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## **Social Security Reform and Women's Pensions**

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The reform of the Chilean social security system had gender-differentiated impacts on incentives. This report examines the benefit structures and the gender breakdown of recipients to determine the future implications of the new system in a rapidly aging society. The new social security system may have the effect of increasing women's labor-force participation.

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# **Social security reform and women's pensions.\***

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## ***ABSTRACT***

The Chilean population is expected to age rapidly in the course of the generations born from 1960 to 1980. The fraction of individuals 65 years or older will increase from 6.1% (1990), to 12.7% (2025), and to 17.3 (2050). Such a change in the demographic composition of the population will likely exhaust traditional support systems of the elderly, and increase the relative importance of life-time savings, including social-security benefits. Thus, a policy approach that does not distort incentives to save for retirement becomes important for the well being of the population as a whole.

In 1981 Chile replaced a mature government-run social security system that operated on a pay-as-you-go basis, with a privately managed system based on individual retirement accounts. Overall, the new system is more fiscally sustainable. At the same time, incentives towards using the social security system to channel savings towards retirement changed, particularly for married women.

This paper examines the levels of income per capita and living arrangements of the current elderly by sex, estimates their poverty rates, and compares these with the poverty rates for the younger population. In addition, it estimates future pension benefits for the current generation of contributors, by sex, in an effort to establish the likely effects of reform on the living standards of elderly men and women. The key data source for the statistical analysis is the micro data set of the *1994 Caracterización Socioeconómica Nacional* (CASEN), a nationally and regionally representative household survey.

The 1994 cross section shows that women are less likely to earn income than men in any of the categories of income generation. Yet, in the case of retirement income, gender differences are relatively smaller. In urban areas, the fraction of elderly men that receive an old-age pension is twice as large as that of elderly women – 62 vs. 31 percent. But, an additional 19 percent of elderly women receive survivor's pensions, closing the retirement income gender gap. In rural areas, where old-age pensions are less typical, more than 23 percent of elderly women are beneficiaries of a PASIS, a government program targeted to the elderly poor. In urban and rural areas, older women are more likely to be widows, and more likely to live in extended households than men of the same

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\* This paper draws heavily on two detailed reports by the author: "Pension Projections for Chilean Men and Women: Estimates based on Social Security Contributions," and "A Close look at the Living Standards of Chilean elderly men and women," available at <http://www.csulb.edu/~acoxedwa/recent.htm>. These papers are part of a World Bank Research Project on Gender and Social Security managed by Estelle James (World Bank Institute) and Maria Correia (Latin America and the Caribbean Region Gender Team).

age group. An interesting finding for the case of Chile is that poverty rates –measured at the household level using equivalency scales, are generally lower among elderly males and females, compared to younger males and females. However, controlling for age category, poverty rates are higher among females.

In the future, old age pensions are expected to be lower for women than men, because women accumulate funds at a lower pace, can retire 5 years earlier and are expected to live longer than men. However, a close examination of the impact of reform reveals that it brought about significant changes in women's incentives to participate in the labor market, to save, and to use the social security system as a channel for their savings. In fact, the elimination of cross subsidies within the system is a source of complex effects on the relative position of women. Under the new system's rules: (1) there is no minimum level of contributions to obtain a pension; (2) contributions at a young age get an increased weight via compound interest; (3) widows can keep their own pension benefits in addition to their widow's pension. These three characteristics raised the marginal benefit of own contributions for working women relative to what the old system offered. In addition, the new system guarantees a minimum pension (MPG) for those that have contributed a minimum of 20 years, adding another incentive for participation. Transfers associated to the MPG are funded from general taxes and survivor's pensions are funded via distribution within households. In effect, married men are required to build a joint annuity leading to a within-family distribution towards women. Therefore, the new system eliminated a significant degree of regressive distribution from working families to elderly widows with no contribution of their own, but with generous pensions as a function of their spouses' pensions.

Overall, the new system is more fiscally sustainable and creates an incentive for greater labor force participation. Which system is preferable? If one thinks of labor market behavior as immutable and women's place as in the home, some method of subsidizing women in old age may be necessary. But, if one views the role of women as changing and responding to incentives, the new structure is more appropriate way to provide a social safety net while encouraging work and discouraging dependency.

## 1. Introduction

In 1981 Chile replaced a mature government-run social security system that operated on a pay-as-you-go (PAYG) basis<sup>1</sup>, with a privately managed system based on individual retirement accounts. In this paper I investigate whether Chile's social security reform affected men and women differently. A gender-differentiated analysis of current and future living standards of the elderly is important because women are expected to live longer, but they tend to save less than men through the social security system. In 1990, a 60-year-old woman was expected to live 21.8 years and a 60-year-old man 18.3. In the year 2005, these life expectancies would increase to 23.4 and 19.5 respectively (see Cepal, 1998). Given the differences in longevity, women would have to save more than men do in order to obtain the same retirement incomes.

There are four factors that explain why women are less inclined to contribute to the social security system as a way to provide for old age. (1) Women have lower labor-force participation rates. The division of labor within households has traditionally rendered a specialization along gender, particularly among married couples. Women specialize in home production and men specialize in market-oriented income-generating activities. In Chile, the extent of specialization along gender lines is subsiding, and there is a rising proportion of single and married women that generate monetary incomes from work. However, there is a larger likelihood of career interruptions among women compared to men. In particular, women would stop working to take care of the new born, to care for the sick, and generally to care for elderly parents or in-laws. Therefore, the density of labor market participation throughout the life cycle would be smaller for women than for men. (2) Women's salaries are generally lower than men's, even after controlling for age and schooling. (3) Social security systems generally apply gender-differentiated rules. For example, in Chile women can start drawing a pension five years earlier than men. And (4) the expectation that a woman will survive her husband, who in turn will receive a pension, means that she will typically get a widow's pension independently of her own savings.

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<sup>1</sup> By the late 1970s, the system generated a large deficit in spite of several hikes in payroll taxes. In 1979, pension ages were raised to put the system in balance (see Wagner, 1983).

The empirical analysis reported in this paper shows that Chile's social security reform brought about significant changes in women's incentives to participate in the labor market, to save, and to use the social security system as a channel for their savings. First, under the new system there is no minimum level of contributions to obtain a pension, while in the old system contributors with less than 10 years of contributions could not get a pension benefit. Second, the new system guarantees a minimum pension for those that have contributed a minimum of 20 years. In the old system, the guaranteed minimum was available to whoever had contributed a minimum of 10 years. These two changes hurt women with 10 to 20 years of contributions who would have qualified for the old minimum pension and would not qualify for the new minimum, but generally encourage women to work and contribute. Third, the new system requires married men to build a joint annuity leading to a within-family distribution towards women. In addition, the new system allows widows to keep their own pension benefits in addition to their widow's pension, restoring the marginal benefit of own contributions for working women. Fourth, the reform gives an increased weight to early years of contributions via compound interest, instead of the heavy weight given to the last five years in determining the pensionable wage under the old system. This change favors women relative to men because women are more likely to hold paid jobs when young and later drop out of the labor force. Moreover, even if women maintain a significant attachment to the labor force, they tend to have flatter age-earnings profiles relative to men.

The paper proceeds as follows. Section 2 describes the data and lays out the methodology. Section 3 examines the levels of income per capita and living arrangements of the current elderly, estimates their poverty rates, and compares these with the poverty rates for the younger population. Section 4 draws on the current behavior of the working-age population and current data on gender wage differentials to simulate the accumulation of funds towards pensions for men and women. The degree to which differences in savings are translated into differences in old age pensions depends on the rules of the system. The paper combines the fund accumulation estimates with the rules of the new social security system to simulate old age pensions. In addition, it uses the same data on contributions to simulate the old age pensions that would have been

paid under the old system rules. Section 5 uses the previous results to estimate gender-differentiated effects of the social security reform. Section 6 summarizes the results.

## 2. Data and Methodology

The key data source for the analysis is the micro data set of *the Caracterización Socioeconómica Nacional* (CASEN) for 1994.<sup>2</sup> This is a national household survey carried by the National Planning Office (MIDEPLAN).<sup>3</sup> The sample contains 178,057 observations (111,643 representing urban and 66,414 representing rural areas). Urban areas are defined as groupings of dwellings with a population greater than 2,000 individuals. The survey collects information on: demographics, characteristics of the dwelling, educational attainment, health care, occupation and employment, and incomes. Income questions distinguish labor income, income from capital, rental, imputed rent, and transfers such as pensions.

The paper uses this data set to examine the levels of income per capita and living arrangements of the current elderly. I also estimate poverty rates among the elderly, and compare them to the poverty rates for the younger population. Per capita incomes are estimated at the individual and household levels, using standard methods and following the literature on the subject. A key feature of these calculations is that I formally compare these variables for men and women

In addition, I use the same cross section data to estimate future pension benefits for the current generation of contributors, in an effort to establish the likely effects of reform on the living standards of elderly men and women. The paper does not attempt to predict the living arrangements of the elderly in the future. The results presented focus on social security benefits, and do not include other potential sources of income.

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<sup>2</sup> The data used is the one adjusted by Cepal (see Cepal, 1995) with three additional corrections that were justified in a recent study by The World Bank (see World Bank, 1997). (1) Live-in domestic service workers are treated as a separate household. (2) Incomes are deflated by a regional price index. (3) The three richest households in the sample are excluded from the income analysis because the incomes reported can be regarded as genuine outliers (see World Bank, 1997, Vol. II, pg 6).

<sup>3</sup> I am thankful to the Economics Department at Universidad de Chile, and in particular to Dante Contreras, for assistance with Casen data.

Clearly, a cross section is far from the ideal data source to estimate life-cycle earnings, or life-cycle contributions to social security. However, there is no better alternative. Historical patterns of contributions are not relevant under the current rules, and current longitudinal data files are not available. As a result, the paper goes through a detailed explanation of the way in which the cross-section data is used to make estimates of longitudinal behaviors. One of the most challenging estimates is female labor force participation patterns. This is because female labor force participation rates vary significantly by schooling, have seen a secular increase in the Latin America region, and are likely to respond to changes in labor force participation incentives.

At the simplest level, the cross section data allows us to estimate the labor force participation rate for a typical woman of a given age –say a 30, 40 or 50 year old. The observed participation patterns can then be used to project the behavior of a 20 year old into the future, assuming that the behavior of the observed 30, 40 and 50 year olds is characteristic of all women. Fortunately, we can do better. The data contains other individual variables, such as schooling and marital status, that are known to influence participation behavior. In addition, we note that participation rates are higher among women affiliated to the social security system compared to the female population as a whole. Therefore, the methodology rests on estimates for women affiliated to the social security system, by schooling and marital status.

Using the estimated participation rates, and the estimated wages by age and schooling as seen in the data, the analysis proceeds with an estimation of the accumulation of social security contributions. These estimates are a function of the system's rate of return, and the individual retirement ages. Individual pension benefits are subsequently estimated from the accumulated funds. These individual benefits are then compared to what the same "typical individuals" would have obtained if the nominal formula of the old system was applied. These comparisons allow us to understand better the effects of social security reform on the well being of the elderly

### **3. Standards of Living of the Current Elderly**

Women are less likely to earn income than men. This is true in any of the categories of income generation. Yet, in the case of retirement income, gender differences are relatively smaller. In urban areas, the fraction of elderly men that receive an old-age pension is twice as large as that of elderly women –62 vs. 31 percent. This section examines the sources of income of the elderly population, and looks at the standard of living of the elderly in comparison to the rest of the population.

#### *3.1 Incomes*

The relative importance of the various sources of income varies by age and gender. For example, 67% of urban men of all ages obtain income from work and 70% of non-working older men have retirement income, suggesting a correspondence between work income and retirement income for men. The patterns for women are different. Only 32% of urban women of all ages obtain income from work, while 60% of non-working older women have some sort of retirement income. The picture is not too different in rural areas, except for a smaller percentage –only 16%-- of women report income from work. What is surprising, however, is that when it comes to pension earnings, gender differences are much smaller. About 60% of elderly women and 70% of elderly men receive some sort of pension income.

Two factors explain why a large fraction of elderly women receive pensions while at the same time, a small fraction of women works at younger ages are two. First, in urban areas, most elderly women are widows, and a large fraction of them have pension benefits either from their own work or from their husbands. Second, in rural areas, where poverty rates are higher, close to 40% of female beneficiaries of pension income are beneficiaries of the social assistance pension (Pension Asistencial - PASIS).<sup>4</sup>

The PASIS program, which was implemented in 1975, has two components: (a) free medical assistance in the Public System and, (b) a monthly benefit indexed to the

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<sup>4</sup> The PASIS program makes income transfers given to indigents that are over 18 and incapacitated, or above 65, that have resided in the country for a minimum of three years.

Consumer Price Index (CPI) adjusted every December. In October of 1999, the benefit was \$32,772.84 (approx. US\$ 64) per month. This is equivalent to 50% of the minimum pension, or about 11% of the average wage.<sup>5</sup> In December of 1998, old-age PASIS beneficiaries represented 12.5% of all old-age pension beneficiaries (public and private). Coverage is significant in the rural areas where poverty levels are higher. Based on data from the 1994 survey, we calculate that about 75% of poor women receive the PASIS subsidy. These pensions are financed by a special fund transferred from the central government to the thirteen regional authorities (*Intendencias*) and is independent of the social security system.

### 3.2. *Elderly Women are more likely to live in Extended Households*

Most studies on the living arrangements of older men and women, use three conventional household types: unipersonal, nuclear, and extended. However, a non-trivial fraction of the elderly live with unmarried grown up children. This arrangement does not fit with the extended family definition, although it is closer to the extended family than to a nuclear family, simply because grown children are likely to be taking care of their parents. To attend to this distinction, nuclear families were subdivided into two types: those with at least one child 30 years of age or older, and those with no children 30 or above.<sup>6</sup>

Table 1 summarizes the results of living arrangements for men and women 60 years old or above. It is clear that *elderly women are more likely to live in extended families than elderly men*. More than 50% of elderly women live in extended households. The fraction of elderly men in extended households is just about 40%. About 50% of elderly men live in nuclear households, with or without adult children. These patterns are observed in urban and rural areas, and suggests that *men are more likely to age with their household while women, perhaps because they live longer, are more likely to age with an*

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<sup>5</sup> Given that the data analysis in this paper is based on 1994 information, it is relevant to note that the typical amount for 1994 was \$15,967.

<sup>6</sup> Each household is formed by a minimum of one family, conformed by a “head of household,” who may have a spouse or partner, a child, a parent, a sister, etc. Everybody is defined in relation to the “head of household.” If the family is limited to a head, spouse or partner and child(ren), it is considered a “nuclear” family. If the family includes other members aside from the “nuclear” family, it is considered “extended.” Non-family members, except for live-in domestic workers, are classified in the same family category of the main family. Live-in domestic workers are considered unipersonal households.

*extended family*. Clearly, this analysis faces the challenge of establishing the living standard or well being of the elderly inserted in extended households, and then comparing it with that of older individuals living alone, or with their spouse.

### 3.3 *Income levels and poverty rates of the elderly*

As pointed out above, about 60% of elderly women and 70% of elderly men receive some form of pension income. These numbers, however, do not give an accurate measure of the elderly's real income, because retirement income is not the only source of income, and old men and women most often do not live alone. In order to address these issues, we compare the levels of household income per capita for men and women 60 and over, controlling for the type of household structure they live in.

As a first step in our income calculations, we take into account the fact that there are economies of scale within households, and that the cost of living varies according to age. We use five alternative scales to calculate weights to count household members and calculate income per capita: a simple members count (N); the Chile scale (Neq); the Deaton scale (NeqD); the OECD scale (NeqO); and the Cutler scale (NeqC).<sup>7</sup> The Chile scale is a household-equivalency scale calculated by Contreras (1995), using the "Rothbarth adult goods method".<sup>8</sup>

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<sup>7</sup> The Deaton scale weights all adults 18 or over as 1; children below 6 as .2; children between 7 and 13 as .3; and children 14-17 as .5. The OECD scale weights the first adult as 1; additional adults as .5; and children less than 14 as .3. The Cutler scale weights adults 20 to 65 as 1; adults above 65 as 1.27; and children less than 20 as .72.

<sup>8</sup> Contreras' scale was estimated excluding all households with a single adult from the sample, and taking two adults as a reference type. He found that adult good expenditures were restored to the childless couple level when incomes for families with one child in the age categories below was raised by estimated percentages. Contreras' original scale was modified to include single individual households, and to take into account economies of scale within the household. The scale used, which is also applied to unipersonal households, is the following:

$$Y_i = X_i/M_i, \text{ where}$$

$$M_i = 1.2 + 0.8(N_{aa} + N_{11-15}) + 0.4 N_{5-10} + 0.3 N_{0-4}$$
 With  $N_{aa}$  = number of additional adults in the household  
 $N_{11-15}$  = number of children aged 11-15 in the household  
 $N_{5-10}$  = number of children aged 5-10 in the household  
 $N_{0-4}$  = number of children aged 0-4 in the household

We proceed to use the household-income estimates to establish poverty rates using a poverty line of 30,100 pesos per equivalent adult.<sup>9</sup> The results for poverty calculations by household according to the number of elderly are presented in Table 2, and contain two key results. Poverty rates are higher in rural areas compared to urban areas across comparable households with or without elderly. The data also shows that poverty among households with elderly is lower than poverty among households at large, both in urban and rural areas. This conclusion is robust to the choice of equivalency scale, except when using Cutler's. Therefore, the conclusion regarding the relative well being of the elderly can be turned around if we assume, as Cutler does, that the elderly are subject to a substantially higher cost of living.

Table 3 focuses on individuals, and allows a closer look at gender differentials. Once again, income per capita is measured at the household level adjusting household size according to equivalency scales. The estimated per capita incomes are applied to each individual, and the table presents poverty counts by age and gender category. Table 3 leads us to conclude the following. Poverty rates are generally lower among elderly males and females, compared to younger males and females --in the 16 to 59 age-range. Poverty rates are higher among 16-59 year old females relative to 15-59 year old males, and also higher among elderly females relative to elderly males.

Table 4 presents calculations of poverty counts for the elderly according to housing arrangement. The income per capita figures (not shown) used to arrive to these calculations, indicate that across the different scales, income per capita levels are the highest among unipersonal and nuclear households. Nuclear households with adult children (30 or over) are characterized by per capita incomes below nuclear, and above extended. This would suggest that the unipersonal or nuclear-household arrangement is a less likely alternative for lower income families. Yet, the distribution of income among unipersonal households of elderly individuals is very unequal, causing a high poverty incidence among unipersonal households.

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<sup>9</sup> A regional price level indexed incomes in the different regions. The poverty line is the same used by a recent World Bank study on Chilean Poverty and Income Distribution (World Bank, 1997).

### 3.4 *Sources of Income among the elderly*

We turn to the various sources of income among the elderly and to the significance of these sources to the overall household's monetary income. As shown in Table 5, about 74% of urban and rural elderly women generate some form of monetary income. Close to 100% of elderly males in urban areas generate some form of monetary income and about 93% of elderly males in rural areas do so. Women are less likely than men to contribute in any of the categories of monetary income generation (wages, imputed rent, and own pension), although the differences are less pronounced in the pension category.

The fraction of elderly men that receive an old-age pension is twice as large as that of women—62 vs. 31 percent. Yet, an additional 19 percent of elderly women receive survivor's pensions, closing the retirement income gender gap. In every category, women with sources of income earn less relative to men. Differences are smaller in the PASIS program and the imputed rent category relative to the other income categories. The fact that elderly women are poorer than elderly men is also evident in the importance of the PASIS program as a source of income for elderly women, particularly in rural areas.

Columns 3 and 6 in Table 5 show the significance of income contributions of the elderly to total household income. The likelihood that elderly women make contributions to household incomes is lower than that of elderly men. Furthermore, the relative contribution of elderly women's incomes towards total household incomes—among those that make contributions—is also lower than income producing elderly men. The exception on the last regularity is the case of imputed income from owner occupied housing. This last finding suggests the importance of researching the role of investments in housing, as an alternative to social security savings, in the case of women.

Given that a significant fraction of elderly women live in extended households, it is of interest to know how significant is the contribution of their income to that of the extended household. We restrict our analysis to monetary income sources, because we do not have any direct measure of the non-monetary contribution of elderly individuals to

household's production. Do elderly women improve the standard of living of the household they join? Are these extended households close to the poverty line? Table 6 reports the results of comparing extended-households income per capita with and without the elderly person in question.

Close to 85% of elderly men make a contribution to extended household's income, in rural as well as urban areas. However, less than 45% of elderly women have such a positive impact on household income. The average income effect of the presence of an elderly person in the household (positive or negative) is relative small in rural areas, and more significant in urban areas. These cross tabulations do not allow us to draw any conclusions on causality. Extended households may originate on the move of an elderly widow to her son's household. They may also originate on the move of a man, wife and children to his parent's house. When we turn to poverty counts, we see that *the highest incidence of poverty among the elderly is found among extended households*. Again, there are many possible explanations. However, we shall see that the incidence of poverty is larger among extended households where the elderly have a positive impact on pc income.

Women are less likely to earn income than men are. This is true in any of the categories of income generation. Yet, in the case of retirement income, gender differences are relatively smaller. In urban areas, the fraction of elderly men that receive an old-age pension is twice as large as that of elderly women –62 vs. 31 percent. But, an additional 19 percent of elderly women receive survivor's pensions, closing the retirement income gender gap. In rural areas, where old-age pensions are less typical, more than 23 percent of elderly women are beneficiaries of a PASIS, a government program targeted to the elderly poor. In urban and rural areas, older women are more likely to be widows, and more likely to live in extended households than men of the same age group. Poverty rates –measured at the household level using equivalency scales, are generally lower among elderly males and females, compared to younger males and females. However, controlling for age category, poverty rates are higher among females.

#### **4. Preparing for Old Age: Gender Differences in Employment and Social Security Participation among the Young.**

In this section we estimate longitudinal patterns of contributory behavior and wages. The CASEN 94 survey provides information on current labor force participation, working status, affiliation to social security, and contributory status. It also asks individuals if they have ever worked. Because the information on years of contributions is not available from CASEN, nor is it publicly available from the AFPs, it is crucial to derive the best possible estimate of contributory behavior from the cross section data. In the absence of longitudinal data, we are forced to use the cross section data as a synthetic cohort and estimate years of contributions based on the best estimate of contributory behavior through the life cycle of “typical” men and women.

The group of individuals that makes contributions to the social security system in a given month is a sub-sample of all workers. This group, in turn, is a sub-sample of individuals in the working-age population, with distinct gender, age, schooling, and marital status characteristics. Labor force participation of 16-65 year old urban women and men, is driven by marital status; years since finishing school or potential experience; post-secondary schooling; and marriage. The likelihood of participation is significantly lower for women --at 39% on average than for men-- at 82% on average. Marriage will further reduce the probability of participation for women and will increase it for men. Post secondary schooling increases the likelihood of participation and diminishes the negative effect of marriage for women, but lowers the probability of participation for men.

##### *4.1 Who contributes?*

Chilean law requires employees under contracts to make contributions to their personal retirement accounts. The self-employed and those without contracts may, if they so wish, make voluntary contributions to the pension system. In urban areas, for example, the employees' category accounts for about 72 percent of working men and just about 60 percent of working women. Within the employee's category, 82 percent of males and 85 percent of females have contracts, and among those that have contracts, 95 percent of men and women make contributions.

However, there is also a significant fraction of workers that make contributions without being obliged to do so. Up to 24.8% of individuals not required to contribute (the self-employed and the employees without contracts) do make contributions. This fraction increases with age and schooling, and does not vary much with the level of salaries or the sector of employment. Establishment size and gender are important factors. In particular, workers in larger establishments are more likely to contribute. It is apparent that, with or without controlling for industry and establishment size, women are 6.16% less likely to contribute.<sup>10</sup>

A natural approach to study the behavior of contributors by age is to focus on the sample of “affiliates,” since affiliation to the social security system is a necessary condition to contribute to social security. The survey collects information on current labor force status, and also asks individuals if they have ever worked. In 1994, the proportion of 15 years or older that work or has worked is 90.7%, while the equivalent proportion of women is 70.4%. That is women have, on average about 25% lower probability of ever generating income from labor relative to men. In addition, women have a lower attachment to the labor force, which is captured by the gender differences in employment ratios in a given year. In 1994, for example, 72% of urban working age males worked, and only 36% of working age females did so.

Conditional on working or having worked for pay, 73.4% of men are affiliates to the social security system, and only 55.2% of women are. The already smaller fraction of women that ever worked for pay, is 25% less likely than the equivalent group of men to affiliate to the social security system, suggesting that women are less inclined to use the social security system as a vehicle for channeling savings.

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<sup>10</sup> This finding suggests that women, in similar circumstances to men, are less likely to assign a marginal value to their social security contributions. As we will see later, a large fraction of women are expected to qualify for the pension guarantee. The prospect of a guarantee reduces to zero the marginal value of contributions beyond the 20 years minimum requirement. In addition, the fact that married women obtain health care coverage through a contributing husband’s family plan, may be part of the explanation. This reduces the value of the 20% contribution to just about 13%. Further work should examine the impact of the tied-in character of the pension and health care programs on a married couple’s incentive to save towards retirement.

Affiliates are not a random sample of the working population. In particular, affiliates are individuals that have a higher attachment to the labor force than average. Out of all men affiliates, 82% are working at the time of the survey, and about 64% of women affiliates are working at the time of the survey. These working ratios must be compared to the 72% and 36% ratios as a fraction of the working age population.

More than 90 percent of men and women affiliates that are working at the time of the survey are also contributing towards social security. In fact, the fraction of women contributors in this sample is slightly higher than that of men. This leads us to conclude that the month-to-month contributory behavior of affiliates is driven primarily by the choice of work or no work in any given month. However, the reader should not lose sight of the fact that women affiliates have a lower attachment to the labor force than men affiliates, causing a gender gap in the accumulation of contributions among affiliates.

We proceed to estimate contributing behavior among affiliates only. The reasons to concentrate on affiliates are four. (1) Only those individuals that are “affiliated” to the social security system can make contributions toward retirement. (2) Unlike labor force participation, employment, or employment status, affiliation does not change as an individual ages. Once an individual affiliates, he or she remains affiliated. (3) The probability that an affiliated individual of a given age and schooling level is working at the time of the survey is not 100%, but it is significantly higher than the probability of work of the non-affiliated. (4) In addition, when affiliates work, they have a 90% probability of contributing.

Further data analysis shows that the proportion of women that ever works rises with schooling. As stated earlier, schooling is a key explanatory variable of wage levels, age of marriage, and labor force participation. We consider five schooling groups: incomplete primary, complete primary, incomplete secondary, up to four years of post-secondary, and five or more years of post-secondary. It is of interest to note that, if we restrict the sample to affiliates that are currently working or have worked before, and that

are 60 years old or younger, we see a remarkable similarity across gender in contributory status. Among men and women with less than primary schooling contribution rates are 84%. The contribution rates increase to 89% among those with incomplete primary; to 93% among those with complete secondary and men with up to four years of post secondary; and to 96% for women with post secondary and men with 5 or more years of post secondary.

#### 4.2 *Estimating Years of Contributions*

The methodology rests on estimates of the fraction of contributors within each gender, age, marital status, and schooling category, from the sample of affiliates that have worked at some point. The precise procedure is as follows:

1. The sample of ever-working affiliates is separated in 20 main categories ( $2 \times 2 \times 5$ ): Men and women, married and single, and five schooling categories. Within each of these 20 samples, we calculated the proportion of individuals that contributed to the social security system.<sup>11</sup>
2. Since marriage is an important determinant of participation, and marriage age varies significantly by schooling category, we distinguish the behavioral patterns of single and married individuals. We assume that the “typical” man and woman within each schooling category accumulates contributions as a single person first, gets married, and continues to accumulate contributions as a married person afterwards. The marriage age for the “typical” men and women is the age at which 50% of the corresponding category is married.<sup>12</sup> Marriage tends to be earlier for ever-working men affiliates than for the men sample, and marriage tends to be delayed for ever-working women affiliates than for the women sample. Since we are focused on the group of affiliates, we use the corresponding marriage ages for that sample. This step reduces our categories to 10: five schooling categories, two sexes. We then estimate years of contributions by single age.

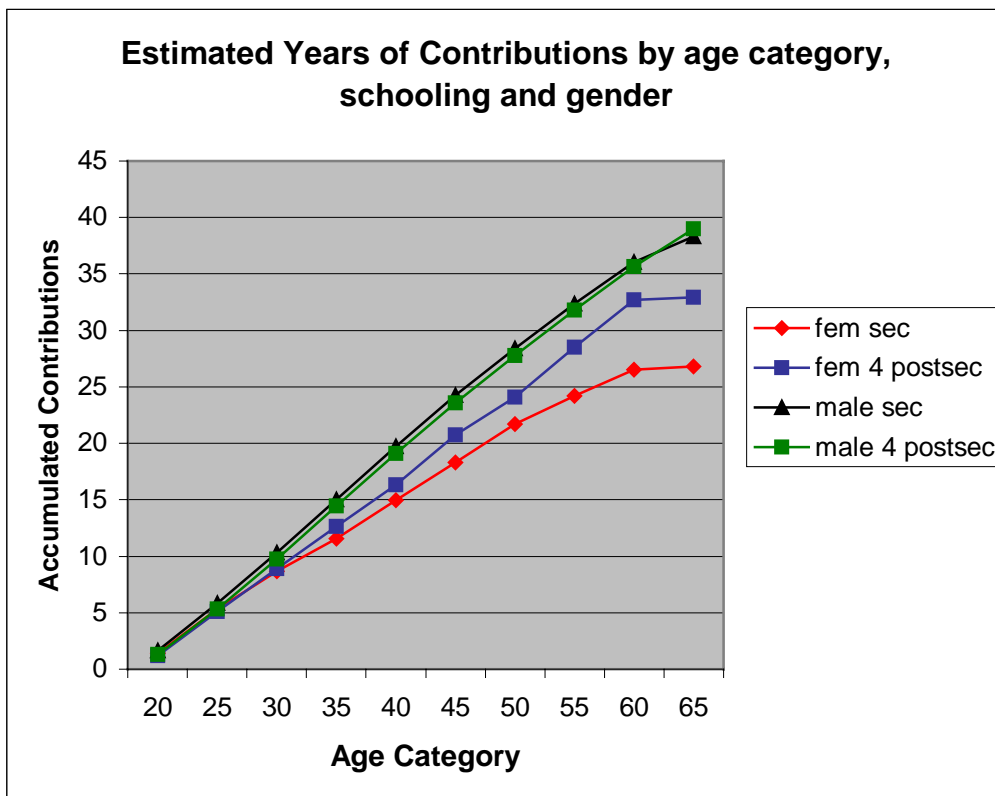
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<sup>11</sup> The sample of men that ever worked is almost always the same as the sample of men, but the sample of women that ever worked varies with schooling. For example, at age 34, the fraction of women that ever worked goes from 67 percent among those without complete secondary schooling, to 75, 93 and 97 percent among those with secondary, up to 4 years of post secondary, and 5 or more years of post secondary schooling.

<sup>12</sup> The “typical marriage age” is the same in the sample of ever working affiliates.

The emerging relationship between age and years of contributions is captured in Figure 1 where two male and female schooling types are represented. The lines describe the relationship between estimates of work experience and age. Assuming that working affiliates make contributions to social security, a relatively higher line indicates steady accumulation of years worth of contributions, as it is the case of male with secondary schooling. A relatively high and steeper line indicates fast accumulation after a later start, as it is the case of males and females with 5 or more years of post secondary schooling. A lower and flatter line shows a relative lower degree of labor force attachment, and a relatively slower accumulation of contributions, as it is the case of female with secondary schooling.

Figure 1



Gender differences in the degree of attachment to the labor force among affiliates result in important differences in life-time-contributions. Men typically accumulate 40 years

worth of contributions from age 16 to 65. Women tend to have more interruptions especially the ones in the lower schooling categories. In particular, women with complete secondary schooling accumulate, on average, less than 30 years worth of contributions by age 65.

### 4.3 *Earnings Profiles*

To estimate the accumulation of funds, it is necessary to have an estimate of contributory behavior --which was obtained in the previous sub section--, and also an estimate of wages. We produce an estimate of wage variations as individuals age, based on observed wages by age, sex and schooling. The wage data used represents all workers. The sample choice is driven primarily by the objective of keeping it as large as possible. However, it is also reassuring that both affiliation and contribution behavior is not significantly affected by wage levels. Therefore wage estimates originated from a broad sample of workers should not be different from wage estimates originated from a sample of ever working affiliates.

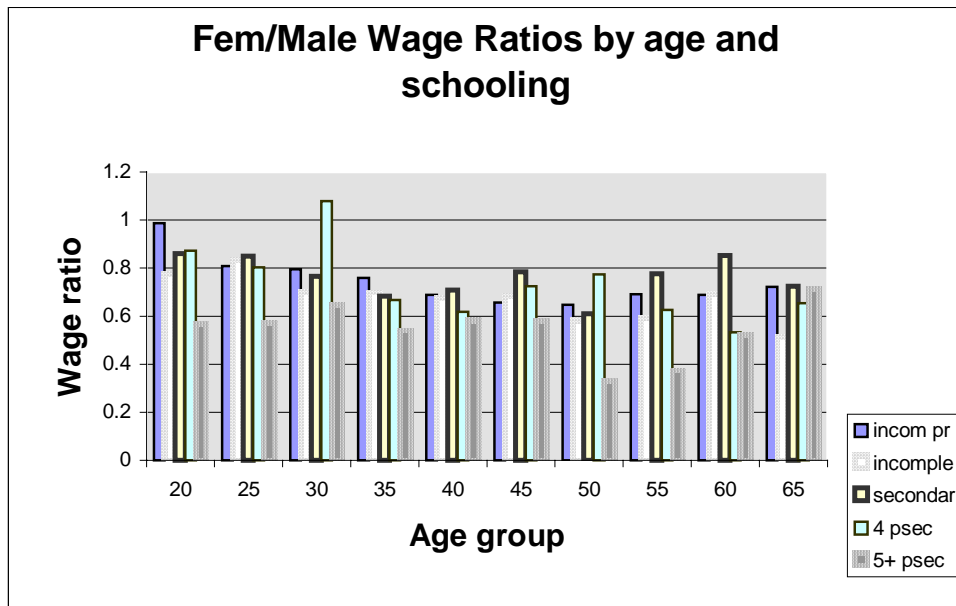
We start from the assumption that current patterns of earnings (as a function of schooling and experience) have been there for some time, and will remain stable in the future. The key challenge is to capture that earnings pattern from the existing data. The human capital earnings function, in which earnings are expressed as a quadratic in potential experience, is probably the most widely accepted empirical specification in economics. Nevertheless, there are two reasons why this procedure is not the most appropriate for the question in front of us. First, we simply do not have a good proxy for female experience. Second, our aim is to get the best estimate of wages for workers of a given age (since contributions and benefits eligibility are bound by age). Consequent with the reasons offered above, we use an alternative procedure to compute earnings.

We organize the data on wages from the 1994 Casen survey along sex/age/schooling categories, and an average wage was calculated for each cell. This method does not impose a particular functional form, and it also has the advantage of implicitly weighting

the sample according to its composition (by other characteristics) within each cell. Given the limitation imposed by sample sizes, it is not possible to estimate average wages for single-age categories. A five-year interval was chosen in order to gain sample size while keeping the age categories short, since estimated salaries for a range of years are likely to overestimate starting-period contributions and underestimate end-period contributions.

The resulting wage – experience profiles have a concave shape. That is, wages grow faster at the earlier stage of most groups’ careers, and growth slows down after age 40, and often we see wages fall below the peak by age 60. Estimated gender wage differentials by schooling and age are captured in Figure 2, and indicate that the female/male wage ratio is in the .6 to .8 range in most cases. The notable exception is the “5 or more years of schooling” category, where the differential is closer to .5. The wage differential tends to grow with age, a feature that will have an impact on the savings accumulation towards pensions.

**Figure 2**



## 5. Funds Accumulation and Gender-Differentiated Pensions

This section explores gender-differentiated accumulation of funds, pension benefits, and replacement rates, based on simulations for representative workers. The impact of social security reform (from a pay-as-you-go to a multi-pillar system) and of particular pay out policies of a defined-contributions system will be calculated.

### 5.1 *Gender differences in funds accumulation*

We assume that workers in a given schooling and gender category contribute 10% of the corresponding estimated wage, as required by law. The wage estimate for each age, in turn, is assumed to be equal to the estimated value for the corresponding 5-age period.<sup>13</sup> For a given age, estimated annual months of contributions are equal to  $12 * (\text{accumulated contributions for the 5 years-period}) / 5$ . The accumulation of funds is the result of compounding the estimated contributions at a various interest rates. According to our estimates, women accumulate funds at a lower pace on average, and have wage profiles that are flatter and typically bellow those of men.

The calculations presented in Table 7 show estimated life-time accumulation of funds for men and women, by schooling. Estimates based on a 5% rate of return and a 2% wage growth generate women's funds that are 36 to 52 percent of male funds. In addition, calculations shown at the bottom of the Table decompose the overall difference in fund accumulations, within each schooling category, in four steps. (1) Starting from that lower level, if women postpone retirement to age 65, their funds accumulation would increase between 10 and 15 points towards male funds accumulation depending on the schooling group. This effect tends to be larger for more educated women because their work intensity from 60 to 65 tends to be higher. (2) If women still work to age 60, but do so with the same work intensity of men, their funds accumulation would increase between 19 and 1%, depending on the schooling group. The effect of this step shows significant variation across schooling groups, because there is a significant variation in work

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<sup>13</sup> In some simulations we add a secular growth to wages, simply increasing the estimated annual wage by the corresponding growth effect.

intensity across these women groups. In fact, highly educated women work almost as intensively as men of that same schooling group do. Therefore the effect of changing the work pattern for this group of women is very small. (3) If, on the other hand, women work to age 60, with their own work patterns, but are paid as men, their funds accumulations would increase between 7 and 25% towards male funds accumulation, depending on the schooling group. In this case, we see a pattern of effects characterized by about 7% impact for the secondary and up to 4 years of post secondary groups, about 13% for the lower education groups, and above 25% for the higher schooling group. One of the reasons for the relatively larger effect of wage increases for women in highest schooling group is that this is precisely the group with the most labor market attachment. Therefore, an increase in wage levels is weighted by a higher number than an increase in wages of other women groups. (4) The last step represents the interaction of the first three effects.

## 5.2 *Estimated Future Pension Benefits (Urban Areas)*

Given a large difference in accumulated funds, the estimated defined-contribution pensions are expected to be lower for women than for men. In addition, the combination of earlier retirement age and longer life expectancy, leads women to provide for 23 years of income from their accumulated fund. Married men retire at 65, and must provide for a joint annuity of 21 years. This joint annuity is composed of 15 years of own pension and 6 years of widow's pension, at 60% of own benefit. Single men retire at 65 and must provide for their own 15 years annuity. Therefore, even if men and women started with the same fund accumulation at their "normal" retirement age, a woman's annuity derived exclusively from her accumulated funds, would be necessarily smaller than that of a man derived from his accumulated fund.

To arrive to the annuities from the estimated fund, we assume that the typical man is married with a woman that is three years younger.<sup>14</sup> This typical man retires at age 65, with a life expectancy of 15 years. His wife is expected to live 6 years beyond his expected life therefore, he is required to provide for 6 years of his "survivor's pension,"

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<sup>14</sup> This is consistent with CASEN data.

at 60% of his own pension. Chilean law requires retiring married men to put aside funds in order to cover a pension for his widow and surviving children in case of death.<sup>15</sup> The law does not require retiring married women to provide for their surviving husbands, unless the husband is handicapped. In our calculations, we assume there are no surviving minors, that men reserve part of their fund to provide for surviving wives, and that women convert their entire fund to their annuity. If the resulting annuity is smaller than the minimum pension guarantee (MPG), the estimated value is increased to the MPG.

Based on the calculated annuity, women's replacement ratios<sup>16</sup> are close to 60% of men's replacement ratios. Note however, that gender differences in replacement rates are smaller than the measured differences in the accumulated funds and the annuities. There are three reasons for this:

- (1) Several categories of women qualify for the MPG, which raises the annuity above the level supported by own funds.
- (2) Replacement ratios are calculated as the ratio of the monthly annuity over the reference salary, which is the average tax base of the last ten calendar years of work divided by 12. The reference period corresponds to 120 calendar months. To the extent that the typical man or women would work less than 120 calendar months during the reference period, the estimated reference salary is lower than the estimated average wage for the same reference period. During the 10 years that precede the minimum pensionable age, women have an average work accumulation that is significantly lower than that of men. This causes the gender differential in reference wages to be larger than the gender differential in wages.
- (3) If the denominator in women's replacement ratio is relatively low, the resulting replacement ratio for women is relatively high.

### 5.3 *The issue of retirement age*

Current information indicates that a significant fraction of men and women that have reached retirement age, choose not to claim benefits. Thus, the retirement age operates as

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<sup>15</sup> The exact amount required to comply with this regulation is a matter of a private contract between the retiree and an insurance company.

an option that individuals take when it is more convenient for them. If women stay in the labor force beyond age 60, they can add to their fund accumulation and they are more likely to qualify for the minimum pension on grounds of years of contributions. The impact on annuities is positive on two grounds: the accumulated fund is larger, and the number of years to be covered by the annuity is smaller.

Under our low returns' scenario, women with less than complete secondary schooling, have no gains from delaying claims. The reason is that they will all qualify for the minimum pension guarantee. On the other hand, women with complete secondary schooling stand to increase their annuity by 10% if they postpone claims, and the effect would be much larger for women with higher levels of schooling. Under the assumption of high return, postponing claims increases the annuity in the order of 50% for all groups. However, we do not know if an additional year of work past age 60 will increase or reduce these women's welfare. The answer depends on individual preferences. We can only say that the option to draw a pension early or late is a superior alternative to that of an age requirement before claiming benefits or that of forced retirement at a given age.

#### 5.4 *The Impact of Reform*

In this section pension estimates obtained for the current system are compared with the corresponding pension incomes that would be obtained under the old system rules,<sup>17</sup> where retirement benefits were based on the following formula:

$$\begin{aligned} \text{Monthly Retirement Benefit} &= 0 \text{ if the affiliate makes less than 10 years worth of} \\ &\quad \text{Contributions; or the maximum between} \\ &= .50 * BS + .01 * BS * (W - 500) / 50, \text{ or} \\ &= .70 * BS^{18}, \end{aligned}$$

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<sup>16</sup> Replacement ratios divide the estimated annuity by the reference salary

<sup>17</sup> Since rules varied according to the specific fund, we used the SSS rules. The SSS represented more than 60 percent of contributors in 1980.

<sup>18</sup> The old system also offered a minimum pension guarantee.

With BS= basic salary = sum of total taxable wages of the prior five years, divided by sixty, indexing the last three years, and

W = Total number of weeks of accumulated experience (above 520).

Men could retire at 65 and women at 60.<sup>19</sup> Benefits included survivor's pensions equivalent to 50% of the pension of the originator for the widow, and 20% of the mean salary per child. Men typically work 40 years, and a man with 40 years of contributions is very close to the maximum replacement rate of 70 percent. Therefore, men's pensions and widow's pensions were generally capped.

Based on the rules of the two systems, it is apparent that women with more than 10 years of contributions got a very good deal under the old system rules. They could retire 5 years earlier than men, receive a benefit based on their last five years of earnings, and with a typical life time experience of 20 to 30 years, got a 60 percent replacement rate. On the other hand, women with less than 10 years of contributions did not have any incentive to participate in the system since they did not qualify for a pension benefit.

However, the rules of the old SSS (*servicio de seguro social*) system, which covered the majority of the currently retired population, forced women to choose between retirement income and pension. That is, if they were eligible for benefits from their own working years, and were also eligible for a widow's pension, they could not access the two sets of benefits, and had to choose the better of the two (see article 7- Law 10.383).

Under the rules of the new social security system, benefits are a function of the accumulation of funds. There is no minimum contributions required to obtain a pension, as there was in the old system, which required a minimum of 10 years. Contributions add to the accumulated fund independently of the timing of labor force participation, and independently of the periodicity of income-generating activities. Women that make contributions early in their careers benefit from the interest accumulation associated to those early contributions.

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<sup>19</sup> The retirement age for women was raised from 55 to 60 in 1979 as part of an effort to equilibrate the old system.

The new system pays benefits as a function of contributions. This would tend to lower some women's benefits, and raise the benefits of single men to the extent that they would not be subject to a maximum benefit. On the other hand, the new system includes a minimum pension guaranteed, which as shown, would raise the benefits for women with low levels of schooling significantly above the actuarially fair levels. Moreover, married men are required to provide for the funding of their spouse pension as a function of her probability of survival, lowering the individual benefits of married men relative to single men.

In Table 8 we provide estimates of social security related incomes for elderly men and women in each of the schooling categories. To estimate widow's pensions, it is assumed that married couples belong to the same schooling category.<sup>20</sup> The calculations highlight the complex effects of the system's reform. In particular, it suggests systematic effects by marital status and across schooling categories. The calculations presented at the bottom of Table 8 assume full indexation. However, since the old system was not fully indexed, the benefit estimates for the old system presented at the bottom of Table 8 represent an upper bound. To give an idea of the degree of overestimation of these benefits, the following calculation is of interest. If benefits are maintained at the nominal level shown in Table 8, and there is a 10% annual inflation, in the absence of indexation real benefits fall to less than 50% of their initial value after 10 years, less than 20% after 17 years, and just over 10% after 23 years.

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<sup>20</sup> These estimates can be compared with those provided by Baeza and Burger (1995). Their estimates are based on actual retirement cases. They use a sample of 4,064 individuals that have retired under the new system, and estimate that the average replacement rate has amounted to 78%. The highest (relative) pensions have been obtained by those individuals that have opted for early retirement, with a replacement rate of 82% under programmed retirement. Baeza and Burger (1995) attribute this result to the fact that only those that have had rapid accumulation of funds -- mostly by making voluntary contributions -- can in reality opt for early retirement. To December of 1997 average old age pensions under the capitalization system were 39% higher than average pensions under the old pay-as-you-go regime. In the case of disability, pensions under the new system were 61% higher than under the previous regime. Overall, replacement rates have been quite high -- indeed higher than under most industrialized countries' systems (see Davis (1998) and Gruber and Wise (1999)). Naturally, since the Chilean system is a defined-contribution system, there are no assurances that the replacement rates observed until now will be maintained in the future.

In addition, direct comparisons of benefits before and after the reform do not take into account the degree of sustainability of the systems, and in particular, the fact that the old system was unable to deliver the promised benefits under its formulas; and do not take into account the fact that there was a significant reduction in contribution rates. In view of these shortcomings, we continue the analysis comparing gender ratios of contributions and benefits before and after the reform. Furthermore, the old system had a higher contribution ratio than the new system. However, the contribution rate of the old system had increased over time, making the actual estimate of contributions more difficult to make.

Given the shortcomings of comparing dollar value of benefits across the two systems, we move to a relative cost and benefits approach. Table 9 reports the gender ratio of accumulated contributions and the gender ratio of the present value of benefits for various categories of men and women. The first row in the top panel of Table 9 shows that women with complete secondary schooling contribute 43% of the amount contributed by a typical man in that same schooling category. The ratio of accumulated contributions of women relative to men is always less than 1 and typically below 50 percent. A decomposition of the contributing factors towards this differential was provided earlier (see Table 7), and include the fact that women retire at a younger age, earn lower wages, and have a lesser degree of attachment to the labor force than men.

The first row in the second panel of Table 9 shows that, under the old system's rules, working women in the secondary school category draw 82% of single men's benefits. In the old system, there is no strict link between contributions and benefits and the disparity between contribution ratios and benefits ratios by gender indicates a significant pro women bias in the allocation of benefits. The pro women's bias is also regressive since the gender ratio of benefits rises more than 30 points above the gender contributions' ratio for women with secondary education. This compares with a difference of less than 20 points between the ratio of contributions and the ratio of benefits among women with less than secondary schooling.

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The first row of the third panel of Table 9 shows that under the new system's rules, single women draw 42% and married women 54% of the benefits that single men obtain. In the new system, benefits for single men are calculated differently than for married men because married men are required to make provisions for survivor's benefits. This is why the ratio of benefits for married men relative to single men is less than one. Single women are beneficiaries if they have made contributions, and married women are beneficiaries if they are married to a contributor and/or if they have made contributions. In the new system, there is a close link between contributions and benefits except for two factors. The joint annuities provision requires a redistribution of benefits from husbands to wives, and the minimum pension guarantee brings additional benefits from sources outside the system to those that would otherwise draw pension below a minimum. As we see in the bottom part of Table 9, single women's benefit ratios are just below their corresponding contributions ratios<sup>21</sup>, except for the case of low schooling categories where the MPG raises benefits significantly above contributions. Married women, on the other hand obtain benefits ratios above their contribution ratios because they receive a widow's pension. For the same reason, the ratio of benefits of married men to single men, for a given ratio of contributions, is below 1.

A striking result from the benefit ratios presented in Table 9 is that, according to the old system rules, all contributing women get better benefits ratios than their corresponding contribution ratios. In addition, non-contributing married women get a benefit that does not have a counterpart in reduced benefits for married men. There are only two ways to have this result: either the system is in deficit, or aggregate benefits are below aggregate contributions for the remaining contributors. This means that the old system contained a significant labor tax component, a significant inflation tax component or both. In fact, inflation and system's deficit were part of the picture at the time of reform, which bring

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<sup>21</sup> The difference between the ratio of contribution and the ratio of benefits in a system that is "defined contributions" comes from the cost of annuities. In Chile, contributors pay a cost for transforming their accumulated fund into an indexed annuity. This cost is assumed here to be higher for women because they take their annuity through a longer period.

another difficulty in the direct comparison of benefits between the old and the new system.

Another feature of the benefit's structure of the old system is that women married to high wage men, receive a relatively larger unfounded benefit from the system than women married to low wage men. This adds a regressive dimension to the old system biases, where contributors in general finance widow's pensions, which are more generous for widows that were married to high wage earners.

The old system appears to have a significant bias in favor of women, particularly, married non-contributor women. However, inflation reduced the real value of benefits relative to contributions for all groups. Did the gender bias remain? The answer is an empirical one. However, we can say that the real gender bias was smaller than the nominal one. The reason is that the system was characterized by a notorious absence of indexation protections. This introduces a negative gender bias because women have longer life expectancies and stand to lose a larger proportion of their pension benefits via inflation tax. The new system reversed the regressive nature of the gender bias, as it forced each married man to make provisions for his own widow. In addition, it removed the bias against single men, whose funds do not help finance widow's pensions any longer.

## **6. Summary and Conclusions**

The Chilean pension reform benefited contributors on three fronts: it reduced contributions; it established indexation of benefits; and made the system sustainable as it tied benefits directly to contributions. The reform established a distributive pillar funded directly from the government budget. All these elements reinforce the effect of reducing the tax on labor, generally encouraging labor force participation and employment. At the same time, the direct link of contributions to benefits required the elimination of cross subsidies within the system, a source of complex effects on the relative position of women.

The analysis reported in this paper shows that Chile's social security reform brought about significant changes in women's incentives to participate in the labor market, to save, and to use the social security system as a channel for their savings. First, under the new system there is no minimum level of contributions to obtain a pension, while in the old system contributors with less than 10 years of contributions could not get a pension benefit. Second, the new system guarantees a minimum pension for those that have contributed a minimum of 20 years. In the old system, the guaranteed minimum was available to whoever had contributed a minimum of 10 years. These two changes hurt women with 10 to 20 years of contributions who would have qualified for the old minimum pension and would not qualify for the new minimum, but generally encourage women to work and contribute. Third, the new system requires married men to build a joint annuity leading to a within-family distribution towards women. In addition, the new system allows widows to keep their own pension benefits in addition to their widow's pension, restoring the marginal benefit of own contributions for working women. Fourth, the reform gives an increased weight to early years of contributions via compound interest, instead of the heavy weight given to the last five years in determining the pensionable wage under the old system. This change favors women relative to men because women are more likely to hold paid jobs when young and later drop out of the labor force. Moreover, even if women maintain a significant attachment to the labor force, they tend to have flatter age-earnings profiles relative to men.

Overall, the new system is more fiscally sustainable and creates an incentive for greater labor force participation. Which system is preferable? If one thinks of labor market behavior as immutable and women's place as in the home, some method of subsidizing women in old age may be necessary. But, given the distortions introduced by subsidies, it may be more desirable to target public subsidies toward low-earning women, rather than toward the middle-class women who are most likely to work for pay 10 to 20 years. Middle class women can be protected by survivor's benefits and joint annuities financed by their spouses, as in the new system. Moreover, if one views the role of women as changing and responding to incentives, the new structure is more appropriate way to provide a social safety net while encouraging work and discouraging dependency.

But the new system also contains its own equity-efficiency trade-offs, particularly with respect to women. The MPG mainly benefits women, given their low rates of pay and limited years of contributions. This study focuses on the work patterns of women affiliates, a subsample of women with a relatively higher attachment to the labor force. In this group, the typical woman now works around 20 years. Clearly, the new rules will encourage everyone in this group to work to accumulate 20 years of paid work to qualify for the guarantee. The guarantee is targeted toward low earners rather than middle class women. However, once low-earning women (i.e. women without substantial post-secondary education) qualify for the MPG, they get little if any additional benefit for incremental years of contributions. In effect, they are subject to a heavy implicit marginal tax rate on their labor. The MPG effectively becomes a ceiling as well as a floor. Thus, the new policy is well designed to keep working women out of poverty in their old age, given their current labor market behavior, but it also maintains that behavior, with transitory labor market attachment, for women with limited education. While this may be an improvement over the previous policy, Chile may wish to re-evaluate this guarantee, and tie it more continuously to years of contributions, in order to provide a safety net with still more positive incentive effects.

The new system removed three biases that were associated to the funding of survivor's pensions. In the defined contributions Chilean system, survivor's pensions are funded directly by contributors. This is in contrast to the traditional pay-as-you-go design, where survivor's pensions are funded from the general system funds. Thus, in the traditional system when a rich old man married a young woman a few years before retiring, he would draw a generous pension until his death and bequeath her widow a generous pension funded from all contributors in the system. In contrast, in the new system, the old man would draw a lesser pension so that the remaining fund after his death would fund a proportional pension for his young widow, who is expected to live many years. Therefore, the new system removed the bias that favored married men (who did not have to make provisions for their widows' pensions), and the bias in favor of widows from rich men who obtained a relatively generous pension financed from all

contributors. In addition, according to the rules that apply to the majority of beneficiaries of the old system, if a widow has her own benefits, corresponding to her own labor force participation, she has to choose between those and her widow's pension. In contrast, own pension and survivor's pensions are complementary in the new system. Thus, the reform eliminated a bias against married – working women.

Current evidence from the living arrangements and poverty levels of the elderly indicate that elderly females rely heavily on extended household arrangements, and that they typically contribute with incomes below that of the per capita income of the nuclear family with which they live. Projecting the expected population aging to the future with the same living arrangements would imply a threefold increase in the fraction of extended households living with elderly individuals. This is unlikely to happen. Instead, the incentives to work and save built in the new social security system rules are likely to help the current generation prepare for a self-sustained living in old age.

The aging of the female population presents a more difficult social challenge in Chile not just because working women accumulate less funds and live longer, but because a significant fraction of women do not save on their own. The fact that women have a lower attachment to the labor force is naturally explained by traditional patterns of division of labor within households. These choices are protected within the new social security system's rules, by a mandated redistribution of savings from husbands to wives. However, in Chile there is a striking gender difference in labor force participation. In 1994, 91% of the 15 and above male population had been in the labor force, and only 70% of the female population in the same age category had done so.

Women that never enter the labor force are in a more vulnerable position in old age, and this vulnerability is likely to expand with aging. The fact that the social security reform improved women's incentives to work for pay, offers hopes for changes in behavior that would reduce women's risk of poverty in old age.

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**TABLE 1: In what types of families do elderly men and women live?**

URBAN

	Unipersonal	Nuclear	Nuclear/adult	Extended
Male elderly	7.16	37.23	12.81	42.81
Female elderly	13.05	21.62	12.83	52.50

RURAL

	Unipersonal	Nuclear	Nuclear/adult	Extended
Male elderly	9.60	36.56	12.10	41.74
Female elderly	9.79	26.45	13.90	49.85

**TABLE 2: HOUSEHOLD POVERTY RATES**

Poverty line = \$30,100 pesos pc per month  
 (using adult equivalence scales)  
 by gender of elderly household members

**URBAN AREAS**

# of elderly in household	Deaton equivalency scale	OECD equivalency scale	Cutler equivalency	Chile equivalency scale	Income per capita
None	16.0	10.1	23.8	19.8	28.9
1	10.7	6.1	25.3	12.3	17.2
2	9.7	3.5	29.8	9.2	13.5
3	5.1	2.4	30.3	4.0	6.8
4	2.0	0.0	42.6	2.0	2.0
5	0.0	0.0	69.7	0.0	0.0
Total	14.3	8.6	24.7	17.2	25.0

**RURAL AREAS**

# of elderly in household	Deaton equivalency scale	OECD equivalency scale	Cutler equivalency	Chile equivalency scale	Income per capita
None	36.3	23.6	49.8	42.2	56.6
1	29.2	17.1	52.3	31.6	38.1
2	24.6	9.8	57.4	22.8	31.4
3	20.2	4.6	55.0	18.9	23.6
4	15.1	12.2	35.8	15.1	15.1
5					
Total	33.3	20.5	51.2	37.5	49.5

**TABLE 3: Proportion of INDIVIDUALS below the poverty line  
(\$30,100 pesos pc) by age and gender  
(using adult equivalence scales to calculate per capita income)**

**URBAN AREAS**

age group	Deaton equivalency scale	OECD equivalency scale	Cutler equivalency scale	Chile equivalency scale	Income per capita
Males 0 -17	20.4	13.5	35.1	26.3	40.2
Fem 0 -17	20.0	13.2	34.2	26.0	40.0
Males 18-59	14.3	7.5	21.7	16.1	24.6
Fem 18-59	15.3	8.5	23.4	17.5	26.6
Males 60+	9.5	3.8	25.9	9.6	14.4
Fem 60+	10.5	5.5	29.0	11.3	15.6

**RURAL AREAS**

# of elderly in household	Deaton equivalency scale	OECD equivalency scale	Cutler equivalency scale	Chile equivalency scale	Income per capita
Males 0 -17	42.7	29.2	63.2	50.9	69.5
Fem 0 -17	43.4	30.4	64.1	52.1	70.6
Males 18-59	34.1	18.6	47.8	36.6	50.9
Fem 18-59	38.0	21.4	52.6	41.4	55.8
Males 60+	26.6	13.1	52.9	26.4	34.1
Fem 60+	44.1	33.6	49.5	44.4	47.4

**TABLE 4 : Proportion of elderly population below the poverty line (\$30,100 pesos p.c.) by living arrangement**

<b>Living arrangements</b>	Deaton equivalency scale	OECD equivalency scale	Cutler equivalency	Chile equivalency scale	Income per capita
<b>URBAN</b>					
<i>Male elderly</i>					
Uniperson	6.6	6.6	28.5	9.1	6.6
Nuclear	7.5	2.3	22.9	7.6	8.7
Nuclear/adult	8.0	3.4	17.2	7.0	8.7
Extended	12.3	4.8	30.8	12.3	22.2
<i>Female elderly</i>					
Uniperson	7.7	7.7	30.2	9.8	7.7
Nuclear	6.8	1.9	25.6	6.7	7.3
Nuclear/adult	9.4	3.7	21.9	8.3	0.1
Extended	12.9	7.0	31.9	14.2	22.4
<i>Non- elderly*</i>					
Uniperson	7.7	7.8	7.7	9.1	7.8
Nuclear	15.1	8.8	22.0	18.4	26.6
Nuclear/adult	8.7	3.1	14.4	7.3	9.8
Extended	16.3	7.7	26.8	17.1	28.5
<b>RURAL</b>					
<i>Male elderly</i>					
Uniperson	22.0	22.0	48.6	24.1	22.0
Nuclear	21.9	11.5	46.6	21.3	24.7
Nuclear/adult	25.8	7.1	45.9	22.3	25.6
Extended	32.0	14.1	61.4	32.6	47.4
<i>Female elderly</i>					
Uniperson	19.8	19.8	62.9	26.7	19.8
Nuclear	19.7	9.4	48.9	18.5	20.9
Nuclear/adult	29.7	9.6	53.6	26.8	30.0
Extended	30.5	14.5	61.0	31.7	45.3
<i>Non- elderly*</i>					
Uniperson	12.5	12.5	12.5	14.7	12.5
Nuclear	36.3	23.2	49.4	41.9	55.7
Nuclear/adult	26.6	9.1	38.7	25.1	28.8
Extended	39.5	17.7	57.6	39.8	57.6

\* above 16 years of age

**Table 5: Individual income sources of the elderly, and contribution to total household income. 1994 pesos/month**

URBAN

	<i>Elderly women</i>			<i>Elderly men</i>		
	% with income source	Average amount (of those with income source)	Share of total household income (of those with income source)	% with income source	Average amount (of those with income source)	Share of total household income (of those with income source)
Salaried work	11.2	93,962	26.6	37.8	153,204	35.3
Imputed rent(a)	37.7	31,007	17.6	72.2	36,107	12.9
Own pensions	59.7	71,859	35.7	70.1	124,703	43.7
Old age *	30.9	78,413	36.2	62	133,160	44.7
Disability *	4.5	48,363	32.0	5.6	64,233	39.8
Survivor's *	19.4	77,206	36.8	1.2	125,943	48.5
(PASIS) *	6.2	15,139	18.6	3.2	15,835	19.1
Total Income	73.5	108,161	47.2	97.9	226,814	62.1

\* included in the own pensions calculation

RURAL

	<i>Elderly women</i>			<i>Elderly men</i>		
	% with income source	Average amount (of those with income source)	Share of total household income (of those with income source)	% with income source	Average amount (of those with income source)	Share of total household income (of those with income source)
Salaried work	6.1	70,003	27.0	41.4	92,102	31.0
Imputed rent (a)	32.2	13,775	13.0	64.6	18,795	10.8
Own pensions	60.2	36,515	31.3	64.9	59,085	40.4
Old age *	18.8	55,193	37.3	46.2	70,028	43.6
Disability *	6.9	32,304	31.5	7.5	46,418	35.4
Survivor's *	14.5	40,754	37.4	0.8	50,751	36.7
(PASIS) *	23.3	14,912	18.2	14.2	15,001	22.3
Total Income	74.2	56,045	43.0	97.6	134,606	64.2

\* included in the own pensions calculation

(a) from owner-occupied housing

**Table 6: Elderly males raise the extended household pc income, elderly females tend to lower it.**

*Urban areas*

Effect on the extended household per capita income (YN-Yna)	Elderly males			Elderly Females		
	100	Houshls. in Poverty	Average change in income per capita	100	Houshls. in Poverty	Average change in income per capita
Increase	85.0	12.9	32,376	44.3	19.4	18,917
Reduce	15.0	9.1	-14,054	55.7	9.9	-24,814

*Rural areas*

Effect on the extended household per capita income (YN-Yna)	Elderly males			Elderly Females		
	100	Houshls. in Poverty	Average change in income per capita	100	Houshls. in Poverty	Average change in income per capita
Increase	84.3	33.2	20,214	41.9	43.1	12,156
Reduce	15.7	29.4	-11,198	58.1	22.9	-13,060

YN= Household Income/Household Members

Note: Nominal figure refer to monthly incomes.

**Table 7: Gender differences in fund accumulation and their components.**

(Estimated fund assumes 5% return and 2% secular growth in wages)

	Incomplete Primary	Incomplete Secondary	Secondary	Up to 4years Post Sec	more than 4 years Psec
Women at 60 assuming female work patterns	\$5,611,611	\$7,831,774	\$13,808,015	\$22,801,463	\$41,918,370
Women at 65 assuming female work patterns	\$7,329,864	\$10,016,482	\$17,716,552	\$29,215,282	54,947,302
Women at 60 assuming men's working patterns	\$8,503,617	\$11,611,013	\$18,700,506	\$25,314,871	\$43,017,496
Women at 60 assuming same wages as men	\$7,600,612	\$10,624,350	\$16,143,792	\$25,971,681	\$67,483,964
Men at 65	\$15,578,851	\$21,962,848	\$32,354,342	\$43,970,743	\$100,470,055
<i>Three steps to eliminate the gender difference in fund accumulation</i>					
Women's fund at 60/Men's fund at age 65	36.02%	35.66%	42.68%	51.86%	41.72%
(1) Effect of raising retirement age/Men's fund at age 65	11.03%	9.95%	12.08%	14.59%	12.97%
(2) Effect of increasing work experience/Men's fund at 65	18.56%	17.21%	15.12%	5.72%	1.09%
(3) Effect of eliminating wage differentials/Men's fund at 65	12.77%	12.72%	7.22%	7.21%	25.45%
(4) Effect of the interaction of the various changes	21.62%	24.47%	22.90%	20.63%	18.77%
Initial ratio + (1) + (2) + (3) + (4)	100.00%	100.00%	100.00%	100.00%	100.00%

**Note:**

To calculate the effect of step (1) we assumed women continued to work and contributed according to the average experience accumulation and wages for women between the ages of 61 and 65.

To calculate the effect of step (2) we assumed that women worked as men but continued to earn the same salaries, and retired at age 60 (from Table 9).

To calculate the effect of step (3) we used female work patterns, but assumed that women were paid as men.

The sum of these three separate effects does not fully make up for the differences in fund accumulation between men and women. The reason is that there are important interaction effects. For example, if women are paid as men and also work as men, the wage differential effect is higher than if the wage differential effect is valued assuming female work patterns. Therefore, the unexplained difference represents interaction effects of having the three changes take place. We report this difference as a one step because the values of partial interaction depend on the order in which these are applied.

**Table 8: Estimated Retirement Incomes under the new and old systems.  
Urban contributors. 1994 pesos/month**

(5% return on funds and 2% secular wage growth)

<b>MARRIED MALES RETIRING AT 65</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>NEW SYSTEM</b>	\$107,219	\$151,155	\$222,673	\$302,618	\$691,467
<b>OLD SYSTEM*</b>	\$86,775	\$136,776	\$214,990	\$335,491	\$764,117

<b>FEMALES</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>NEW SYSTEM</b>					
Own pension adjusted for MPG Age 60-77**	\$37,738	\$43,302	\$76,346	\$126,071	\$231,770
Widow's pension Age 78-83	\$64,331	\$90,693	\$133,604	\$181,571	\$414,880
Own + Widow's*** Age 78-83	\$64,331	\$133,995	\$209,950	\$307,642	\$646,650
<b>OLD SYSTEM</b>					
Own pension working women Age 60-77****	\$28,508	\$48,661	\$116,798	\$185,780	\$333,517
Widow's pension Age 78-83	\$43,388	\$68,388	\$107,495	\$167,746	\$382,059
Own OR Widow's Age 78-83	\$43,388	\$68,388	\$116,798	\$185,780	\$382,059

The calculation of benefits under the old system's rule is based on the concept of "basic salary," or the average amount earned during the 10 years preceding pension benefits.

\* These benefits are at the maximum (.7 of the basic salary)

\*\* The estimated annuity for the typical female in the lowest schooling categories falls below the minimum pension. The estimated income is replaced by the minimum pension (\$37,738).

\*\*\* Since the widow's pension is significantly above the minimum pension, it is assumed that the beneficiary would stop receiving the minimum pension (and her own funds would be exhausted).

\*\*\*\* Estimated monthly income under the old SSS system starts at age 60

\*\*\*\*\* Old system benefits for women in the two upper schooling groups are at the maximum. Benefits are very close to the maximum for the lower schooling categories.

**Table 9: Gender Differences in Contributions and Benefits by:  
 Schooling, Marital Status, and System  
 (System Generates 5% return - with 2% secular growth in wages)**

<b>Ratio of Accumulated Contributions</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>Women / Men</b>	0.36	0.36	0.43	0.52	0.42
<b>Married Men / Single Men</b>	1.00	1.00	1.00	1.00	1.00

<b>Ratio of Present Value of Benefits</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>OLD SYSTEM</b>					
<b>Single women/ Single men</b>	0.50	0.54	0.82	0.84	0.66
<b>Married women/ Single men</b>	0.56	0.59	0.82	0.84	0.68
<b>Non working married women/ Single men</b>	0.19	0.19	0.19	0.19	0.19
<b>Married men / Single men</b>	1.00	1.00	1.00	1.00	1.00
<b>NEW SYSTEM</b>					
<b>Single women/ Single men</b>	0.43	0.35	0.42	0.51	0.41
<b>Married women/ Single men</b>	0.48	0.47	0.54	0.63	0.53
<b>Non working married women/ Single men</b>	0.12	0.12	0.12	0.12	0.12
<b>Married men / Single men</b>	0.93	0.93	0.93	0.93	0.93

Source: Author estimates. Calculation assumes women retire at 60 and men retire at 65.  
 The calculations apply to urban contributors