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**Pension projections for Chilean Men and Women:  
Estimates from social security contributions\***

by

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## 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. Significant analyses has been made of the management and operation of the reformed system, as well as the financial effects (see for example, Vittas and Iglesias, 1992; Baeza and Margozi, 1995. Torche and Wagner (1997) estimate the individual valuation of mandated contributions, and Barrientos (1998) analyzes gender differences in pension coverage.

A gender-differentiated analysis of pension projections 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 renders 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 men. (2) It is generally the case that women' salaries are lower than men's, even after controlling for age and schooling. These differences are explained, to a degree, by the same fact that

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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).

women have a lower labor force attachment than men, and a subsequent lesser accumulation of experience or human capital than men of the same age and schooling. (3) In addition, social security systems generally apply gender-differentiated rules. For example, in Chile, women can start drawing a pension five years younger than men. Eventhough this decision does not have to coincide with the retirement from the labor force, it tends to reduce savings or increase desavings. (4) The expectation that a women 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.

This paper 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. The results become a base line estimate of gender differentiated effects of the social security reform.

## **2. Social Security Reform and Incentives**

This section offers a brief description of the old and new systems and points out key elements that affect workers incentives to participate in each case. The old system was composed of several retirement funds managed by distinct institutions, with affiliates channeled along the white and blue-collar divide. The most important of the funds --the Social Service System (*Servicio de Seguro Social*), SSS – served blue-collar workers, or the equivalent of 62.6% of all contributors in 1980. The second and third most important funds were the Public Employees Fund and the Private Employees Fund.

The 1981 reform allowed the members of the old system to choose between staying in the old system or join the new system. Those that moved to the new system received a transfer value from the old program acknowledging the acquired benefits (*Bono de Reconocimiento*). In addition, they were able to pocket the payroll tax savings associated

to the change, which represented an average 11% increase in net wages (Iglesias, 1990). Previous contributors that stayed in the old system, an important fraction of the current elderly, were consolidated into the Institute of Pension Settlements (*Instituto de Normalizacion Previsional* - INP). The younger generation and more precisely, those that entered the labor force after the reform (after 1981) did not have the option to enter the old system. The Armed Forces stayed out of the reform altogether, and continue to organize their health and old-age benefits programs around CAPREDENA -- *Caja de Prevision de la Defensa Nacional* (Social Security Fund of the Armed Forces.)

Table 1 presents summary data for 1994 on contributory behavior among workers. The data is organized along the urban-rural divide and by age categories and gender. The categories correspond to: INP -- the Instituto de Normalizacion Previsional, which manages affiliates to and pensioners from the old system; AFP -- contributions to the new system; Capredena -- contributions to the Armed Forces pension system; Other represents alternative means -- usually foreigners; and NO represents no contributions at all.

Urban males have the highest rate of total coverage – defined as contributing to any retirement scheme --, at 70%. The fraction of urban working women that contribute to social security is 65%. The lowest coverage corresponds to rural males, with 47%. It may also be seen that, with the exception of rural males, those in the 16 to 39 year-old had the highest degree of coverage.

Although there are no comparable survey data for the pre reform period, existing estimates indicates that Chile's old pay-as-you-go system received contributions from up to 86% of those employed in 1975 and 71 percent of the employed in 1980 (Cheyre, 1991). It has been argued that the 1970s drop in coverage was motivated by the high, and then rising, contribution rates from 1975 to 1980. After the privatization reform, the contribution rates fell, but there has only been a small increase in the fraction of contributors to the formal retirement system, suggesting that there is a fraction of the population that does not value the social security system (see Torche and Wagner, 1997).

### *The old system*

The old system is financed by a payroll tax with a relatively weak link between contributions and benefits. In 1973, for example, the total contribution rate to the retirement plan, both by employers and employees, averaged 26% of wages. Once contributions to the national health system were included, total payroll contributions exceeded, for some workers, 50% of wages. During the late 1970s, payroll taxes rates were lowered, and in 1980, social security contributions varied between 32.5 and 41.04% of taxable wages. In November 1980, social security contributions to the old system funds were adjusted to a range between 30% and 8% of taxable wages.<sup>2</sup>

Eligibility towards pension benefits, under the old-system rules, is restricted to those with a minimum of 10 years of service. The minimum age to start getting pension benefits is 65 for men and 60 for women in the SSS, and 65 for all (or a minimum seniority of 30 years) in the two main employee funds. Pension benefits are based on a formula that includes, the base salary --the average of the last five years of wages in the case of SSS and Private Employee Funds, or the last three in the case of the Public Employees Fund--, and a premium as a function of years of service. The benefit has an upper bound of .70 basic salaries<sup>3</sup> in the SSS, and one basic salary in the Public and Private Employees Funds. It also has a lower bound. Only the SSS and the Private Employees Funds contemplate an indexing clause in their benefits formula, with the correction applying to the last three years of salaries only. While benefits also include survivor's pensions, widows with pension benefits from the SSS are required to choose between their own pension and the corresponding widow's pension.

### *The new system*

The new system reduced the overall contribution towards social security to approximately 20% of taxable wages; established a set of common rules for all contributors; compartmentalized the various parts of the social security package in different products; and introduced competitive forces in the market for these products.

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<sup>2</sup> See Decree Law 3,501 (Nov 1980)

<sup>3</sup> The basic salary was defined as the sum of total taxable wages over the five years preceding retirement, divided by sixty. Indexing was only applied to the last three years.

The new system requires employees to make a 10% contribution towards pensions and a 7% towards a health program. The self-employed are not required to contribute, but they can do so. Pension Fund Administrators -AFPs must insure their affiliates against the risk of income loss associated to invalidity and death. The same rules apply to all civilian contributors, except for the fact that income base for social security contributions is capped at maximum of 60 UF (Unidad de Fomento -- an indexed unit that adjusts to inflation) per month and is subject to a minimum equal to the minimum wage<sup>4</sup>. Any affiliate can also make voluntary contributions over and above the required 10%, which as in the case of required contributions, are exempted from income taxes.

The first element of competition is the choice of AFP--or retirement fund administrator. Each AFP manages a fund that yields a rate of return and at the same time, offers a variety of information services to its affiliates.<sup>5</sup> Each AFP charges a fee for services, which funds the administration of individual accounts, the management of investments, information and consultation services, and the insurance premium towards a death and disability insurance. The market-determined fee currently varies between 2.36 and 2.95% of taxable wages, plus a fixed amount which can vary between \$0 and \$1,000. In the case of hazardous occupations, workers are required to make an additional contribution of 2% to cover the higher risk. Upon retirement, the obligation to provide death and disability insurance ceases and in practice AFPs stop charging the administrative fee.<sup>6</sup>

The requirement to contribute towards a health program introduces a second choice. Affiliates can stay in the public health system (Fonasa), or may opt out. Those that opt out, must apply 7% of their taxable wage (additional coverage is optional) to buy a health insurance package from a private health care insurer or Isapre--Instituto de Salud

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<sup>4</sup> The data analysis will focus on November 1994. The minimum wage was 39,000.56 pesos per month, and the UF (unidad de fomento) was 11,463.72. Given the value of the dollar at that time (413.45 pesos/dollar), the minimum contribution was equivalent to US\$ 94.3 and the maximum to US\$ 1,663.6. While the minimum wage is set on a monthly basis, in practice, the minimum contribution can be less than 10% of the minimum wage, if the affiliate declares a small amount of hours.

<sup>5</sup> The conventional wisdom is that the choice is primarily influenced by AFPs' marketing techniques, presence of sellers and the like.

<sup>6</sup> For a discussion on the economics of this fee, and in particular, the implicit cross-subsidies on the financing of the workers' compensation insurance, see Valdes and Navarro (1992).

Previsional. Isapres, in turn, offer various health care packages with variable costs, generally more expensive than the basic public (Fonasa) program.<sup>7</sup>

Employees cannot be contributors to the pensions program without making contributions towards the health care program. It is the responsibility of employers to make the appropriate transfers of funds. Employers deposit contributions towards pension benefits at the respective AFPs, and contributions towards health insurance at Fonasa or the respective Isapres. Retirees and beneficiaries for disability are also required to buy a health insurance plan, which can be public or private. In these cases, retiree's contributions towards a health care program (also equivalent to 7% of the monthly pension) are subtracted directly from their pension benefit. The self-employed, who are not required to contribute, must make arrangements directly with AFPs and Isapres.

In the new system, retirement benefits are a function of the accumulation of funds, with a tight matching between contributions and benefits, except for a guaranteed minimum pension financed by the central government budget. Men can start a pension at age 65 and women at 60. Both have also the option to start a pension earlier. This option is only available to individuals with enough funds to finance an annuity equivalent to 50% of average annual income of the last 10 years of contributions (indexed according to the consumer price index); and in addition, the annuity obtained must be at least equal to 110% of the minimum pension. Men and women that choose to continue working after starting their respective pension, do not have the obligation to make the 10% contribution towards pensions (they can make voluntary contributions), but they must continue to make the contributions towards health.

Pension beneficiaries have another choice. Their accumulated funds can be withdrawn in three alternative modes: (1) they can opt for a programmed monthly withdrawal; (2) an immediate transformation of their accumulated fund into a stream of steady monthly payments or annuity (through a contract with a private insurance company); or (3) a

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<sup>7</sup> The choice of health care provider is highly influenced by income and health status (see Sapelli and Torche, 1998).

combination of a deferred annuity and a programmed withdrawal. Unlike annuities, programmed withdrawals vary year after year as a function of the remaining fund (which varies with returns and initial withdrawals), and life expectancy (which varies with age).<sup>8</sup> The remaining funds are invested as part of the AFP's portfolio, and have market returns.

Old age pensions are calculated on the basis of the accumulated fund in the individual account, the life expectancy of the affiliate, and of the individual's family members who will be beneficiaries of the "survivors' pension." By law, any affiliate generates a benefit towards his/hers legal dependents of a survivors' pension. This mandatory bequest becomes available to survivors at the active affiliate's time of death, or at the retired affiliate's time of death. In the case of an active affiliate's death, his/her survivor will receive the accumulated fund plus any benefits that would apply in case of work-related accident covered by insurance. Naturally, the legal obligation to provide funding towards a "survivors pension," establishes a financial constraint that reduces the affiliate's own pension in any of its three modalities.

Married men are required to make provisions for their wives survivor's pensions<sup>9</sup>, while married women are required to make provisions for their husbands --only when the husband is disabled. Parents are required to make provisions for dependent children. Any unused portion of the accumulated fund, in case of death of an active worker without survivors, or in case of death of a retiree that opted for a program of annual withdrawals, becomes part of the beneficiaries' inheritance.

In the old public system, SSS widows had to choose between old age pension benefits and widows pensions. However, in the new system, old age pension benefits and family-related pensions can complement each other. This feature has particular impact on women, who are likely to become widows and who typically have pension benefits from their husband's accounts.

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<sup>8</sup> By 1997 there were already 250,000 pensioners under the new system. Of these, approximately one half had opted for annuities, and one half for programmed withdrawal.

<sup>9</sup> The surviving wife must have been married to the contributor for at least six months before his death and for at least three years if the wedding took place with a male pensioner.

The new system guarantees a minimum pension to individuals that have been active contributors for at least 240 months. Given the system design, where pensions are determined by individual accumulation of funds, any shortfall between the self-financed benefit and the minimum guaranteed pension is financed by the central government budget. The minimum pension guaranteed did not fall below 95% of the minimum wage between 1987 and 1994, and has typically been equivalent to 80% of the minimum wage afterwards.

In a separate means-tested program, the elderly poor may qualify for the PASIS subsidy. This is a poverty-targeted transfer program, financed by the central government budget, and administered at the regional (*intendencias*) level. Neither the minimum pension nor the poverty-targeted programs are funded through a narrow tax on social security contributors. Instead, they are funded through general taxation, where two thirds of tax revenues come from consumption taxes (including VAT, alcohol and other taxes) and one fourth comes from the corporate income tax (see Diamond and Valdes, 1994).

Individual contributors look at the net present value of contributions relative to the expected net present value of benefits. A match will generate popular support for the system, a positive difference between contributions and benefits will reduce that support, and a negative difference will erode the long-term viability of the system. The new system is less vulnerable to the risk of become unsustainable than the old system was. However, in exchange for reducing that risk, contributors have had to assume a larger financial risk, to the extent that their pensions are a function of the rate of return of the financial system. While in the old system, there were large cross subsidies from men in general to women in general, in the new system, there are no major transfers across contributors, except for the forced joint annuity that requires transfers from husbands to wives. The minimum pension guarantee, which tends to benefit more women, is funded from general revenue and not from social security contributions.

### **3. Gender Differences in Labor Force Participation, Social Security System's Participation, and Contributions' Density**

The aim of this section is to 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 plus some individuals that worked in the past but are temporarily out of work. This group, in turn, is a sub-sample of individuals in the working-age population, with distinct gender, age, schooling, and marital status characteristics. Table 2 presents two streamlined equations that estimate the impact of several variables on the probability of labor force participation of 16-65 year old urban women and men. The participation variable (0,1) is driven by marital status; years since finishing school or potential experience and its quadratic; a dummy for post-secondary schooling; and an interactive for married with post secondary. The average man and woman in the sample have 22 years of potential experience (ex). 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.

#### *Who contributes?*

A closer look at the sample of currently working men and women, reveals that most of the gender differences in contributory status, are associated to occupational

classifications. Recall that 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 (see Table 3). 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, the decision to become an employee and to have a contract is not independent from the decision of contributing to social security. It is of interest, therefore, to examine the contributory behavior of those not required to contribute. Table 4 summarizes this data with two probit equations that measure the impact of several variables on the probability of contributing. 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. 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.

Another look at Table 3 where we report the proportion of affiliates as a function of employment leads us to an additional result. While 77.6% of men are affiliated, only

71.5% of women are --a 6.1% difference. Since the probability of contributing is about the same for men and women, the key determinant of gender differences in contributory behavior is affiliation. This analysis lead us to move away from the characterization of the sample along employment status and simply recognize that affiliation to the social security system reveals a preference towards this public system as a vehicle to channel savings. Affiliation is correlated with employee status but not limited by it. Unlike labor force participation, employment, or employment status, affiliation does not change as individuals age. Thus, it is a more appropriate variable along which the data is to be separated.

#### *Identifying the sample of affiliates and likely contributors*

Only those individuals that are “affiliated” to the social security system can make contributions toward retirement. 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. Since affiliates do not work or contribute all the time, their contributions accumulate at a slower pace than their aging. However, when affiliates work, they have a 90% probability of contributing. As it is shown in Table 5, as we restrict the sample to “affiliates” we get a much more precise sample of contributors.

There are three are additional pieces of information that are worth noting from Table 5. First, the proportion of men that work or has worked (out of the sample of 15 and above) 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. Once we restrict the samples to those individuals that work at some point in their lives, we see that 73.4% of ever working men become affiliates to the social security system, while only 55.2% of women do so. The already smaller fraction of working women 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. However, out of all the men affiliates, 82% are working at the time of the survey, while 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. We conclude, therefore, that affiliates have a higher attachment to the labor force than the population at large, and that the differences are particularly marked for women. However, women affiliates have a lower attachment to the labor force than men affiliates, causing a gender gap in the density of contributions among affiliates.

Among the affiliates that work more than 90 percent of men and women make contributions, and 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. In short, the combined information from Tables 3 and 5 indicate that the sample of women affiliates is not a random sample of all women, but rather a subsample of women that have a higher attachment to the labor force.

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. For the case of Chile, it makes sense to distinguish 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.

### *Estimating Years of Contribution (Contribution Density)*

We start from a sub sample of people that are affiliates and that have worked at some point. The fraction of individuals that make contributions out of that restricted sample would lead us to estimate the density of contributions for affiliates by age. It is important to keep the sample to those that ever worked and not restrict it to those that are working at the time of the survey for two reasons. First, in a given month, most affiliated workers pay contributions, but many affiliates are not working and therefore do not pay contributions. Second, there are a few affiliates that make contributions at the time of the survey even though they report being out of work. Thus, 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.<sup>10</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 women 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>11</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 (see Table 6). Since we are focussed 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 contribution density, by single age.

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<sup>10</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.

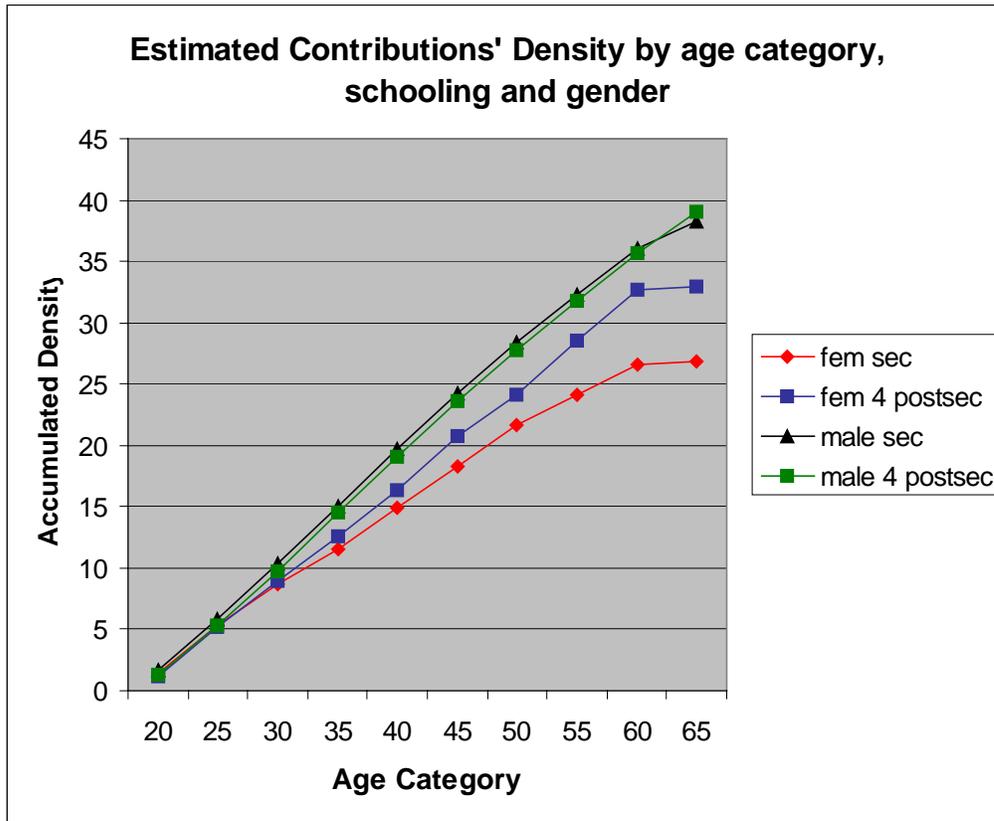
<sup>11</sup> The “typical marriage age” is the same in the sample of ever working affiliates.

3. The relative importance of each schooling group in the men or women sample changes very rapidly with age cohort. The younger groups have a significantly larger number of years of school completion (see Table 7), and this is particularly true among women affiliates. For example, 40% of the females' sample in the 26-30 age group has post-secondary schooling. The situation changes significantly for the near retirement cohorts. For example, more than 60% of women affiliates have less than complete secondary schooling in the 50-60 age group. The sample of ever working male affiliates has schooling characteristics that are closer to the population sample. In fact, only 25% of affiliates in the 26-30 age group have post secondary schooling. When we examine the near retirement cohorts, we find that the schooling distribution is similar to that of women.

4. The results of the estimation are summarized in Table 8, where the estimated value for years of contributions (or contributions' density) is shown by cells of age and schooling-categories. As suggested by the participation equations presented in Table 2, women accumulate labor market experience at a lower pace than men. Given the correlation between work and contributions among affiliates, this means that women would accumulate less years worth of contributions than men at the same age. However, these gender differences are less significant among more educated women.

The emerging relationship between age and contribution's density is captured in Figure 1 where two male and female schooling types are represented. The lines describe the relationship between accumulated work experience (estimated) and age. 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 lines 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-contribution's density. 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.

### *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 patterns of wage differences by age from a cross section. To do this, we use the data on

salaries by age and schooling to obtain age-wage profiles for the same schooling categories. 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 heroic 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 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, for the question in front of us, this procedure is not the most appropriate. 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).

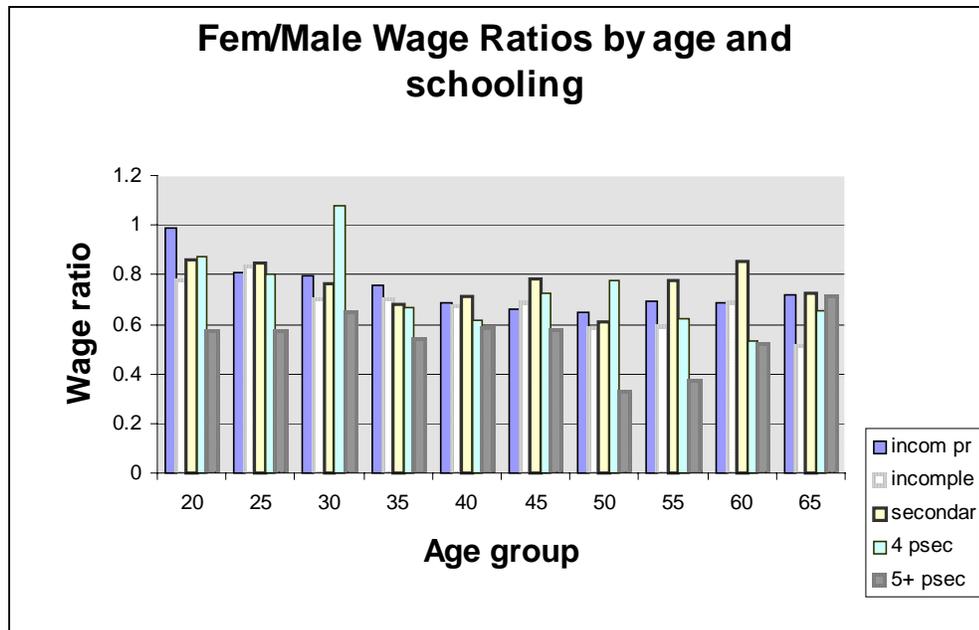
The literature has suggested that it is appropriate to use other specifications to measure wage profiles as long as one focuses on wages as a function of experience. The empirical evidence tells us that the labor market values accumulated experience and not just age. However, these two variables are co linear for a given schooling level, if workers stay continuously in the labor force after leaving school.

We seek wage estimates in order to calculate contributions towards social security. These contributions are made on a monthly basis and accumulate through time. We are aware that wages vary by experience, and that experience increases with age. The data on wages from the 1994 Casen survey was organized along sex/age/schooling categories, and an average wage was calculated for each cell (see Table 9). 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 compromise had to be found between gaining sample size and 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. Thus a period estimate is acceptable to the extent that the average estimate is reasonable, and that the periods are short enough. We finally settled for a five-year interval.

Based on the estimates shown in Table 9, it is interesting to examine the resulting wage differentials by schooling and age. These 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. It is also of interest to note that the wage differential tends to grow with age, a feature that will have an impact on the savings accumulation towards pensions.

Figure 2



#### 4. 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.

##### *Gender differences in funds accumulation*

We assume that workers in a given schooling and gender category contribute 10% of the corresponding wage –as estimated in Table 9. The wage estimate for each age is assumed to be equal to the estimated value for corresponding 5-age period. In some simulations we add a secular growth to wages, simply increasing the estimated annual wage by the corresponding growth effect. The fraction of contributions in a year at a given age is estimated at one fifth of the accumulated density estimated for the corresponding five-year period, as indicated in Table 8. The accumulation of funds is the result of compounding the estimated annual contributions at a various interest rates.

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 10 decompose the overall difference in fund accumulations, within each schooling category, in four steps. Estimates based on a 5% rate of return and a 2% wage growth generate women’s funds that are 32 to 46 percent of male funds. Starting from that lower lever, if women postpone retirement to age 65, and work and are paid according to the current estimates for that age range<sup>12</sup> their funds would grow 9 to 13 percentage points (of men’s funds). The effect of delaying retirement age increases in schooling. If, in addition to postponing retirement, women work and make contributions with the same periodicity of men, their funds will climb 23 to 3 percentage additional points (of men’s funds). The effect of increasing labor market experience decreases with schooling. If, in addition to

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<sup>12</sup> These estimates can be improved by examining more careful the selectivity bias associated to retirement at age 60.

postponing retirement and changing labor market experience, gender wage differences are eliminated, then women's annuities would climb 29 to 47 additional points, making the men/female differential disappear. The wage differential effect is the largest among the group with the highest schooling level.<sup>13</sup>

Starting from a large difference in accumulated funds, the estimated pensions are expected to be lower for women. Furthermore, the earlier age of retirement leads women to provide for 23 years of income from her accumulated fund. Men retire at 65, and must provide for a joint annuity of 21 years, 15 for his own pension, at 6 for the widow's pension at 60% of his benefit. Therefore, for a given fund, a woman's annuity will be necessarily smaller than that of a man.

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

Table 11, 11a and 11b estimate annuities and replacement rates based on different sets of parameters. Table 11 uses the wage estimates from the cross-section -with their implicit return on experience-, but without any further adjustment.<sup>14</sup> The fund accumulation assumes a 3% rate of return. All values are in real terms. Table 11a assumes a 1% secular trend in wage growth, and 23b assumes a 2% secular trend in wage growth and a rate of return of 5% for the accumulation of funds. Each table reports the reference salary or the average tax base for the last 10 years of contributions, in per-month units. Using the accumulated fund, we estimate the monthly benefit that would result from transforming the fund into an annuity.<sup>15</sup> In these set of calculations we make no corrections for the effect of the guaranteed minimum pension. Finally, we report the

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<sup>13</sup> A more accurate estimate of this decomposition can be obtained from an analysis that controls for cohort effects. The issue is that participation patterns and wage differentials are correlated, and with the secular increase in female schooling and decline in fertility, labor force participation patterns are changing and wage differentials too (see for example, Edwards and Roberts, 1992).

<sup>14</sup> Estimated returns to experience (the coefficient of experience on a Mincer regression on the cross-section data) is 3.3 for workers with less than complete primary; 3.0 for workers with primary and less than complete secondary; 5.4 for workers with complete secondary; and 9 for workers with post secondary schooling.

<sup>15</sup> Insurance companies charge a fee for their service, so no one gets an annuity based on the full accumulation value. The current practice in Chile consists of a loading factor that reduces the accumulation value, and a rebate that brings forward some retirement benefits to the retiree. In the absence of a precise figure for this cost, we estimated the annuities with a rate of return 1 point lower than the market rate.

replacement ratios that result using the pensionable salary as a reference salary (average of last ten years of contributory wages).

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. 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,” 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>16</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.

The resulting replacement ratios divide the estimated annuity by the reference salary. These ratios are highly sensitive to the system’s rate of return, which drive the annuity, and to the estimated reference salary, which is a function of the experience earnings profile and the degree of attachment to the labor force during the last ten years of work. If earnings get flat or fall during the late stage of a worker’s career, the reference salary tends to be low and the replacement ratio tends to be relatively high. Thus, as we compare the replacement ratios that result from assuming no secular wage growth (Table 11), with a one percent growth (Table 11a) using the same rate of return (3%), we see replacement ratios systematically fall.

Based on the calculated annuity, women’s replacement ratios are close to 60% those of men. Obviously, the measured differences in replacement rates are smaller than the measured differences in the accumulated funds and the annuities. There are three reasons for this:

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<sup>16</sup> The exact amount required to comply with this regulation is a matter of a private contract between the retiree and an insurance company.

- (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. The reader may compare the average salaries reported in Table 9 with the estimated reference salary reported in Table 11. For example, the reference salary for men with secondary schooling is \$115,628, while the corresponding salaries for ages 56 to 65 in Table 9 are \$198,000 and \$161,000. The same comparison for the case of women with secondary schooling shows \$78,841 for the reference salary and \$157,000 and \$169,000 for average wages.
- (3) In addition, women's experience earnings profiles are flatter, adding another reason for the denominator in women's replacement ratio to be relatively low.

#### *The issue of retirement age*

Current information indicates that a significant fraction of men and women that have reached retirement age, choose not to retire. Thus, the retirement age operates as an option that individual 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 (see Table 13).

Under the low returns' scenario, the impact of postponing retirement is non-existent for women with less than complete secondary schooling. 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%, and the effect would be much larger for women with higher levels of schooling. Under the assumption of high return, postponing retirement has a significant effect of annuities 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 retire early or late is a superior alternative to the requirement to reach age 65 before retiring or forced retirement at age 65.

### *The Impact of Reform*

This section compares pension estimates obtained for the current system 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:

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

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.

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<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.

<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.

There are three changes brought about by the reform that benefited everybody irrespective of gender: reduced contributions; indexation of benefits; and sustainability. First, the 26% contribution out of taxable wages was reduced to 10%. Second, in the old system, benefits were not indexed while inflation was high. In the new system, contributions and annuities are valued in an indexed unit of account. There is evidence to indicate that indexation is valued by individuals. James and Vittas (1999) argue that consumers pay 10 to 12 cents on the dollar for inflation protection, while nominal annuities cost practically nothing. In other words, indexation is an important added value of the reform. It may be argued that this change benefited women in particular, because women live longer and are subsequently more exposed to the inflation tax. Third, the old system was not financially sustainable before 1979 (see Wagner, 1983). It was running large deficits until benefits were cut. As a result, the popular support of the system was eroded, and its political viability threatened. Since in the new system, benefits are defined contribution, the system is built to be sustainable. The redistribution portion of the program is funded from general government revenue.

#### *Gender differentiated elements of the pension reform*

Even before making calculations it is apparent that women with more than 10 years of contributions get a very good deal under the old system rules. They can 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, get a 60 percent replacement rate. On the other hand, women with less than 10 years of contributions do not have any incentive to participate in the system since they do not qualify for a pension benefit.

However, the rules of the old SSS (*servicio de seguro social*) system, which covers the majority of the currently retired population, forced women to choose between retirement income and pension. That is, if they had benefits from their own working years, and were eligible for a pension as a widow at the same time, 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.

The new system pays benefits as a function of contributions. This would tend to lower some women's benefits, and raise the benefits of men to they extent that they would not be subject to a maximum. 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.

In Table 14 and 14a we provide estimates of social security related incomes for elderly men and women in each of the schooling categories using the results of Table 11. We also add calculations of pension incomes that would be derived under the old system's formula, using the same contributory behavior and wages. To estimate widow's pensions, it is assumed that married couples belong to the same schooling category. We refer to only two of the six scenarios contemplated in Table 11. Table 14 considers a system rate of return of 3% and no secular growth in wages, and Table 14a considers a 5% rate of return with 2% secular growth in wages.<sup>20</sup> Perhaps, a more appropriate use of the point estimates offered in Tables 14 and 14a is the corresponding estimates of relative gains

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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.

and losses associated to the change in system. These are offered in Table 14b where we report the ratio of monthly pension benefit under the new system relative to the corresponding estimate under the old system's rules.

A number of interesting results appear from the calculations.

1. The new system generates higher pensions for working men under high and low rates of return, except for the “typical” man with up to 4 years of post-secondary schooling. Assuming a 3% rate of return and no secular wage growth, this “typical” male will receive a higher pension under the old rules. Yet, it is important to note that under the old rules, the no secular wage growth assumption takes all typical males, including the ones with 4 years of post-secondary schooling, to the maximum pension benefit.
2. In the case of working females, the old system would pay “nominally” higher own pensions. This inequality is reversed by the MPG in the case of the two lower schooling categories under low returns. In the high growth scenario, women at the mean of the wage distribution receive close to the maximum pension under the old system rules. The resulting pension is higher than the one derived under the new system's rules except in the case of women with incomplete secondary schooling.
3. However, widows’ pensions are higher under the new system independently of rates of return. The reason is that survivor’s pensions in the new system are 60 percent of the reference pension, against 50% under the old system rules. Furthermore, the estimated pensions for men are generally higher in the new system relative to the old.
4. Given our assumptions, working women married to a contributor are expected to obtain higher incomes in old age under the new system relative to the old system. For example, a working woman with 4 years of post secondary schooling, and under pessimistic expectations on system’s returns, would draw an annuity of about \$47,000 pesos at age 60. This annuity will be topped with a widow’s pension of \$69,000 at age 78, to generate a combined income of \$116,000. Under the old system rules, these two benefits could not be combined. According to our estimates, this typical

woman would have drawn an old-age pension of \$87,000 under the old system rules, and would not increase it after becoming a widow.

5. The estimated values for the old-age pension and survivor's pensions are combined to calculate the present value of benefits under the new and old system rules. Table 15 presents the results. The new system improves the pension prospects of non working women and working women with low levels of schooling, who qualify for the MPG. The new system reduces the "nominal" present value of pension incomes of more educated working women. The differences are driven by the effect of making "own" pensions a function of "own" contributions throughout the life cycle rather than just the last five years of work. Widow's pensions are expected to be much higher under the new system rules. As shown at the bottom of Table 15, the present value of benefits for non-working females is significantly higher under the new system rules.

*Who will benefit from the guaranteed pensions (MPG) and how much is it going to cost?*

In principle, the state guarantees minimum old age, invalidity, and survival pension benefits to poor affiliates and their beneficiaries, as long as they are poor and have made contributions for a minimum of 20 years. "[N]o one can obtain the state subsidy if the sum of all individual incomes from pensions, rents and taxable wages, is equal or higher than the minimum pension." (art 80, DL 3,500). Therefore, unlike earned benefits through contributions, access to the guaranteed minimum pensions can be taken away if income-generating conditions change. In fact, if the qualifying affiliate were also a recipient of the PASIS benefit, he/she would have to give up that pension as soon as the guaranteed minimum benefit is activated.<sup>21</sup>

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<sup>21</sup> There is a minimum invalidity pension to be paid to those affiliates that are declared legally incapacitated and do not qualify for the minimum pension, and belong to one of the three following groups,  
Have registered a minimum of two years of contributions during the 5 years preceding incapacitation, or  
Are affiliates at the time of the accident that causes incapacitation and are contributors at the time of the declaration of incapacitation, or  
Have accumulated 10 years of contributions.

There is also a minimum survivor's pension (60% of the MPG), which will be available to legal survivors of affiliates in the following cases:

The affiliate was retired at the time of his/her death.

The affiliate was an active contributor with a minimum of two years of contributions during the last five years preceding death.

The affiliate was a contributor and died on the job.

In practice, the means-testing procedures have not been fully incorporated, and qualification towards the MPG is mainly a function of the accumulated fund and life expectancy. According to the data presented in Table 16, in 1998, 4.4% of beneficiaries qualified for the MPG. However, these ratios may underestimate the expected share of MPG beneficiaries since an important fraction of those that retired in the 1990s did so under the "early retirement" provision which required them to be able to self finance an annuity above the MPG.

Putting aside the means testing, an accurate estimate of the number of affiliates who would qualify for minimum pension at retirement, or for invalidity or survivor's benefits while active, requires longitudinal data on individual contributions. Given that our analysis has to rely on a cross section, we focus on the following facts:

1. As shown in the previous calculations, our "typical" woman in the lowest schooling category would qualify for the MPG under low and high returns; and under low returns our "typical" women in the next two schooling categories would also qualify for the state guarantee. Typical men do not qualify in either case. In essence, the MPG program is expected to favor women. This is something that other authors have already pointed out (see Wagner (1991) and Zurita (1994)).
2. Given our assumptions on life expectancy and rates of return, we have specific target levels of accumulation that would establish (a) qualification towards MPG subsidy and (2) expected level of MPG subsidy.
3. Our "typical" contributors stay in the system more than 20 years. If we take this estimated behavior regarding contributions as representative of all individuals within each schooling category, every person that accumulates below the target qualifies for the MPG. The actual number of workers that would qualify for the minimum pension

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The affiliate had accumulated 10 years of contributions.

Accidents on the jobs are covered by insurance, which in turn pay out in proportion to reference salaries. Therefore, the relevant cases for the state guarantee are of three types, (1) individuals who earn very low salaries, or (2) work few hours or contribute sporadically, or (3) become incapacitated or die early in their career, leaving a large number of legal survivors.

can be estimated examining the wage dispersion, assuming a system's rate of return, and using a given level of the MPG.

4. From the observed wage distribution, and using the 1994 MPG, we estimated the fraction of contributors in each schooling category that would qualify for the guarantee and the various levels of subsidy. These estimates are reported in Table 17.
5. The estimates above must be seen with caution because the relationship between wages and accumulation is affected by two factors: the individual's contribution density, and the systems' rate of return. While the rate of return is a parameter of the system, the density of contributions is a behavioral variable. The current system's rules discourage social security contributions beyond 20 years worth of accumulated contributions of contributors whose taxable wages are low enough to make them qualify for the MPG. Thus, one should expect a reduction (limited to 20 years) in the density of contributions for those around the minimum wage.
6. One of the weaknesses of the current rules is that the minimum contribution (one minimum wage) it is not actually enforced. In particular, if a worker reports part-time income, the minimum contribution becomes in effect lower than the minimum wage. If authorities counted part-time employment (relative to the minimum legal contribution) as partial time, the possibility of making contributions below the legal minimum would be eliminated. The implication is that in effect, the calendar years of contributions to qualify for the MPG, will be more than 20 for those that work part time. The effective years of contributions, measured in full time equivalent minimum wages, to qualify for the MPG will still be 20 years. In addition, authorities can restrict access to the MPG by making the program a truly means tested program. At the very list, information regarding access to widow's pensions should be taken into account to examine eligibility towards continued MPG benefits in the case of women.

## **6. 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.

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. 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 man 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 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. The results of this study apply to 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 and others will be induced to work 20 years 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.

## References

- Baeza Valdés, Sergio, and Raúl Burger Torres. 1995. Calidad de las pensiones del sistema privado chileno. In Quince años después: Una mirada al sistema privado de pensiones, edited by S. Baeza and F. Margozzini. Santiago: Centro de Estudios Públicos.
- Baeza Valdés, Sergio and Rodrigo Manubens (eds) (1988) Sistema Privado de Pensiones en Chile. Santiago: Centro de Estudios Públicos
- Barrientos, Armando (1998): "Pension Reform, Personal Pensions and Gender Differences in Pension Coverage" World Development 26 #1 pp.125-37.
- Cepal (1998) America Latina: Proyecciones de Población 1970-2050. Boletín Demográfico # 62 Julio
- Cheyre, Hernan (1991) *La Prevision en Chile Ayer y Hoy: Impacto de una Reforma* Santiago :Centro de Estudios Públicos.
- Davis, E. P.1998. ""Pensions in the Corporate Sector", in Redesigning Social Security, H. Siebert (Ed.)
- Diamond, Peter and Salvador Valdés-Prieto (1994): "Social Security Reforms," in The Chilean Economy: Policy Lessons and Challenges, edited by B. Bosworth, R. Dornbusch, and R. Labán. Washington DC: Brookings.
- Edwards, Gonzalo (1997) "Introducción al análisis de las rentas vitalicias," Trabajo Docente # 58, Instituto de Economía U. Católica.
- Gruber J. and D. A. Wise, (Eds) 1999. Social Security and Retirement around the World, University of Chicago Press.
- Iglesias, A., Rodrigo Acuña, and Claudio Chamorro (1990) *10 Años de Historia del Sistema de AFP: Antecedentes Estadísticos*. Santiago: Habitat.
- Iglesias, A. and D. Vittas, 1992. The Rationale and Performance of Personal Pension Plans in Chile, Working Paper 867, The World Bank.
- INP Estadísticas (December , 1998) : División de Pago de Beneficios
- James, Estelle & Dimitri Vittas (1999): "Annuities Markets in Comparative Perspective: Do Consumers Get Their Money's Worth?" The World Bank (September) Paper presented at New Ideas About Old Age Security Conference - World Bank, Washington DC.
- Murphy, Kevin and Finis Welch (1990) "Empirical Age-Earnings Profiles," Journal of Labor Economics, vol 8 #2 pp 202-229.

Superintendencia de Administradora de Fondos de Pensiones Boletín Estadístico (various issues)

Torche, Arístides and Gert Wagner (1997) Previsión Social : Valoración Individual de un beneficio mandado,” Cuadernos de Economía 34, # 103 pp.363-390.

Valdés Prieto, Salvador, and Gonzalo Edwards (1998) “Jubilación en Sistemas de Pensiones Privados,” *El Trimestre Económico*. March.

Valdes Prieto, Salvador (1997) Seguros en los Sistemas de Pensiones. Instituto de Estudios Bancarios Guillermo Subercasaux. Serie de Estudios Financieros #3.

Valdes Prieto, Salvador and Eduardo Navarro Beltran (1992) “Subsidios Cruzados en el Seguro de Invalidez y Sobrevivencia del Nuevo Sistema Previsional Chileno” Cuadernos de Economía 29, #88, pp. 409-41. December.

Wagner, Gert (1983) “Estudio de la Reforma Previsional: Previsión y Reforma, efectos en la industria y en el país.” Universidad Católica. Instituto de Economía (Mayo).

Wagner, Gert. (1991). "La seguridad social y el programa de pensión mínima garantizada." Estudios de Economía, Vol. 18, No. 1 (June): 35-91. Santiago: Universidad Católica de Chile.

Zurita, Salvador. (1994). “Minimum pension insurance in the Chilean pension system.” Revista de Análisis Económico, Vol 9. N° 1. (June): 105-126. Santiago : ILADES.

**Table 1: Workers by Contributing Status and Institution:  
Urban and rural, by age and gender**

	16 to 39	40 to 59	60 plus	Total
<b>URBAN</b>				
<b>Males</b>				
INP	1.38	6.18	16.52	4.14
AFP	68.87	60.01	35.02	63.36
Capredena	1.38	2.55	0.95	1.76
Other	0.33	1.11	1.48	0.68
No	28	30.15	46.04	30.03
No answer	0.04	0	0	0.02
Total	100	100	100	100
<b>URBAN</b>				
<b>Females</b>				
INP	1.94	7.88	16.22	4.75
AFP	66.56	52.89	24.57	59.63
Capredena	0.4	0.81	0.14	0.53
Other	0.12	0.58	0.36	0.29
No	30.98	37.6	58.71	34.72
No answer	0	0.24	0	0.08
Total	100	100	100	100
<b>RURAL</b>				
<b>Males</b>				
INP	2.09	10.62	13.21	5.83
AFP	44.85	39.12	21.02	40.79
Capredena	0.28	0.35	0.07	0.28
Other	0.28	0.36	0.19	0.3
No	52.49	49.56	65.51	52.8
No answer	0.01	0	0	0.01
Total	100	100	100	100
<b>RURAL</b>				
<b>Females</b>				
INP	1.37	6.02	12.91	3.38
AFP	48.79	41.69	17.83	44.93
Capredena	0.13	0	0	0.09
Other	0.09	0.23	0.72	0.17
No	49.62	52.06	68.54	51.44
Total	100	100	100	100

Source: Casen 94

**Table 2: Labor Force Participation in Urban Areas, 1994**

**Women ages 16 to 65**

Probit Estimates Number of obs = 36318  
 chi2(5) = 5282.99 Prob  
 > chi2 = 0.0000  
 Log Likelihood = -21625.39 Pseudo R2 = 0.1089

lf	dF/dx	Std. Err.	z	P> z	x-bar	[	95% C.I.	]
married*	-.2989674	.0059621	-47.92	0.000	.527342	-.310653	-.287282	
ex	.0424897	.0008599	49.20	0.000	22.1012	.040804	.044175	
ex2	-.0008204	.0000167	-48.92	0.000	671.896	-.000853	-.000788	
postsec*	.1501181	.0101847	14.92	0.000	.16931	.130156	.17008	
mar&post*	.2027046	.0143729	14.09	0.000	.080649	.174534	.230875	
obs. P	.3887329							
pred. P	.3753771	(at x-bar)						

(\*) dF/dx is for discrete change of dummy variable from 0 to 1  
 z and P>|z| are the test of the underlying coefficient being 0

**Men ages 16 to 65**

Probit Estimates Number of obs = 33104  
 chi2(4) = 9412.63 Prob  
 > chi2 = 0.0000  
 Log Likelihood = -11069.162 Pseudo R2 = 0.2983

lf	dF/dx	Std. Err.	z	P> z	x-bar	[	95% C.I.	]
married*	.1122782	.0049625	22.62	0.000	.543983	.102552	.122004	
ex	.0388999	.0006178	70.44	0.000	21.4947	.037689	.040111	
ex2	-.0007603	.0000114	-73.45	0.000	642.041	-.000783	-.000738	
postsec*	-.0569415	.0055919	-11.15	0.000	.181489	-.067901	-.045982	
obs. P	.8165781							
pred. P	.8879128	(at x-bar)						

(\*) dF/dx is for discrete change of dummy variable from 0 to 1  
 z and P>|z| are the test of the underlying coefficient being 0

**Table 3: Affiliation and Propensity to Contribute among Workers by Employment Status:1994**

Males				
Status	Employment Distribution	Total Employment	Affiliates Among the Employed	Contributors Among working Affiliates
Employer	3.87	107,027	60.55%	85.93%
Self-employed	21.80	603,020	44.48%	60.54%
Employee	71.19	1,968,742	89.01%	94.90%
Live-in domestic	0.05	1,334	100.00%	100.00%
Other domestic	0.09	2,532	73.50%	77.97%
Short-term commission	1.40	38,598	62.13%	76.97%
Unpaid family	0.45	12,364	15.67%	43.06%
Military	1.15	31,917	99.08%	99.95%
Total	100.00	2,765,534	77.60%	90.15%
Females				
Status	Employment Distribution	Total Employment	Affiliates Among the Employed	Contributors Among working Affiliates
Employer	2.38	36,757	59.77%	87.79%
Self-employed	17.85	275,358	33.09%	64.82%
Employee	59.14	912,578	88.79%	96.22%
Live-in domestic	4.54	70,044	79.62%	97.51%
Other domestic	12.16	187,666	51.36%	78.89%
Short-term commission	1.41	21,824	63.06%	81.70%
Unpaid family	2.26	34,835	27.15%	54.32%
Military	0.25	3,914	100.00%	100.00%
Total	100.00	1,542,976	71.46%	91.48%

**Table 4: Contributors among Civilian Workers Not Required to Contribute (self employed and employees without contracts)**

**EQ1**

Probit Estimates Number of obs = 11019  
 chi2(20) = 600.04 Prob > chi2 = 0.0000  
 Log Likelihood = -5991.4309 Pseudo R2 = 0.0477

contr	dF/dx	Std. Err.	z	P> z	x-bar	[	95% C.I.	]
salarloh	.0000209	4.38e-06	4.78	0.000	543.83	.000012	.00003	
yschool	.0140523	.0012457	11.25	0.000	8.86959	.011611	.016494	
age	.0107557	.0018747	5.73	0.000	38.2814	.007081	.01443	
age2	-.000092	.0000223	-4.12	0.000	1629.07	-.000136	-.000048	
AGRI*	-.0208325	.0158046	-1.29	0.195	.124512	-.051809	.010144	
MINI*	-.0274786	.0354607	-0.75	0.453	.014339	-.09698	.042023	
INDU*	-.0370054	.0146957	-2.43	0.015	.127507	-.065808	-.008202	
UTIL*	-.0577195	.0641543	-0.83	0.406	.003267	-.18346	.068021	
CONS*	.0151046	.0155179	0.98	0.325	.143389	-.01531	.045519	
COMM*	.0050619	.0129518	0.39	0.695	.27988	-.020323	.030447	
TRAN*	.0026499	.0165642	0.16	0.873	.101552	-.029815	.035115	
FINA*	.1381073	.0308374	4.84	0.000	.026953	.077667	.198548	
REG1*	.0257467	.0160953	1.60	0.110	.498412	-.005799	.057293	
REG2*	.0845879	.0188047	4.67	0.000	.221073	.047731	.121444	
REG3*	.0268874	.0184528	1.48	0.139	.19666	-.009279	.063054	
t6_9*	.0616362	.0222535	2.90	0.004	.045739	.01802	.105252	
t10_49*	.1726473	.0170998	10.87	0.000	.091478	.139132	.206162	
t50_199*	.1617451	.0261941	6.69	0.000	.035393	.110406	.213085	
t_200*	.3308905	.0332646	10.36	0.000	.021508	.265693	.396088	
woman*	-.0622602	.0097629	-6.16	0.000	.278065	-.081395	-.043125	
obs. P	.2580089							
pred. P	.2488856	(at x-bar)						

(\*) dF/dx is for discrete change of dummy variable from 0 to 1  
 z and P>|z| are the test of the underlying coefficient being 0

**EQ2 No controls for sectors or region**

Probit Estimates Number of obs = 11223  
 chi2(5) = 288.15 Prob > chi2 = 0.0000  
 Log Likelihood = -6247.2808 Pseudo R2 = 0.0225

contr	dF/dx	Std. Err.	z	P> z	x-bar	[	95% C.I.	]
salarloh	.000021	4.31e-06	4.89	0.000	533.945	.000013	.000029	
yschool	.0149383	.0011765	12.67	0.000	8.88096	.012632	.017244	
edad	.0078518	.001826	4.30	0.000	38.1842	.004273	.011431	
e2	-.0000693	.0000219	-3.17	0.002	1622.17	-.000112	-.000026	
dwoman*	-.0667793	.008799	-7.31	0.000	.28005	-.084025	-.049533	
obs. P	.2566159							
pred. P	.2520265	(at x-bar)						

**Table 5: Restricting the cross-section sample to estimate contributions**

	Totals	% of WAP	% of ever worked	% of Affiliates	% of working affiliates
Working Age Population (16 and over)	3,835,406	100.00%			
Males that have worked	3,478,141	90.69%			
Affiliates that have worked	2,553,313	66.57%	73.4%	100.00%	
Current worker among affiliates	2,117,124	55.20%		82.92%	100.00%
Contributors among current workers	1,908,237	49.75%		74.74%	90.13%
	<b>FEMALES</b>				
	Totals	% of WAP		% of Affiliates	% of working affiliates
Working Age Population (16 and over)	4,328,801	100.00%			
Females that have worked	3,046,683	70.38%			
Affiliates among ever worked	1,683,020	38.88%	55.2%	100.00%	
Current worker among affiliates	1,076,478	24.87%		63.96%	100.00%
Contributors among current workers	985,112	22.76%		58.53%	91.51%

Source: CASEN 94, urban sample

Note: The rural population adds an approximate number of 600 thousand affiliates and 350 thousand contributors in 1994.

**Table 6: Marriage Age by Schooling Category: Urban Areas**

	Incom prim	incomple sec	Compl secondary	up to 4 post sec	5+ year post sec
<b>MALES</b>					
Full Sample	30	27	26	27	28
Ever working affiliates	30	27	25	26	27
<b>FEMALES</b>					
Full sample	28	23	26	27	26
Ever working affiliates	28	30	27	28	28

**Table 7: Distribution of ever-working affiliates by school completion in each cohort. Urban areas**

FEMALES						
Age	Incom pr	incomple	Secondar	4 psec	5+ psec	Total
-----	-----	-----	-----	-----	-----	-----
16 – 20	9.57	35.92	39.85	14.67	0	100
21 – 25	5.01	23.45	32.83	35.44	3.27	100
26 – 30	6.72	19.19	33.02	31.53	9.54	100
31 – 35	9.01	22.21	33.21	23.13	12.43	100
36 – 40	12.23	25.28	29.16	20.85	12.48	100
41 – 45	23.57	16.25	25.81	18.37	16	100
46 – 50	35.45	16.33	20.1	17.67	10.45	100
51 – 55	46.06	17.86	15.09	10.47	10.53	100
56 – 60	53.97	8.92	17.12	11.71	8.29	100
61 – 65	64.76	8.49	13.69	7.68	5.38	100
66 +	69.87	9.13	13.37	4.47	3.16	100
Total	24.58	19.09	26.61	20.88	8.84	100
MALES						
Edadcat	Incom pr	incomple	Secondar	4 psec	5+ psec	Total
16 – 20	11.93	44.87	30.64	12.56	0	100
21 – 25	7.62	33.08	32.34	23.82	3.14	100
26 – 30	10.24	30.2	34.94	17.4	7.23	100
31 – 35	12.85	28.04	31.94	14.76	12.41	100
36 – 40	16.42	30.42	27.8	13.7	11.67	100
41 – 45	26.58	22.1	25.86	13.39	12.07	100
46 – 50	34.64	16.23	23.43	13.63	12.07	100
51 – 55	45.23	15.61	17.91	11.47	9.79	100
56 – 60	52.98	11.84	17.27	9.33	8.58	100
61 – 65	56.92	12.76	17.86	4.39	8.07	100
66 +	64.71	11.6	12.33	5.46	5.9	100
Total	26.33	24.53	26.45	14.07	8.62	100

**Table 8: Estimated Years of Contributions by Age Category in Urban Areas**

**Ever Working Males affiliates**

age category	Schooling category				
	Incom prim	Incomple sec	Compl secondary	up to 4 post sec	5+ year post sec
16 – 20	3.37	3.02	1.65	1.28	0.00
21 – 25	7.02	6.91	5.84	5.35	2.79
26 – 30	10.65	11.04	10.33	9.77	7.25
31 – 35	14.49	15.33	15.03	14.47	12.12
36 – 40	18.46	19.63	19.72	19.09	17.02
41 – 45	22.86	23.98	24.25	23.56	21.77
46 – 50	26.75	28.22	28.37	27.79	26.48
51 – 55	30.49	32.42	32.34	31.80	31.25
56 – 60	33.52	35.74	36.04	35.63	35.91
61 – 65	35.98	38.05	38.29	38.97	38.97

**Ever Working Females affiliates**

age category	Schooling category				
	Incom prim	incomple sec	Compl secondary	up to 4 post sec	5+ year post sec
16 – 20	3.64	2.85	1.39	1.21	0.00
21 – 25	6.84	6.51	5.31	5.12	3.26
26 – 30	9.80	10.03	8.64	8.90	7.87
31 – 35	11.44	11.95	11.58	12.64	12.10
36 – 40	13.79	14.78	14.95	16.35	16.92
41 – 45	16.23	17.69	18.32	20.72	21.53
46 – 50	18.32	19.90	21.70	24.08	26.18
51 – 55	20.86	22.21	24.17	28.52	30.81
56 – 60	22.49	24.06	26.55	32.68	34.77
60 - 65	23.42	24.17	26.80	32.92	36.05

**Table 9: Average Wage by Cell. 1994 pesos. Urban Areas**

**Estimated Monthly Male Wages (based on full time earners)**

age category	schooling category				
	incom prim	incomple sec	Compl secondary	up to 4 post sec	5+ year post sec
16 – 20	\$49,145	\$61,958	\$72,894	\$76,149	
21 – 25	\$61,366	\$72,884	\$89,050	\$119,020	\$313,293
26 – 30	\$67,259	\$84,219	\$108,092	\$155,493	\$358,164
31 – 35	\$70,030	\$94,988	\$133,436	\$195,497	\$482,094
36 – 40	\$76,019	\$103,699	\$151,606	\$223,750	\$524,083
41 – 45	\$88,323	\$115,844	\$174,791	\$248,305	\$540,316
46 – 50	\$93,893	\$143,450	\$221,171	\$269,793	\$643,224
51 – 55	\$90,986	\$128,078	\$201,733	\$247,731	\$595,663
56 – 60	\$92,653	\$135,883	\$197,906	\$281,721	\$542,736
61 – 65	\$81,430	\$122,726	\$161,457	\$240,541	\$513,568

**Estimated Monthly Female Wages (based on full time earners)**

age category	Schooling category				
	incom prim	incomple sec	Compl secondary	up to 4 post sec	5+ year post sec
16 – 20	\$48,479	\$48,124	\$62,718	\$66,393	
21 – 25	\$49,496	\$60,800	\$75,702	\$95,447	\$179,198
26 – 30	\$53,374	\$59,136	\$82,812	\$167,499	\$232,048
31 – 35	\$53,044	\$66,317	\$91,003	\$130,258	\$260,202
36 – 40	\$52,251	\$70,051	\$107,584	\$138,252	\$304,915
41 – 45	\$58,110	\$79,232	\$137,248	\$179,873	\$312,696
46 – 50	\$60,745	\$83,353	\$134,975	\$209,027	\$212,333
51 – 55	\$62,959	\$75,782	\$156,673	\$154,783	\$222,027
56 – 60	\$63,795	\$93,730	\$168,694	\$149,990	\$283,680
60 – 65	\$58,703	\$62,813	\$116,958	\$157,500	\$365,000

**Table 10: 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 65 assuming same work patterns than men	\$11,300,585	\$15,267,891	\$24,685,205	\$33,942,037	\$58,373,368
Men at 65	\$17,432,989	\$24,243,188	\$34,855,906	\$49,509,468	\$110,966,020
<i>Three steps to eliminate the gender difference in fund accumulation</i>					
Women's fund at 60/Men's fund at age 65	32.19%	32.31%	39.61%	46.05%	37.78%
(1) Effect of raising retirement age/Men's fund at age 65	9.86%	9.01%	11.21%	12.95%	11.74%
(2) Effect of increasing work experience/Men's fund at 65	22.78%	21.66%	19.99%	9.55%	3.09%
(3) Effect of eliminating wage differentials/Men's fund at 65	35.18%	37.02%	29.18%	31.44%	47.40%
Initial ratio + (1) + (2) + (3)	100.00%	100.00%	100.00%	100.00%	100.00%

**Note: Step (1) implies the accumulation of additional funds from age 60 to 65. Step (2) is derived from using female wages and male's work experience (from Table 9). Step (3) shows the fund accumulation of men. In other words, it represents the impact of having women work as men and be paid as men.**

**Table 11: Estimated Retirement Benefits. Urban contributors.**  
(assumes no secular wage growth) 1994 pesos

<b>MALES RETIRING AT 65</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	more than 4 years of post secondary
Accumulated Fund					
3%	\$7,259,200	\$9,818,501	\$14,113,770	\$20,039,150	\$44,906,795
Reference Salary (Average contributory base for the last 10 years) / month					
	\$54,994	\$80,107	\$115,628	\$204,564	\$429,993
Estimated Annuity (expressed in monthly payments)					
3%	\$41,670	\$56,361	\$81,017	\$115,030	\$257,777
Replacement ratio					
3%	0.76	0.70	0.70	0.56	0.60

<b>FEMALES RETIRING AT 60</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	more than 4 years of post secondary
Accumulated Fund					
3%	\$2,577,764	\$3,596,560	\$6,331,764	\$10,455,633	\$19,222,864
Reference Salary (Average contributory base for the last 10 years) / month					
	\$26,411	\$34,879	\$78,841	\$131,125	\$215,058
Estimated Annuity (expressed in monthly payments)					
3%	\$37,738	\$37,738	\$37,738	\$47,214	\$86,803
Replacement ratio					
3%	1.43	1.08	0.48	0.36	0.40

Fund calculations are based on estimated wages from cross section (Table 8), except for the estimated wage for males age 46-55. These values were capped at 60 UF (\$550,259). The wage base of each year is equal to the estimated wage times the average fraction of a year of estimated contributions for the period, estimated from Table 9. The annuity is calculated assuming no commission for the insurance company (see Valdes-Prieto and Edwards (1998)), and a 2% interest rate. Males are assumed to survive for 15 years and make provisions for survivors' pension for 6 years at 60% of their own. Females are assumed to survive for 23 years and make no additional provisions. Females with secondary schooling or less build up a fund insufficient to finance the MPG. Their annuity is lifted to the minimum pension.

**Table 11a: Estimated Retirement Benefits. Urban contributors.  
(assumes a 1% secular wage growth) 1994 pesos**

<b>MALES RETIRING AT 65</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	More than 4 years of post secondary
Accumulated Fund					
3%	\$8,803,369	\$12,321,620	\$17,771,418	\$25,415,898	\$57,085,516
Reference Salary (Average contributory base for the last 10 years) / month					
	\$81,930	\$119,210	\$171,924	\$305,080	\$640,414
Estimated Annuity (expressed in monthly payments)					
3%	\$50,534	\$70,729	\$102,013	\$145,894	\$327,686
Replacement ratio					
3%	0.62	0.59	0.59	0.48	0.51

<b>FEMALES RETIRING AT 60</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	More than 4 years of post secondary
Accumulated Fund					
3%	\$3,458,739	\$4,794,362	\$7,948,444	\$12,720,623	\$23,319,139
Reference Salary (Average contributory base for the last 10 years) / month					
	\$44,564	\$52,379	\$111,110	\$188,357	\$313,618
Estimated Annuity (expressed in monthly payments)					
3%	\$37,738	\$37,738	\$37,738	\$56,948	\$104,515
Replacement ratio					
3%	0.85	0.72	0.34	0.31	0.34

Fund calculations are based on estimated wages from cross section (Table 8), except for the estimated wage for males age 46-55. These values were capped at 60 UF (\$550,259).

The wage base of each year is equal to the estimated wage adjusted by a 1% annual growth, times the average annual work time for the period estimated from Table 9.

The annuity is calculated assuming no commission for the insurance company (see Valdes-Prieto and Edwards (1998)), and a 2% interest rate. Males are assumed to survive for 15 years and make provisions for survivors' pension for 6 years at 60% of their own. Females are assumed to survive for 23 years and make no additional provisions.

Females with secondary schooling or less build up a fund insufficient to finance the MPG. Their annuity is lifted to the minimum pension.

**Table 11b: Estimated Retirement Benefits. Urban contributors.  
(assumes a 2% secular wage growth) 1994 pesos**

<b>MALES RETIRING AT 65</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	More than 4 years of post secondary
5%	\$17,432,989	\$24,243,188	\$34,855,906	\$49,509,468	\$110,966,020
Reference Salary (Monthly)					
	\$121,677	\$176,846	\$254,822	\$453,557	\$950,809
Estimated Annuity (expressed in monthly payments)					
5%	\$119,979	\$166,849	\$239,889	\$340,740	\$763,704
Replacement ratio					
5%	0.99	0.94	0.94	0.75	0.80

<b>FEMALES RETIRING AT 60</b>					
Fund average rate of return	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	More than 4 years of post secondary
5%	\$5,611,611	\$7,831,774	\$13,808,015	\$22,801,463	\$41,918,370
Reference Salary (Monthly)					
	\$52,877	\$70,548	\$159,626	\$264,660	\$436,010
Estimated Annuity (expressed in monthly payments)					
5%	\$37,738	\$43,302	\$76,346	\$126,071	\$231,770
Replacement ratio					
5%	0.71	0.61	0.48	0.48	0.53

Fund calculations are based on estimated wages from cross section (Table 8), except for the estimated wage for males age 46-55. These values were capped at 60 UF (\$550,259). The wage base of each year is equal to the estimated wage adjusted by a 2% annual growth, times the average annual work time for the period estimated from Table 9. The annuity is calculated assuming no commission for the insurance company (see Valdes-Prieto and Edwards (1998)), and a 4% interest rate. Males are assumed to survive for 15 years and make provisions for survivors' pension for 6 years at 60% of their own. Females are assumed to survive for 23 years and make no additional provisions. Females with incomplete primary schooling build up a fund insufficient to finance the MPG. Their annuity is lifted to the minimum pension.

**Table 12: Useful Benchmarks Chilean Economy (1994 data)**

Indicator	1994 pesos
Average monthly income per capita *	78,057.60
Average monthly wage *	133,348.00
Minimum Wage (monthly)	39,000.56
Minimum Taxable Income	39,000.56
Social Security Benefits (1994 average) *	93,673.00
Workers' pensions *	107,521.00
Invalidity pensions *	54,954.00
Widows' or survivors' pensions *	72,132.00
Minimum Pension	37,738.39
PASIS benefit (monthly)	17,906.60
Poverty Line (monthly per equivalent adult)	30,100.00

\* Estimates based on CASEN data.

**Table 13: Postponing Retirement: Estimated Impact on Women' Pensions**

	Incompl Primary	Incompl Second	Secondary	Up to 4years Post Sec	More than 4 Years PSec
System offers a 3% rate of return & there is no secular trend in wage growth					
ANNUITY					
at 60	\$37,738	\$37,738	\$37,738	\$47,214	\$86,803
at 65	\$37,738	\$37,738	\$38,926	\$64,105	\$120,611
System offers a 5% rate of return & wages grow at 2% per year					
ANNUITY					
at 60	\$37,738	\$43,302	\$76,346	\$126,071	\$231,770
at 65	\$40,527	\$55,382	\$97,956	\$161,533	\$303,808

Note: Postponing retirement means:

1. Women work from age 60 to 65 (according to experience accumulation reported in Table 22).
2. Retirement benefits will cover 19 years (life expectancy at age 65).

**Table 14: Estimated Retirement Incomes under the new and old systems.  
Urban contributors. 1994 pesos**

(3% return on funds and no secular wage growth)

<b>MALES RETIRING AT 65</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	More than 4 years of post secondary
<b>NEW SYSTEM</b>	\$41,670	\$56,361	\$81,017	\$115,030	\$257,777
<b>OLD SYSTEM</b>	\$32,120*	\$43,818*	\$60,007*	\$124,191*	\$242,884*

<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	\$37,738	\$37,738	\$47,214	\$86,803
Widow's pension Age 78 - 83	\$25,002	\$33,817	\$48,610	\$69,018	\$154,666
Own + Widow's Age 77 - 83	\$37,738	\$37,738	\$48,610	\$116,232	\$241,469
<b>OLD SYSTEM</b>					
Own pension working women Age 60-77***	\$13,239	\$21,916	\$52,183	\$87,075	\$161,682
Maximum ****	\$14,619	\$24,314	\$56,077	\$87,503	\$157,088
Widow's pension Age 78-83	\$16,060	\$21,909	\$30,004	\$62,096	\$121,442
Own OR Widow's Age 77 - 83	\$16,060	\$21,916	\$52,183	\$87,075	\$157,088

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

\*\* The estimated annuity for the typical female in the three lowest schooling categories falls below the minimum pension. The estimated incomes are replaced by the minimum pension (\$37,738). We assume that the overall pension remains at the MPG when women in the two lower schooling categories become widows, given that those widows' pensions are still below the MPG. However, the secondary school category can attain a higher pension, and we increase the annuity accordingly.

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

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

**Table 14a: Estimated Retirement Incomes under the new and old systems.  
Urban contributors. 1994 pesos**

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

<b>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>	\$119,979	\$166,849	\$239,889	\$340,740	\$763,704
<b>OLD SYSTEM*</b>	\$75,197	\$102,616	\$140,452	\$290,845	\$568,819

<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	\$71,988	\$100,110	\$143,934	\$204,444	\$458,222
Own + Widow's*** Age 78-83	\$71,988	\$153,497	\$229,029	\$340,617	\$707,066
<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	\$37,598	\$51,308	\$70,226	\$145,423	\$284,409
Own OR Widow's Age 78-83	\$37,598	\$51,308	\$116,798	\$185,780	\$333,517

\* 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 start 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 14b: Relative pensions of men and women:  
New system as proportion of old system's pensions.  
Urban contributors.**

<b>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>3% return</b>	1.30	1.29	1.35	0.92	1.06
<b>5% return</b>	1.60	1.63	1.71	1.17	1.34

<b>WORKING WOMEN</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>OWN PENSION AGES 60 - 77</b>					
<b>3% return</b>	2.85	1.72	0.72	0.54	0.53
<b>5% return</b>	1.32	0.89	0.65	0.68	0.69
<b>OWN PENSION IN COMBINATION WITH WIDOW'S PENSION AGES 78 - 83</b>					
<b>3% return</b>	2.34	1.72	0.93	1.33	1.99
<b>5% return</b>	2.53	3.15	1.96	1.83	2.12

<b>NON - WORKING WOMEN</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4 years of post-secondary	More than 4 years of post secondary
<b>WIDOW'S PENSION AGES 78 - 83</b>					
<b>3% return</b>	1.56	1.54	1.62	1.11	1.27
<b>5% return</b>	1.91	1.95	2.05	1.41	1.61

Source: Tables 14 and 14a

**Table 15: Overall pension income in old age: the effect of reform**

**PRESENT VALUE OF BENEFITS AT AGE 60**

<b>WORKING FEMALES</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	more than 4 years of post secondary
Low growth					
New System retiring at 60	\$860,196	\$860,196	\$919,851	\$1,454,895	\$2,827,236
Old System retiring at 60	\$317,247	\$499,551	\$1,189,454	\$1,984,779	\$3,580,648
High growth					
New System retiring at 60	\$1,029,908	\$1,554,995	\$2,512,395	\$3,941,678	\$7,692,015
Old System retiring at 60	\$624,008	\$1,065,134	\$2,556,577	\$4,066,515	\$7,300,311

The calculations compound benefits from age 60 to age 83 under the rules of the old and new systems.

<b>NON-WORKING FEMALES MARRIED TO A CONTRIBUTOR</b>					
	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years of post-secondary	more than 4 years of post secondary
Low growth					
New System	\$137,187	\$185,555	\$266,725	\$378,704	\$848,657
Old System	\$88,122	\$120,215	\$164,633	\$340,723	\$666,356
High growth					
New System	\$396,646	\$551,596	\$793,061	\$1,126,465	\$2,524,755
Old System	\$207,161	\$282,702	\$386,938	\$801,265	\$1,567,064

The calculations compound benefits from age 78 to age 83 under the rules of the old and new systems.

**Table 16: New System's Beneficiaries by Year and the relative importance of MPG's beneficiaries**

	MPG	Total	MPG ben/Total
Year	Beneficiaries		
1990	7,211	99,706	7.23%
1991	8,484	127,218	6.67%
1992	9,388	158,222	5.93%
1993	10,913	194,657	5.61%
1994	12,203	238,407	5.12%
1995	13,434	288,975	4.65%
1996	15,462	328,756	4.70%
1997	17,263	378,420	4.56%
1998	18,952	427,039	4.44%

Source: SAFP

**Table 17: Accumulation below the MPG Target by schooling**

<b>men at 65</b>					
<b>FUND ACCUMULATED 3% annual rate of return - no secular wage growth</b>					
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$6,468,000	Primary	Second		Post Sec	years Psec
10th percentile	\$3,582,019	\$4,550,527	\$5,579,140		
20th percentile	\$4,788,407	\$5,501,859			
25th percentile	\$5,147,599	\$5,957,300			
30th percentile	\$5,309,888	\$6,312,167			
40th percentile	\$5,952,367				
<b>women at 60</b>					
<b>FUND ACCUMULATED AT 3% annual rate of return - no secular wage growth</b>					
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$8,018,000	Primary	Second		Post Sec	years Psec
10th percentile	\$1,212,817	\$1,647,376	\$2,564,196	\$3,927,087	\$7,669,210
20th percentile	\$1,923,563	\$2,458,496	\$3,357,370	\$5,250,964	
25th percentile	\$2,137,522	\$2,639,627	\$3,586,592	\$5,685,485	
30th percentile	\$2,334,777	\$2,893,717	\$3,925,008	\$6,500,917	
40th percentile	\$2,661,036	\$3,204,034	\$4,505,003	\$7,588,586	
50th percentile	\$2,878,844	\$3,543,527	\$5,390,867		
60th percentile	\$3,196,751	\$4,030,192	\$6,408,994		
70th percentile	\$3,665,575	\$4,808,575	\$7,402,749		
80th percentile	\$4,299,426	\$5,371,644			
90th percentile	\$5,076,339	\$7,165,566			
<b>women at 65</b>					
<b>FUND ACCUMULATED AT 3% annual rate of return - no secular wage growth</b>					
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$ 7,000,000	Primary	Second		Post Sec	years Psec
10th percentile	\$1,439,545	\$1,912,497	\$3,015,529	\$4,655,162	
20th percentile	\$2,280,273	\$2,851,713	\$3,936,752	\$6,189,899	
25th percentile	\$2,545,089	\$3,061,693	\$4,209,350	\$6,693,628	
30th percentile	\$2,773,762	\$3,356,664	\$4,601,668		
40th percentile	\$3,168,764	\$3,718,733	\$5,291,210		
50th percentile	\$3,421,263	\$4,112,709	\$6,318,169		
60th percentile	\$3,803,227	\$4,679,214			
70th percentile	\$4,356,189	\$5,581,573			
80th percentile	\$5,118,443	\$6,240,895			
90th percentile	\$6,052,656				

**Table 17a**

men at 65	FUND ACCUMULATED AT 5% Rate of Return - 2% secular wage growth				
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$5,432,000	Primary	Second		Post Sec	years Psec
10th percentile					
20th percentile					
25th percentile					
30th percentile					
40th percentile					
women at 60	FUND ACCUMULATED AT 5% Rate of Return - 2% secular wage growth				
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$6,605,000	Primary	Second		Post Sec	years Psec
10th percentile	\$2,640,371	\$3,583,689	\$5,581,615		
20th percentile	\$4,187,835	\$5,351,228			
25th percentile	\$4,653,435	\$5,745,890			
30th percentile	\$5,083,753	\$6,298,100			
40th percentile	\$5,793,417				
50th percentile	\$6,267,608				
women at 65	FUND ACCUMULATED AT 5% Rate of Return - 2% secular wage growth				
Target	Incompl	Incompl	Secondary	up to 4years	more than 4
\$ 5,926,000	Primary	Second		Post Sec	years Psec
10th percentile	\$3,451,569	\$4,580,462			
20th percentile	\$5,467,425				
25th percentile					
30th percentile					
40th percentile					