UNIVERSIDAD DE CHILE
FACULTAD DE CIENCIAS FÍSICAS Y MATEMÁTICAS
DEPARTAMENTO DE INGENIERÍA INDUSTRIAL

FERTILITY AND HOUSEHOLD SAVINGS: THE CASE OF CHILE

TESIS PARA OPTAR AL GRADO DE MAGISTER EN ECONOMÍA APLICADA
MEMORIA PARA OPTAR AL TÍTULO DE INGENIERIO CIVIL INDUSTRIAL

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SANTIAGO DE CHILE
ENERO 2016

RESUMEN DE LA TESIS PARA OPTAR
AL GRADO DE MAGISTER EN ECONOMÍA APLICADA
Y AL TÍTULO DE INGENIERO CIVIL INDUSTRIAL
POR: **FERNANDO JOSÉ BRITO GONZÁLEZ**
FECHA: ENERO 2016
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There is consensus among economists and policy makers that higher saving rates foster domestic investment and economic growth. Therefore, understanding the determinants of savings is a fundamental concern for economic development. Consistent with the life-cycle hypothesis, one of the key determinants of savings is demographics. The decline in fertility and the forthcoming population aging, particularly in emerging economies, have the potential to reshape age structure and affect domestic savings. Thus, exploring the dynamics of demographics plays a central role in the study of the main determinants of household savings.

This study estimates the impact of the quantity of children on household savings. To explore this issue, this paper employs Chilean cross-sectional micro-data from the Household Expenditure Survey (waves 1987, 1997, 2007 and 2012). A main problem in the study of the relationship between the number of children and household savings is endogeneity. The number of children is likely to affect household savings, but the reverse causal effect may also be true. The household data set used in this study not only allows us to control for attributes at households level, but also to deal with potential endogeneity. Specifically, this paper contributes to the literature on the demographic-savings nexus using an Instrumental Variable approach to avoid potential endogeneity biases.

Specifically, this study exploits the fact that sex sibling composition generates an exogenous variation of the household's quantity of children. Consistent with the idea that Chilean parents prefer balanced sex ratios in their family composition, this study cannot reject the null hypothesis that the sex sibling composition of the first two children significantly affects the probability of having a third child. Another advantage of this instrument is that the sex of a child is randomly determined. Thus, an instrumental variable constructed from the sex sibling composition proves to satisfy both the relevance and exclusion conditions.

Studies that do not take into account potential endogeneity problems found little effect (see, e.g., [Harris et al., 2002] or [Gallego and Butelmann, 2001]). However, once we deal with potential endogeneity, this paper finds that the effect of the number of children on household savings is statistically significant and economically meaningful. This study finds an average effect of -13.98%. This effect is progressive in the sense that it is small for the poor (-8.05%) and large for the rich (-18.29%).

The main conclusion of this paper is that the demographic transition increased average savings rates in Chile. Specifically, while parents (of all socioeconomic segments of population) begun to have less children and postponing parenting they automatically decreased household's consumption and via labor offer they also increased household's income. Additionally, they had an important precautionary motive for increasing savings rate. Increased savings rates due to fertility trends, however, was mostly observed among the rich. This show us how much can be gained from well run public policies targeted to the poor. Governmental aid that not only provides basic goods and services to reduce marginal propensity to consume, but also that promotes basic financial education to make young people conscious on the consequences of their consumption lifestyles, can have a dramatic positive effect and can help to match up opportunities.

A mi familia.

Acknowledgements

The long period that concludes with this thesis work was only possible thanks to the continuous support of my family and Rosario; also, to the trust and dedicated guidance of professor Patricio Valenzuela; to the time and comments from the members of my thesis committee; and finally, to the joy and the endurance that I found in my friends in MagCEA.

La larga etapa que concluye con este trabajo de tesis, solo fue posible gracias al continuo apoyo de mi familia y de Rosario; a la confianza y dedicada guía del profesor Patricio Valenzuela; a la disposición y comentarios de los miembros de mi comisión de tesis; y finalmente, a la alegría y al aguante que encontré en mis amigos y amigas en el MagCEA.

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Section 1

Introduction

The world has experimented a set of revolutionary demographic shifts during the second half of the XX century[1]. By far, the most cited stylish fact is the decline of the fertility rate worldwide. The most outstanding examples, however, have occurred in developing regions such as Eastern Asia and in Latin America and the Caribbean. For instance, early in the 1960s, Chilean fertility rate was 5.5 children per woman; but during the forthcoming decades, it rapidly decreased and placed below the replacement rate of 2.1 children per woman.

As a result, demographic ratios dropped, affecting labor markets and capital markets. Many economists coincide that households reacted to the decline in the fertility rate by incrementing their savings rates. However, they have disagreed on the magnitude of this substitution. Examples of this discussion can be found in [Schultz, 2005] and [Székely and Attanasio, 2000].

The main hypothesis to explain this substitution is the hypothesis of **the old-age security**, which states that childlessness encourages precautionary savings. As long as children are able to provide altruistic support to their parents, they are a kind of security asset. Parents gain underlying protection against negative events when they have children, because children can do some task at house, can contribute to household budget when they grow up and they can even strengthen retirement pension for their parents in old-age. According to this idea, parents need to increment precautionary savings to offset the impact of having one child less.

The interest of this work is to explore the relation between the quantity of children that parents decide to raise and the savings rate they decide to maintain, for the case of Chile. Two challenges were accepted: first, this work used cross-sectional micro-data to control for attributes at households level, which could not be possible otherwise; and second, unlikely most of the studies on this matter, this work didn't ignore the recent discussion about possible problems of endogeneity. Rather, endogeneity was considered in and properly avoided with an Instrumental Variable method of estimation.

This work is ordered as follow. First section presents a review of recent literature on the matter and on the possible problems of endogeneity. Second section introduces the econometric framework of the instrumental variables method of estimation and justifies the use of sibling sex compo-

[1] a brief characterization is presented in **Annex A.1**

sition as a valid start point to construct instrumental variables. Third section shows the data used in this work and fourth section presents the model estimated. Fifth section reports the instruments validation and the estimation results. Finally, sixth section shows the main conclusion of this work.

Additionally, two brief notes are included: first, **Annex A** characterizes the Demographic Transition and **Annex B** characterizes Chilean household savings.

Section 2

Literature Review

2.1 Empirical Findings

Literature on savings is vast and mature in macroeconomic terms of study, however the literature of the same topic is still ongoing and controverted at a household scale of analysis. Although interesting, to try to reconcile these controversies is not the purpose of the present work. Rather, the goal is to contribute to the better understanding of one of the most cited key determinant of the household savings: the parents' fertility choices. Supported by recent contributions to the empirical literature on this matter, this work aim to establish causality between the quantity of children that parents decide to raise and the savings rate they decide to maintain, once all other commonly cited effects have been controlled.

In general terms, empirical literature is divided in the study of aggregated household savings and in the study of disaggregated household savings.

For aggregated household savings, [Browing and Lusardi, 1996] provide a comprehensive review of recent literature and [Schmidt-Hebbel et al., 1992] present a complete characterization of savings in developing countries. They agree in the equal relevance of the discount factor, real interest rate, variation in consumption, liquidity constraint and the fertility rate among the main determinant of household's savings rate. However, many other authors have lately given greater importance to the fertility rate determinant. Examples of these works are [Lee, 2003], [Williamson, 2013], [Taylor, 1995], [Bloom et al., 2010] and [Bloom and Williamson, 1998]. They explore the effect of demographic shifts, specifically referring to fertility rates, on public and private savings, and all of them agree with the conclusion of the seminal paper of [Leff, 1969]: there is a negative relation between the quantity of children in a household and the household savings, being this relation at the same time statistically significant and economically meaningful.

Similar studies have been done for every specific region cross-country panel-data in the world obtaining mixed results. While the relation holds very closed to what it is expected in the case of Eastern Asian countries, findings for Latin America and the Caribbean are, with salient exceptions, not conclusive. [Schultz, 2005] and [Székely and Attanasio, 2000].

On the other hand, for disaggregated household savings, recent country-specific studies support the conclusion of [Leff, 1969]. These studies, however, are commonly run where and when specific high-quality data is available. In general, developed economies show a negative relation between the quantity of children and the household savings as expected. Some works, such as [Browing and Lusardi, 1996], [Eizenga, 1961] and [Smith and Ward, 1980], reported that savings rates are high for childless couples, lower for households with children and lowest among single-parents in the US. [Harris et al., 2002] shows same negative relation for the case of Australia. [Cigno and Rosati, 1996] found similar results for Germany, Italy, UK and USA. Also, [Musgrove, 1978] reported that the relation between the quantity of children and households savings rate is positive for Peru and Venezuela, but negative for Chile, Equator and Colombia (average effect was a decrease of -1.5% er additional child). Also, [Chhoedup, 2013] found a negative relation in Bhutan, [Tehman et al., 2010] in Pakistan and [Orbeta, 2005] in the Philippines. In the same sense, [Kleinbaum and Mason, 1987] found that the relation is negative for Thailand and Korea (average effect was a decrease of -2% per additional child).

For the case of developing economies, specific high-quality data is not easy to survey and is available only for some particular years, therefore this kind of studies are scarce, with salient exceptions like Chile. A complete characterization of Chilean household savings was made by [Huneeus, 2001], [Bennet et al., 2000] and [Gallego and Butelmann, 2001]. Also, a brief note can be found in **Annex B.3**.

2.2 Causality

One of the most documented hypothesis to explain why the quantity of children in a household and the household savings is negatively related is the hypothesis of **the old-age security**. The hypothesis of the old-age security is based on the idea that children are a sort of security asset, since they provide altruistic support to their parents. Specifically, parents gain underlying protection against negative events when they are not childless, for instance: younger children can work in home productive activities and older children can also directly contribute to expand the household budget if they work. Moreover, when they are adults, they can even strengthen retirement pension for their parents or personally take care of them in old-age.

[Nugent, 1985] argue that hedging against risk *"is likely to be an important motive for fertility when the relevant parent is both uncertain about his or her ability to be self-supported in old age and dubious that there are other more reliable or more effective means of such support than his or her own children"*.

Some examples of works supporting this hypothesis are [Willis, 1980], [Nerlove et al., 1987], [Neher, 1971], [Cain, 1983], [Jensen, 1990] and [Nugent, 1985].

2.3 Endogeneity

According to specialized economists, when exploring the relation between the quantity of children and the household's savings rate, discussion should include possible problems of endogeneity.

Endogeneity may exist due to reverse causality, specifically because causality can be reasonably established in both direct and reverse direction. In simple words, the number of children is likely to affect household savings because children play a security asset role substituting parent's precautionary savings, according to the hypothesis of **the old-age security**, [De Vos, 1985]. So the relation may be negative. However, the reverse causal effect may also be true: parents with higher savings expand their budget constraint and therefore they can afford having an additional child. Considering this the relation may be positive.

Not taking into account possible problems of endogeneity can be harmful, because if the positive effect offsets the negative effect, it can be wrongly concluded that the relation is small or close to nonexistent.

Section 3

Methodology: Instrumental Variables

3.1 Framework

The use of Instrumental Variables (IV) is the empirical research's corner stone to deal with endogeneity issues. This section explains briefly the standard econometric framework of the IV method.

Let's be a generic linear model,

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_k x_k + u$$

Where u is an unobservable error term. Only if $\text{cov}(x_j, u) = 0, \forall j$, the variation of the dependent variable is fully explained by the variation of the explanatory variables in the model. This ideal property, however, hardly holds in the real world. Almost always we found arguments to believe that $\text{cov}(x_k, u) \neq 0$ for some k. In this case, there is some degree of endogeneity in variable k, which means that not all of the variation of the dependent variable is explained by the variation of the explanatory variables, but some part is explained by the variation of the unobservable error term too. [Roberts and Whited, 2012] calls this *bad* variation, because in presence of endogeneity and under any (direct) method of estimation, it delivers biased estimators.

An instrumental variable is a variable z capable to replace the endogenous explanatory variable x_k in the model. A candidate to instrumental variable must satisfy two conditions: the relevance condition and the exclusion condition. First, the relevance condition requires the correlation between z and x_k be different from zero. Second, the exclusion condition requires the correlation between z and u be equal to zero. According to [Roberts and Whited, 2012], if both conditions are satisfied, then the instrumental variable only influences the outcome y through its effect on the endogenous explanatory variable, x_k.

Testing whether the relevance condition is satisfied (or not) is easy and most of the available econometric software comes with a pro toolkit to do statistical inference. However, testing whether the exclusion condition is satisfied (or not) is not possible, since the error term is unobservable, and must be conducted in a purely conjectural way. [Roberts and Whited, 2012] argues that the only way to ensure that the exclusion condition is satisfied is understanding the underlying economics

of the particular question and being capable to respond: *Does the instrumental variable affect the outcome only via its effect on the endogenous explanatory variable?* Sometimes the answer is not straightforward and it is needed to proceed with a case-by-case analysis, addressing every concern in literature referring to the question [Galiani and Cruces, 2007].

The IV method consists in estimating a two-stage linear model. In the first stage, the endogenous variable x_k is the dependent variable and all the instrumental variables plus all the explanatory variables are the independent variables, as follows:

$$x_k = \alpha_0 + \alpha_1 x_1 + ... + \alpha_{k-1} x_{k-1} + \alpha_k z + v$$

In the second stage, the original dependent variable y is teh dependent variable and all the original explanatory variables are the independent variables, but replacing x_k with $\hat{x}_k$, the predicted value of the endogenous variable obtained from the first step:

$$y = \gamma_0 + \gamma_1 x_1 + ... + \gamma_{k-1} x_{k-1} + \gamma_k \hat{x}_k + w$$

The intuition behind estimating the model in two stages is to try to separate the *good* variation of y from the *bad* variation of y.

Instrumental variables that satisfies the relevance condition only with a low degree of confidence are known as *weak* instruments. [Murray, 2006] and [Angrist and Krueger, 2001] argue that using weak instruments can be worse than using none. So, this work will follow the more common criteria established by empirical researchers in this matter: if the F-statistic of the first-stage is larger than 10, the instruments are considered strong enough, [Stock and Yogo, 2005], [Bound et al., 1995] and [Levitt, 2002].

3.2 Sibling Sex Composition

Recall the interest of this work is to explore the relation between the quantity of children that parents decide to raise and the savings rate they decide to maintain. Endogeneity is included in discuss because both decisions are conjointly made, [Cigno and Rosati, 1996]. To deal with endogeneity an instrument that satisfy both relevance and exclusion condition is required.

[Roberts and Whited, 2012] argues that good instruments come from biological or physical events, but sometimes also from unpredictable institutional changes. However, such kind of instruments is hard to find. This works will follow [Angrist, 1998], [Galiani and Cruces, 2007], [Orbeta, 2005] and [Chun and Oh, 2002].

[Angrist, 1998] suggests exploiting the sibling sex composition as an exogenous variation of the quantity of children desired by parents. [Angrist, 1998] observed that American parents have preferences about the sex ratio of their children, being balanced sex ratios more preferred than unbalanced sex ratios. [Angrist, 1998], [Galiani and Cruces, 2007] and [Orbeta, 2005] argue that parents of same-sex children are more likely to have an additional child. While findings in [Angrist, 1998] hold only for US parents, [Galiani and Cruces, 2007] extends validation for the case of Argentina and Mexico, [Orbeta, 2005] for the case of Philippines and [Chun and Oh, 2002] for the case of

South Korea. As far as it's known, there's no published study exploring this matter for the case of Chile.

As long as these findings hold for the Chilean case, a dummy that takes value 1 when the first two children are of same sex becomes a valid instrument the quantity of children that parents decide to raise.

Key advantage of exploiting the sibling sex composition is that it's a biological outcome determined by chance. In this sense, is straightforward that the savings rate that parents decide to maintain can't cause sibling sex composition, which is a desired property. Rejecting that the sibling sex composition doesn't determine the savings rate that parents decide to maintain, however, is less easy. It's required to proceed in a case-by-case basis.

The main concerns on the non exogeneity of sibling sex composition are well documented in literature. First, [Rozenweig and Wolpin, 1980] found some scale-economies in India: the cost of children depends on sex composition, since parents are able to reduce expenditures on clothes and footwear when their children were the same sex. The difference in expenditures levels, explained by sex composition, may affect decisions on savings rate and in that case sex composition is no longer exogenous. However, [Galiani and Cruces, 2007] argues that such scale-economies are associated to poor economies where expenditures on those items are a relevant percentage of the total expenditure. Fortunately, this isn't a concern in the case of Chile. According to the Institute of National Statistics, in the 1990s, infant clothing plus foot wearing represented just a 1% of the total expenditure; and early in 2010s, same items represented only 0.8% of total expenditure. These percentages are low when comparing with data for India, where same items represented 11% of total expenditure, [Rozenweig and Wolpin, 1980].

Second possible concern is argued by [Basu and Das Gupta, 2001]. In traditional cultures, parents balance spending in favor of sons and in detriment of daughters. This can be observed, for instance in school enrollment and subsequent educational attainment. However, traditional *son preference* implies a kind of discrimination that isn't observed in Latin American economies, [Galiani and Cruces, 2007].

Third possible concern is about selective abortion, like in China or India. If selective abortion exists, then the gender of the forthcoming children is not assigned only by chance, but assigned by parent's preferences or by Government's regulation too. However, at the beginning of the year 2015, Chile remains as one of the four countries in the world where abortion is still considered a criminal offense without exception. Moreover, documented motivations to look for an out-of-law abortion does not include gender preferences of parents.

The fulfillment of the exclusion condition will be assumed true, as long as there are no other major concerns in literature, about the non-exogeneity of the sibling sex composition.

3.3 Abortion Legislation in Chile

At the beginning of the year 2015, Chile remains as one of the four countries in the world where abortion is still considered a criminal offense without exception.

Chile is a democracy since 1990, however no legal changes has been introduced after the military dictator Augusto Pinochet banned therapeutic abortion just before leave power. It is a fact that current abortion laws do not fully represent the opinion of Chilean citizens, notwithstanding both the political Right and the political Left in Congress have stopped all attempts of reforming them for the last 25 years, [Palermo et al., 1980].

According to several sociologists and political scientists, the main explanation for this state is the underlying influence that the Catholic Church and the Chilean elite has over Congress and which uses to promote a severe conservative moral agenda since 1990. Examples of this underlying influence include the ownership of massive media channels (such as newspapers, radio stations and television studios), the direction of private universities, of private schools, of private strategic firms, of think tanks and of other civil society organizations, and in last instance, the funding of political campaigns of the Right-wing and of the Left-wing candidates, [Blofield, 2013].

As a result of this moral agenda, public policy was designed in order to *protect the life of the unborn*. In theory, no private nor public hospital in Chile provides abortion services, no matter the method nor the circumstances. No doctor nor nurse is allowed to offer abortion services at patient's home neither. The stipulated penalty goes from three to five years of imprisonment for having an abortion and goes from one to three years for performing an abortion. In general terms, a rigorous law enforcement exists.

In recent years, discomforted new generations of Chileans had strongly criticize the current abortion law, pointing to the need of a modern and legit agenda on womenâs sexual rights. Of course, discomfort points not only to gender issues but to discrimination and poverty issues too. For example, early the decade of 1990, out-of-law procedures of abortion, which are not professionally assisted, varied from USD$50 to USD$200 depending dramatically on the level of risk assumed by the patient, being the cheaper the riskier, [Casas-Becerra, 1997]. In this sense, law enforcement is skewed to the poor. In practice, poor mothers that can not afford a safe abortion abroad nor pay for doctor's complicity in Chile, are forced to look for high-risk methods putting themselves under mortal threat. For this reason, they are more likely to be entered in a public emergency room and automatically reported to the police.

Only at the end of 2015, socialist President Michelle Bachelet managed to get approved by Congress a reform that includes three exception to the current birth control policies. These exceptions imply that abortion will not be punished if continuing with the pregnancy means mortal risk for the mother, if the pregnancy is because the mother was victim of rape, or if there is medical certainty that the fetus will not survive the pregnancy period.

[Casas-Becerra, 1997] have characterized the main motivations to look for an out-of-law abortion in Chile, suggesting that more important than labor issues and poverty issues, there are health issues. Mothers look for an abortion to protect their health, their lives and the well-being of the rest of their families. Motivations does not include gender preferences neither, as in selective abortion in China or India, [Casas-Becerra, 1997]. This result is very important in this work, since it proves that the gender of the forthcoming children is truly and only assigned by chance.

Section 4

Data

4.1 Household Expenditure Survey

Data used in this work comes from the Household Expenditures Survey[1] designed and applied by the Chilean Institute of Statistics[2]. Among all large-scale cross-sectional surveys in Chile, the Household Expenditures Survey (HES) provides the most disaggregated and accurate measure of household expenditures. Also, the expenditure survey is complemented with an income survey, which includes questions about taxes, government's aids and demographics such as age, sex, education, labor status, etc.

The following definitions are very useful to easily understand the framework of this work.

Definition 4.1 *the **household disposable income** is the sum of its members' disposable income. A member's disposable income is him or her monthly income minus taxes, plus transfers and minus mandatory contribution to social security.*

Definition 4.2 *the **household savings** is the gap between household expenditure and household disposable income . As percentage terms are preferred over absolute terms, dividing by the household disposable income results convenient. So, the **household savings rate** is computed as:*

$$S_i = \frac{\sum_{j=1}^{J(i)} \left(I_{i,j} - E_{i,j}\right)}{\sum_{j=1}^{J(i)} I_{i,j}} \times 100$$

Where $I_{i,j}$ and $E_{i,j}$ are the disposable income and the expenditure of member j in household i, correspondingly.

Definition 4.3 *an **poly-nuclear household** is a household that includes not only children and their parents, but also uncles, aunts, cousins, grandparents, grandsons or other kin. A household that isn't classified as poly-nuclear is referred as **mono-nuclear household**.*

[1] conveniently translated from: *Encuesta de Presupuestos Familiares.*
[2] conveniently translated from: *Instituto Nacional de Estadisticas.*

Definition 4.4 *a **single-parent household** is a household that fails to report one of the two parents. A household that isn't classified as single-parent is referred as **bi-parental household.***

Definition 4.5 *a **small household** is a household with just one child or childless. A household that isn't classified as small is referred as **large household.***

For theoretical and methodological concerns, the latest four editions of HES were pooled. These editions are from 1987, 1997, 2007 and 2012. Year-dummies {*d1987, d1997, d2007, d2012*} were added accordingly.

From this pooled database, poly-nuclear households were deliberately omitted, because savings decisions aren't centralized in one member. Indeed, consumption and savings decisions within poly-nuclear household are a result of a complex and unclear bargaining game. In order to stay in the mainstream framework and for simplicity, this work considers only mono-nuclear households.

Single-parent households and bi-parental households are analyzed separately. Given that single-parent households are commonly sustained by women and are more exposed to income shortfalls, it would be incorrect treating them as similar to bi-parental household.

In order to construct the instrument suggested in the previous section, the same-sex dummy, it is required to restrict analysis to only those households with at least two children already born. This is an undesired limitation, indeed, because small households are expected to be a clear majority of total households in next decades and because the effect of the quantity of children on household savings is expected to be stronger in small households. Fortunately, the pooled database is large enough to make analysis possible even after dropping small households.

According to the life-cycle hypothesis, households whose head is in working ages are net savers while households whose head is in old-ages are net *dis-savers*. This work considers that the key incentives for having savings can vary close to retirement, and therefore, analysis focuses exclusively on young household heads for simplicity. A household head is considered young as long as is younger than 50 years old.

After these considerations, the sample size of each edition of HES and the pooled database are shown in **Table 7.1**.

4.2 Descriptive Statistics

Database includes the following variables at household level: savings rate (in percentages), mean disposable income (in logs), quantity of children, sex of the household head (dummy that takes value 1 iff male and takes value 0 otherwise), age of the household head (categorical dummies, 5-year groups), educational attainment of the household head (categorical dummies, from 0 to 4), labor status of the household head (dummy that takes value 1 iff employed; and take value 0 otherwise). Descriptive statistics are shown in **Table 7.5** only for large households and in **Table 7.6** for all households.

Educational attainment groups are: Primary Uncompleted, Primary Completed, Secondary Com-

pleted and University Completed. Age groups consist in 5 years each, from 1 to 15, and the 16^{th} group include household heads older than 75 years old.

A brief uni-variate analysis of the pooled database shows that household savings rate decreases with the quantity of children (**Figure 7.10**) and increases with the educational attainment (**Figure 7.11**), age (**Figure 7.12**) and income (**Figure 7.13**). Also, bottom groups of educational attainment, age and income are associated with a high dispersion of the savings rate, different from other groups of these variables. Women save slightly more than men (**Figure 7.14**). Finally, being unemployed has a negative impact on savings rate: mean value is lower (and dispersion is higher) than when employed, as shown in **Figure 7.15**).

In order to construct the instrument, there are some additions: a dummy s_{i}^{1} that takes value 1 iff the first-born of household i is a male, and takes value 0 otherwise; a dummy s_{i}^{2} that takes value 1 iff the second-born of household i is a male, and takes value 0 otherwise; and the dummies resulting from the combination of s_{i}^{1} and s_{i}^{2}, as follows:

Definition 4.6 *the **two-girls dummy** takes value1 iff the first two children are girls, and takes value 0 otherwise. It is computed as follows:*

$$\boldsymbol{dmatch}_i^g = (1-s_i^1)(1-s_i^2), \forall i$$

Definition 4.7 *the **two-boys dummy** takes value1 iff the first two children are boys, and takes value 0 otherwise. It is computed as follows:*

$$\boldsymbol{dmatch}_i^b = s_i^1 s_i^2, \forall i$$

Definition 4.8 *the **same-sex dummy** takes value1 iff the sex of the second-born child matches the sex of the first-born child, and takes value 0 otherwise. It is computed as follows:*

$$\boldsymbol{dmatch}_i = \boldsymbol{dmatch}_i^b + \boldsymbol{dmatch}_i^g, \forall i$$

Section 5

Model

This work uses a two-stage linear regression model to deal with potential problems of endogeneity. The linear regression of first stage places the quantity of children as dependent variable and the IV set plus the explanatory variables set as independent variables. The first-stage model's coefficients are estimated by Generalize Method of Moments (GMM) and they are used to predict the quantity of children. The first-stage model is characterized as follows:

$$\mathbf{fert}_{\mathrm{i}} = \alpha_0 + \sum_{h=1}^{H} \alpha_h \mathbf{IV}_{\mathrm{i}}^{h} + \sum_{k=2}^{K} \alpha_{k+H-1} \mathbf{EV}_{\mathrm{i}}^{k} + \mu_{\mathrm{i}} \tag{5.1}$$

Where $\mathbf{fert}_{\mathrm{i}}$ is the observed quantity of children in household i and $\{\mathbf{IV}_{\mathrm{i}}^{h}\}_{h=2}$ is the instrumental variables set. Notice that H is the number of available instrumental variables, so in the case of using only **dmatch**, then H=1. However, following [Levitt, 2002] this main instrumental variable, **dmatch**, is interacted with the gender of the children, g_{i}^{1}, to capture the gender specific effect and with the year dummies, $\{\mathrm{d1987}, \mathrm{d1997}, \mathrm{d2007}, \mathrm{d2012}\}$, to capture the year specific effect of the coincidence in children's gender. Thus, the number of instrumental variables increases to $H = 8$.

The linear regression model of the second stage places the household savings rate as dependent variable and the predicted quantity of children $\mathbf{p.fert}_{\mathrm{i}}$ and the explanatory variable set as independent variables. Again, the coefficients are estimated by Generalize Method of Moments (GMM). The second-stage model is characterized as follows:

$$S_{\mathrm{i}} = \beta_0 + \beta_1 \mathbf{p.fert}_{\mathrm{i}} + \sum_{k=2}^{K} \beta_k \mathbf{EV}_{\mathrm{i}}^{k} + \varepsilon_{\mathrm{i}} \tag{5.2}$$

Where S_{i} is savings rate and $\{\mathbf{EV}_{\mathrm{i}}^{k}\}_{h=2}$ is the explanatory variable set of households i.

In order to make useful comparisons, an alternative and much more simple regression model is also estimated:

$$S_{\mathrm{i}} = \gamma_0 + \gamma_1 \mathbf{fert}_{\mathrm{i}} + \sum_{k=2}^{K} \gamma_k \mathbf{EV}_{\mathrm{i}}^{k} + \omega_{\mathrm{i}} \tag{5.3}$$

Where S_{i} is savings rate and $\{\mathbf{EV}_{\mathrm{i}}^{k}\}_{h=1}$ is the explanatory variable set of households i. Notice that instead of the predicted quantity of children, $\mathbf{p.fert}_{\mathrm{i}}$, this model uses the observed quantity of children, $\mathbf{fert}_{\mathrm{i}}$.

This last is the more common strategy of not taking into account (or ignoring) potential problems of endogeneity, which as explained in the past sections, delivers biased coefficients.

Section 6

Results

The probability of having an additional child after having two same-sex children is compared with the *contrafactual* having two different-sex children. As shown in **Table 7.3** the probability of having no more children decreased 3%, the probability of having one additional child increased 3% and the probability of having two additional children or more remained unaltered.

When the whole sample is separated according to the value of **dmatch** in two sub-samples, let's say sub-sample A including all parents of same-sex children and sub-sample B including all parents of different-sex children, the *Tests of Difference of Means* tests the null hypothesis formulated as: the mean quantity of children in sub-sample A is equal to the mean quantity of children in sub-sample B. The test of means is applied not only for the quantity of children, but also for other relevant variables. To prove that the relevance condition is satisfied, a test of differences of means is applied on all households, and then only on single-parent households and finally only on bi-parental households. Results are shown in **Table 7.8**, **Table 7.9** and **Table 7.10** correspondingly. If the difference of means is nonzero and it's statistically significant, then the guess of that **dmatch** has an effect is assumed true. The expected result is that **dmatch** has an effect on the quantity of children, but has no effect for other relevant variables.

Results from **Table 7.8** and **Table 7.9** suggest that only **fert** appears to be affected by **dmatch**, in effect, the null hypothesis is be rejected at 95%. For the rest of the variables, even when the difference of means isn't close to zero, the test fails to reject the null hypothesis at 90%, and therefore such difference of means isn't statistically significant. So, expected results are met.

These results don't hold, however, for single-parent households. When the test is applied on this sample, it fails to reject the null hypothesis at 95% for all variables, **fert** included. A sensible interpretation is that for single-parents, preference for balanced sex-ratios is weak or null. Another limitation comes from the sample size, which isn't large enough to do analysis. Sub-sample A has only 645 observations and sub-sample B has only 673 observations. In fact, even if the preference for balanced sex-ratios were strong, estimators would be severely biased due to sample poverty. This limitation can't be avoided, since it's a fact that single-parents with two or more children are a minority and this sample doesn't hold any additional disaggregation.

To hold reliance on analysis, the model is estimated using only bi-parental households. Estima-

tion results based fully o partially on single-parent households are not expected to be reliable, since the instrument, **dmatch**, is only weakly correlated with the endogenous explanatory variable, **fert**.

6.1 Estimation Results

The model is estimated using all bi-parental households. The sample is separated in Thirds, namely Bottom Third, Middle Third and Top Third, to study the possible differences between income groups. Estimation results, therefore, are presented in **Table 7.11** for all thirds of income together, in **Table 7.12** for the bottom third; in **Table 7.13** for middle third; and in **Table 7.14** for top third.

"All-Thirds-Together" Sample

The *all-thirds-together* sample consists in 7,138 observations. Column labeled as **OLS** shows the estimation results for the traditional model (see eq. (5.3)), which dependent variable is the household savings rate. Estimation results suggest that the relation between the quantity of children and household savings rate is close to zero and not statistically significant at 90%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is statistically significant and positive. Although, the magnitude of this effect remains low except for the oldest group. Finally, variable sex is statistically significant and suggests that women have higher savings rate than men.

Column labeled as $\mathbf{IV}_1$ shows the results of the first-stage of the instrumental variable estimation (see eq. (5.1)), which dependent variable is the quantity of children. Estimation results suggest that the effect of income is negative and statistically significant. Being employed has no effect. The effect of educational attainment is positive and statistically significant. Unsurprisingly, being older leads to have more children. Finally, variable sex is statistically significant but close to zero. This column includes estimation results for the instrumental variables as well. If the sex of the second-born child matches the sex of the first-born child, then the probability of having an additional children increases[1]. This effect is statistically significant regardless that *same-sex* refers to boys-specific instrument or to girls specific instrument. Also, it is statistically significant for each year-specific instrument.

For instance, having two girls at the year 2012, increases the predicted quantity of children in 0.64-0.46=0.18.

At the bottom of **Table 7.11**, both the F-statistic and the R^2 are reported. F-statistic is 54.05 (larger than 10), so instruments are strongly correlated with the endogenous explanatory variable. R^2 is equal to 0.20 and all instruments are statistically significant.

Column labeled as $\mathbf{IV}_2$ shows the results for the second-stage of the instrumental variable esti-

[1] expect for those holds consulted in 1987, whose probability of having an additional child decreases.

mation (see eq. (5.2)), which dependent variable is the household savings rate. Estimation results suggest that the effect of the quantity of children on the household savings rate is -13.98% per child, and it is statistically significant at 99%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is positive, but only statistically significant for the oldest group. Finally, variable sex is statistically significant and suggests that women have higher savings rate than men.

"Bottom-Third" Sample

The *bottom-third* sample consists in 2,221 observations. Column labeled as **OLS** shows the estimation results for the traditional model (see eq. (5.3)), which dependent variable is the household savings rate. Estimation results suggest that the relation between the quantity of children and household savings rate is 4.46% and statistically significant at 99%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is close to zero and not statistically significant. Finally, variable sex is statistically significant and suggests that women have much higher savings rate than men.

Column labeled as $\mathbf{IV}_1$ shows the results of the first-stage of the instrumental variable estimation (see eq. (5.1)), which dependent variable is the quantity of children. Estimation results suggest that the effect of income is negative and statistically significant. Being employed has no effect. The effect of educational attainment and age are both close to zero and not statistically significant. Finally, variable sex is statistically significant and equal to -0.25. At the bottom third of income, women have less children than men. As before, this column includes estimation results for the instrumental variables as well. If the sex of the second-born child matches the sex of the first-born child, then the probability of having an additional children increases[2]. This effect is statistically significant regardless that *same-sex* refers to boys-specific instrument or to girls specific instrument. Also, it is statistically significant for each year-specific instrument.

For instance, having two girls at the year 2012, increases the predicted quantity of children in 0.70-0.41=0.29.

At the bottom of **Table 7.12**, both the F-statistic and the R^2 are reported. F-statistic is 23.86 (larger than 10), so instruments are strongly correlated with the endogenous explanatory variable. R^2 is equal to 0.22 and all instruments are statistically significant.

Column labeled as $\mathbf{IV}_2$ shows the results for the second-stage of the instrumental variable estimation (see eq. (5.2)), which dependent variable is the household savings rate. Estimation results suggest that the effect of the quantity of children on the household savings rate is -8.05% per child, but not statistically significant at 90%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant

[2]expect for those holds consulted in 1987, whose probability of having an additional child decreases.

and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is close to zero and not statistically significant. Finally, variable sex is statistically significant and suggests that women have much higher savings rate than men.

"Middle" Sample

The *middle-third* sample consists in 2,441 observations. Column labeled as **OLS** shows the estimation results for the traditional model (see eq. (5.3)), which dependent variable is the household savings rate. Estimation results suggest that the relation between the quantity of children and household savings rate is close to zero and not statistically significant at 90%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is statistically significant at 90% for almost all age-groups and positive. Although, the magnitude of this effect remains low except for the middle-age groups. Finally, variable sex is not statistically significant, but suggests that women have higher savings rate than men.

Column labeled as $\mathbf{IV}_1$ shows the results of the first-stage of the instrumental variable estimation (see eq. (5.1)), which dependent variable is the quantity of children. Estimation results suggest that the effect of income is negative and statistically significant. Being employed has no effect. The effect of educational attainment is positive and statistically significant, however, is flat between educational-groups. Unsurprisingly, being older leads to have more children. Finally, variable sex is statistically significant but close to zero. As before, this column includes estimation results for the instrumental variables as well. If the sex of the second-born child matches the sex of the first-born child, then the probability of having an additional children increases[3]. This effect is statistically significant regardless that *same-sex* refers to boys-specific instrument or to girls specific instrument. Also, it is statistically significant for each year-specific instrument.

For instance, having two girls at the year 2012, increases the predicted quantity of children in 0.99-0.71=0.28.

At the bottom of **Table 7.13**, both the F-statistic and the R^2 are reported. F-statistic is 28.71 (larger than 10), so instruments are strongly correlated with the endogenous explanatory variable. R^2 is equal to 0.27 and all instruments are statistically significant.

Column labeled as $\mathbf{IV}_2$ shows the results for the second-stage of the instrumental variable estimation (see eq. (5.2)), which dependent variable is the household savings rate. Estimation results suggest that the effect of the quantity of children on the household savings rate is -7,46% per child, and it is statistically significant at 90%. The effect of both income and being employed on savings, are statistically significant and positive. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is positive, but only statistically significant for the middle-age group. Finally, variable sex is not statistically significant, but suggests that women have higher

[3] expect for those holds consulted in 1987, whose probability of having an additional child decreases.

savings rate than men.

"Top-Third" Sample

The *top-third* sample consists in 2,476 observations. Column labeled as **OLS** shows the estimation results for the traditional model (see eq. (5.3)), which dependent variable is the household savings rate. Estimation results suggest that the relation between the quantity of children and household savings rate is -2.34% and statistically significant at 95%. The effect of income is statistically significant and positive. Being employed has no effect. The effect of education is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that the effect of age is statistically significant and positive. The magnitude of this effect is higher for middle-age groups. Finally, variable sex has no effect.

Column labeled as $\mathbf{IV}_1$ shows the results of the first-stage of the instrumental variable estimation (see eq. (5.1)), which dependent variable is the quantity of children. Estimation results suggest that the effect of both income and being employed is negative and statistically significant. The effect of educational attainment is close to zero and not statistically significant. Unsurprisingly, being older leads to have more children. Finally, variable sex has no effect. This column includes estimation results for the instrumental variables as well. If the sex of the second-born child matches the sex of the first-born child, then the probability of having an additional children increases[4]. This effect is statistically significant regardless that *same-sex* refers to boys-specific instrument or to girls specific instrument. Also, it is statistically significant for each year-specific instrument.

For instance, having two girls at the year 2012, increases the predicted quantity of children in 0.34-0.32=0.02.

At the bottom of **Table 7.14**, both the F-statistic and the R^2 are reported. F-statistic is 23.25 (larger than 10), so instruments are strongly correlated with the endogenous explanatory variable. R^2 is equal to 0.16 and all instruments are statistically significant.

Column labeled as $\mathbf{IV}_2$ shows the results for the second-stage of the instrumental variable estimation (see eq. (5.2)), which dependent variable is the household savings rate. Estimation results suggest that the effect of the quantity of children on the household savings rate is -18.29% per child, and it is statistically significant at 99%. The effect of both income and being employed on savings, are not statistically significant. The effect of education, however, is statistically significant and negative. Having a higher educational attainment means having a lower savings rate. These results also suggest that age has no effect. Finally, variable sex has no effect.

[4]expect for those holds consulted in 1987, whose probability of having an additional child decreases.

Section 7

Conclusions

It is a well documented fact that couples in non-traditional developing countries are getting married later in life, with both partners entering to labor force and having very few children or staying childless. This is consistent with the increasing opportunity cost of parenting, specially in economies that have outstandingly created labor opportunities, raised their general level of wages and promoted people's property rights and people's obligation to save for retirement, like Chile. World Bank's data reveals that in Chile, the quantity of children per woman decreased from more than six to less that two, which is the replacement level to maintain population constant. This severe demographic transition is considered one of the fastest in the region, within a window of four decades or less, similarly to that of other OCDE economies.

While incomes are high and the number of children is low, households savings rate is expected to increase. Also, having less children or no child at all could be considered as a future lack of support for retirement, making savings even more important. However, a first a approach to micro-data shows that Chilean households have not experimented such increase in savings rate, instead, the average increase in household savings rate is only moderated and skewed to the rich. In fact, poor parents that have less children than the average, do not seem to change their consumption/saving behavior when compared with poor parents that have more children than the average. This may be a reflect of both a higher marginal propensity to consume and a lack of financial education among the poor.

This work studied the relation between the quantity of children and the household savings rate. In particular, we were interested in the decrease of savings rate explained by the causal effect of having one additional child. This paper finds that the causal effect of the number of children on household savings is statistically significant and economically meaningful. This study finds an average effect of -13.98%. This effect is progressive in the sense that it is small for the poor (-8.05%) and large for the rich (-18.29%).

This paper employed Chilean cross-sectional micro-data from the Household Expenditure Survey (waves 1987, 1997, 2007 and 2012). A main problem in the study of the relationship between the number of children and household savings is endogeneity. The number of children is likely to affect household savings, but the reverse causal effect may also be true. The household data set

used in this study not only allows us to control for attributes at households level, but also to deal with potential endogeneity. Specifically, this paper contributed to the literature on the demographic-savings nexus using an Instrumental Variable approach to avoid potential endogeneity biases.

Specifically, this study exploited the fact that sex sibling composition generates an exogenous variation of the household's quantity of children. Consistent with the idea that Chilean parents prefer balanced sex ratios in their family composition, this study cannot reject the null hypothesis that the sex sibling composition of the first two children significantly affects the probability of having a third child. Another advantage of this instrument is that the sex of a child is randomly determined: Nowadays in Chile, there is no kind of gender selective abortion, budget balancing in favor of boys nor significant economies of scale due to gender of children. Thus, an instrumental variable constructed from the sex sibling composition proves to satisfy both the relevance and exclusion conditions.

This work suggests that the causal effect of having an additional child is higher than reported in previous works, like [Gallego and Butelmann, 2001] that reported an average effect close to -2%. Not taking into account possible problems of endogeneity can be harmful, because if the positive effect offsets the negative effect, it can be wrongly concluded that the relation is small or close to nonexistent. Also, this work suggests that the causal effect is skewed to the rich.

The main conclusion of this paper is that the demographic transition increased average savings rates in Chile. Specifically, while parents (of all socioeconomic segments of population) begun to have less children and postponing parenting they automatically decreased household's consumption and via labor offer they also increased household's income. Additionally, they had an important precautionary motive for increasing savings rate. Increased savings rates due to fertility trends, however, was mostly observed among the rich.

This show us how much can be gained from well run public policies targeted to the poor. Governmental aid that not only provides basic goods and services to reduce marginal propensity to consume, but also that promotes basic financial education to make young people conscious on the consequences of their consumption lifestyles, can have a dramatic positive effect and can help to match up opportunities.

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Annex A

From early in the 1960s to date, demand for children of Chilean households has decreased two thirds. Economists suggest that such change in preferences is explained mainly by opportunity cost of childbearing and upbringing, which increased as economic activities became industrialized. Short-run consequences are an notorious increment of the age to start parenthood and a decline in the desired quantity of children. According to demographic records, fertility has dropped from 5.5 to below the replacement level of 2.1 children per woman, in less than 50 years.

A.1 Demographic Transition

Development economists and demographers agree that the decline in fertility is a key part of the global trend known as the *Demographic Transition*. The demographic transition it's a three-stage process that results unavoidable to developing economies. First, health improvements increment survival rate for children and hence child population rapidly expand. Second, industrialization leads to changes in the demand for children of parents and therefore child population shrinks. And third, life expectancy increases significantly, so old-age population expands while child population remains low.

Definition 7.1 ***Young Dependency Ratio*** *refers to the portion of population younger than 15 years old, over the portion of population aged between 16 and 64 years old.*

Definition 7.2 ***Old-Age Dependency Ratio*** *refers to the portion of population older than 65 years old, over the portion of population aged between 16 and 64 years old. The sum of the young dependency ratio and the old-age dependency ratio is known as total dependency ratio.*

Figure 7.3 shows the evolution of dependency ratios driven by the Demographic Transition for the case of Chile, USA, China, Europe and Africa[1]. While short-run includes a decrease of young dependency ratio, which results beneficial for labor markets and public finances, long-run comes with an increase of old-age dependency ratio, which results challenging to social security supply and domestic product.

For the Chilean case, the demographic transition is pretty advanced, very similar to China. According to **The World Population Prospects: The 2012 Revision** of the UN, Chile has ended

[1]Data comes from The World Population Prospects: The 2012 Revision of the UN.

its second stage by 2010 and its expected to face third stage during all the XXI century. The USA and Europe hadn't a dramatic decrease of young-dependency ratios, but the increase of old-age dependency ratios is expected to be important (however, not as important as in Chile). Africa is very late on its demographic transition (it's not expected to end second stage in XIX century), thus, Africa will benefit the most from other regions' experience and stresses the importance of future migration platforms for global economic prospects.

Figure 7.1: Demographic Transition: Dependency Ratios in Chile.

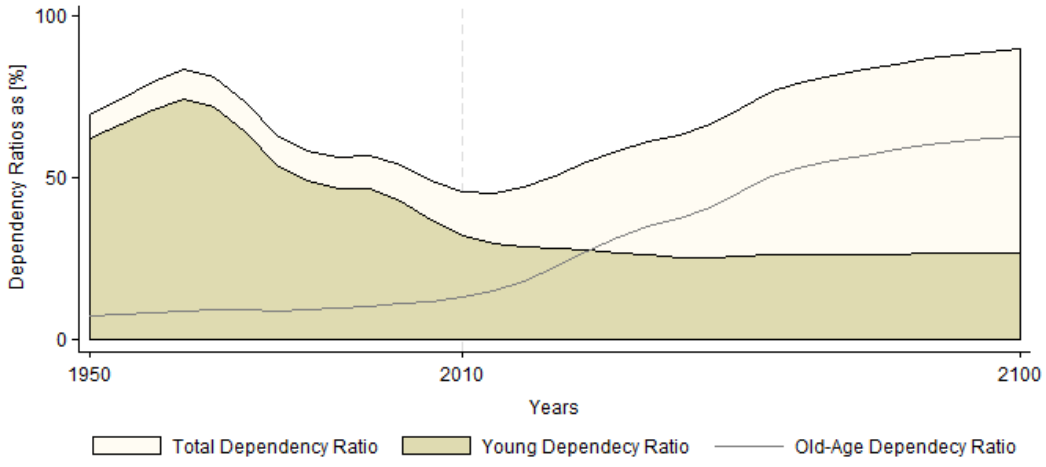


Figure 7.2: Demographic Transition: Dependency Ratios in the United States of America.

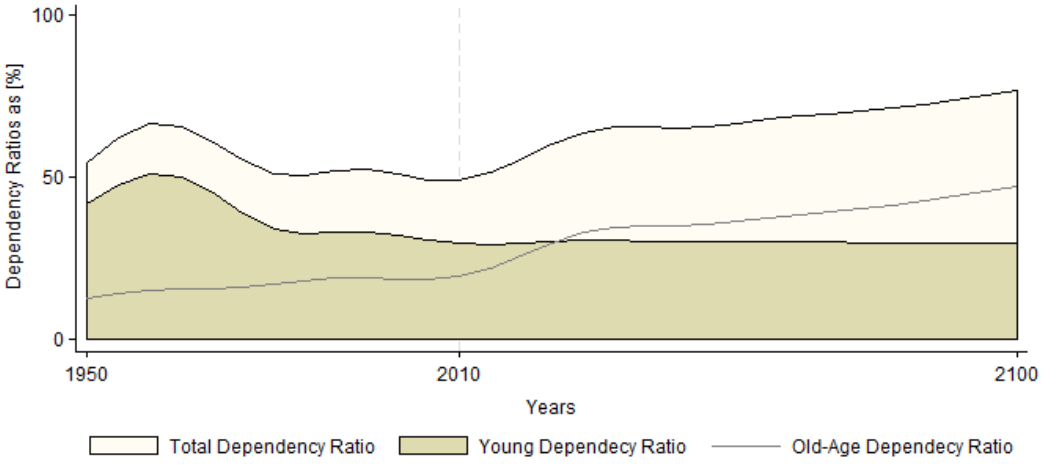


Figure 7.3: Demographic Transition: Dependency Ratios in China.

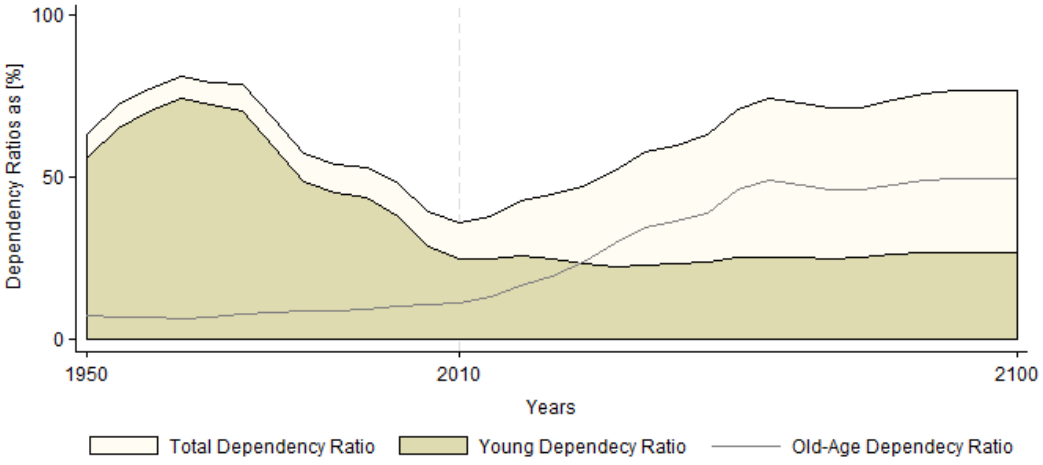


Figure 7.4: Demographic Transition: Dependency Ratios in Europe.

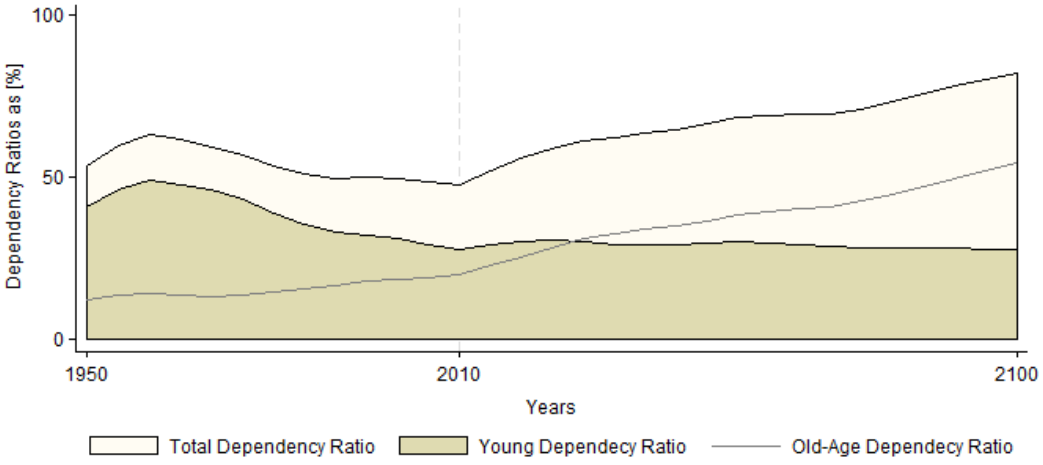
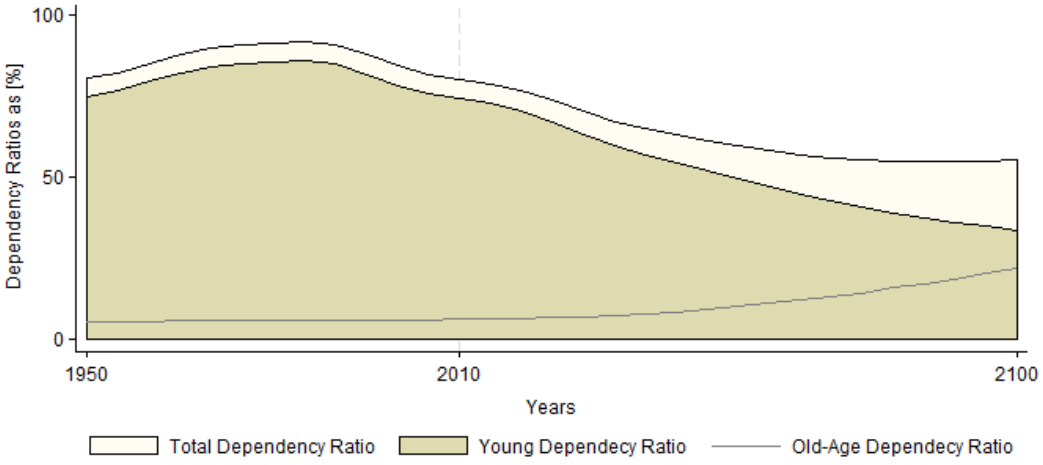


Figure 7.5: Demographic Transition: Dependency Ratios in Africa.



Annex B

B.1 Chilean Social Security

Social security is considered the major governmental intervention to improve people's welfare. It is a system that confers benefits to workers such as old-age pension, disability pension and survivor's pension; also, unemployment insurance and health care. The mechanism of funding social security, as well as the underlying principles behind it, varies from country to country.

Chile reformed the way of financing social security in 1981, switching from a PAYGO system to a Fully Funded one.

Definition 7.3 *the **PAYGO system** is a social security system that economists called benefit-oriented. Government fixes a promise of future benefits to workers and in return, it asks them to make a contribution in order to finance present retiree's expenditures. This system establishes a transfer from the young to the aged. A key characteristic of the PAYGO system is that the ones that pay the contribution are not the ones that receive the benefits, thus, in absence of a clear contractual link, the system show severe problems of incompatibility of incentives. Contributions are managed at union level by public agencies, organized by industry and occupational sectors.*

According to [Coronado, 2002], early in the 1960s, discussion on the disadvantages of the PAYGO system included two main concerns: incompatibility of incentives and demographic transition. First, incompatibility of incentives was evident, for instance, workers close to retirement bargained with the Government to maximize benefits and younger worker bargain with the Government to minimize contribution. In addition to bargaining, many workers close to retirement used other instruments, like cheating, by faking disability or unemployment to extract even more benefits. Many young workers, on the other hand, used to go informal to avoid contributing. The gap produced by under-funding had to be closed by the Government via cutting resources from other policies' budgets. The Government, at the same time, wanted to maximize votes for the next elections by fixing promises of future benefits in a discretionary way, for instance, fixing old-age pension in a 70% of the last wage received by workers (without knowing how high these wages were going to be in the next 20 or 30 years). Managers, however, were organized by industry and occupational sectors without clear incentives, which maintained administrative costs high as usual.

Demographic is a key factor in discussion. As shown in **Figure 7.3** old-age dependency ratio was low, thus, every retiree was financed by nearby 12 workers, which was not a problem. In fact, the PAYGO system was in surplus for several decades and it was able to offset the incompatibil-

ity in incentives. Economists, demographers and policy makers, however, were aware that as the demographic transition was evolving, the PAYGO budget was getting constraint. The government realized that long-run solvency of the system was compromised, because there will be no children to replace their parents' level of contribution and because retirees were going to live longer, and reacted keeping promises of benefits low and increasing the required contribution. For instance, as shown in **Figure 7.3** by 2020, every retiree will be financed by 4 workers (25% deducted from wage) and by 2050 every retiree will be financed by 2 workers (50% deducted from wage), assuming ideal conditions, such as same level of income and living styles, efficiency and no costs due to incompatibility in incentives. Close to 1980, switching the system was inevitable.

Reform of 1981, was a structural change to the way of financing social security. Workers were free to opt-in to the new system or to stay under the old-system. Almost all workers opted-in to the new system, partially motivated by the possible detriment of resources that the Government destined to *extend the agony* of the PAYGO system. Government was not going to count with the contribution of those who opted-in to the new system, but it was going to finance the benefits of those who decided to stay under the old one, so it was very interested in accelerating the transition to the Fully Funded system. According to records, only the workers close to retirement stayed under the old system.

Definition 7.4 *the **Fully Funded system** is a social security system that economists called contribution oriented. Government fixes a mandatory payroll tax, which is deposited in a personal savings account, allowing every worker to self-fund his or her own retirement pension. This systems establishes an individual capitalization of forced savings. Contrarily to the PAYGO system, the ones that pays the payroll tax are the same that receive the benefits. The Fully Funded system is considered to be compatible in incentives. Contributions are managed individually by a private Pension Fund Administrator.*

The Fully Funded system was an innovation for the epoch. It promoted individual freedom of choice and efficiency. Workers save month to month, a 10% of their wage, to self-fund their retirement pension. Workers are allowed to save an extra amount of money (up to 20% of wage), in order to strengthen retirement pension or to retire earlier (contrarily to the PAYGO system, workers, and no the Government, decide when to go to retirement). In theory, as long as workers don't go to the informal labor market or haven't too many unemployment gaps, they accumulate enough resources to maintain an average level of consumption during old-age. As incentives are inline, the higher the demanded benefits, the higher the required personal savings.

Personal savings accounts are managed by private agencies, domestic or foreign, called Pension Fund Administrator or PFA, which have to enter and compete in a market, in order to get hold of workers' savings accounts. PFAs are allowed to invest workers' savings in capital markets. PFAs deduct an extra 3% to 4% of workers' wage to cover administrative costs. As long as the market of PFA is truly competitive, administrative costs were pushed down, because workers are allow to choose the PFA that offered the lower commission relative to the promised profitability of investment portfolio. As every theoretical free market, inefficient PFAs are kicked out of the system and new PFA have no costs of entry.

Government has only two roles to play. First, it has to regulate the investment portfolio of PFAs, encouraging them to diversify the risk as much as possible, thus, even if one asset (among one

thousand assets) collapsed, workers' savings remains unaltered. And second, Government had to complement the benefits of the very poor, which didn't save enough to maintain a minimum average level of consumption during old-age. Given that Chilean fiscal situation was in surplus during the period from 1990 to 2008, everyone in congress approved this policy. Incentives were in line, so the Government tried to promote formal labor market and encourage savings habits, in order to reduce the required complement to benefits.

The Fully Funded system is not discussion free. According to [Diamond, 1993], it has obtained positive critiques for isolating the system from political discretion and for giving a huge amount of fresh resources to capital markets. In fact, high real returns rates (14.5% in average from July, 1981 to July, 1992) and steady flows of contributions, fueled Chilean economic growth of 7% during the 1990s and consolidated initial popularity of the system. After euphoria, however, the Fully Funded system has obtained negative critiques for having high administrative costs. Contrary to what was expected, administrative costs are higher than under the *inefficient* old system because non-competitiveness in the PFA market. In average, one third of 10% contribution is for funding administrative costs, which is only better if compared to the most critical period of the PAYGO system (period from 1970 to 1975) when half of the average contribution was for funding administrative costs. If compared with a well-run unified public system, nevertheless, the Fully Funded system results more expensive. High costs are also explained because the lack of economies of scales. Managing a group of portfolios together is cheaper than managing them separately, but the Fully Funded system promotes individual freedom as key principle. Another negative critique is related to the low retirement pensions that the system actually confers. In spite that economists have provide many explanations, such as retirees living longer than expected, low real returns rates after 2008, low retirement age and low mandatory payroll tax, the Fully Funded systems has turned unpopular to public opinion.

According to estimations from [Madeira, 2015], pensions are expected to decrease in the forthcoming decades, unless the Government applies the correct policies to face demographic transition. To maintain the same level of retirement pensions, without introducing to much distortion, mandatory payroll tax should be fixed in 13% and retirement age should be fixed in 67 years old.

B.2 Household's Savings in Chile

Definitions

It is well known the importance of savings in developing economies. From the macro-perspective, domestic savings enables domestic investment, which is the key driver of economic growth.

Definition 7.5 ***Domestic Savings*** *refers to the aggregation of public and private savings. In the one hand, public savings refers to Government's savings, Central Bank's savings and public firms' savings. On the other hand, private savings refers to private firms' savings and household's savings.*

However, from the micro-perspective, household's savings are motivated by other reasons more

relevant than the increase of domestic investment. These motives are summarized by [Keynes, 1936], with two additions: one from [Browing and Lusardi, 1996] and another from [Huneeus, 2001] as follows:

- to have protection against income shortfalls (the precautionary motive)
- to expand future budget (the improvement motive)
- to smooth consumption (the inter-temporal substitution motive)
- to secure old-age necessities (the life-cycle motive)
- to start a business (the enterprise motive)
- to enjoy the sense of independence (the independence motive)
- to buy houses, cars and other durable goods (the down-payment motive)
- to satiate miserliness (the avarice motive) [Browing and Lusardi, 1996]
- to leave heritage (The heritage motive) [Huneeus, 2001]

Characterization

Aggregate household's savings can be estimated as residual from domestic savings, minus public savings and minus private firm's savings. An example of this is [Bennet et al., 2000], which used Chilean macro-data from different sources to obtain a reliable measure of aggregated household's savings. Given that, data can't be disaggregated at household's characteristics, household savings are in terms of percentages of GDP instead of percentage of household disposable income. According to [Bennet et al., 2000] household's savings was -1.7% in the 1960s, -1.4% in the 1970s, -2.4% in the 1980s and only reached positive numbers in the 1990s, when it was 1.9% of GDP. Time series for Chilean Domestic Savings is shown in **Figure 7.9**, for Chilean Private Savings in **Figure 7.10** and for Chilean Household Savings in **Figure 7.11.**

[Schmidt-Hebbel et al., 1992] argues that main determinants of household's savings are economic growth, uncertainty about income and dependency ratios. [Hachette, 1998] adds the relevance of capital markets development and government's expenditures. [Vergara, 2001] cite as well terms of trade, taxes, interest rate and PFAs profitability.

The use of Chilean macro-data allows economists to look for evidence against or in favor of a wide range of theories, e.g. some economist focuses in the permanent income theory, the life-cycle theory, the old-age security theory, the Ricardian equivalence theory, the impact of social security reforms, the impact of tax reforms, etc. Nevertheless, one undesired limitation is the impossibility to control for household's attributes, which certainly gives a more deep understanding of household's savings.

Disaggregated household's savings are obtained applying large-scale cross-sectional surveys. Most of these surveys, with data and results, are published. [Gallego and Butelmann, 2001] studied household's savings using micro-data and determined that mean household's savings was -21.8% in 1987 and -9.2% in 1997 (as percentage of household's disposable income). Also, that permanent attributes of household's head, such as sex and education, together with other non-permanent, as income and age, are key determinants of household's savings.

[Landerretche and Martinez, 2013] finds that having a pensioned relative in the household improve knowledge about pensions system and encourage additional savings of working-age members. [Coronado, 2002] uses labor status, quantity of children, private pension system membership and other controls to show via *difference-in-difference* that reforms of 1981 encouraged household's savings. [Attanasio et al., 2011] suggests that having and additional child encourages mothers to leave the formal labor sector and avoid mandatory contribution to social security system.

The use of micro-data, however, isn't free of discussion. Some disadvantages are under-weighted self-reported incomes [Repetto, 2001]. Also, as long as the survey doesn't track the sample over time, e.g. in cross-sectional surveys, it fails to recognize the difference between a negative shock and average income within a household. This disadvantage can be partially corrected if controlling by permanent characteristics, such as educational attainment.

Figure 7.6: Chilean Domestic Savings as % of GDP.

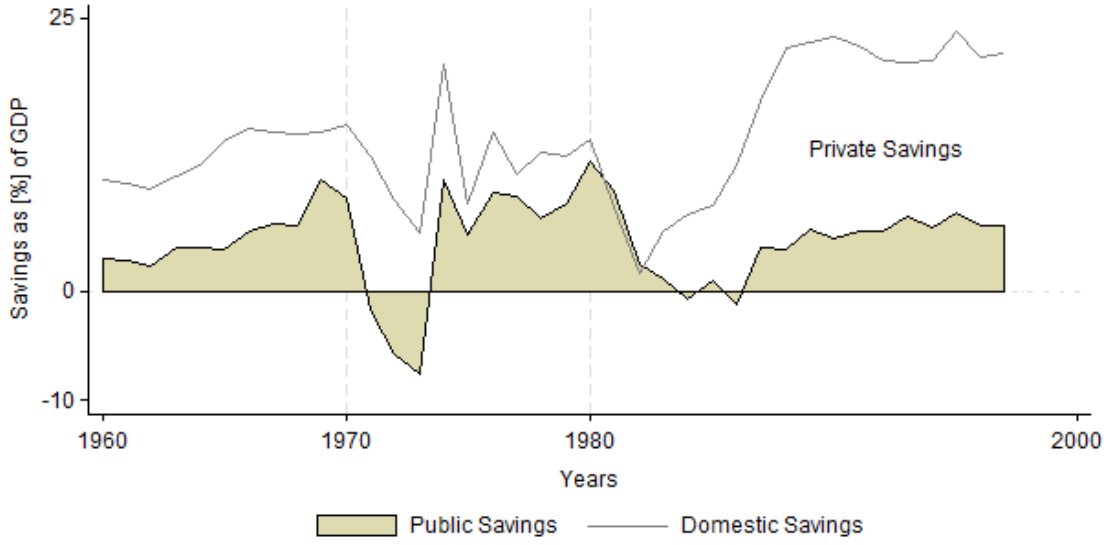


Figure 7.7: Chilean Private Savings as % of GDP.

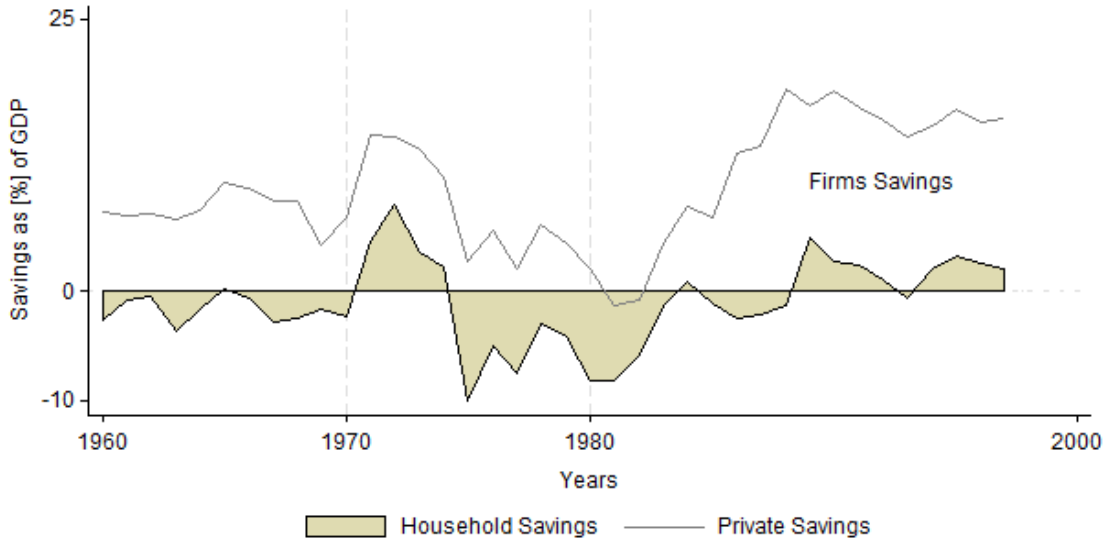
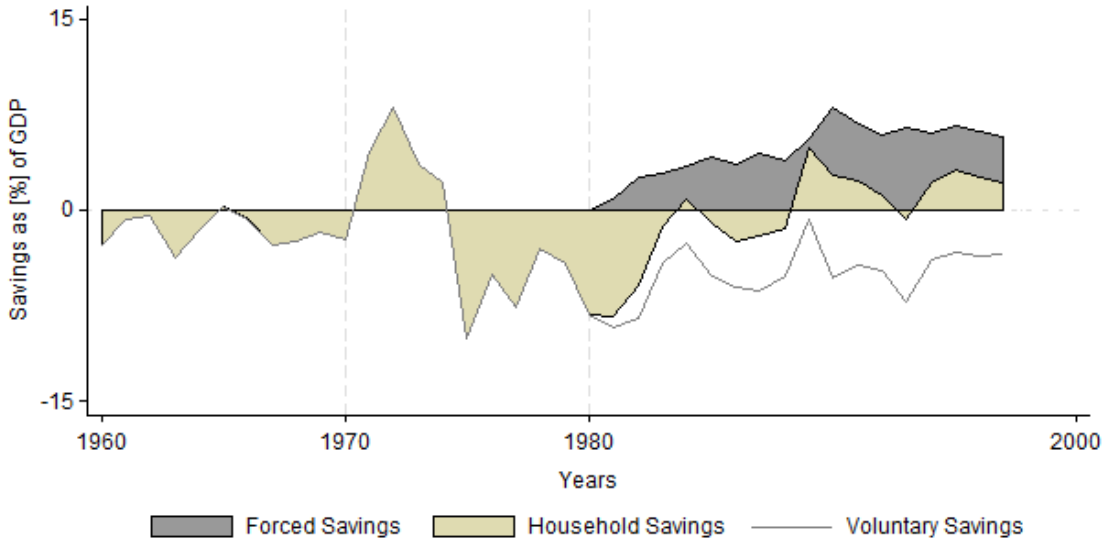


Figure 7.8: Chilean Household Savings as % of GDP.



B.3 Figures

This section shows comparative figures that result useful to explain uni-variate analysis of the Chilean household savings. Data comes from the pooled sample, which consists in HES editions of 1987, 1997, 2007 and 2012, and includes the treatment detailed in **Section 3.1**.

Figure 7.9: Chilean Domestic Savings Rate by Year.

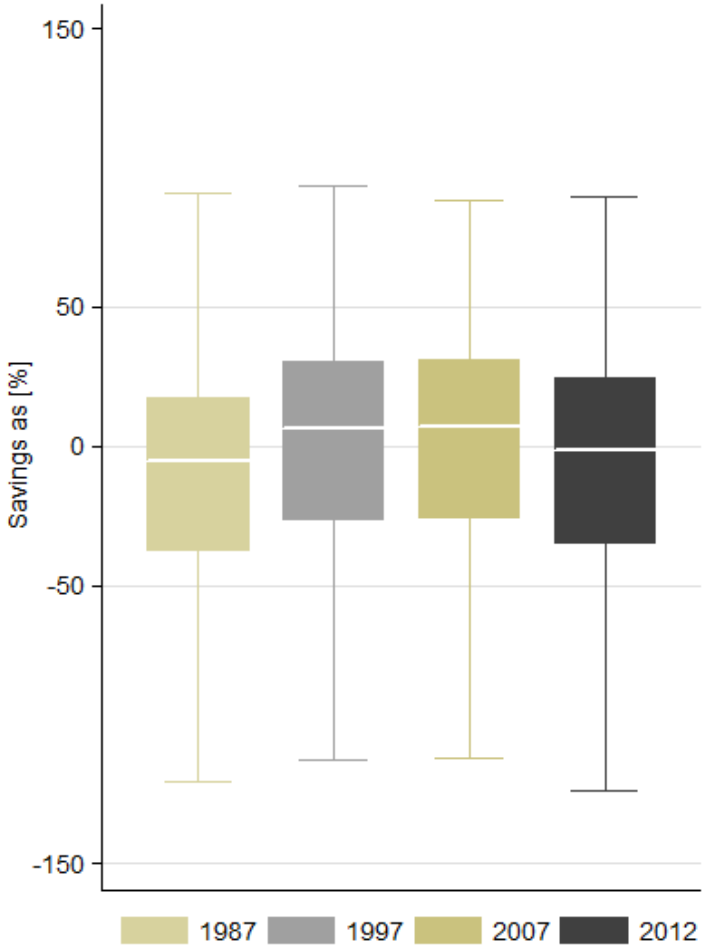


Figure 7.10: Chilean Domestic Savings Rate by Quantity of Children.

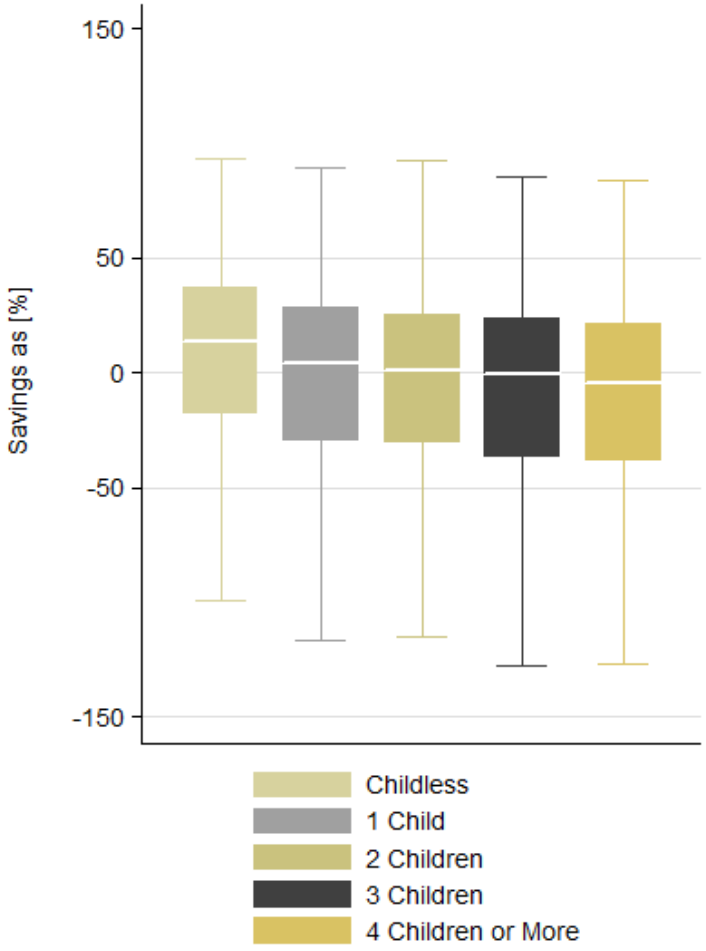


Figure 7.11: Chilean Domestic Savings Rate by Educational Attainment of the Head of Household.

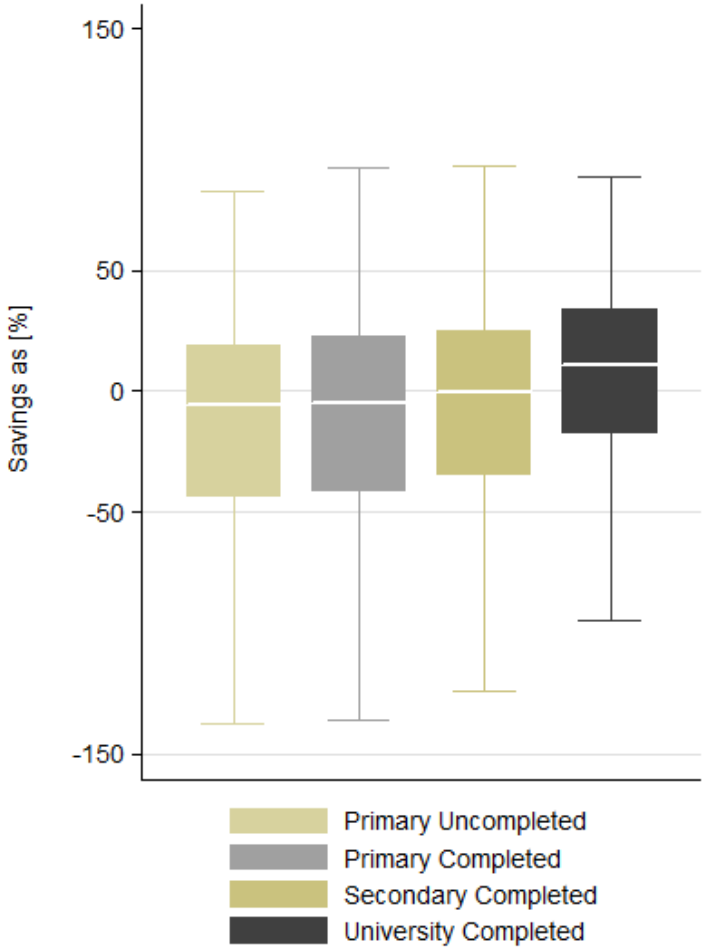


Figure 7.12: Chilean Domestic Savings Rate by Age Group of the Head of Household.

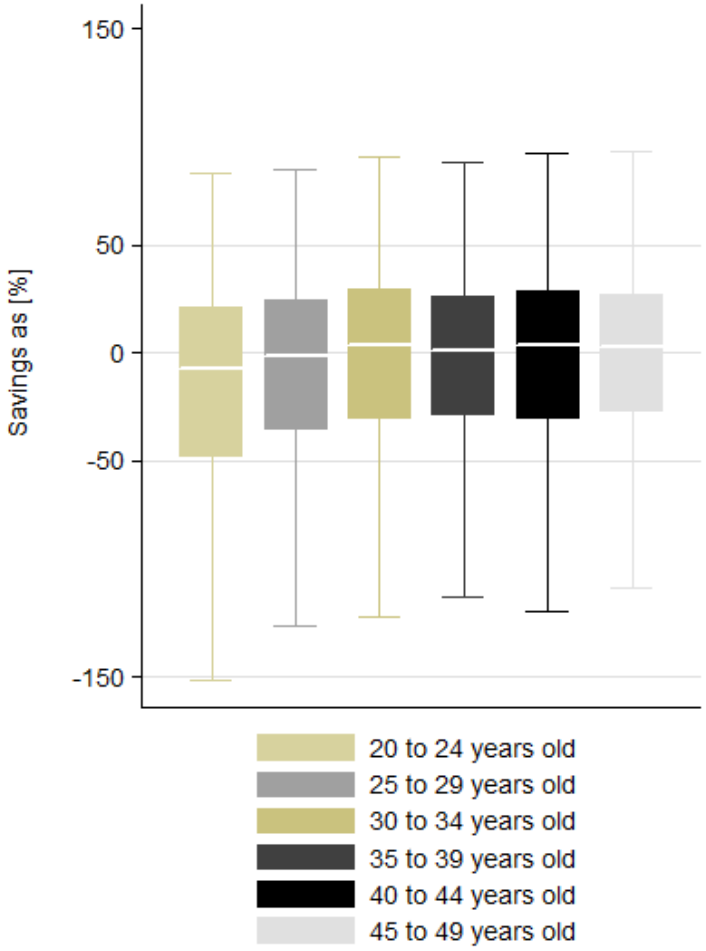


Figure 7.13: Chilean Domestic Savings Rate by Income Group.

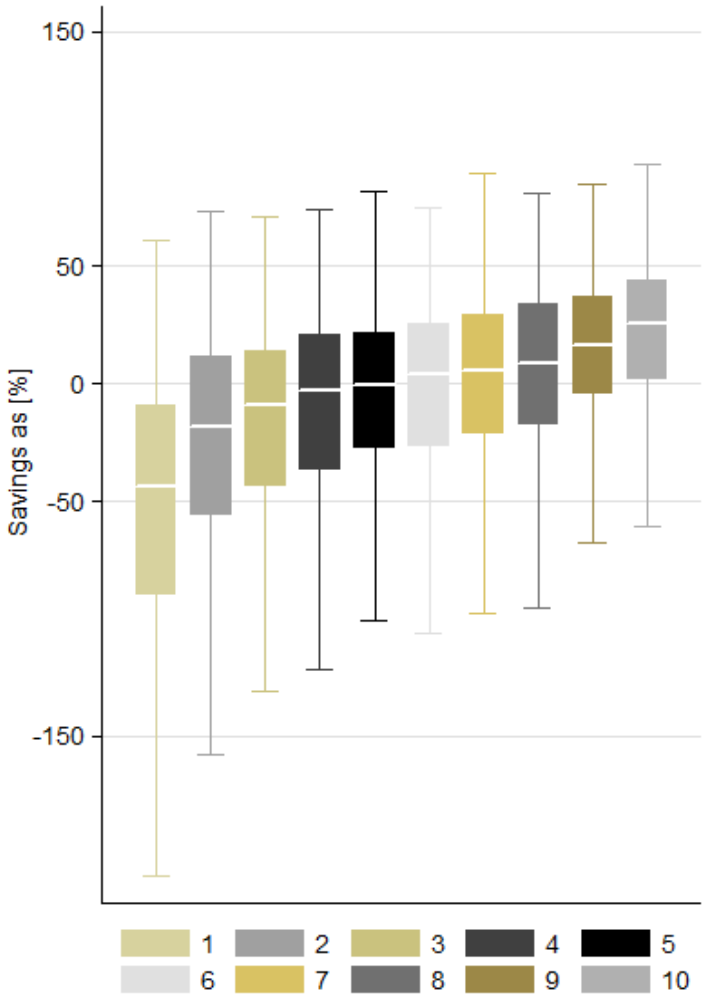


Figure 7.14: Chilean Domestic Savings Rate by Sex of the Head of Household.

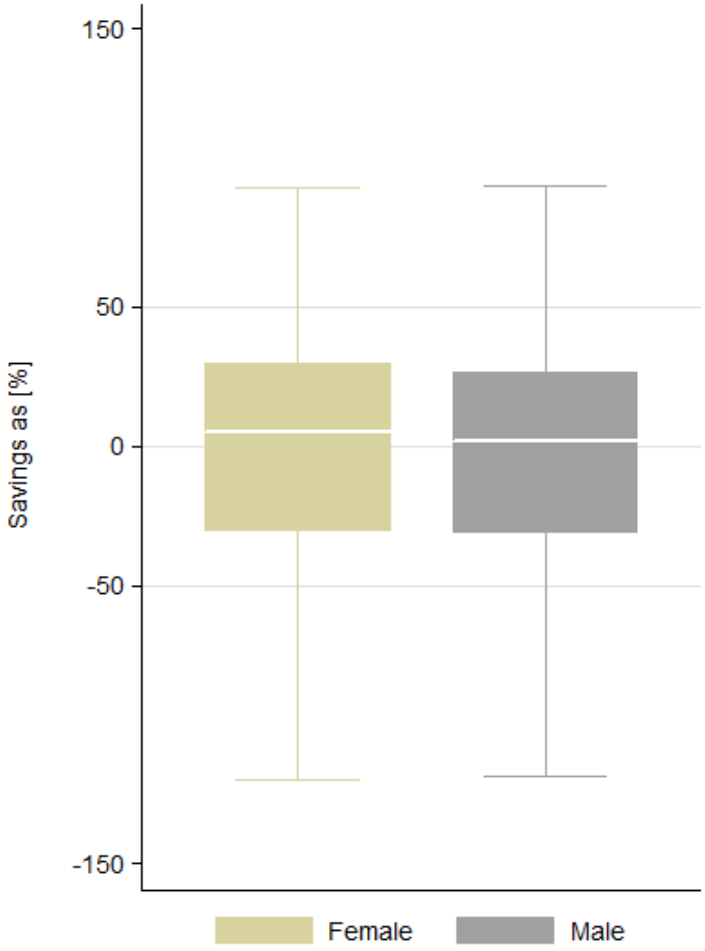
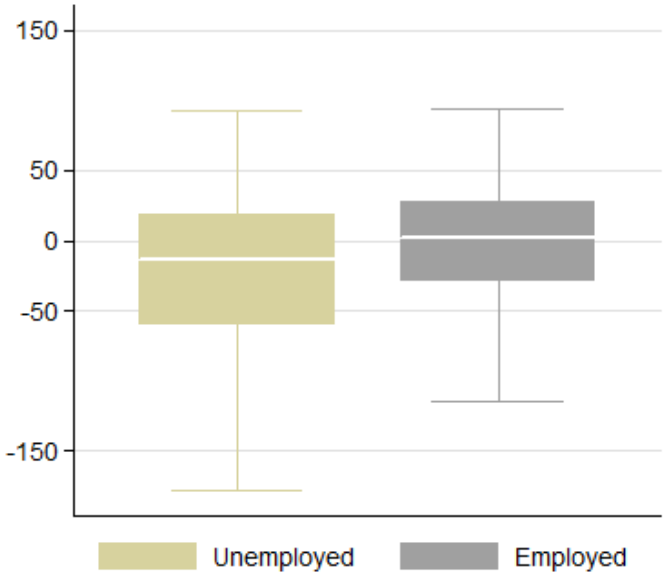


Figure 7.15: Chilean Domestic Savings Rate by Labor Status of the Head of Household.



Annex C

C.1 Tables of Descriptive Statistics

Table 7.1: Database size.

HES	Sample size		Percentage of Total	
Edition	**Large Households**	**All Households**	**Large Households**	**All Households**
1987	1,332	1,828	18.66	17.00
1997	2,124	3,018	29.76	28.07
2007	1,970	3,042	27.60	28.29
2012	1,712	2,864	23.98	26.64
Pooled	7,138	10,752	100.00	100.00

Large Households refers to those households with 2 or more children. Percentages may not sum 100% due to rounding.

Table 7.2: Frequency of the Quantity of Children.

HES wave	0	1	2	3	≥ 4	**Total**	**Sample Size**
1987	6%	21%	36%	24%	13%	100%	1,828
1997	9%	21%	38%	22%	10%	100%	3,018
2007	10%	25%	39%	19%	7%	100%	3,042
2012	13%	28%	39%	16%	5%	100%	2,864
Pooled	10%	24%	38%	20%	8%	100%	10,752

All treatment applied, but including low-fertility households. Percentages may not sum 100% due to rounding.

Table 7.3: Probability of Having φ Children.

φ	$\mathbb{P}(\varphi \mid \mathrm{d}match = 0)$	$\mathbb{P}(\varphi \mid \mathrm{d}match = 1)$
2	61%	58%
3	28%	31%
4	7%	8%
5	3%	2%
6	1%	1%
7	0%	0%
Total	100%	100%

All treatment applied. Percentages may not sum 100% due to rounding.

Table 7.4: Household's Savings Rate by Quantity of Children.

HES wave	0	1	2	3	≥ 4	**Average**	**Sample Size**
1987	-1%	-15%	-16%	-17%	-20%	-12%	1,828
1997	15%	-1%	-5%	-8%	-10%	-2%	3,018
2007	6%	-6%	-4%	-4%	-12%	-3%	3,042
2012	-4%	-8%	-11%	-17%	-22%	-10%	2,864
Pooled	4%	-6%	-8%	-11%	-15%	-6%	10,752

All treatment applied, but including low-fertility households.

Table 7.5: Descriptive Statistics for Large Households.

Savings	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332	-17.13	49.07	-246.35	-6.65	90.65
1997	2,124	-6.99	49.49	-209.8	2.81	92.57
2007	1,970	-5	48.5	-205.11	5.06	81.33
2012	1,712	-13.55	50.65	-220.76	-4.24	89.28
Pooled	7,138	-9.9	49.63	-246.35	-0.03	92.57
Quantity of Children	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	2.78	0.99	2.00	3.00	8.00
1997	2,124.00	2.65	0.86	2.00	2.00	10.00
2007	1,970.00	2.53	0.77	2.00	2.00	7.00
2012	1,712.00	2.46	0.73	2.00	2.00	8.00
Pooled	7,138.00	2.60	0.84	2.00	2.00	10.00
Income	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	146,095.00	188,007.00	3,000.00	67,050.00	1,630,000.00
1997	2,124.00	796,594.00	904,843.00	50,000.00	432,440.00	8,000,003.00
2007	1,970.00	1,022,787.00	1,154,603.00	53,344.00	616,820.00	8,643,333.00
2012	1,712.00	1,159,830.00	1,168,781.00	71,500.00	743,937.00	8,352,453.00
Pooled	7,138.00	824,753.00	1,034,103.00	3,000.00	476,220.00	8,643,333.00
Head's Sex	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	0.98	0.13	0.00	1.00	1.00
1997	2,124.00	0.95	0.22	0.00	1.00	1.00
2007	1,970.00	0.89	0.32	0.00	1.00	1.00
2012	1,712.00	0.81	0.39	0.00	1.00	1.00
Pooled	7,138.00	0.91	0.29	0.00	1.00	1.00
Head's Employment Status	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	0.96	0.19	0.00	0.00	1.00
1997	2,124.00	0.96	0.17	0.00	0.00	1.00
2007	1,970.00	0.94	0.23	0.00	0.00	1.00
2012	1,712.00	0.91	0.28	0.00	1.00	1.00
Pooled	7,138.00	0.94	0.50	0.00	0.00	1.00
Head's Age	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	8.07	1.36	5.00	8.00	10.00
1997	2,124.00	8.31	1.22	4.00	8.00	10.00
2007	1,970.00	8.50	1.24	5.00	9.00	10.00
2012	1,712.00	8.43	1.33	4.00	8.00	10.00
Pooled	7,138.00	8.34	1.29	4.00	8.00	10.00
Head's Education	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	1.52	1.12	0.00	2.00	3.00
1997	2,124.00	1.90	0.99	0.00	2.00	3.00
2007	1,970.00	2.11	0.65	0.00	2.00	3.00
2012	1,712.00	1.86	0.83	0.00	2.00	3.00
Pooled	7,138.00	1.87	0.92	0.00	2.00	3.00

To compare money from different years, the following relations hold:
[2012CL$] 9 $\approx$ [1987*CL*$]1; [2007*CL*$]7 $\approx$ [1987*CL*$]1; [1997*CL*$]5 $\approx$ [1987*CL*$]1.

Table 7.6: Descriptive Statistics for All Households.

Savings	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,828	-15.67	50.17	-246.35	-5.5	90.65
1997	3,018	-3.79	49.19	-209.8	6.02	93.53
2007	3,042	-4.04	49.08	-205.11	6.69	88.33
2012	2,864	-10.77	50.23	-220.76	-1.84	89.28
Pooled	10,752	-7.74	49.81	-246.35	2.02	93.53
Quantity of Children	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	2.23	1.25	0.00	2.00	8.00
1997	3,018.00	2.07	1.18	0.00	2.00	10.00
2007	3,042.00	1.89	1.10	0.00	2.00	7.00
2012	2,864.00	1.74	1.08	0.00	2.00	8.00
Pooled	10,752.00	1.96	1.16	0.00	2.00	10.00
Income	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	139,985.00	177,552.00	3,000.00	65,500.00	1,630,000.00
1997	3,018.00	769,409.00	856,468.00	40,000.00	431,148.00	8,000,003.00
2007	3,042.00	999,174.00	1,087,806.00	53,344.00	612,520.00	8,643,333.00
2012	2,864.00	1,178,468.00	1,161,551.00	68,000.00	763,683.00	9,920,756.00
Pooled	10,752.00	836,364.00	1,013,707.00	3,000.00	492,968.00	9,920,756.00
Head's Sex	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	0.98	0.15	0.00	1.00	1.00
1997	3,018.00	0.94	0.23	0.00	1.00	1.00
2007	3,042.00	0.87	0.33	0.00	1.00	1.00
2012	2,864.00	0.80	0.40	0.00	1.00	1.00
Pooled	10,752.00	0.89	0.31	0.00	1.00	1.00
Head's Employment Status	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	0.96	0.18	0.00	0.00	1.00
1997	3,018.00	0.96	0.17	0.00	0.00	1.00
2007	3,042.00	0.94	0.23	0.00	1.00	1.00
2012	2,864.00	0.91	0.18	0.00	1.00	1.00
Pooled	10,752.00	0.94	0.50	0.00	0.00	1.00
Head's Age	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	7.82	1.47	4.00	8.00	10.00
1997	3,018.00	8.06	1.36	4.00	8.00	10.00
2007	3,042.00	8.21	1.41	4.00	8.00	10.00
2012	2,864.00	8.11	1.50	4.00	8.00	10.00
Pooled	1,0752.00	8.08	1.44	4.00	8.00	10.00
Head's Education	**Obs.**	**Mean**	**Std. Err.**	**Min**	**Median**	**Max**
1987	1,828.00	1.57	1.12	0.00	2.00	3.00
1997	3,018.00	1.93	1.00	0.00	2.00	3.00
2007	3,042.00	2.16	0.66	0.00	2.00	3.00
2012	2,864.00	1.95	0.83	0.00	2.00	3.00
Pooled	10,752.00	1.94	0.91	0.00	2.00	3.00

To compare money from different years, the following relations hold:
[2012CL$] 9 $\approx$ [1987*CL*$]1; [2007*CL*$]7 $\approx$ [1987*CL*$]1; [1997*CL*$]5 $\approx$ [1987*CL*$]1.

Table 7.7: Sibling Sex Composition Dummies.

Two Boys Dummy						
HBS Edition	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	0.27	0.45	0.00	0.00	1.00
1997	2,124.00	0.27	0.44	0.00	0.00	1.00
2007	1,970.00	0.28	0.45	0.00	0.00	1.00
2012	1,712.00	0.26	0.44	0.00	0.00	1.00
Pooled	7,138.00	0.27	0.44	0.00	0.00	1.00
Two Girls Dummy						
HBS Edition	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	0.24	0.43	0.00	0.00	1.00
1997	2,124.00	0.24	0.43	0.00	0.00	1.00
2007	1,970.00	0.24	0.42	0.00	0.00	1.00
2012	1,712.00	0.25	0.43	0.00	0.00	1.00
Pooled	7,138.00	0.24	0.43	0.00	0.00	1.00
Same-Sex Dummy						
HBS Edition	Obs.	Mean	Std. Err.	Min	Median	Max
1987	1,332.00	0.52	0.50	0.00	1.00	1.00
1997	2,124.00	0.51	0.50	0.00	1.00	1.00
2007	1,970.00	0.51	0.50	0.00	1.00	1.00
2012	1,712.00	0.51	0.50	0.00	1.00	1.00
Pooled	7,138.00	0.51	0.50	0.00	1.00	1.00

Households with at least two children born.

C.2 Tables of IV Validation

Table 7.8: Test of Means for All Households.

All Households							
Parameter	Savings	LOG income	education	age	sex	employed	fert
$N_{dmatch=1}$	4121	4121	4121	4121	4121	4121	4121
$N_{dmatch=0}$	4335	4335	4335	4335	4335	4335	4335
N_{total}	8456	8456	8456	8456	8456	8456	8456
$\mu_{dmatch=1}$	-11.78	12.03	1.86	0.77	8.38	0.92	2.56
$\mu_{dmatch=0}$	-10.54	12.03	1.85	0.77	8.39	0.92	2.62
μ_{total}	-11.16	12.03	1.85	0.77	8.38	0.92	2.59
$S.d._{dmatch=1}$	50.80	1.27	0.92	0.42	1.28	0.28	0.82
$S.d._{dmatch=0}$	49.75	1.28	0.92	0.42	1.29	0.27	0.85
$S.d._{total}$	50.27	1.27	0.92	0.42	1.28	0.27	0.84
$\mu_{dmatch=1} - \mu_{dmatch=0}$	-1.24	0.01	0.02	0.00	-0.01	0.00	-0.05
p-value	0.26	0.77	0.43	0.96	0.73	0.52	0.00
Rejected	NO	NO	NO	NO	NO	NO	**YES**

$H_0 : \mu_{dmatch=1} - \mu_{dmatch=0} = 0$. Null Hypothesis is rejected if *p-value* is lower than 0.01.

Table 7.9: Test of Means for Single-Parents Households.

Single-Parent Households							
Parameter	Savings	LOG income	education	age	sex	employed	fert
$N_{dmatch=1}$	645	645	645	645	645	645	645
$N_{dmatch=0}$	673	673	673	673	673	673	673
N_{total}	1318	1318	1318	1318	1318	1318	1318
$\mu_{dmatch=1}$	-17.65	11.84	1.79	0.06	8.54	0.78	2.55
$\mu_{dmatch=0}$	-18.10	11.79	1.71	0.07	8.65	0.77	2.57
μ_{total}	-17.88	11.81	1.75	0.06	8.60	0.77	2.56
$S.d._{dmatch=1}$	53.20	1.21	0.90	0.23	1.23	0.42	0.85
$S.d._{dmatch=0}$	53.00	1.14	0.90	0.25	1.25	0.42	0.82
$S.d._{total}$	53.08	1.18	0.90	0.24	1.24	0.42	0.83
$\mu_{dmatch=1} - \mu_{dmatch=0}$	0.45	0.05	0.08	-0.01	-0.10	0.01	-0.02
p-value	0.88	0.40	0.13	0.40	0.13	0.76	0.61
Rejected	NO	NO	NO	NO	NO	NO	**NO**

$H_0 : \mu_{dmatch=1} - \mu_{dmatch=0} = 0$. Null Hypothesis is rejected if *p-value* is lower than 0.01.

Table 7.10: Test of Means for Bi-Parental Households

Bi-Parental Households							
Parameter	Savings	LOG income	education	age	sex	employed	fert
$N_{dmatch=1}$	3662	3662	3662	3662	3662	3662	3662
$N_{dmatch=0}$	3476	3476	3476	3476	3476	3476	3476
N_{total}	7138	7138	7138	7138	7138	7138	7138
$\mu_{dmatch=1}$	-9.15	12.07	1.87	8.34	0.90	0.95	2.62
$\mu_{dmatch=0}$	-10.69	12.07	1.88	8.35	0.91	0.94	2.57
μ_{total}	-10.69	12.07	1.88	8.35	0.91	0.94	2.57
$S.d._{dmatch=1}$	49.02	1.30	0.92	1.29	0.29	0.22	0.86
$S.d._{dmatch=0}$	49.02	1.30	0.92	1.29	0.29	0.22	0.86
$S.d._{total}$	49.63	1.28	0.92	1.28	0.29	0.22	0.84
$\mu_{dmatch=1} - \mu_{dmatch=0}$	-1.54	0	0	0.01	0	-0.01	-0.06
p-value	0.19	1.00	0.82	0.82	0.58	0.29	0.00
Rejected	NO	NO	NO	NO	NO	NO	**YES**

$H_0 : \mu_{dmatch=1} - \mu_{dmatch=0} = 0$. Null Hypothesis is rejected if *p-value* is lower than 0.01.

C.3 Tables of Estimation Results

Table 7.11: Estimation Results: All Households

All Households			
Variable	**OLS** [Savings]	**IV**$_1$ [fert]	**IV**$_2$ [Savings]
fert	0.93		
	(0.74)		
p.fert			-13.98***
			(3.48)
LOG income	9.55***	-0.47***	4.27***
	(0.66)	(0.02)	(1.31)
employed	16.99***	-0.05	15.58***
	(3.30)	(0.05)	(3.41)
head's education [primary]	-9.88***	0.13***	-7.61***
	(2.27)	(0.04)	(2.41)
head's education [secondary]	-19.89***	0.11***	-17.61***
	(2.27)	(0.04)	(2.38)
head's education [universitary]	-26.21***	0.22***	-22.46***
	(2.60)	(0.05)	(2.77)
head's age [25 to 29 yeas old]	13.87***	-0.57***	4.04
	(5.37)	(0.07)	(5.80)
head's age [30 to 34 yeas old]	8.87***	-0.46***	1.85
	(2.36)	(0.04)	(2.91)
head's age [35 to 39 yeas old]	5.28***	-0.27***	1.40
	(1.83)	(0.03)	(2.04)
head's age [40 to 44 yeas old]	4.62***	-0.12***	2.72*
	(1.51)	(0.03)	(1.59)
head's age [44 to 49 yeas old]	34.96***	0.83***	43.46***
	(2.77)	(0.05)	(3.45)
head's sex	-3.50*	-0.09***	-4.39**
	(2.07)	(0.03)	(2.17)
2 boys		-0.56***	
		(0.05)	
2 girls		-0.46***	
		(0.06)	
2 boys×97		0.69***	
		(0.06)	
2 girls×97		0.71***	
		(0.07)	
2 boys×07		0.70***	
		(0.06)	
2 girls×07		0.68***	
		(0.07)	
2 boys×12		0.74***	
		(0.06)	
2 girls×12		0.64***	
		(0.07)	
Observations	7,138	7,138	7,138
R^2	0.15	0.20	0.10
R^2 Partial		[0.04]	
F-statistic		54.05	

Terms in parenthesis are standard deviations.
Note: [* 0.01, ** 0.05, *** 0.10]

Table 7.12: Estimation Results: Bottom Third

Bottom Third			
Variable	**OLS** [Savings]	**IV**$_1$ [fert]	**IV**$_2$ [Savings]
fert	4.46***		-8.05
	(1.44)		(7.06)
p.fert			
LOG income	13.52***	-0.48***	9.00***
	(1.30)	(0.03)	(2.70)
employed	26.48***	0.07	27.08***
	(5.10)	(0.07)	(5.21)
head's education [primary]	-11.94***	0.07	-10.76***
	(3.19)	(0.06)	(3.25)
head's education [secondary]	-21.89***	0.11*	-19.99***
	(3.49)	(0.06)	(3.59)
head's education [universitary]	-32.77***	-0.00	-32.93***
	(8.20)	(0.09)	(8.15)
head's age [25 to 29 yeas old]	10.72	-0.43***	3.94
	(6.94)	(0.09)	(7.39)
head's age [30 to 34 yeas old]	1.97	-0.28***	-2.08
	(4.37)	(0.06)	(4.64)
head's age [35 to 39 yeas old]	-2.23	-0.09	-3.75
	(3.94)	(0.06)	(3.91)
head's age [40 to 44 yeas old]	-0.13	0.08	0.18
	(3.59)	(0.06)	(3.70)
head's age [44 to 49 yeas old]	1.19	0.14**	2.08
	(3.67)	(0.06)	(3.95)
head's sex	-10.01**	-0.25***	-12.49**
	(4.60)	(0.07)	(4.97)
2 boys		-0.54***	
		(0.09)	
2 girls		-0.41***	
		(0.12)	
2 boys×97		0.72***	
		(0.11)	
2 girls×97		0.62***	
		(0.13)	
2 boys×07		0.79***	
		(0.11)	
2 girls×07		0.66***	
		(0.13)	
2 boys×12		0.77***	
		(0.12)	
2 girls×12		0.70***	
		(0.14)	
Observations	2,221	2,221	2,221
R^2	0.07	0.22	0.04
R^2 Partial		[0.04]	
F-statistic		23.86	

Terms in parenthesis are standard deviations.
Note: [* 0.01, ** 0.05, *** 0.10]

Table 7.13: Estimation Results: Middle Third

Middle Third			
Variable	**OLS** [Savings]	**IV**$_1$ [fert]	**IV**$_2$ [Savings]
fert	0.57		-7.46*
	(1.22)		(4.12)
p.fert			
LOG income	7.28***	-0.60***	4.33**
	(1.19)	(0.03)	(1.96)
employed	13.47**	-0.06	10.83**
	(5.33)	(0.08)	(5.33)
head's education [primary]	-6.88**	0.27***	-4.31
	(3.47)	(0.07)	(3.72)
head's education [secondary]	-15.84***	0.24***	-14.05***
	(3.36)	(0.07)	(3.55)
head's education [universitary]	-26.95***	0.26***	-24.11***
	(4.05)	(0.07)	(4.22)
head's age [25 to 29 yeas old]	12.35	-0.52***	6.79
	(9.41)	(0.06)	(9.62)
head's age [30 to 34 yeas old]	14.89***	-0.47***	11.15***
	(3.26)	(0.06)	(3.79)
head's age [35 to 39 yeas old]	5.49*	-0.26***	3.71
	(3.02)	(0.05)	(3.22)
head's age [40 to 44 yeas old]	4.52*	-0.16***	2.96
	(2.43)	(0.04)	(2.54)
head's age [44 to 49 yeas old]	0.52	0.03	2.14
	(2.63)	(0.04)	(2.63)
head's sex	-4.84	-0.08	-4.12
	(3.35)	(0.05)	(3.35)
2 boys		-0.83***	
		(0.09)	
2 girls		-0.71***	
		(0.11)	
2 boys×97		0.92***	
		(0.10)	
2 girls×97		0.86***	
		(0.12)	
2 boys×07		0.97***	
		(0.10)	
2 girls×07		0.94***	
		(0.12)	
2 boys×12		1.15***	
		(0.11)	
2 girls×12		0.99***	
		(0.12)	
Observations	2,441	2,441	2,441
R^2	0.04	0.27	0.02
R^2 Partial		[0.08]	
F-statistic		28.91	

Terms in parenthesis are standard deviations.
Note: [* 0.01, ** 0.05, *** 0.10]

Table 7.14: Estimation Results: Top Third

	Top Third		
Variable	**OLS** [Savings]	**IV$_1$** [fert]	**IV$_2$** [Savings]
fert	-2.34**		-18.29***
	(1.16)		(5.55)
p.fert			
LOG income	6.79***	-0.36***	1.54
	(0.85)	(0.02)	(1.71)
employed	1.51	-0.20*	-5.76
	(6.96)	(0.10)	(7.23)
head's education [primary]	-12.03	-0.07	-5.57
	(8.60)	(0.18)	(8.98)
head's education [secondary]	-25.09***	-0.10	-18.02**
	(7.92)	(0.17)	(8.20)
head's education [universitary]	-27.10***	0.05	-17.98**
	(7.89)	(0.17)	(8.30)
head's age [25 to 29 yeas old]			
head's age [30 to 34 yeas old]	8.40*	-0.60***	-1.33
	(4.33)	(0.06)	(5.61)
head's age [35 to 39 yeas old]	9.71***	-0.39***	4.43
	(2.61)	(0.05)	(3.37)
head's age [40 to 44 yeas old]	5.80***	-0.20***	3.22
	(2.16)	(0.04)	(2.52)
head's age [44 to 49 yeas old]	3.33	0.00	3.43
	(2.20)	(0.05)	(2.30)
head's sex	4.33	0.01	4.65
	(2.89)	(0.05)	(3.08)
2 boys		-0.40***	
		(0.09)	
2 girls		-0.32***	
		(0.08)	
2 boys×97		0.51***	
		(0.11)	
2 girls×97		0.70***	
		(0.10)	
2 boys×07		0.45***	
		(0.11)	
2 girls×07		0.48***	
		(0.10)	
2 boys×12		0.42***	
		(0.10)	
2 girls×12		0.34***	
		(0.09)	
Observations	2,476	2,476	2,476
R^2	0.04	0.16	0.02
R^2 Partial		[0.03]	
F-statistic		23.25	

Terms in parenthesis are standard deviations.
Note: [* 0.01, ** 0.05, *** 0.10]