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The Case of Chile

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Abstract*

This paper compares the saving behavior of formal and informal workers and additionally provides a socioeconomic and financial characterization of informal workers in Chile. The paper uses the Financial Household Survey conducted by the Central Bank of Chile in 2007, 2008, 2009 and 2010, which covers between 1,740 and 2,533 urban households, performing both OLS and probit regressions. The cross-section regression results indicate that, in general, informal households save less than formal households. Further, descriptive data indicate that informal workers have less access to financial services and possess less financial assets and liabilities. In terms of policy implications, combating informality may not only improve the well-being of workers, but may also have positive consequences on the aggregate saving rate. In addition, for Chile, it is evident that there is ample room to improve access to financial services not only for informal but also for formal workers.

JEL classifications: D10, D11, D12, D91, O16, O17

Keywords: Saving, Precautionary Saving, Labor Informality, Financial Household Survey, Life Cycle Theory, Chile, Latin America

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1. Introduction

One of the main problems facing Latin America and the Caribbean (LAC) is the relatively low levels of saving, especially if compared with other regions of the world, such as East Asia and the Pacific (EAP), that have shown greater dynamism in saving rates. For example, Gutiérrez (2007) presents evidence that on average the saving rate for LAC between 2000 and 2003 was 19.2 percent, while EAP countries had a mean saving rate of 34.5 percent. Further, Reinhardt (2008) provides evidence that the average gross domestic saving for LAC was 17.1 percent in the 1990s, compared to 24.8 percent for a group of 25 developing middle-income countries. In the 2000s, according to Pérez Monteiro, Cavalcante Ferreira and Radusweski Quintal (2014), the average gross saving rate was 20 percent for LAC and 30 percent for EAP. With respect to Chile, although it has a higher average saving rate than most other LAC countries, its average of 22.3 percent for the 2000-2003 period is still low if compared to EAP countries (Gutiérrez, 2007).

Another important concern in the region is related to the high levels of informal employment that are prevalent. Although the 2000s have seen a reduction in the informality figures in comparison to the 1990s, informality affects between 37.7 percent and 88.4 percent of total workers in LAC (Tornarolli et al., 2014). In the case of Chile, the country has the lowest levels of informality in the region and has been facing a mild downward trend from 40.6 percent in 1990 to 37.7 percent in 2009. According to Peticara and Celhay (2010), informality declined from 39.5 percent in 1998 to 35.8 percent in 2006. However, when that total is disaggregated between salaried workers and self-employed workers, the figures in 2006 were 24.9 percent and 71.6 percent, respectively. Evidently, by disaggregating by type of worker some heterogeneity appears, where it is evident that self-employed workers suffer a much higher level of informality than salaried workers.

A natural question that arises is whether these two phenomena are interrelated and whether the prevalent high informality rates prevent the proper channeling of savings into the formal financial system. Clearly, this could have implications on the efficient allocation of surpluses to increase investment and economic growth. Thus, studying the relationship between household saving and informality could allow governments to develop appropriate policies to influence aggregate saving rates. However, although there is abundant research analyzing the

main determinants of saving for the region,¹ studies on how informality affects saving and how/why informal workers save is almost non-existent. A notable exception is the recent work by Granda and Hamann (2014), who build a theoretical occupational choice model to calibrate it with data for Colombia and analyze the effect of several formalization policies on saving. The underlying argument is that if informal workers have a more uncertain and variable income stream, we would expect that informal workers have a higher saving rate due to precautionary motives. On the other hand, Dupas and Robinson (2013) find that simply providing a safe place to keep money was sufficient to increase health saving by 66 percent in an experiment in Kenya. This study may support the argument that informal workers save less than formal workers because they are less financially included. Finally, Ogbuabor, Malaolu and Mba (2013) use time-series analysis for Nigeria and find that informality hinders the growth of domestic saving. Although these studies reach potentially interesting conclusions, more micro-level empirical evidence on the link between informality and saving is needed.

The objective of this paper is to empirically study the saving behavior of formal and informal workers in Chile, following the microeconomic approach of the pioneering studies of Attanasio and Székely (2000) and Butelmann and Gallego (2000). Following both OLS and probit estimation techniques, we econometrically test whether there are any differences in the saving behavior of formal and informal households. Although we do not econometrically study the potential reasons for the differential saving behavior of informal and formal households, we present survey results that characterize how and why informal and formal workers save. In terms of data, we use the microdata from the Financial Household Survey prepared by the Central Bank of Chile for 2007, 2008, 2009 and 2010, which surveys between 1,740 and 2,533 households. A novelty of this survey for LAC is that it surveys not only income, expenditure and household characteristics, but also the structure and level of household assets and liabilities with a high degree of detail. Moreover, it surveys restrictions to credit access for households, expectations about households' future levels of saving, access to insurance markets and various other determinants of saving. Thus, we are able not only to compare the saving rate of formal and informal households, but also to analyze the types of financial instruments selected by such households. Clearly, this database allows us to study in much more detail the saving pattern and

¹ For Latin America, the following articles may be mentioned: Attanasio and Székely (2000) for Mexico and Peru, Attanasio and Székely (1998) for Mexico, Lorenzo and Osimani (2001) for Uruguay, Butelmann and Gallego (2000) for Chile, and Sandoval-Hernández (2011) for Mexico.

financial behavior of households than previous studies, which use databases with focus on labor and expenditure characteristics, such as the CASEN survey in Chile, the EPH survey in Argentina, the PNAD survey in Brazil or the ENAHO survey in Peru (Maurizio, 2012).

This study is structured as follows. Section 2 reviews the literature on saving in order to discuss different theoretical and empirical findings, especially for LAC. This survey allows us to establish the most relevant variables affecting saving, which not only help us in our empirical strategy but also allow us to compare our estimation results with that of the literature. In Section 3, we undertake a descriptive analysis of formal versus informal workers, paying particular attention to the socioeconomic characteristics and financial and saving behavior of workers in each group. Section 4 presents the data and econometric methodology that have been used to analyze whether informal households save less than formal households. The section additionally discusses the main results and findings. In Section 5, we provide several robustness tests. Finally, Section 6 concludes.

2. Survey of the Literature on Saving

Until the mid-1950, the prevailing Keynesian view was that the main determinant of the level of saving was the current income and it was assumed that both people and countries with higher incomes had a higher saving rate than poorer people or countries (Deaton, 2005). Furthermore, saving was seen as a potential source of macroeconomic instability (Modigliani, 1986). However, Modigliani and Brumberg (1954) and Friedman (1957) proposed a new theoretical framework with a similar interpretation of motivations for saving. Modigliani, in particular, took the intertemporal maximization notion of Fisher and combined it with the idea that people aim to smooth consumption, saving in their active stage of life in order to finance their consumption expenditures in retirement age. The proposition of Modigliani had novel implications, introducing a new determinant of saving, namely retirement. In its simplest version, the model had predictions that went contrary to the prevailing beliefs of the economic thinking at that time. On the one hand, he argued, as Friedman (1957), that the saving rate does not depend on current income but on transitory income, which means that low-income countries or people may have greater saving rates than those with greater resources. In addition, the model predicts a higher level of saving in those countries that have a longer duration of retirement period. Further, it establishes a relationship between the saving rate and population growth and productivity. He

also became a reference for the study of the effects of population aging on pension systems and the overall performance of an economy. Among the empirical papers that support the theory of Modigliani, the following, among many others, may be mentioned: Butelmann and Gallego (2000) for Chile, Attanasio (1998) for the United States, Beckmann, and Hake and Urvova (2013) for Eastern Europe.

Among the criticism the Modigliani hypothesis has received, the following can be mentioned. The empirical study of Carroll and Summers (1991) finds evidence that consumption growth follows closely income growth over the life cycle in the studied countries. Other authors, such as Deaton (2005), Carroll (1997), and Belke, Dreger and Ochmann (2012), suggest that people in their retirement period do save rather than dissave. However, a possible explanation for this result is that they consider pensions as income and not as dissaving (Deaton, 2005; Butelmann and Gallego, 2000). In addition, Abdelkhalek et al. (2010) perform a microeconomic study for Moroccan households and find no evidence of the existence of the life cycle theory. Further, Deaton (1992) made a comparison between Thailand, which has shown an extended period of strong growth, and the Ivory Coast, with no or a low level of income growth over the same period. This author argues that if the lifecycle theory is correct, and assuming that both countries have the same preference structure, in Thailand the consumption profiles should peak at younger ages than in Ivory Coast, showing that young people are much richer than their predecessors in the Asian country. However, this author finds that consumption profiles do peak at younger ages in Ivory Coast rather than in Thailand, which would be evidence against the life cycle theory.

Beyond the discussion of the Modigliani hypothesis, there is plenty of evidence on other determinants of saving. Most studies show that the saving rate is strongly influenced by the level of current income and educational level (Butelmann and Gallego, 2000; Attanasio and Székely, 2000; Beckmann, Hake and Urkova, 2013; and Xiao, 1996). Beckmann, Hake and Urkova (2013) go further and suggest that education generates a higher propensity to save using more diversified savings instruments and that these results are not exclusively due to the expectation of future higher earnings. In addition, most of the international evidence on the study of the response of the level of saving to the interest rate indicates that the interest rate has no significant influence on the level of saving (Repetto, 2001). Accordingly, Repetto (2001) claims that measures focused on financial education with creation of illiquid instruments that deliver

immediate rewards would be a more effective strategy to increase saving than using the interest rate. In addition, Bennett, Loayza and Schmidt-Hebbel (2000) find in their analysis of a panel of aggregate data that there is a partial compensation relationships between public and private saving, meaning that policies promoting saving would have only a limited effect on aggregate saving, partially validating the Ricardian equivalence theory.

Attanasio and Székely (2000) find that one of the main explanations for the differences in saving rate of households is explained by demographic shifts in the relative size of the age groups that produce and save, which overall have increased. Moreover, household dependency ratios, i.e., the number of people under 15 or over 65 who are mostly inactive occupationally, is another variable that is often used in studies on saving behavior of households. The expected coefficient is negative, as confirmed by Butelmann and Gallego (2000), Xiao (1996), Bennett, Loayza and Schmidt-Hebbel (2000) and Deaton (2005). However, Beckmann, Hake and Urvova (2013) claims that families with children save more. With regard to the gender of the household head, Butelmann and Gallego (2000) finds that female-headed households save more, a possible explanation being that they face a higher uncertainty due to raising their children alone. Another hypothesis is given by Beckmann, Hake and Urvova (2013) that claim that for Eastern Europe this may be due to the fact that women have a higher life expectancy. The same authors further suggest that marital status is another important variable and that married people save more. In addition, according to Lorenzo and Osimani (2001) for Uruguay, Denes et al. (2011) for Argentina, and Beckmann, Hake and Urvova (2013), larger families save more.

Another reason to save is the precautionary motive (Browning and Lusardi, 1996). It is expected that families who have unemployment insurance, life insurance coverage and possess durable goods have a lower rate of saving, as there is a lower risk of falling household income. Following this line of thought, households including informal workers may save more due to precautionary motives. Lorenzo and Osimani (2001) find that there is differential behavior of lower income households, which a priori could resemble informal households. Further, Attanasio and Székely (2000) argue that difficulties in accessing social welfare systems, as is the case for informal workers, can generate a much less synchronized retirement age and therefore show a curve with a lower saving “hump.” Moreover, if there are restrictions on credit access, households may save more to face periods of low income (Deaton, 1992; Carroll, 1998; Butellman and Gallego, 2000; and Alvarado Díaz-Romero, 2010). In addition, recent work by

Ogbuabor, Malaolu and Mba (2013) uses time-series analysis and finds that for Nigeria informality hinders the growth of domestic saving. Further, Granda and Hamann (2014) build a theoretical occupational choice model to calibrate it with data for Colombia and analyze the effect of several formalization policies on saving. Although they reach potentially interesting conclusions, more micro-level empirical evidence on the link between informality and saving is needed.

3. Characterizing Informality in Chile

This paper uses data from the Financial Household Survey conducted by the Central Bank of Chile in 2007, 2008, 2009 and 2010, which is a Chilean urban survey including demographic, economic, financial and social indicators.² While for 2007 the survey covers 3,828 households from the whole country, for 2008, 2009 and 2010 the survey covers 1,207, 1,190 and 2,037 households, respectively, from the metropolitan region of Santiago de Chile.

In terms of the definition of informality, although this concept has certain ambiguities, both in terms of the empirical measurement and the theoretical definition, in this paper we follow the most common definitions found in the literature, namely the social protection definition and the productive definition (Kanbur, 2009; Tornarolli et al., 2014). While the social protection definition stresses non-compliance with labor legislation in terms of labor protection and social security benefits, the productive definition includes the level of productivity of jobs and the skills needed for carrying out those jobs to characterize informality.

Concretely, the social protection definition (ILOD definition) defines an informal worker as a salaried or a self-employed worker who does not contribute to a pension (or retirement) plan.³ Further, we classify as informal those salaried workers who report not having an employment contract, even if they contribute to a pension plan. This definition has previously been used by Peticara and Celhay (2010) in their study of informality in Chile.

In terms of the productive definition (PD definition), we define an informal worker as one who falls under one of the following categories: i) a self-employed worker without a tertiary or superior education degree, ii) a salaried worker in a small private firm with five or less

² For more details on the survey and its methodology, please visit the following link: <http://www.bcentral.cl/estadisticas-economicas/financiera-hogares/index.htm>

³ It is important to mention that until 2015 self-employed workers in Chile were not obliged to contribute to a pension plan.

employees, or iii) an unremunerated family member. Given that an individual could have more than one job, we apply the classification only to his/her main occupation. This definition of informal workers is similar to the one used by Tornarolli et al. (2014).

Further, we construct a third definition of informality that combines the above definitions (COMBD definition), i.e., an informal worker is a worker that is informal according to both the ILOD definition and the PD definition. Clearly, this is a much more restrictive definition of informality.

3.1 Informality Rates and Social Attributes

In Figure 1, we present the informality rates for Chile in 2007 according to the three definitions of informality discussed above.⁴ According to the social protection definition (ILOD), around 36.7 percent of the work force in Chile is informal, or around 2.49 million of the country's almost 6.8 million worker. Note that Chile had a total population of around 16.5 million and a 41.1 employment rate in 2007.⁵ In terms of the productive definition (PD), the informality rate is 28.6 percent, which implies that around 19.4 million Chilean workers were informal. For the third definition, which combines the social protection and the productive definition (COMBD), the informality rate is 19.7 percent, which represents 1.33 million workers. Note, however, that as this definition is stricter, it also means that many workers who are informal according to one definition but not the other (either the ILOD or the PD) would be considered non-informal workers. From Table 1, we see that 1,158 million workers are informal according to the ILOD definition but not according to the PD definition, 606 thousand are informal according to the PD definition but not for the ILOD definition, and that 3.69 million are formal according to both definitions. Thus, the exclusion of these workers from the informal group is the reason for the rate being lower than the other two definitions of informality. If we compare pure groups, i.e., the number of formal/informal workers who comply with both definitions, we would obtain an informality rate of 26.6 percent. Note also that in Subsections 3.2 and 3.3 and Section 4, when comparing different financial attributes and behavior of informal and formal workers using this

⁴ We present the data for 2007 because for this year the survey covers more households from the whole country. However, the results for the other years do not change our main conclusions. The results are available upon request from the authors.

⁵ Note also that the EFH survey is an urban survey, but we are assuming that employment and informality figures of rural workers can be derived from urban workers. In 2007, the Chilean urban population was 12.14 million and the rural population was 4.36 million.

strict definition of informality, we will use pure groups of formal and informal workers in order to avoid possible distortion of results caused by workers who are informal by one definition but not the other.

Figure 1. Informality Rates in Chile

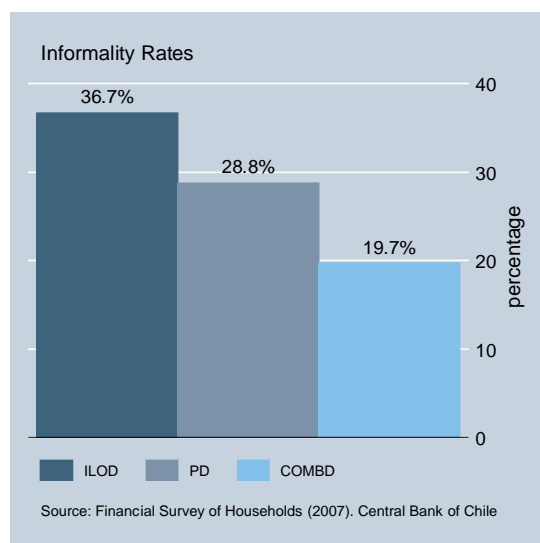
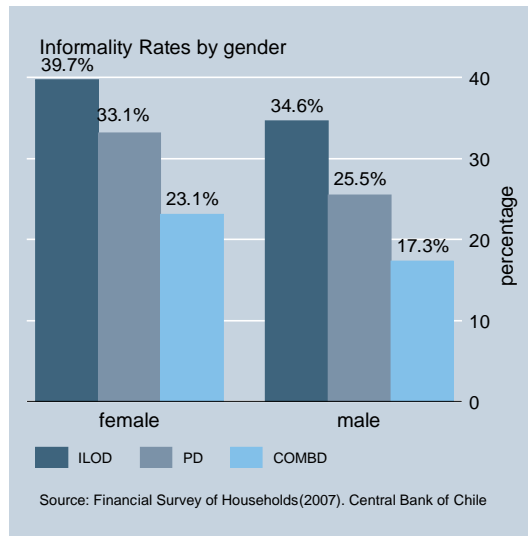


Table 1. Number of Formal/Informal Workers

ILO Definition	Productive Definition											
	Female						Male					
	no		yes		total		no		yes		total	
	Persons	%	Persons	%	Persons	%	Persons	%	Persons	%	Persons	%
no	1,416,956	50.2%	283,191	10.0%	1,700,147	60.3%	2,277,892	57.3%	323,536	8.1%	2,601,428	65.4%
yes	470,100	16.7%	650,326	23.1%	1,120,426	39.7%	687,998	17.3%	689,399	17.3%	1,377,397	34.6%
total	1,887,056	66.9%	933,517	33.1%	2,820,573	100.0%	2,965,890	74.5%	1,012,935	25.5%	3,978,824	100.0%

In Figure 2, we present the results of informality rates when discriminating between genders. The informality rates for women are 39.7 percent, 33.1 percent and 23.1 percent according to the ILOD, PD and COMBD definitions, respectively. For men, in contrast, the informality rates are 34.6 percent, 25.5 percent, 17.3 percent. Clearly, informality affects more women for all three definitions.

Figure 2. Informality Rates by Gender



In case of classifying the different definitions of informality by income groups, a clear picture emerges. As can be seen in Figure 3, informality affects more those workers with lower incomes. In stratum 1, consisting of households in the income deciles 1-5, 46.6 percent (ILOD), 41.4 percent (PD) and 31.1 percent (COMBD) of workers are informal. In stratum 2, corresponding to persons belonging to households positioned in income deciles 6-8, 33.9 percent (ILOD), 26.2 percent (PD) and 16.9 percent (COMBD) of the employed are informal. In stratum 3, for workers belonging to households in deciles 9 and 10 of income, the informality rate falls to 28.2 percent (ILOD), 15.8 percent (PD) and 9 percent (COMBD).

Educational level shows also a negative relationship with the rate of informality, as can be seen in Figure 4. Workers with primary or less education levels have informality rates of 56.9 percent, 55.3 percent and 43.7 percent for the ILOD, PD and COMBD definitions, respectively. In addition, 34.3 percent (ILOD), 33.3 percent (PD) and 20.8 percent (COMBD) of workers with secondary education are informal. Further, while workers with tertiary or undergraduate university degree have informality rates of 30.1 percent (ILOD), 6.7 percent (PD), and 3.9 percent (COMBD), workers with a postgraduate university degree have rates of 22.5 percent (ILOD), 3 percent (PD), and 1.2 percent (COMBD). Note also that the reduction of the informality rate between lower education levels and higher education levels for the PD and COMBD definitions is very marked. This result is partially explained by the specific

construction of the PD definition, where self-employed workers with lower education levels are assumed to be informal.

Figure 3. Informality Rates by Income Group

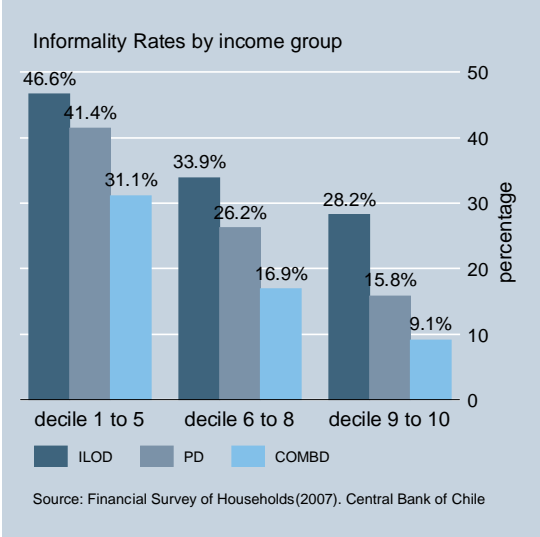
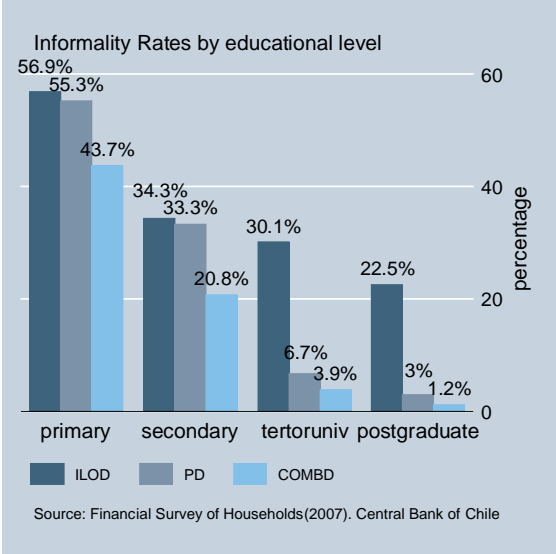


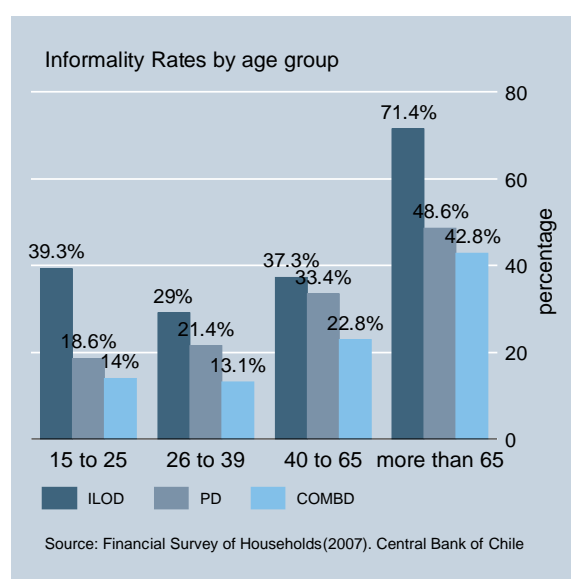
Figure 4. Informality Rates by Education Levels



As Figure 5 shows, informality is not distributed evenly by age groups. Clearly, informality affects more workers older than 65 years, who have rates of 71.4 percent (ILOD), 48.6 percent (PD) and 42.8 percent (COMBD). The second most affected group is old middle-aged workers between 40 and 65 years, with informality rates of 37.3 percent (ILOD), 33.4

percent (PD) and 22.8 percent (COMBD). In third place are young workers aged between 15 to 25, who have informality rates of 39.3 percent (ILOD), 18.6 percent (PD) and 14 percent (COMBD). Finally, we observe that the age group least affected by informality is the young middle-aged between 26 and 39 years, who have informality rates of 29 percent, 21.4 percent and 13.1 percent for the ILOD, PD and COMB definitions, respectively. Note, however, that if we only consider the ILOD definition of informality, the second most affected group are young workers and in third place are old middle-aged workers.

Figure 5. Informality Rates by Age Group



3.2 Informality and Access to Financial Services

In this subsection we compare informal and formal households in terms of access to financial services using data for 2007.⁶ Note that we define informal (formal) households as those where all the members that are occupied are informal (formal) workers. This imply that we discard households that have no member working or where there are some members that are informal and some that are formal workers. Again, we use the three different informality definitions. For the ILOD definition, we end up having 684 informal households and 1,891 formal households. Regarding the PD definition, we have 431 informal households and 2,346 formal households.

⁶ The results for the other years do not change our main conclusions. The results are available upon request from the authors.

Finally, for the COMBD definition we have 284 informal households and 1,620 formal households.

We constructed four variables that proxy access to financial services, namely:

1. Possess bank account;
2. Possess credit card;
3. Possess a debit card; and
4. Face credit constraints

The variable “possess bank account” indicates households where the head of the household reports having a bank account. In addition, the variables “possess credit card” and “possess debit card” indicate households where there is at least one member who uses a credit card and debit card, respectively. Further, households that face credit constraints are those that have applied for credit in the last two years and have suffered at least one rejection of the application. In addition, we also consider that a household is credit constrained if they have been granted credit but they have not accepted it because they consider the conditions of credit to be unfavorable. Further, we consider a household to be credit constrained if they have been granted a credit but the amount granted is less than what was applied. Finally, we also consider that a household is credit constrained if members do not apply for a credit because they believe that they will not be granted credit or believe they will not be able to afford paying to back the credit.⁷

From Figure 6, it is clear that there is a much higher proportion of heads of formal households who possess a bank account than heads of informal households. For the ILOD definition, while 25.1 percent of heads of formal households report having a bank account, only 9.9 percent of heads of informal households possess a bank account. This comparison is 26.6 percent versus 5.9 percent for the PD definition and 27 percent versus 4.6 percent for the COMBD definition.

⁷ All these questions are available in the Financial Household Survey conducted by the Central Bank of Chile in 2007, which allow us to construct the single variable “Face credit constraints.”

Regarding the use of credit cards, we see in Figure 7 that a higher proportion of formal households (between 17.4 percent and 18.6 percent) use credit cards than informal households (between 11.9 percent and 13.2 percent). Again, this pattern is consistent for the three definitions of informality.

With respect to the use of debit cards, from Figure 8 we find a pattern similar to that for the use of credit cards, ranging between 12.9 percent and 13.9 percent for formal households that use debit cards and between 0 percent and 3.9 percent for informal households. Note that the use of debit cards is much less extensive than the use of credit cards. A possible explanation is that debit cards are associated with the possession of a bank account, while credit cards are increasingly being issued by department and retail stores without the need of having a bank account.

Figure 6. Heads of Households with Bank Account

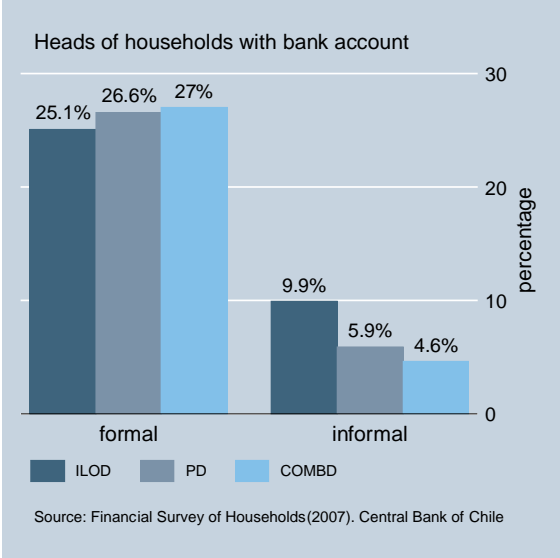


Figure 7. Households Using Credit Cards

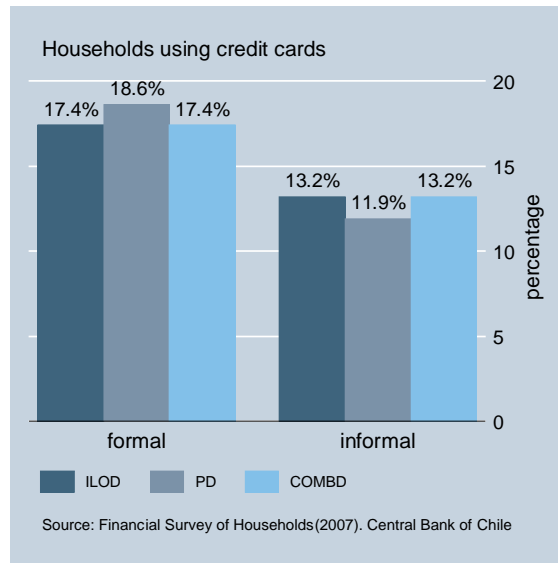
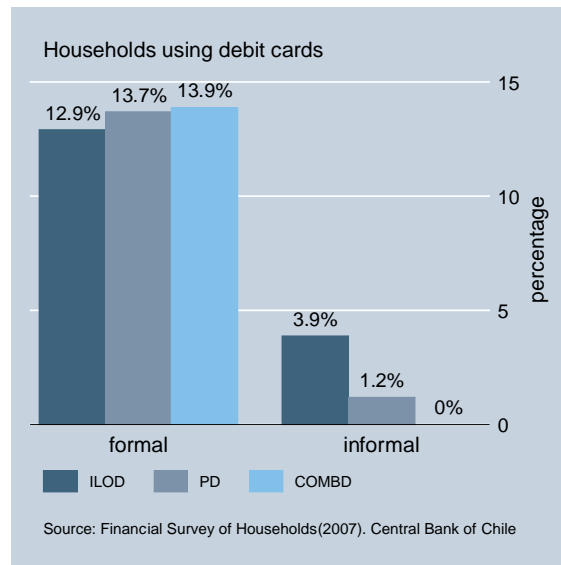
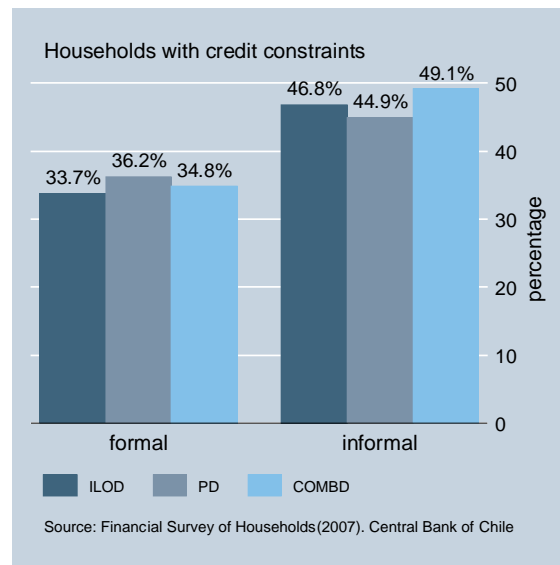


Figure 8. Households Using Debit Cards



In Figure 9, we see that there is a higher proportion of informal households that suffer credit constraints in comparison with formal households. While between 44.9 percent and 49.1 percent of informal households suffer credit constraints, only 33.7 percent to 36.2 percent of formal households are credit constrained. Clearly, this pattern is consistent across all three definitions of informality. Moreover, for all four variables that capture access to financial services, we see that informal households have less access than formal households.

Figure 9. Households with Credit Constraints



3.3 Informality and Households' Assets and Liabilities

The database that we use allows us to analyze the proportion of households that have assets and liabilities and compare formal and informal households. In terms of assets, we distinguish between real assets, such as motor vehicles, primary residence and other real states, and financial assets, such as fixed-income assets (saving accounts, retirement saving plan and term deposits) and variable-income assets (shareholding, mutual and investment funds and business partnership). Further, we also have data on households' liabilities, such as bank credit card debt, personal loans by banks, other bank credit, mortgage loans, retail store credit card debt, personal loans by retail stores and other financial companies, credit by credit unions, car loans, student loans, loans by family and friends, pawnshop credit, purchases on credit and other debts.

From Table 2, it is clear that there is a higher proportion of formal households that possess assets in comparison to informal households for 2007 in Chile. Although there is not much difference between formal and informal households in terms of ownership of primary residence, it is clear that a higher proportion of formal households possess a motor vehicle and other real states. Furthermore, the difference is particularly notable in terms of financial assets, especially for variable-income assets such as shareholding, mutual and investment funds and business partnership. Note also that beyond the difference between formal and informal households, possession of financial assets by households is quite low in general, especially if compared with real assets.

With respect to liabilities, it is also clear that a higher proportion of formal households are indebted in comparison to informal households. The difference is especially important for loans granted by banks, such as debt by bank-issued credit cards, personal loans by banks, other bank credit, and mortgage loans. However, when analyzing the loans granted by retail stores (credit card or personal loans) the difference between formal and informal households is less important. Another interesting pattern is that credit card penetration by retail stores is much larger than for bank-issued credit cards. Clearly, retail stores provide an important source of financing for both formal and informal households. Finally, although a small proportion of households take loans from family and friends and from pawnshops, they are the only categories of liabilities where informal households have a higher percentage than formal households. These results may suggest that informal households have a greater tendency to seek credit through more informal channels.

Table 2. Proportion of Formal and Informal Households with Assets and Liabilities

Proportion of formal and informal households with assets and liabilities						
Assets	ILO Definition		Productive Definition		Combined Definition	
	Formal	Informal	Formal	Informal	Formal	Informal
Real assets	81,2%	72,8%	78,8%	78,4%	79,2%	73,1%
Motor vehicles	41,3%	30,5%	42,3%	29,0%	42,0%	26,5%
Primary residence	67,2%	63,5%	65,5%	68,4%	65,8%	66,4%
Other real states	12,2%	8,1%	12,4%	9,0%	11,6%	6,1%
Financial assets	14,9%	7,4%	15,8%	6,6%	15,4%	5,9%
Fixed-income assets	11,1%	6,5%	11,7%	5,7%	11,6%	5,9%
Savings account	10,1%	6,5%	10,5%	5,5%	10,2%	5,8%
Retirement savings plan	3,2%	0,4%	3,0%	0,9%	3,3%	0,5%
Term deposit	1,6%	0,4%	1,6%	0,3%	1,8%	0,4%
Variable-income assets	5,7%	1,2%	6,1%	0,9%	5,8%	0,0%
Shareholding	2,8%	0,5%	3,0%	0,1%	2,8%	0,0%
Mutual and investment funds	3,5%	1,1%	4,4%	0,4%	4,2%	0,3%
Business partnership	1,3%	0,4%	1,1%	0,7%	1,1%	0,0%
Liabilities	Formal	Informal	Formal	Informal	Formal	Informal
Indebted	65,8%	51,0%	64,5%	50,8%	67,1%	47,4%
Bank credit card debt	15,1%	6,5%	16,2%	3,6%	16,9%	3,9%
Personal loans by banks	15,5%	9,2%	15,3%	8,4%	15,7%	7,2%
Other bank credit	8,3%	5,5%	9,2%	3,5%	9,0%	3,9%
Mortgage loans	16,7%	6,0%	16,8%	5,0%	17,7%	3,9%
Retail store credit card debt	56,1%	43,6%	55,8%	43,8%	58,4%	42,8%
Personal loans by retail stores and other financial companies	6,0%	4,8%	5,7%	5,2%	5,9%	5,0%
Credit by credit unions	8,1%	4,0%	8,2%	4,7%	9,3%	5,6%
Car loans	1,9%	1,6%	2,2%	1,6%	1,9%	1,4%
Student loans	4,9%	3,1%	5,8%	1,1%	5,4%	0,8%
Loans by family and friends	1,0%	2,9%	1,6%	1,5%	1,3%	2,2%
Pawnshop credit	0,0%	1,1%	0,2%	0,5%	0,1%	0,8%
Bought on credit	1,4%	1,1%	1,5%	0,7%	1,3%	0,6%
Other debts	3,0%	2,4%	2,7%	2,9%	2,6%	2,2%

Source: Financial Survey of Households (2007); Central Bank of Chile

3.4 Informality and Saving Behavior

In this subsection we analyze the saving rates of households, discriminating by different percentiles of income and between formal and informal households for 2007. Further, we present data on the percentage of households that report being able to save (not save) in the last year, discriminating by formal and informal households. In addition, we present data on households' reported reasons for saving in 2007. Finally, we present the average saving rate for 2008, 2009 and 2010, discriminating between formal and informal households. The first step is to conceptualize saving since there are a great diversity of definitions, with some preponderance for the standard notion of total family income, net of retirement contributions and health insurance, minus total household expenditures, including durable goods, health expenses and educational expenses. These last three items are suggested as an unconventional form of saving by, among others, Attanasio (1998) and Butelmann and Gallego (2000). Furthermore, Deaton (2005) points out, as a criticism, that usually household surveys include the incomes of young people without their contributions to the pension system and consider the income of retirees as income and not as dissaving. These two effects may contribute to underestimating saving by young people and dissaving by retirees.

Following the above mentioned literature and benefiting from the richness of the Financial Household Survey, we use the following five saving definitions:

1. Definition 1 (SR1): Saving is the difference between total household income, net of retirement contributions and health insurance, and consumption expenditures. The saving rate is given by saving divided by total household income. Total household income includes imputed rent of own property or leased property for free. Consumption expenditures include all surveyed expenses.
2. Definition 2 (SR2): As in definition 1 (SR1), but excluding pension incomes from total household income.
3. Definition 3 (SR3): As in definition 1 (SR1), but considering spending on education and health as saving; i.e., consumption expenditures excludes education and health spending.
4. Definition 4 (SR4): As in definition 1 (SR1), but excluding pension incomes from total household income and considering spending on education and

health as saving; i.e., consumption expenditures excludes education and health spending.

5. Definition 5 (SR5): A dichotomous variable that assumes value 1 if the head of the household reports that the household's income has been greater than its expenses in the last 12 months (i.e., they have been able to save) and 0 otherwise.

In Figure 10 we present the saving rates by income percentile using definition SR1, discriminating between formal and informal households according to the ILOD definition for 2007. Two main conclusions are evident. Firstly, for all the different income percentiles, formal households have larger saving rates than informal households. Secondly, saving rates are increasing in the level of income for both formal and informal households; i.e., households with higher incomes have greater saving rates. These two results are confirmed in Figures 11, 12 and 13 for the SR2, SR3 and SR4 definitions of the saving rate, respectively.⁸ Note, however, that for the SR2 definition the saving rates are slightly lower in general than the SR1, SR3 and SR4 definitions. Further, the saving rates of the SR3 definitions are in general slightly higher than for the other two definitions. These differences are due to the different components included in the specific definitions of saving rates. Note also that for the lowest income percentile in the SR2 definition, we get negative saving rates for informal households. This result shows the importance of pension incomes for informal low-income households.

⁸ We reach the same conclusions using the PD and COMBD definitions of informality, which are not presented due to space considerations, but are available upon request from the authors.

Figure 10. Saving Rates SR1 by Income Percentiles

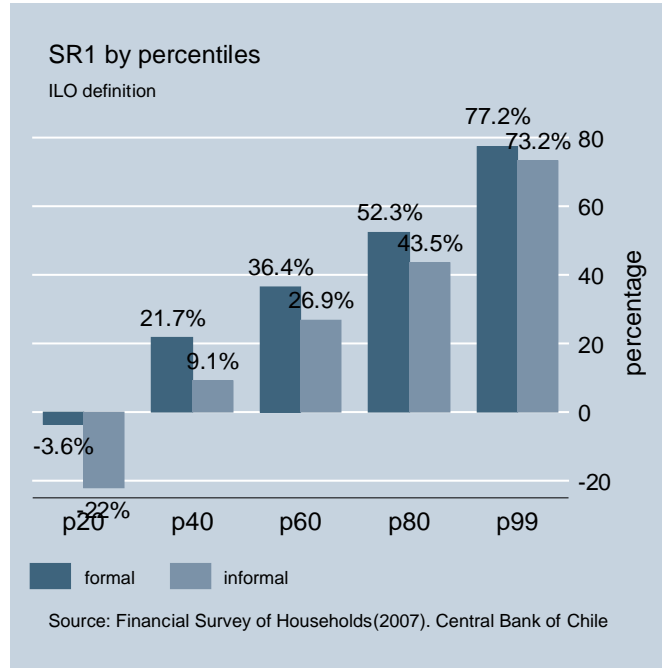


Figure 11. Saving Rates SR2 by Income Percentiles

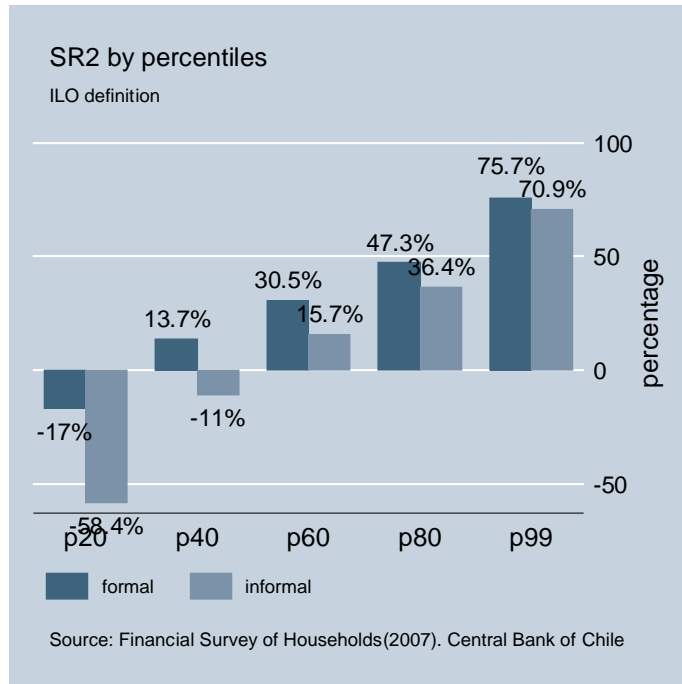


Figure 12. Saving Rates SR3 by Income Percentiles

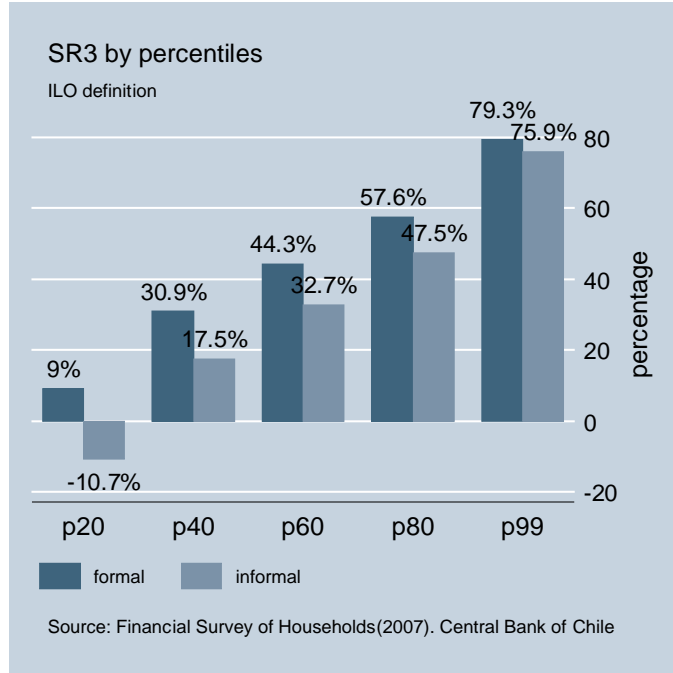


Figure 13. Saving Rates SR4 by Income Percentiles

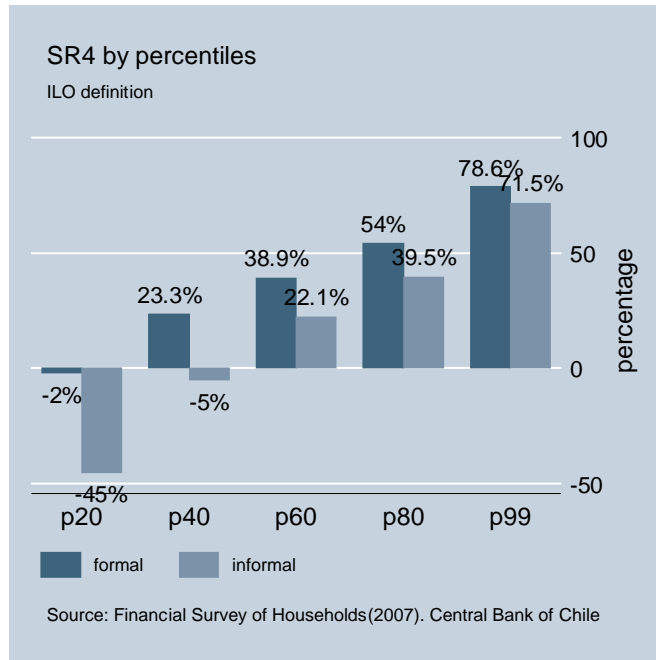


Table 3 presents the percentage of households that report having saved (not saved) in the last year, discriminating between formal and informal households according to the different informality definitions. Note that these are the results for the SR5 definition of saving. Similarly to the results for the other definitions of saving, we find that the percentage of formal households that save is greater than the percentage of informal households that save for all three definitions of informality. Equivalently, we find that the percentage of formal households that do not save is lower than the percentage of informal households that have not saved in the last year.

Table 3. Percentage of Households that Report Having Saved (Not Saved) in the Last Year

	ILOD		PD		COMBD	
	Formal	Informal	Formal	Informal	Formal	Informal
Not saved	64.2%	77.7%	66.3%	77.0%	64.8%	79.7%
Saved	35.8%	22.3%	33.7%	23.0%	35.2%	20.3%

Source: Financial Survey of Households (2007). Central Bank of Chile

In Table 4, we present the reported motives for saving, distinguishing between formal and informal households according to the three different informality definitions used in this paper. Note that the data are presented as a percentage of households, including those households that do not report saving for any reason, and that households could select one or more reasons; i.e., the different motives are not mutually exclusive. The principal reason for saving for both formal and informal households is precautionary motive. Note, however, that a larger proportion of formal households than informal households report this reason. This result can be somewhat counterintuitive if we assume that informal households have less stability in their employments and a larger variation in their income streams, and would, thus, have more incentives for precautionary saving. Another interesting result is that a larger proportion of informal households than formal households state that they save for retirement. This is an intuitive result if we consider that the informality definitions imply that informal workers are less covered by contributory retirement plans than formal workers. Note also that there is no other reason for saving for which informal households report a higher percentage than formal households (an exception with mixed results is the health and education reason). Further, it is interesting to note that a larger proportion of formal households than informal households report saving in order to reduce debt. This may be an intuitive result if we consider that, in general and from Table 2, a smaller proportion of informal households are indebted.

Table 4. Reported Reason for Saving by Percentage of Households

Reported reason for household saving						
	ILOD		PD		COMBD	
	Formal	Informal	Formal	Informal	Formal	Informal
Precautionary	24.1%	17.9%	22.2%	20.3%	23.4%	18.0%
Retirement	7.7%	10.4%	8.2%	10.8%	7.7%	12.7%
Durable goods	9.5%	8.1%	9.3%	9.4%	9.1%	8.2%
Health and education	8.8%	7.4%	8.3%	11.3%	7.9%	9.7%
Heritage	0.7%	1.1%	0.9%	0.5%	0.8%	0.7%
Save	9.4%	6.8%	9.2%	6.7%	9.4%	6.3%
Reduce debt	6.3%	3.4%	5.6%	4.3%	5.8%	3.3%
Other	8.3%	5.2%	8.7%	5.6%	8.6%	6.3%

Source: Financial Survey of Households (2007). Central Bank of Chile

In Figure 14 we present the evolution of the median saving rates for definition 1 (SR1) for the years 2008, 2009 and 2010, discriminating between formal and informal households following the ILOD definition. Note that we are not including 2007 because, while the survey for 2007 includes the urban population of the whole country, the surveys for 2008, 2009 and 2010 include only the urban population of the metropolitan region of Santiago de Chile, which implies that these saving rates are not completely comparable. In terms of the results and in line with the results for 2007, it is clear from the figure that informal households have lower saving rates than formal households. In terms of the time pattern, we observe that the median saving rates increase in 2009 with respect to 2008 and 2010. Another interesting pattern is that the median saving rate of informal households increases relatively more in 2009 and falls relatively more in 2010 than that of formal households. Although these patterns may be related to the effects of the 2009 crisis,⁹ we should be cautious with this inference because the 2008 survey collected data between December 2008 and March 2009, i.e., in the middle of the 2009 crisis, and the 2009 survey between November 2009 and March 2010, when the economy had already resumed growth.

⁹ Note that in Chile, as in most other Latin American countries, the effects of the 2007/2008 financial crisis were only felt in 2009 when commodity prices fell abruptly. The effects were short-lived because commodity prices recovered soon thereafter.

Figure 14. Evolution of Saving Rates



4. Saving and Informality Nexus

4.1-Data and Variables

As discussed in the last section, we use data from the Financial Household Survey conducted by the Central Bank of Chile. In this section, we present the results for 2007, which covered 3,828 urban households from the whole country. However, we have only considered those households with at least one member employed and have considered only “pure” households where all members are either formal or informal, i.e., we exclude households that have some members that are formal and others that are informal. Thus, our sample is reduced to between 1,740 and 2,533 urban households, depending on the used saving rate variable ($SR1$, $SR2$, $SR3$, $SR4$ and $SR5$) and informality definition (ILOD, PD and COMBD). In Section 5, we discuss the estimation results for the 2008, 2009 and 2010 surveys.

The variables that are used in the regression analysis are the saving rates $SR1$, $SR2$, $SR3$, $SR4$ and $SR5$ that were defined in the last section. In terms of the informality dummy variables, we have $infILOD$, $infPD$ and $infCOMBD$ that are constructed using the ILOD, PD and COMBD definitions, respectively. In addition, we have the $dprecsav$ variable that is a dummy variable indicating a household that reports having saved during the last year for precautionary motives. $dretsav$ is a dummy variable capturing those households that have saved during the last year for

retirement. The variable *ddurgoodsav* captures households that have saved in order to buy durable goods, and *ddebtreducsav* captures those households that have saved to pay back loans. In addition, for each of these dummy variables, we create new interaction variables with the informality variable, namely *infprec*, *Infret*, *infdurgood* and *infdebt*. For example, *infprec* captures the effect on the saving rate of those households that save for precautionary reasons and are informal.

On top of these variables, we constructed several variables that have been used in the surveyed literature in section 2 and whose descriptive statistics are presented in Table 6. Note that the descriptive statistics of these variables correspond to the ILOD definition of informality. The average age of household heads (*age*) was 48 years and the average number of household members with revenues (*minc*) was 1.67 persons. The *mincsq* variable indicates the square of the number of people in the household with income. Variable *empspo* indicates the percentage of households in which the household head has a spouse or cohabiting partner who works. We find that 22 percent of households with at least one worker are in this situation. To control for dependency rates, two variables were constructed: i) *mchild* to define the number of members under 18 years for each household and ii) *melderly* to identify the number of family members over 65 years. The averages were 0.83 and 0.23 per household, respectively. With regard to the gender of the household head, 65 percent are males. For the educational level of the household head, four indicator variables were developed: i) *primary* to define primary education level, ii) *secondary* to define secondary education level, iii) *tertoruniv* to define college or tertiary education level, and iv) *postgraduate* to define postgraduate education level, with the following prevalence rates: 27 percent, 43 percent, 19 percent and 11 percent, respectively. We further constructed a categorical variable indicating households for which the household head is retired (*hhretired*), finding that 11 percent of households have a pensioner as household head.

Finally, the variable indicating that a household head has a bank account (*bankacc*) shows an average of 18 percent. This variable is important because the Modigliani conceptual framework assumes that financial markets operate properly. However, in reality that is not the case and, thus, it is important to control for households that do not have proper access to credit markets and may have difficulties in smoothing their consumption over their lifetime. A dichotomous variable was constructed to indicate whether the household owns at least one durable good, i.e., a car, a house or another property (*durgood*). This variable shows that 79

percent of households have at least one durable good. In addition, we have the *thincome* variable that measures household's total monthly income expressed in constant millions of 2007 Chilean pesos of 2007 and the *thincomesq* variable that is the square of household's total monthly income, which is supposed to capture non-linearities in the relationship with the saving rate. Note that in Section 5 we perform some robustness tests using, instead of the level of income, an indicator variable that captures the relative position of households in the income distribution. The reason for this robustness test is that, as Sandoval-Hernández (2011) points out, household income levels and educational levels are strongly correlated, which may imply the risk of facing multicollinearity.

Table 6. Descriptive Statistics of Variables Used in Regression Analysis

Descriptive Statistics (ILO Definition)						
Only formal and informal households						
Variables	Labels	mean	sd	median	p10	p90
SR1	Savings rate (definition 1)	0.11	1.04	0.26	-0.39	0.60
SR2	Savings rate (definition 2)	-0.05	1.28	0.17	-0.75	0.57
SR3	Savings rate (definition 3)	0.20	1.00	0.34	-0.26	0.64
SR4	Savings rate (definition 4)	0.06	1.19	0.25	-0.57	0.61
SR5	Variable dichotomous (0 not save, 1 saved)-(definition 5)	0.20	0.40	0.00	0.00	1.00
infilOD	Variable dichotomous (0 Formal household; 1 Informal household)	0.34	0.47	0.00	0.00	1.00
age	Age of household head	48	13	47	30	66
agesq	Age squared of the household head	2,443	1,343	2,209	900	4,356
thincome	Total household income (in millions of pesos)	0.791	3.226	0.420	0.181	1.260
thincomesq	Square Total household income (in millions of pesos)	11.03	348.80	0.18	0.03	1.59
thincome2	Total household income without pensions (in millions of pesos)	0.733	3.205	0.380	0.155	1.153
thincomesq2	Square Total household income without pensions(in millions of pesos)	10.81	342.16	0.14	0.02	1.33
minc	Number of household members with income	1.67	0.79	2.00	1.00	3.00
mincsq	Square of number of household members with income	3.40	3.46	4.00	1.00	9.00
empspo	Wife or concubine who is employed	0.22	0.41	0.00	0.00	1.00
mchild	Number of children at home	0.83	0.96	1.00	0.00	2.00
melderly	Number of elderly at home	0.23	0.54	0.00	0.00	1.00
primary	Head of household with primary education	0.27	0.44	0.00	0.00	1.00
secondary	Head of household with secondary education	0.43	0.49	0.00	0.00	1.00
tertoruniv	Head of household with tertiary or university education	0.19	0.39	0.00	0.00	1.00
postgraduate	Head of household with postgraduate education	0.11	0.32	0.00	0.00	1.00
bankacc	Head of household who has current account	0.18	0.39	0.00	0.00	1.00
gender	Gender of household head	0.65	0.48	1.00	0.00	1.00
durgood	Home with durable goods	0.79	0.40	1.00	0.00	1.00
hhretired	Head of household is retired	0.11	0.32	0.00	0.00	1.00
dprecsav	dummy precautionary saving	0.22	0.41	0.00	0.00	1.00
dretsav	dummy retirement saving	0.09	0.28	0.00	0.00	0.00
ddurgoodsav	dummy saving durable goods	0.09	0.29	0.00	0.00	0.00
ddebtreducsav	dummy savings debt reduction	0.05	0.22	0.00	0.00	0.00
infret	interaction dummy retirement saving and informality	0.04	0.19	0.00	0.00	0.00
infprec	interaction dummy precautionary saving and informality	0.06	0.24	0.00	0.00	0.00
infdurgood	interaction dummy durable goods saving and informality	0.03	0.16	0.00	0.00	0.00
infdebt	interaction dummy saving debt reduction and informality	0.01	0.11	0.00	0.00	0.00

Source: Financial Household Survey 2007, Central Bank of Chile.

4.2 Empirical Methodology

The objective of this section is to determine whether households of informal workers have differential saving behavior relative to households with formal workers. Additionally, the relationship between saving and the main determinants commonly cited in the literature is also analyzed. The empirical strategy follows a cross-section regression analysis by using both ordinary least squares and probit estimation models. It is important to clarify that the estimates are made on a population of households containing only formal workers and only informal workers according to each of the three possible informality definitions (ILOD, PD and COMBD). In other words, in addition to discarding those households that have no member who works, we also remove those households that have some members who are formal and others who are informal. In this way, we are comparing the saving behavior of purely formal households with purely informal households.

4.2.1 Ordinary Least Squares Regression Analysis

We perform the regression analysis for each of the four saving rate definitions as dependent variable (*SR1*, *SR2*, *SR3* and *SR4*). Further, for each saving rate definition, we test the three different informality dummy variables, namely the ILOD, PD and COMBD informality definitions. Further, following Butelmann and Gallego (2000), we remove the extreme percentiles 1 and 99 for each alternative definition of saving rates in order to ensure appropriate empirical treatment since household surveys typically have a high dispersion of data by the presence of outliers, which tend to strongly bias the estimation results.

Concretely, we estimate the following equation by ordinary least squares, weighting with the expansion factors given to each household in the EFH and with robust standard errors for heteroskedasticity:¹⁰

$$SR_i = \alpha_0 + \alpha_1 inf_i + \alpha_2 age_i + \alpha_3 agesq_i + \alpha_4 thincome_i + \alpha_5 thincomesq_i + \alpha_6 minc_i + \alpha_7 mincsq_i + \alpha_8 empspo_i + \alpha_9 mchild_i + \alpha_{10} melderly_i + \alpha_{11} secondary_i + \alpha_{12} tertoruniv_i + \alpha_{13} postgraduate_i + \alpha_{16} bankacc_i + \alpha_{17} gender_i + \alpha_{18} durgood_i + \alpha_{19} hhretired_i + \alpha_{20} Dprec sav_i + \alpha_{21} Dretsav_i + \alpha_{22} Ddurgoodsav_i + \alpha_{23} Ddebtreducsav_i + \alpha_{24} infprec_i + \alpha_{25} infret_i + \alpha_{26} infdurgood_i + \alpha_{27} infdebt_i + \epsilon_i$$

¹⁰ See Madeira (2011) for a discussion of the computation of population weights for the EFH survey and Solon, Haider and Wooldridge (2013) for the use of population weights in studies on causal effects.

where the i subscript represent household i , SR_i is the $SR1$, $SR2$, $SR3$ or $SR4$ definition of saving rates, inf_i is the informality dummy variable for the ILOD, PD or COMBD definitions of informality, and the other variables are the ones described in Subsection 4.1.

4.2.2 Probit Regression Analysis

In the case of the probit regression we use saving definition 5 ($SR5$) as the dependent variable. In addition, we use the three different informality dummy variables, namely the ILOD, PD and COMBD informality definitions. Note that we are not removing the extreme percentiles as in the OLS regression because $SR5$ is a dummy variable without the variability of the $SR1$, $SR2$, $SR3$ and $SR4$ variables.

We estimate the following model using a probit regression methodology, correcting the standard errors for heteroskedasticity, but without weighting with the expansion factors given to each household in the EFH as we did in the OLS regression:

$$P[SR5_i=1] = \varphi [\beta_0 + \beta_1 inf_i + \beta_2 age_i + \beta_3 agesq_i + \beta_4 thincome_i + \beta_5 thincomesq_i + \beta_6 minc_i + \beta_7 mincsq_i + \beta_8 empspo_i + \beta_9 mchild_i + \beta_{10} melderly_i + \beta_{11} secondary_i + \beta_{12} tertoruniv_i + \beta_{13} postgraduate_i + \beta_{14} bankacc_i + \beta_{15} gender_i + \beta_{16} durgood_i + \beta_{17} hhretired_i]$$

Note that, given the non-linear relationship between the dependent variables and its determinants, φ is the standard normal cumulative distribution function corresponding to the probit methodology. Also, estimating this equation means that we are estimating the probability that the dependent variable $SR5$ is equal to 1, i.e., that a household saved in the last year, conditional on the other independent variables. Further, we have not included the dummy variables $dprecsvi$, $dretsavi$, $ddurgoodsavi$, $ddebtreducsavi$, $infpreci$, $infreti$, $infdurgoodi$, and $infdebt$ because these variables and the dependent variable $SR5$ are constructed from the same survey questions.

4.3 Results

4.3.1 OLS Regression Results

Tables 7, 8 and 9 present the estimation results for each of the four definitions of saving rates and for each of the three definitions of informality for the year 2007.¹¹ It should be noted that the size of the linear coefficients of determination (R^2) varies between 0.232 and 0.294. This means that between 23.2 percent and 29.4 percent of the variability of saving rates is explained by the

¹¹ In Section 5, we discuss the estimation results for 2008, 2009 and 2010.

dependent variables included in the regressions, which implies that the specification of the equations appear to be correct in terms of the results. This is not a minor detail because the R^2 of the regressions with saving rates from the surveyed papers in Section 2 ranges from 0.03 and 0.14.

Table 7 presents the estimation results for each of the four definitions of saving with the ILOD definition of informality. In the model using the saving rate definition 1 (*SR1*), the dummy variable indicating households that have only informal workers (*infILOD*) yields a coefficient of -0.124, which turns out to be significant at the 1 percent level. Further, for the *SR2* definition, the informal household coefficient (*infILOD*) is -0.202 and significant at the 1 percent level. In addition, for the *SR3* and *SR4* regressions, the coefficients are -0.14 and -0.201, both significant at the 1 percent level. These results imply that informal households according to the ILOD definition save between 12.4 and 20.2 percentage points less than formal households.

In Table 8, where the PD definition of informality is used for the four saving regressions, we find similar results. We get coefficient values of -0,167, -0,269, -0,19 and -0,257 for the *SR1*, *SR2*, *SR3* and *SR4* definitions of saving, respectively, all with a statistical significance level of 1 percent. Accordingly, for the PD definition of informality, informal households save between 16.7 and 26.9 percentage points less than formal households. Finally, in Table 9 for the COMBD informality definition, the informality dummy coefficient has the values -0.228, -0.337, -0.23 and -0.332 for the saving definitions *SR1*, *SR2*, *SR3* and *SR4*, respectively, and in all four cases with significance levels of 1 percent. These results imply that for the COMBD definition of informality informal households save between 22.8 and 33.7 percentage points less than formal households. Concluding, for all four definitions of saving rate and all three informality definitions, informal households have a lower saving rate than formal households. Note also that the negative relationship found between households saving rates and informal workers may also be indicating, particularly in the ILOD definition of informality, that there might not be any trade-off between pension saving and voluntary household saving. This result is in contrast to the one obtained by Butelmann and Gallego (2000).

Regarding the dummy variables for the stated motives of saving and the corresponding interaction variables, we find that the variable *infprec* is positive and significant, meaning that informal household that indicate that they save for precautionary motives saves between 12.8 and 35.6 percentage points more than other households. When comparing the size of these

coefficients with the size of the coefficients of the informality variables *infILOD*, *infPD* and *infCOMBD*, we reach the conclusion that informal households that save for precautionary motives have saving rates similar to formal households. Note also that the *dprecsav* is insignificant in all specifications, meaning that formal households that state that they save for precautionary motives do not have significantly different saving rates than the rest of formal households. In addition, there is some evidence that the *infdurgood* variable is positive and significant, meaning that informal households that save for buying a durable good have between 19.8 and 26.7 percentage points higher saving rates than the rest of informal households. In addition, there is also some evidence that informal households that save for the retirement (*infret*) have between 16.3 and 20 percentage points higher saving rates than other informal households. Note that both the *ddurgoodsav* and *dretsav* variables are insignificant, which imply that formal households that save for either of these motives do not have significantly different saving rates than the other formal households. Finally, the other indicator variables capturing the motive of reducing debt (*ddebtreducsav* and *infdebttred*) are insignificant.

With regard to the variables that relate to the life cycle hypothesis, age and age squared of the household head, we can see that these are significant in three of the four saving definitions. Particularly, for saving definitions 2 and 4 (*SR2* and *SR4*) we get negative, and significant, values for the age variable, and positive and significant values for the age squared variable. Note that these results imply that the age profile of saving rates presents a U form, instead of the expected inverted-U form. This result is in line with the findings of Butelmann and Gallego (2000) for the Chilean economy, as well as of Sandoval-Hernández (2011) for the Mexican economy. One possible explanation for this finding focuses on different saving preference structures between generations.

For all the regression equations we find a positive relationship between the household's income variable *thincome* and the rates of household saving; i.e., households with higher incomes save more. These results are in line with Harris, Loundes and Webster (2002), Sandoval-Hernández (2011) and Beckman, Hake and Urvova (2013), among others. Further, we included the square of the income variable (*thincomesq*), which is negative and significant, meaning that there is an inverted-U relationship between income and the saving rate. In addition, the number of household members with incomes (*minc*) has a significant and positive relationship in most of the estimates, also in line with the results commonly seen in the literature,

such as in Sandoval-Hernández (2011). Further, the square of the number of members with income (*mincsq*) is mostly negative and significant, meaning that there is an inverted-U relationship between *minc* and the saving rates. Further, households headed by men seem to save between 7.13 and 17.4 percentage points more than those in which the head is a woman, which is in line with Attanasio (1998) and Sandoval-Hernández (2011). To control for household dependency ratio, two variables are introduced: *mchild* and *melderly*. *mchild* shows a negative and statistically significant relationship in all econometric specifications as in Xiao (1996), Harris, Loundes and Webster (2002), and Sandoval-Hernández (2011). In terms of the *melderly* variable a negative relationship is found, but it is only statistically significant for saving definitions 2 and 4.

In most studies, educational level has been shown to be an important determinant for household saving, with a positive sign. In our study, though, education is insignificant for most specifications. This result should nonetheless be taken with caution because household income level and educational level are strongly correlated, which may imply the risk of facing multicollinearity (Sandoval-Hernández, 2011). Thus, in the robustness section, we estimate these models with different indicator variables for the relative position of households in the income distribution instead of the continuous income variable. In order to capture the effect of households not restricted to credit, a dichotomous variable, *bankacc*, indicating household heads that have bank account, is defined. In most specifications, this variable is insignificant. For the variable capturing households that own durable goods, we find highly significant results in all three specifications with the same positive sign as most studies (Attanasio, 1998; Butelmann and Gallego, 2000; Harris et al., 2002; and Sandoval-Hernandez, 2011). This result may be explained by taking into account that most durable goods are bought on credit, which imply that households need to save more in order to pay for that credit.

The variable *hhretired* shows a statistically significant relationship in almost all cases, but the sign of the coefficient varies depending on the definition of saving that is used. While for saving definitions 1 and 3 the sign is positive, for saving definitions 2 and 4 it is negative. This apparently contradictory result may be justified by taking into account that saving definitions 2 and 4 consider retirement income as dissaving.

Table 7. Saving Rates Regressions with ILOD Definition of Informality

Saving Rates Equations with ILO definition of labor informality

	Model SR1		Model SR2		Model SR3		Model SR4	
infILOD	-0.124***	(-3.25)	-0.202***	(-4.33)	-0.140***	(-4.02)	-0.201***	(-4.74)
age	-0.0101**	(-2.12)	-0.0220***	(-3.35)	-0.00601	(-1.46)	-0.0156***	(-2.64)
agesq	0.0000723	(1.53)	0.000197***	(2.89)	0.0000343	(0.83)	0.000133**	(2.19)
thincome	0.206***	(10.58)			0.196***	(8.44)		
thincomesq	-0.00719***	(-9.35)			-0.00696***	(-8.18)		
minc	0.317***	(4.59)	0.192**	(2.02)	0.315***	(5.11)	0.167**	(2.04)
mincsq	-0.0470***	(-3.55)	-0.0291	(-1.38)	-0.0519***	(-3.60)	-0.0249	(-1.41)
empspo	-0.0214	(-0.58)	0.0477	(1.10)	-0.0148	(-0.50)	0.0323	(0.74)
mchild	-0.0833***	(-4.40)	-0.0793***	(-3.66)	-0.0412***	(-3.61)	-0.0560***	(-2.63)
melderly	-0.0324	(-1.43)	-0.0964***	(-3.01)	-0.0308	(-1.40)	-0.0976***	(-3.18)
secondary	-0.0395	(-1.11)	-0.0118	(-0.27)	-0.0292	(-1.00)	-0.00283	(-0.07)
tertoruniv	-0.0165	(-0.41)	-0.0438	(-0.76)	-0.00559	(-0.16)	-0.0216	(-0.39)
postgraduate	-0.00666	(-0.15)	-0.0562	(-1.03)	-0.0344	(-0.58)	-0.0541	(-0.90)
bankacc	-0.0964***	(-2.60)	-0.111***	(-2.66)	-0.0533	(-1.60)	-0.0562	(-1.50)
gender	0.0998***	(3.11)	0.164***	(4.22)	0.0714***	(2.72)	0.144***	(3.92)
durgood	0.141***	(4.01)	0.262***	(5.00)	0.141***	(4.52)	0.249***	(5.07)
hhretired	0.169***	(4.95)	-0.117*	(-1.91)	0.175***	(5.48)	-0.0849	(-1.48)
dretsav	-0.0642	(-1.47)	-0.0391	(-0.80)	-0.0243	(-0.78)	0.00322	(0.08)
infret	0.101	(1.15)	-0.0129	(-0.12)	0.0605	(0.72)	-0.0402	(-0.44)
dprecav	0.00733	(0.26)	-0.0365	(-0.78)	-0.0122	(-0.47)	-0.0506	(-1.09)
infprec	0.136**	(2.57)	0.213***	(2.66)	0.136***	(2.80)	0.193**	(2.56)
ddurgoodsav	-0.0933	(-1.41)	-0.0696	(-0.99)	-0.0256	(-0.76)	-0.0738	(-1.05)
infdurgood	0.202**	(2.18)	0.219**	(2.10)	0.113	(1.57)	0.198**	(1.98)
ddebtreducsav	0.0320	(0.72)	0.0371	(0.78)	0.0103	(0.27)	0.0264	(0.64)
infdebttred	-0.142	(-1.40)	-0.120	(-1.14)	-0.110	(-1.13)	-0.0918	(-0.94)
thincome2			0.293***	(10.88)			0.271***	(9.92)
thincomesq2			-0.0101***	(-9.46)			-0.00950***	(-8.96)
Constant	-0.0665	(-0.51)	0.0911	(0.53)	-0.0790	(-0.71)	0.0626	(0.41)
Observations	2355		2345		2350		2346	
Adjusted R-squared	0.245		0.232		0.261		0.251	
F	15.87		16.09		19.27		17.14	

t statistics in parentheses

Source: Financial Household Survey 2007. Central Bank of Chile

Econometric methodology: Ordinary Least Squares with robust standard errors.

* p<0.10, ** p<0.05, *** p<0.01

Table 8. Saving Rates Regressions with PD Definition of Informality

Saving Rates Equations with Productive Definition of labor informality

	Model SR1		Model SR2		Model SR3		Model SR4	
infPD	-0.167***	(-3.58)	-0.269***	(-4.75)	-0.190***	(-4.46)	-0.257***	(-4.93)
age	-0.0127***	(-2.65)	-0.0223***	(-3.47)	-0.00666	(-1.62)	-0.0145***	(-2.59)
agesq	0.0000952*	(1.95)	0.000198***	(2.94)	0.0000440	(1.04)	0.000125**	(2.12)
thincome	0.165***	(8.32)			0.147***	(7.65)		
thincomesq	-0.00453***	(-5.73)			-0.00412***	(-5.43)		
minc	0.338***	(5.49)	0.195**	(2.28)	0.293***	(5.65)	0.148**	(2.06)
mincsq	-0.0551***	(-4.47)	-0.0338*	(-1.78)	-0.0466***	(-4.50)	-0.0215	(-1.43)
empspo	-0.0340	(-1.06)	0.0396	(1.00)	-0.0146	(-0.54)	0.0303	(0.80)
mchild	-0.0720***	(-4.31)	-0.0741***	(-3.87)	-0.0362***	(-3.32)	-0.0513***	(-2.84)
melderly	-0.0201	(-0.90)	-0.0865***	(-2.74)	-0.0259	(-1.27)	-0.0971***	(-3.24)
secondary	-0.0570*	(-1.69)	-0.0470	(-1.12)	-0.0406	(-1.38)	-0.0194	(-0.50)
tertoruniv	-0.0684*	(-1.74)	-0.110**	(-2.01)	-0.0392	(-1.10)	-0.0330	(-0.75)
postgraduate	-0.0306	(-0.75)	-0.0946*	(-1.84)	-0.00406	(-0.11)	-0.0260	(-0.55)
bankacc	-0.0552	(-1.55)	-0.0565	(-1.41)	-0.0244	(-0.76)	-0.0239	(-0.68)
gender	0.0993***	(3.34)	0.174***	(4.74)	0.0713***	(2.84)	0.135***	(4.34)
durgood	0.115***	(3.56)	0.244***	(4.91)	0.130***	(4.58)	0.216***	(5.34)
hhretired	0.160***	(4.68)	-0.131**	(-2.23)	0.157***	(5.04)	-0.0961*	(-1.75)
dretsav	-0.0551	(-1.02)	-0.0271	(-0.48)	-0.0424	(-0.82)	-0.0201	(-0.39)
infret2	0.163**	(2.06)	-0.000236	(-0.00)	0.171**	(2.31)	0.0338	(0.36)
dprecsv	0.0120	(0.48)	-0.0356	(-0.82)	-0.00449	(-0.19)	-0.0150	(-0.52)
infprec2	0.106	(1.60)	0.238***	(2.80)	0.128**	(2.15)	0.198***	(2.80)
ddurgoodsav	0.00798	(0.24)	0.0299	(0.75)	0.00811	(0.29)	0.0174	(0.52)
infddurgood2	-0.108	(-0.62)	-0.0181	(-0.10)	0.00832	(0.06)	-0.0538	(-0.31)
ddebtreducsav	0.0377	(0.96)	0.0546	(1.19)	0.0378	(1.36)	0.0472	(1.54)
infdebtreducsav	-0.0401	(-0.33)	0.0287	(0.23)	-0.0608	(-0.54)	0.00266	(0.02)
thincome2			0.234***	(8.48)			0.203***	(7.94)
thincomesq2			-0.00631***	(-5.70)			-0.00557***	(-5.47)
Constant	0.0421	(0.31)	0.167	(0.98)	-0.0223	(-0.19)	0.113	(0.75)
Observations	2533		2526		2532		2527	
Adjusted R-squared	0.250		0.237		0.261		0.254	
F	15.36		15.00		19.10		17.84	

t statistics in parentheses

Source: Financial Household Survey 2007. Central Bank of Chile

Econometric methodology: Ordinary Least Squares with robust standard errors.

* p<0.10, ** p<0.05, *** p<0.01

Table 9. Saving Rates Regressions with COMBD Definition of Informality

Saving Rates Equations with Combined Definition of labor informality

	Model SR1		Model SR2		Model SR3		Model SR4	
infCOMBD	-0.228***	(-3.70)	-0.337***	(-4.66)	-0.230***	(-4.18)	-0.332***	(-5.03)
age	-0.00662	(-1.09)	-0.0212***	(-2.60)	-0.00292	(-0.57)	-0.0152**	(-2.09)
agesq	0.0000465	(0.77)	0.000197**	(2.34)	0.0000125	(0.25)	0.000143*	(1.87)
thincome	0.198***	(9.75)			0.175***	(9.52)		
thincomesq	-0.00704***	(-8.86)			-0.00639***	(-8.79)		
minc	0.228***	(2.96)	0.0372	(0.38)	0.245***	(3.77)	0.0214	(0.23)
mincsq	-0.0319**	(-2.08)	0.00345	(0.16)	-0.0365***	(-2.75)	0.00554	(0.26)
empso	0.0393	(1.04)	0.115**	(2.50)	0.0384	(1.22)	0.123***	(2.84)
mchild	-0.0634***	(-4.35)	-0.0567***	(-3.02)	-0.0383***	(-3.03)	-0.0286*	(-1.67)
melderly	-0.00468	(-0.18)	-0.0767*	(-1.92)	-0.0106	(-0.44)	-0.0755**	(-2.00)
secondary	-0.0732*	(-1.81)	-0.0757	(-1.52)	-0.0413	(-1.15)	-0.0533	(-1.17)
tertoruniv	-0.0527	(-1.11)	-0.114*	(-1.65)	-0.0151	(-0.34)	-0.0772	(-1.16)
postgraduate	-0.0444	(-0.91)	-0.107*	(-1.83)	-0.00513	(-0.11)	-0.0586	(-1.09)
bankacc	-0.0802*	(-1.79)	-0.0770	(-1.52)	-0.0485	(-1.23)	-0.0353	(-0.77)
gender	0.0896**	(2.57)	0.152***	(3.49)	0.0713**	(2.37)	0.120***	(2.96)
durgood	0.166***	(4.15)	0.283***	(4.77)	0.145***	(4.41)	0.276***	(4.90)
hhretired	0.171***	(4.48)	-0.136*	(-1.90)	0.167***	(4.98)	-0.108	(-1.59)
dretsav	-0.0693	(-1.38)	-0.0394	(-0.70)	-0.0278	(-0.81)	0.00470	(0.11)
infret3	0.200**	(2.41)	0.00548	(0.04)	0.164**	(2.37)	0.00904	(0.09)
dprec3	0.00759	(0.24)	-0.0458	(-0.85)	-0.0134	(-0.47)	-0.0633	(-1.17)
infprec3	0.219***	(2.91)	0.356***	(3.32)	0.204***	(2.97)	0.324***	(3.31)
ddurgoodsav	-0.0439	(-0.94)	-0.0123	(-0.24)	-0.0307	(-0.83)	-0.0116	(-0.25)
infddurgood3	0.236**	(1.97)	0.267*	(1.94)	0.169	(1.47)	0.219*	(1.70)
ddebtreduc3	0.0366	(0.71)	0.0386	(0.67)	0.0344	(0.98)	0.0345	(0.80)
infdebtreduc3	-0.0775	(-0.50)	-0.0379	(-0.25)	-0.0913	(-0.65)	-0.0493	(-0.36)
thincome2			0.270***	(10.22)			0.239***	(9.64)
thincomesq2			-0.00950***	(-8.81)			-0.00858***	(-8.65)
Constant	-0.0766	(-0.47)	0.225	(1.05)	-0.0987	(-0.73)	0.178	(0.93)
Observations	1742		1742		1742		1740	
Adjusted R-squared	0.261		0.263		0.294		0.284	
F	15.60		15.19		19.58		17.22	

t statistics in parentheses

Source: Financial Household Survey 2007. Central Bank of Chile

Econometric methodology: Ordinary Least Squares with robust standard errors.

* p<0.10, ** p<0.05, *** p<0.01

4.3.2 OLS Regressions Discriminating Between Positive and Negative Saving Rates

In this subsection we present results for the same OLS estimation methodology as in the previous subsection, but we discriminate between those households that have positive and negative saving rates, i.e., we have estimation results for two separate groups. Note that a negative saving rate implies that the household is dissaving that year either by selling assets or borrowing. In Table 10 we present the results for the subset of households with positive saving rates. For the COMBD definition of informality, we find that the informality variable is not significant, implying that there is no difference between informal and formal households for the group of households that have positive saving rates. This result is corroborated for the other two informality definitions, with the exception of the specification using the SR3 saving definition

with the ILOD definition of informality where it is negative and significant.¹² In Table 11 we present the regression results for the subset of households with negative saving rates, i.e., which dissave. For the COMBD definition of informality, we find that the informality variable is negative and significant, meaning that informal households have lower saving rates than formal households. While this result is corroborated for the PD definition of informality, for the ILOD definition we find that the difference between formal and informal households is insignificant. Concluding, these results show some evidence that the negative relationship between saving rates and informality is stronger for the group of households that have negative saving rates. More results and tests should be carried out, however, in order to draw further conclusions.

Table 10. Saving Rates Regressions for Households with Positive Saving Rates with COMBD Definition of Informality

Saving Rates Equations with Combined Definition of labor informality

	Model SR1		Model SR2		Model SR3		Model SR4	
infCOMBD	-0.00116	(-0.05)	0.00715	(0.30)	-0.0253	(-1.14)	-0.00250	(-0.11)
age	-0.0110***	(-4.01)	-0.00913***	(-3.17)	-0.00607**	(-2.22)	-0.00926***	(-3.22)
agesq	0.0000957***	(3.20)	0.0000794**	(2.55)	0.0000456	(1.54)	0.0000885***	(2.85)
thincome	0.0990***	(12.01)			0.105***	(12.20)		
thincomesq	-0.00366***	(-12.05)			-0.00397***	(-12.02)		
minc	0.0130	(0.43)	0.0306	(0.96)	0.0400	(1.31)	0.0395	(1.21)
mincsq	0.000830	(1.38)	0.00248	(0.39)	0.00195	(0.32)	-0.000499	(-0.08)
empspo	0.00974	(0.64)	0.0223	(1.44)	0.0158	(1.06)	0.0291*	(1.87)
mchld	-0.0467***	(-7.39)	-0.0438***	(-6.51)	-0.0349***	(-5.01)	-0.0291***	(-3.97)
melderly	-0.0194	(-1.24)	-0.0483***	(-3.24)	-0.00426	(-0.30)	-0.0705***	(-4.61)
secondary	-0.0320*	(-1.76)	-0.0259	(-1.34)	-0.0235	(-1.31)	-0.0123	(-0.65)
tertoruniv	-0.0164	(-0.71)	-0.00969	(-0.38)	0.000933	(0.04)	0.00785	(0.30)
postgraduate	-0.0343	(-1.46)	-0.0179	(-0.71)	-0.00275	(-0.12)	0.0105	(0.42)
bankacc	-0.00458	(-0.28)	-0.0110	(-0.60)	0.00327	(0.19)	-0.000223	(-0.01)
gender	0.0104	(0.78)	0.0169	(1.21)	0.0223*	(1.71)	0.0324***	(2.37)
durgood	0.0742***	(4.70)	0.0590***	(3.79)	0.0663***	(4.19)	0.0514***	(3.33)
hhretired	0.0406	(1.54)	-0.0356	(-1.12)	0.0423	(1.62)	-0.0369	(-1.31)
dretsav	-0.00862	(-0.43)	-0.0182	(-0.84)	-0.0232	(-1.07)	-0.0148	(-0.69)
infret3	-0.0378	(-0.79)	-0.0300	(-0.52)	-0.0109	(-0.23)	-0.0629	(-1.11)
dprecav	0.0141	(1.00)	0.00469	(0.30)	0.00374	(0.26)	-0.0107	(-0.65)
infprec3	-0.00780	(-0.19)	0.0259	(0.68)	0.00694	(0.18)	0.0415	(1.10)
ddurgoodsav	0.00922	(0.52)	0.0188	(1.06)	0.00254	(0.14)	0.0135	(0.74)
infdurgood3	-0.0205	(-0.37)	-0.0115	(-0.22)	0.0138	(0.29)	-0.0164	(-0.32)
ddebtreducav	-0.0227	(-0.94)	-0.0336	(-1.32)	-0.0485	(-1.52)	-0.0587*	(-1.80)
infdebtrd3	0.0487	(0.58)	0.196***	(3.16)	0.0865	(0.99)	0.233***	(4.14)
thincome2			0.103***	(11.84)			0.112***	(11.73)
thincomesq2			-0.00380***	(-12.05)			-0.00420***	(-11.92)
Constant	0.531***	(7.34)	0.456***	(6.16)	0.406***	(5.65)	0.445***	(5.92)
Observations	1425		1299		1528		1406	
Adjusted R-squared	0.277		0.261		0.293		0.291	
F	21.89		19.49		22.10		21.90	

t statistics in parentheses

Source: Financial Household Survey 2007. Central Bank of Chile

Econometric methodology: Ordinary Least Squares with robust standard errors.

* p<0.10, ** p<0.05, *** p<0.01

¹² Note that we are only presenting the estimation results for the COMBD definition of informality due to space considerations. However, the results for the other informality definitions are available from the authors upon request.

Table 11. Saving Rates Regressions for Households with Negative Saving Rates with COMBD Definition of Informality

Saving Rates Equations with Combined Definition of labor informality

	Model SR1	Model SR2	Model SR3	Model SR4				
infCOMBD	-0.240**	(-2.08)	-0.289***	(-2.80)	-0.258**	(-2.28)	-0.269***	(-2.60)
age	-0.00355	(-0.21)	-0.00456	(-0.30)	-0.0133	(-0.74)	-0.0216	(-1.40)
agesq	0.0000574	(0.32)	0.0000776	(0.50)	0.000132	(0.67)	0.000249	(1.57)
thincome	0.652**	(2.56)			-0.0375	(-0.08)		
thincomesq	-0.182*	(-1.94)			0.174	(0.83)		
minc	-0.130	(-0.49)	-0.0307	(-0.12)	-0.185	(-0.61)	0.00426	(0.02)
mincsq	0.0301	(0.54)	-0.00633	(-0.10)	0.0384	(0.61)	-0.0327	(-0.48)
empspo	-0.0364	(-0.38)	0.0379	(0.46)	0.00719	(0.07)	0.105	(1.06)
mchild	0.0351	(1.14)	0.0384	(1.07)	0.0470	(1.48)	0.0629*	(1.65)
melderly	0.0631	(0.90)	0.0227	(0.36)	0.139*	(1.70)	0.00113	(0.02)
secondary	-0.170*	(-1.67)	-0.153*	(-1.71)	-0.217**	(-2.09)	-0.169*	(-1.86)
tertoruniv	-0.175	(-1.57)	-0.274*	(-1.97)	-0.267*	(-1.89)	-0.366**	(-1.99)
postgraduate	-0.163	(-1.16)	-0.223*	(-1.83)	-0.415**	(-2.42)	-0.155	(-1.04)
bankacc	-0.279**	(-2.10)	-0.287**	(-2.34)	-0.210	(-1.29)	-0.199	(-1.31)
gender	0.0937	(1.18)	0.113	(1.47)	0.0824	(0.90)	0.0538	(0.64)
durgood	0.0513	(0.63)	0.184**	(2.07)	0.0640	(0.84)	0.206**	(2.37)
hhretired	0.264**	(2.53)	-0.135	(-1.46)	0.395***	(2.61)	-0.139	(-1.60)
dretsav	-0.0409	(-0.29)	0.0559	(0.47)	-0.000579	(-0.00)	0.171	(1.38)
infret3	0.213	(1.15)	0.0236	(0.10)	0.0521	(0.23)	-0.0419	(-0.23)
dprecsv	0.118*	(1.73)	-0.0369	(-0.27)	0.0639	(0.84)	-0.136	(-0.77)
infprec3	0.0703	(0.55)	0.365*	(1.93)	0.0701	(0.51)	0.440**	(2.07)
ddurgoodsav	-0.0132	(-0.10)	0.0796	(0.62)	0.126	(0.90)	0.113	(0.70)
infdurgood3	0.104	(0.52)	0.229	(1.17)	-0.125	(-0.59)	0.159	(0.74)
ddebtreducsv	0.182**	(1.98)	0.209**	(2.46)	0.175	(1.61)	0.209**	(2.24)
infdebtrd3	-0.0616	(-0.39)	0.00743	(0.05)	-0.00527	(-0.04)	-0.0305	(-0.19)
thincome2			1.188***	(4.36)			1.120**	(2.53)
thincomesq2			-0.393***	(-3.63)			-0.459**	(-2.09)
Constant	-0.404	(-0.93)	-0.740*	(-1.83)	0.167	(0.31)	-0.222	(-0.52)
Observations	313	438	208	329				
Adjusted R-squared	0.118	0.151	0.121	0.161				
F	2.459	3.861	2.141	3.647				

t statistics in parentheses

Source: Financial Household Survey 2007. Central Bank of Chile

Econometric methodology: Ordinary Least Squares with robust standard errors.

* p<0.10, ** p<0.05, *** p<0.01

4.3.3 Probit Regression Results

The estimation results for the probit regression analysis for year 2007 are presented in Table 12. For the variables indicating households that belong to informal households, we find negative and significant results at the 1 percent level for the ILOD definition of informality (*infILOD*) and at the 10 percent level for the COMBD definition of informality (*infCOMBD*). In terms of the marginal effects for these estimations given the average value for the other independent variables, we find that households with informal workers have a between 8.31 and 9.13 percent

lower probability of saving than households with only formal workers.¹³ In the case of the PD definition, we do not find that the variable *infPD* is significant.

Table 12. Probit Saving Regression

Saving Rates Equations						
	Model ILOD		Model PD		Model COMBD	
SR5						
<i>infILOD</i>	-0.254***	(0.0814)				
<i>age</i>	-0.0353**	(0.0173)	-0.0194	(0.0164)	-0.0252	(0.0209)
<i>agesq</i>	0.000224	(0.000184)	0.000111	(0.000175)	0.000119	(0.000224)
<i>thincome</i>	0.000000305***	(5.02e-08)	0.000000114***	(3.48e-08)	0.000000305***	(5.78e-08)
<i>thincomesq</i>	-1.63e-14***	(2.98e-15)	-3.59e-15**	(1.65e-15)	-1.62e-14***	(3.32e-15)
<i>minc</i>	0.0797	(0.176)	0.0504	(0.158)	0.238	(0.219)
<i>mincsq</i>	-0.0411	(0.0361)	-0.0333	(0.0310)	-0.0754	(0.0471)
<i>empspo</i>	0.0553	(0.0892)	0.0911	(0.0834)	-0.00135	(0.107)
<i>mchild</i>	-0.235***	(0.0383)	-0.210***	(0.0358)	-0.257***	(0.0452)
<i>melderly</i>	-0.00720	(0.0842)	0.00933	(0.0787)	-0.00227	(0.104)
<i>secondary</i>	-0.137	(0.107)	-0.0625	(0.107)	-0.0572	(0.131)
<i>tertoruniv</i>	0.0198	(0.123)	0.139	(0.122)	0.0221	(0.154)
<i>postgraduate</i>	0.0473	(0.135)	0.317**	(0.131)	0.169	(0.163)
<i>bankacc</i>	0.245***	(0.0911)	0.310***	(0.0841)	0.262**	(0.105)
<i>gender</i>	-0.0757	(0.0713)	-0.0178	(0.0682)	-0.128	(0.0835)
<i>durgood</i>	0.514***	(0.0986)	0.522***	(0.0952)	0.475***	(0.114)
<i>hhretired</i>	0.0863	(0.136)	-0.00954	(0.128)	-0.0342	(0.168)
<i>infPD</i>			-0.163	(0.105)		
<i>infCOMBD</i>					-0.229*	(0.130)
Constant	0.382	(0.449)	-0.165	(0.423)	0.0290	(0.549)
Observations	1550		1672		1137	
Pseudo R-squared	0.136		0.117		0.149	

Standard errors in parentheses
 Source: Financial Household Survey 2007. Central Bank of Chile
 Econometric methodology: probit.
 * p<0.10, ** p<0.05, *** p<0.01

For the income variables *thincome* and *thincomesq*, we find similar results to the OLS results from last section. Household income and the probability of saving appear to have an inverted-U relationship, which means that the probability of saving is increasing to household income but at a decreasing rate. In the case of the age variables (*age* and *agesq*), we only find that it is significant at the 5 percent level for the ILOD definition but not for the other definitions, which means that we cannot establish a clear pattern for age and saving. For the household dependency ratio *mchild*, we find that households with children have a significantly lower probability of saving at the 1 percent level for all three informality definitions. In addition, we find a positive, and significant at the 1 percent level, relationship between the probability of saving and the variable *bankacc*, i.e., household heads that have a bank account. Note that this relationship was insignificant in the OLS estimations. The possession of durable goods

¹³ The calculations of the marginal effects are not presented due to space considerations but are available upon request from the authors.

(*durgood*) is positively and significantly related at the 1 percent level with the probability of saving. Note that we have not included the dummy variables that capture the motives for saving and their interaction with the informality variables because these variables and the dependent variable *SR5* are constructed from the same survey questions.

5. Robustness Tests

In this section we make several robustness tests in order to verify the stability and significance of our main results. The main robustness test was to estimate the same models but using the EFH surveys for 2008, 2009 and 2010. Note that while the 2007 survey considers urban households in the whole country, the other years consider only urban households from the metropolitan region of Santiago de Chile. In addition, for all these years we estimated the models using different subsamples of the data.¹⁴

In the case of the OLS estimation, we find that for 2008, 2009 and 2010, the informality variable is still negative and significant for 32 out of 36 different specifications, corroborating the main OLS results. In the case of the probit regressions, for 2008 we find that all the coefficients for the informality variables become insignificant. Further, for year 2009 we only find that the informality variable is negative and significant for the ILOD definition, but not for the PD and COMBD definitions. Note that we could not estimate the model for the year 2010 because the survey did not include the necessary questions to build the *SR5* definition of saving.

Regarding the OLS results when splitting the data between households that have positive saving rates and those that have negative saving rates, we confirm for 2008, 2009 and 2010 the baseline results. For the subgroup of positive saving rates, we find that in only 2 out of 36 specifications is the informality variable significant. For the rest of the specifications (34 out of 36), we find that the informality variable is insignificant. In the case of the subgroup of households with negative saving rates, we find that the informality variable is negative and significant in 10 out of 36 different specifications and that it is insignificant in 26 out of 36 specifications. These results confirm that it seems that informal households that dissave (with negative saving rate) that have the largest difference in terms of saving behavior with formal households. Note, however, that while most results for the split sample show a non-significant relationship between saving and informality, for the merged sample the results show a robust

¹⁴ We do not present the results due to space considerations but they are available from the authors upon request.

negative relationship between saving and informality. This fact may show that the sample size may be important and that more research is needed in order to draw further conclusions.

Another robustness check that we made was to estimate the OLS model for a subsample of observations that excluded households belonging to deciles 9 and 10, i.e., with high incomes. The rationale was to avoid possible distortions in the results by the saving behavior of self-employed high income earners that do not contribute to a pension plan, and thus are considered informal workers according to the ILOD definition, but may have a distinct behavior given their income levels.¹⁵ For the years 2007, 2008, 2009 and 2010, we found that the informality variable was significant in 10 out of 12 specification, 6 out of 12, 0 of 12 and 0 of 12, respectively. These results show that the negative relationship between the saving rate and the dummy variable is weakened when not considering high-income households. More research is needed, however, before drawing further conclusions because the sample size is considerably reduced, which generates doubts whether the weakening of the relationship is due to the elimination of higher-income households or due to the reduction in sample size. Note that the reduction in sample size is a consequence of the EFH survey being heavily focused on surveying higher-income households.

Additionally, we made a robustness test by including in the dataset those households that had both informal and formal workers. Recall that these households had been eliminated from the dataset. We treated these households as informal households. The main results regarding the difference between informal and formal households' saving behavior were maintained. However, although the coefficient for the informality dummy variable was negative and significant for all definitions of informality and all saving variables, the size of the coefficient diminished.

In terms of the other variables, our robustness tests, both for the OLS and probit regressions, indicate that the income variable, measured both as a continuous variable for the level of household income and a categorical variable for the relative position in the income distribution, is one of the most important and robust determinant of saving. On top of using the level of household income, we constructed several indicator variables capturing different income deciles, i.e., the relative position in the income distribution. The reason for using this dummy strategy is that, as Sandoval-Hernández (2011) points out, household income level and educational level are strongly correlated, which may imply the risk of facing multicollinearity.

¹⁵ Recall that contributing to a pension plan is not mandatory for self-employed in Chile until 2015.

Other variables that showed robust and significant results across the different robustness tests were the child dependency ratio (*mchild*), which had a negative relationship with saving, and the ownership of durable goods variable (*durgood*), which had a positive sign.

6. Conclusions

The purpose of this paper is to compare the saving behavior of formal and informal workers. Further, we provide a socioeconomic and financial characterization for these workers. We use the Financial Household Survey conducted by the Central Bank of Chile for the years 2007, 2008, 2009 and 2010 that covers between 1,740 and 2,533 urban households. For the saving variable we have used five different definitions and for the informality variable we have used three different definitions. In terms of the cross-section estimation methodology, we have used an OLS model and a probit model.

The regression results tend to indicate that informal households save less than formal households. Although this conclusion is robust to most specifications, there are some results that indicate a non-significant difference. We also find evidence that those informal households that in the survey questioner declare saving for precautionary motives have higher saving rates than the other informal households. In addition, we also find evidence that those informal households that report saving in order to buy durable goods or for retirement also have higher saving rates. Further, the estimation results for the other determinants of saving are in line with the literature on saving, being the most relevant determinant the income level. In addition, the descriptive data indicate that informal workers seem to have less access to financial services and possess less financial assets and liabilities.

Putting forward some tentative explanations for the differential behavior in terms of saving between informal and formal households, one possible explanation is that informal households are less risk averse than formal households. Thus, they prefer consuming a higher proportion of their income and have lower saving rates than formal households. It might be that informal households are more used to having short-term temporary jobs and a more variable income stream than formal households. Thus, this experience of living in a more volatile environment may end up influencing their risk aversion preferences. Note that our results do not support the hypothesis that informal households have higher saving rates than formal households due to precautionary saving given the higher variability of the income stream of informal

households. We find, however, support the idea that the saving rates of informal households that state that they save for precautionary motives is higher than other informal households.

In terms of policy implications, it seems that combating informality may not only improve the well-being of workers, but may also have positive consequences on the aggregate saving rate. However, we should be careful with this tentative conclusion as more research is needed, especially in terms of understanding why informal households save less than formal households. In addition, for Chile, it is evident that there is ample space to improve access to financial services among formal as well as informal workers.

References

- Alvarado Díaz-Romero, C. 2010. "Ahorros y Deudas: ¿Es un Puzzle Tener Ambos?" Santiago, Chile: Pontificia Universidad Católica de Chile. Master's thesis.
- Abdelkhalek, T. et al. 2010. "A Microeconomic Analysis of Households Saving Determinants in Morocco." *African Review of Money, Finance and Banking*: 7-27.
- Attanasio, O. 1998. "A Cohort Analysis of Saving Behavior by U.S. Households." *Journal of Human Resources* 33(3): 575-609.
- Attanasio, O. 1999. "Consumption." In: J.B. Taylor and M. Woodford, editors. *Handbook of Macroeconomics*. Amsterdam, The Netherlands: Elsevier.
- Attanasio, O., and M. Székely. 1998. "Household Saving and Income Distribution in Mexico." Research Department Working Paper 390. Washington, DC, United States: Inter-American Development Bank.
- Attanasio, O., and M. Székely. 2000. "Household Saving in Developing Countries—Inequality, Demographics and All That: How Different Are Latin America and South East Asia?" Research Department Working Paper 427. Washington, DC, United States: Inter-American Development Bank.
- Beckmann, E., M. Hake and J. Urvova. 2013. "Determinants of Households Savings in Central, Eastern and Southeastern Europe." *Focus on European Economic Integration* Q3/13: 8-29.
- Belke, A., C. Dreger and R. Ochmann. 2012. "Do Wealthier Households Save More? The Impact of the Demographic Factor." IZA Discussion Paper 6567. Bonn, Germany: Institute for the Study of Labor (IZA).
- Bennett, H., N. Loayza and K. Schmidt-Hebbel. 2000. "Un Estudio del Ahorro Agregado por Agentes Económicos en Chile." Documento de Trabajo 85. Santiago, Chile: Banco Central de Chile.
- Browning, M., and A. Lusardi. 1996. "Household Saving: Micro Theories and Micro Facts." *Journal of Economic Literature* 34(4): 1797-1855.
- Butelmann, A., and F. Gallego. 2000. "Household Saving in Chile: Microeconomic Evidence." *Journal Economía Chilena* 3(1): 5-24.
- Carroll, C. 1997. "Buffer-Stock Saving and the Life Cycle / Permanent Income Hypothesis." *Quarterly Journal of Economics* 112(1): 1-55.

- Carroll, C. 1998. "Why Do the Rich Save So Much?" NBER Working Paper 6549. Cambridge, United States: National Bureau of Economic Research.
- Carroll, C., and L.H. Summers, 1991. "Consumption Growth Parallels Income Growth: Some New Evidence." In: B.D. Bernheim and J. Shoven, editor. *National Saving and Economic Performance*. Chicago, United States: National Bureau of Economic Research / University of Chicago Press.
- Deaton, A. 1992. *Understanding Consumption*. Clarendon Lectures in Economics. Oxford, United Kingdom: Oxford University Press.
- Deaton, A. 2005. "Franco Modigliani and the Life Cycle Theory of Consumption." *Banca Nazionale del Lavoro Quarterly Review* 58(233-234): 91-107.
- Denes, A. et al. 2011. "El Uso Simultáneo del Crédito Formal, Informal y el Desahorro: Explorando el Comportamiento Financiero de los Hogares en Argentina." Documento de Trabajo 51. Buenos Aires, Argentina: Banco Central de la República Argentina.
- Dupas, P., and J. Robinson. 2013. "Why Don't the Poor Save More? Evidence from Health Savings Experiments." *American Economic Review* 103(4): 1138-71.
- Friedman, M. 1957. *A Theory of Consumption Function*. Princeton, United States: Princeton University Press.
- Granda, C., and F. Hamann. 2014. "Informality, Savings and Wealth Inequality in Colombia." Working Paper IDB-WP-575. Washington, DC, United States: Inter-American Development Bank.
- Gutiérrez, M. 2007. "Savings in Latin America after the Mid 1990s: Determinants, Constraints and Policies." Serie Macroeconomía del Desarrollo 57. Santiago, Chile: Economic Commission for Latin America and the Caribbean.
- Harris, M., J. Loundes and E. Webster. 2002. "Determinants of Household Saving in Australia." *Economic Record* 78: 207-223.
- Kanbur, R. 2009. "Conceptualizing Informality: Regulation and Enforcement." IZA Discussion Paper 4186. Bonn, Germany: Institute for the Study of Labor (IZA).
- Lorenzo, F., and R. Osimani. 2001. "Alternativas de Política para Fortalecer el Ahorro de los Hogares de Menores Ingresos: El Caso de Uruguay." Serie Financiamiento del Desarrollo 110. Santiago, Chile: Economic Commission for Latin America and the Caribbean.

- Madeira, C. 2011. "Computing Population Weights for the EFH Survey." Santiago, Chile: Banco Central de Chile. Mimeographed document.
- Maurizio, R. 2012. "Labour Informality in Latin America: The Case of Argentina, Chile, Brazil and Peru." Brooks World Poverty Institute Working Paper 165. Manchester, United Kingdom: University of Manchester.
- Modigliani, F. 1986. "Life Cycle, Individual Thrift and the Wealth of Nations." *American Economic Review* 76(3): 297-313.
- Modigliani, F., and R. Brumberg. 1954. "Utility Analysis and the Consumption Function." In: K. Kurihara, editor. *Post Keynesian Economics*. New Brunswick, United States: Rutgers University Press.
- Ogbuabor, J.E., V. A. Malaolu and I.C. Mba. 2013. "Informality and Domestic Savings in Nigeria: Lessons from Time Series Analysis." *International Journal of Development and Economic Sustainability* 1(3): 24-32 September 2013.
- Perticara, M., and P. Celhay. 2010. "Informalidad Laboral y Políticas Públicas en Chile." ILADES-Georgetown University Working Paper 257. Washington, DC, United States and Santiago, Chile: Ilades-Georgetown University, Universidad Alberto Hurtado/School of Economics and Business.
- Pérez Monteiro, M., P. Cavalcante Ferreira and L. Radusweski Quintal. 2014. "The Latin American Saving Gap." Working paper presented at the Anais do XL Encontro Nacional de Economia, Ingá Niterói, Brazil.
- Reinhardt, N. 2008. "The Conundrum of Low Saving Rates in Latin America." *Development Policy Review* 26(6): 727-744.
- Repetto, A. 2001. "Incentivos al Ahorro Personal: Lecciones de la Economía del Comportamiento." Documento de Trabajo 103. Santiago, Chile: Universidad de Chile, Centro de Economía Aplicada.
- Sandoval-Hernández, J. 2011. "Household Saving Behavior in Mexico: Evidence from Cross-Sectional Analysis and Synthetic Panels." Santa Cruz, United States: University of California, Santa Cruz. Available at:
<http://sandovalhernandezj.people.cofc.edu/Household%20saving%20behavior.pdf>
- Solon, G., S. Haider and J. Wooldridge. 2013. "What Are We Weighting For?" NBER Working Paper 18859. Cambridge, United States: National Bureau of Economic Research.

- Tornarolli, L. et al. 2014. "Exploring Trends in Labor Informality in Latin America, 1990-2010."
CEDLAS Documento de Trabajo 159. La Plata, Argentina: Universidad Nacional de la
Plata, Centro de Estudios Distributivos Laborales y Sociales.
- Xiao, J. 1996. "Effects of Family Income and Life Cycle Stages on Financial Asset Ownership."
Financial Counseling and Planning 7: 21-30.