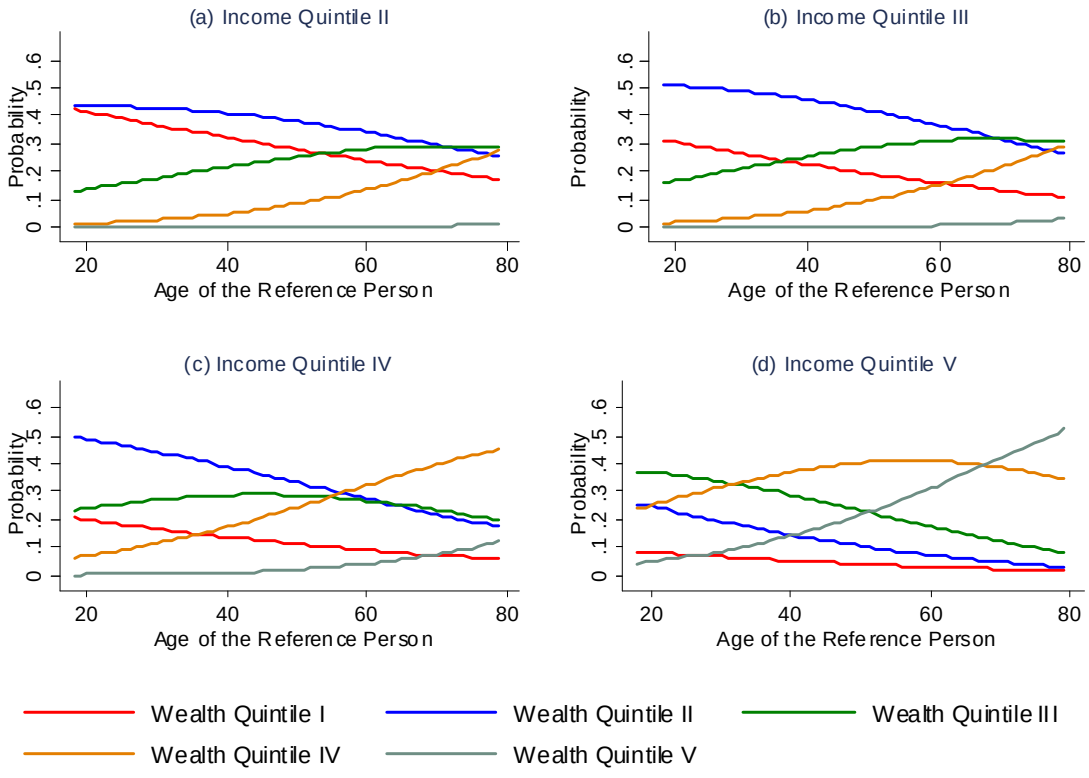
In the Figure 2, we make the same exercise described in (2), but now we allow that income quintile varies in each panel of the figure. The panel (a) shows the predicted probability for a representative household, which belongs to the second income quintile on this case. The results indicate that the probability of being in the lowest wealth quintiles decreases with the age of the reference person, while the probability of belonging to the third or the fourth wealth quintiles increases rapidly from 40 years of the reference person. 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 in the model.

In the panel (b) of the Figure 2, we find a very similar patterns to those observed at the panel (a). However, we see 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 income quintile when the reference person is young. Consequently, this is the main difference between the first two panels.

The panel (c) in Figure 2 shows the predicted probability for the representative household in the fourth income quintile. In this plot, as in the previous figures, 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 raises up to 55 years and then it decreases. This behavior is because for households in the fourth income quintile and led by a reference person aged over 55 years, there is a higher probability of being in the richest wealth quintiles.

The panel (d) shows the predicted probability for representative household in the fifth income quintile. In this case, we find that the probability of belonging to the lowest wealth quintiles is low according to any age of the reference person. In fact, 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 see that the probability of belonging to the fourth wealth quintile increases up to 58 years and then it decreases. As in the previous case, this result is explained because households in the highest income quintile and led by reference person aged over 58 years have a greater probability of being in the richest wealth quintile.

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



The results in this section show us that the age of the reference person is a very important factor to determine the household position in the wealth distribution. In general, we find that while the age of the reference person raises, the probability of being in higher wealth quintiles increases. We also see that while the household income increases, there is a low probability of belonging to the lowest wealth quintiles. As we saw in the 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 aged at 30 years. In addition, we can see that there is some similarity in the patterns of the predicted probability of belonging to a specific wealth quintile through the age of the reference person between the second and the fourth income quintiles. 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 relevant for these groups.

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

Table 8: 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	30.82	13.88	34.54	19.41	1.36	100
II	30.15	14.56	25.15	28.51	1.63	100
III	14.56	37.85	22.65	22.42	2.52	100
IV	2.49	35.20	13.83	37.14	11.33	100
V	0.90	25.77	4.27	13.99	55.07	100

Source: Own calculations, based on SHF 2014.

In summary, the main result of the Table 8 is that even though the income is a significant factor to explain the household position in the wealth distribution, the relationship between these two variables is weak, even when we control for other variables.

7 Conclusions

In this paper we characterize the wealth distribution in the Chilean households and study factors that influence the household position in the wealth distribution. In particular, we are interesting in understanding the relationship between income and wealth. To develop this work, we use the Survey of Household Finances collected by the Central Bank of Chile. This is the first survey that characterize the balance sheet of Chilean households.

Our results shows that the net wealth is highly concentrated in Chilean households. In fact, the richest wealth quintile accumulate 73% of the total wealth. This level of concentration is similar to the level observed in Germany or Austria, which are the European countries with the most concentrated wealth distribution. In addition, we show that the Gini index in Chile reaches 0.73, which demonstrate a very unequal wealth distribution, such as the United States, Germany or Austria.

Another interesting result, according to the Gini index, is that wealth is more unequal than income. This relationship is very similar to the situation observed in the United States, and in general, this result is very common in the literature related to wealth distribution.

Regarding the factors that influence the household 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 of the household bought its house is significant to explain the household position in the wealth distribution. The previous results reflects that the past economic condition of the household is important in the wealth position of the household today. Additionally, we find that housing subsidy has a significant effect in the probability that households being above the first wealth quintile, but this variable affects negatively the probability of a household of being above the fourth wealth quintile. This implies that the public policies oriented to encourage the housing tenure have had an important effect in wealth stocks of households. This is a novel result in the literature because the analysis of wealth distribution in developing countries is limited, and they are countries that are interested in this kind of policies.

In addition, we find that receiving a property as an inheritance increases in a significant way the probability of being in a better position in the wealth distribution. This result indicates that inheritances are an important way to perpetuate the inequality across generations, such as Piketty (2014) points out.

Finally, we show that there is a weak relationship between income and wealth in the Chilean households. In spite of the income has a significant effect in the household position in the wealth distribution, we do not find that the position in the income distribution is a good predictor of the position in the wealth distribution.

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Appendix

A Household reference person (head of household)

The household reference person was selected according to the criteria presented in the 2011 Camberra Group Handbook on Household Income Statistics[18]. The children are defined according to theirs age (between 0 and 17 years).

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

1. One of the partners in a registered or de facto marriage, with children.
2. One of the partners in a registered or de facto marriage, without children.
3. A lone parent with children.
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 were not possible to identify a reference person according to the above criteria, an additional criterion was established:

6. Person who self-reported as head of household.

[18] United Nations (UN).