The gender impact of pension reform

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**Abstract**

Pension systems may have a different impact on the two genders because women are less likely than men to work in formal labor markets and earn lower wages when they do. Recent multi-pillar pension reforms tighten the link between payroll contributions and benefits, leading critics to argue that they will hurt women. In contrast, supporters of these reforms argue that women will be helped by the removal of distortions pillar and the better targeted redistributions in the new systems. This paper examines the differential impact of the new and old systems in three Latin American countries – Chile, Argentina and Mexico. Based on household survey data, we simulate the wage and employment histories of representative men and women, the pensions that these are likely to generate under the new and old rules, and the relative gains or losses of the two genders due to the reform. We find that women do indeed accumulate private annuities that are only 30–40% those of men in the new systems. However, this effect is mitigated by sharp targeting of the new public pillars toward low earners, many of whom are women, and by restrictions on payouts from the private pillars, particularly joint annuity requirements. As a result, low-earning married women are the biggest gainers from the pension reform.

Critics of multi-pillar pension reforms argue that the tight link between payroll contributions and benefits in the defined contribution (DC) pillar will produce lower pensions for women. In contrast, supporters of these reforms argue that multi-pillar systems remove distortions that favored men and permit a more targeted public pillar that will help women. In order to test these conflicting claims about multi-pillar reforms, and to analyze more generally the gender impact of alternative pension systems, this paper examines the differential impact on the two genders of the new and old systems in three Latin American countries – Chile, Argentina and Mexico.¹

¹ The Latin American studies were part of a joint project carried out by James, Cox Edwards and Wong. The project was financed by the Economics and Gender Trust of the World Bank, for which we express our appreciation. For earlier papers coming out of this project see Cox Edwards (2002, 2001a, 2001b, 2001c, 2000a, 2000b), Parker and Wong (2001), Wong and Parker (2001). Other papers have discussed
Based on household survey data, we simulate the employment histories of representative men and women, and the pensions that these are likely to generate under the new and old rules. We ask:

1. What are the relative monthly and lifetime benefits of men versus women under the new systems?
2. What are the relative gains or losses of men versus women due to the shift from the old to the new systems?
3. What sub-groups within each gender benefit or lose the most from the reform and from redistributions under the new systems?
4. What are the key policy choices that determine these gender outcomes?

These questions matter because the majority of old people are women, pockets of poverty among the old are largest among very old women, and details of pension programs affect the incentive to work in the home versus the formal labor market. Our emphasis is on relative rather than absolute changes, on distributional rather than efficiency effects.

Most basically, we find that women do indeed accumulate retirement funds and private annuities that are only 30–40% those of men, from the DC pillar of the multi-pillar systems. However, this effect is mitigated by targeting of the new public pillars toward low earners, many of whom are women, and by restrictions on payout provisions, particularly joint annuity requirements. Women are the major recipients of redistribution from these two sources. As a result, total lifetime retirement benefits for women reach 60–80% of those for men and for ‘full career’ married women they equal or exceed benefits of men. Also as a result, low-earning women are the biggest gainers from the pension reform. For women who receive these transfers, female/male ratios of lifetime benefits in the new systems exceed those in the old systems. Private intra-household transfers through joint annuities, which are required or strongly encouraged, play the largest role in equalizing gender ratios.

Different sub-groups within each gender benefit differentially from the new systems. Low earners of both genders benefit disproportionately from targeted redistributions in all three countries. Married women who work in the labor force gain substantially from the joint annuity, which they get in addition to their own pension. In Chile and Mexico, those who work the most gain the most. But in Argentina women who specialize in home production are subsidized through the public pillar. Women are allowed to retire early, a ‘privilege’ that cuts the monthly pensions of those who do so more than it did in the old system. Correspondingly, those who retire later get a larger reward in the new system. Future cohorts of women will receive less protection against gender inequality under present indexation rules. These differences mean that gender-based equity crosscuts with other criteria for equity as well as efficiency, so policy makers must think about which women and families have priority needs and which behaviors they want to encourage.

The projected replacement rate of men and women in Chile and Argentina, but none have used actual labor market behavior to simulate employment histories and compare expected benefits under the new and old systems. See Bertranou (2001), Arena de Mesa and Montecinos (1999), Barrientos (1998). Bertranou (1998) reviews the earlier literature. For the full results of the project see James, Cox Edwards and Wong, 2003.
Section 1 starts with an outline of how men and women typically differ, and how alternative pension systems might therefore be expected to affect them differentially. Section 2 describes the multi-pillar reforms in Latin America, with particular reference to provisions that have differential gender impacts, and summarizes our methodology. Section 3 simulates expected annuities for men and women from the new private pillar. Sections 4 and 5 analyze how this is modified by public transfers and by annuitization rules that create private transfers, and discuss the different approaches to and trade-offs between equality and work incentives. Section 6 evaluates which groups gained and lost the most from the shift to a new system. The Conclusion points to key design features that determine the gender impact of pension reform, applicable to other regions as well.

1 Why do pension systems and pension reforms have a gender impact?

Most public pension programs – both the traditional DB and the newer DC plans – are contributory, based heavily on labor market experience. Workers pay payroll taxes and receive benefits that depend on wage history, years of work, or more directly on their contributions. These contributory social security systems developed because (1) pensions were viewed as a replacement for wages and (2) people are more willing to pay the tax that finances the system if they perceive they will receive a contingent monetary benefit in return. However, these arrangements pose a problem for women, who are likely to have worked and contributed for fewer years and earned lower wages when working. The labor market and demographic differences between men and women that impact their pensions are well known.

1.1 Labor market and demographic differences between the genders

Labor force participation rates. Women, especially married women, traditionally have less continuous labor force attachment than men, due to the intra-family division of labor. They are in the labor force roughly 50–70% as many years in our three sample countries. Even when they work it may be part-time, temporary and in the informal labor market. Although women’s labor market experience is converging to that of men, the process is gradual and traditional roles continue to dominate in many countries.

Wages. Women typically earn less per week or year of work than men, even after controlling for age and education. In our three sample countries, at age 20 women earn almost as much as men, but the disparity increases with age and by age 50 they earn only 60–70% as much per month of work. Thus any pension system that links benefits to earnings or contributions is likely to cover a smaller percentage of women and to produce lower benefits for them.²

² The gender gap in work and pay is smaller, but still significant, in higher income countries. For example, in the US, UK, Canada and Australia the female labor force participation rate is 15–25% below that of men (and much of that is part time) and hourly wage rates for women are 15–30% less than that of men (Ginn, Street, and Arber, 2001, US General Accounting Office 1997).
Different retirement ages for men and women. Rules of the system often allow women to retire earlier than men. For example, women are permitted to retire five years earlier than men in Chile and Argentina. These differential rules started in traditional DB systems and they frequently continue in reformed systems – but the penalty for early retirement is greater in a DC system that is actuarially fair.

Longevity. Women at age 60 have a life expectancy that is three to five years greater than that of men, in most countries. In Chile a woman who retires at age 60 has a future lifespan in retirement that is 7.5 years more than that of her husband when he retires at age 65. Thus any given DC accumulation yields lower annual benefits to women, especially if gender-specific tables are used, as in Latin America.

Widowhood. The greater longevity of women, combined with the fact that they are often younger than their husbands, means that they are more likely to become widows than men are to become widowers; hence survivors’ pensions are of key importance to women. Without survivors’ benefits, non-working widows are likely to find themselves without monetary means and even widows who have a pension of their own find their household income cut by far more than their cost of living, due to scale economies, when their husband dies. Survivors’ benefits in the form of joint annuities play a major role in the new Latin American systems.

1.2 Implications for multi-pillar reforms

Given this as background, we conjecture that recent reforms that were designed to link benefits more closely with contributions will produce lower own-annuities for women than for men. In part to mitigate this effect, the new systems all contain ‘public’ defined benefit elements, usually financed by general revenues, which deviate from pure defined contribution. We hypothesize that these generate transfer payments that favor women, but detailed arrangements such as degree of targeting to low earners, years of work required for eligibility, retirement age and indexation provisions dictate which women benefit and by how much. The Latin American reforms also contain elaborate restrictions at the payout stage, especially regarding annuitization, that redistribute between the genders. We expect that the common requirement of survivors’ benefits and joint annuities will generate an important intra-family redistribution toward women. We measure the combined gender impact of own-annuities, public and private transfers.

Finally, the new systems replaced pay-as-you-go DB systems where contributions and benefits were only loosely linked and where women had to choose between receiving their own benefit or the widow’s benefit. The old systems favored women in some ways but hurt them in others; thus the net impact of the change is uncertain a priori. We examine this question empirically.

2 Background, data and methodology

To investigate more precisely the impact of pension reform on men and women, we carried out a detailed simulation of the old and new systems in three Latin American
countries – Chile, Argentina and Mexico. All three countries adopted multi-pillar reforms that had as their foundation the funded DC pillar from which all participants get very similar rates of return. This inevitably means that women receive lower annual pensions than men, due to their less-continuous employment histories, lower wages, earlier retirement and longer life expectancy. However, this outcome is modified by redistributions that occur through the public pillar and by annuitization arrangements during the payout stage. We focus on urban workers, because social security coverage in rural areas is very limited.

2.1 Brief descriptions of the new systems

Chile. In 1981 Chile replaced a mature traditional government-run pay-as-you-go defined benefit system with a new multi-pillar system that included a defined contribution pillar buttressed by a public pillar in the form of a minimum pension guarantee (MPG). A new system of private pension funds (AFP’s) was started, that competed for the mandatory payroll contributions of workers. These contributions are 10% of payroll for investment plus about 3% for administrative fees and requisite premiums for disability and survivors insurance (all data on administrative and insurance costs are from James et al., 2000 and James, Smalhout, and Vittas, 2001). Upon retirement (age 65 for men, 60 for women), workers can draw upon their accumulated savings in the form of gradual withdrawals that are spread over both spouses’ lifetimes or an annuity that had to be joint for married men. All medium- and long-term financial transactions, including annuities, are price-indexed in Chile, and many indexed instruments are traded.

Those who have worked at least 20 years are guaranteed a minimum pension (MPG) that is financed from general revenues. It is formally indexed to prices but has so far risen faster than prices, on par with wages, on an ad hoc basis. It is based purely on the individual’s own pension and does not take other family income into account.³

Argentina. With some important variations that are described below, the Chilean scheme was emulated in Mexico and Argentina, as well as other Latin American and transitional countries. Argentina added several new wrinkles. First, instead of a minimum pension guarantee Argentina provides a basic price-indexed ‘flat’ benefit. It was originally financed by a payroll tax, but later other more general tax revenues were partially substituted. Since this is paid to all eligible workers it is much more costly than the MPG in Chile.⁴ Eligibility is restricted to workers with at least 30 years

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³ Chile also offers a non-contributory social assistance program called PASIS, which pays about 50% of the MPG, funded out of general revenues. This is designed to keep out poverty of the elderly who are not eligible for contributory benefits. The vast majority of its recipients are women living in rural areas. The number of eligible applicants exceeds the available money, so a long waiting list has developed.

⁴ To illustrate the relative costs: If 30% of all workers get the MPG and the top-up from the public pillar is 33% of the lifetime guaranteed level for these workers, the MPG costs only 10% as much as a flat benefit, where both are set at the same percentage of the average wage and have the same eligibility requirements. For example, if the dependency rate is 2/1 so a wage-indexed flat benefit that is 25% of the average wage will cost 12.5% of payroll, an equivalent MPG will cost only 1.25%. To partially counteract its higher costs, Argentina sets higher eligibility conditions that exclude many women and has price-indexed the flat benefit. In view of its lower cost, Chile has been able to wage-index the MPG on an ad hoc basis.
of contributions – a provision that excludes most women. As an alternative that applies mainly to women, workers who reach age 70 with ten years of contributions are granted a reduced flat pension that is 70% of the full amount. Argentina’s public pillar has been under revision, but since the revisions are still in flux our analysis focuses on the benefit structure that was set up in 1994.

In addition to the basic benefit, 11% of payroll is contributed to a second pillar. Here the worker has a choice between a ‘public’ DB pillar (called PAP) that is a downsized version of the old public system, and a ‘private’ pillar that is similar to the Chilean model. PAP is available only to workers with more than 30 years of contributions; all contributions are lost for workers who contribute for less than 30 years – so it is particularly inappropriate for women. As of 2001, over 80% of all contributors were in the private rather than the public second pillar. Consequently, in this paper we focus on the private option. In the private pillar, workers choose among numerous investment managers (AFJP’s) and pensions depend on amounts accumulated. Administrative fees and survivors and disability insurance fees, amounting to 3.25% of payroll, are covered out of the 11% contribution, leaving a net of 7.75% for investment. Upon retirement (age 65 for men, 60 for women), the accumulated assets are taken out in the form of gradual withdrawals, annuities (joint annuity with 70% to survivor for married men) or lump sum for amounts in excess of a specified floor.

_In Mexico._ In Mexico a contribution of 6.5% of payroll is made to the individual accounts in the funded pillar. (Disability and survivors insurance while working are financed separately.) As in Chile, workers have a choice among investment managers, known as AFORES in Mexico. Retirement income is further augmented by a 5% contribution of each worker’s wage to a housing fund, INFONAVIT. If the money in the account is not borrowed to finance the purchase of a home, it becomes part of the worker’s retirement assets.\(^5\) Upon retirement at age 65 for both genders, workers choose between an annuity (joint with 60% to survivor for married men) or gradual withdrawals spread over both spouse’s lifetimes.

The state contributes toward the finances of this system in three ways: First, it pays a flat ‘social quota’ (SQ) equal to 5.5% of one daily minimum wage to each account for each day of work. The SQ is price-indexed (as is the minimum wage) but initially it was 2.2% of the average wage. This percentage will decline as wages rise faster than prices over time. Adding the SQ to the worker’s 6.5% contribution brings the total initial gross contribution of the average-wage worker to 8.7% and the net contribution, after subtracting administrative expenses, to 6.8% (plus some part of INFONAVIT). The SQ is designed to increase the accounts of low-income workers and their incentives to join the system. It is financed out of general revenues. Second, workers are guaranteed a minimum pension, initially equal to the minimum wage or 40% of the average wage, indexed to inflation, providing they had 25 years of contributions. Third, although affiliation to the new system is mandatory in Mexico, workers in the labor force at the date of the reform were guaranteed the right to opt

\(^5\) INFONAVIT historically provided a negative real return, but the hope of the reformers was that this would change in the future. In our simulations we assume a zero real return.
back into the old system upon retirement. In this paper we focus on new workers who are not entitled to this opt-back provision.

2.2 Methodology

Analysis of how women fare relative to men in the new and old social security systems is made difficult by a number of factors. First, the new system has not been in effect long enough to be mature. That is, current retirees in Chile and Argentina are subject to a mixture of old and new system benefits (the former in the form of recognition bonds and compensatory pensions) and we do not know for sure how someone will fare in the future who is fully under the new system. In Mexico almost everyone has retired under old-system rules, given the short period for accumulation and the option current workers have to revert to the old system upon retirement. Moreover, in all three cases we don’t know what the rate of wage growth and rate of return on investments, upon which DC benefits depend, will be in the future. Along similar lines, longitudinal data are not available. Thus, we could not use actual employment histories of current retirees and workers to estimate their retirement accumulations and entitlements.

Construction of representative men and women. We solved these problems by constructing synthetic men and women – using cross-sectional data on current behavior of people at different ages, educational levels and marital status to proxy the lifetime employment, wage and contribution histories of ‘typical’ persons in each category (see Appendix A on Data and Methodology). We then simulated how the average man and woman in each category would fare under the rules of the old and new systems, given these histories. Five educational levels are presented, ranging from incomplete primary to several years of post-secondary. The modal group has full secondary education in Chile, incomplete secondary in Argentina and primary education in Mexico. We use education as a proxy for ‘permanent income’.

This methodology assumes that age-specific labor force participation and wage behavior will remain constant through time (except for secular wage growth), separately for each schooling level. We interpreted these as age effects rather than cohort effects. In reality, cohort effects are undoubtedly involved. Female labor force participation rates are strongly positively correlated with education and educational levels have been rising dramatically over time. This means that aggregate female labor force participation rates will also rise through time. Changing social norms may lead to additional increases in female employment probabilities within each educational category. Moreover, the work incentives and disincentives in the new pension systems may alter work habits.

These potential endogenous and exogenous changes in age-specific female labor force participation rates were not taken into account directly. However, in addition to the ‘average’ woman in each educational group, we also calculated pensions for ‘ten-year women’ who worked only ten years prior to child-bearing and ‘full career women’ who had the same labor force participation and retirement age as men. Full career women give us an indication of the impact of increasing age- and education-specific labor force participation rates. The absence of longitudinal data meant that
we could not vary wages as a function of experience so the lifetime earnings and pensions of full career women are probably understated.

Our representative men and women are assumed to be single until the median age of marriage in each country, and married thereafter. They marry within their educational class, and the average husband is three years older than the wife. Thus we do not model women who remain single throughout their lifetimes, because of small sample size of single women in some age-educational cells. Since single women probably have a greater labor force attachment than married women, our simulations for full career women may give us a rough approximation of their lifetime earnings and benefits.

**Data.** In constructing our synthetic men and women, we used national data sets for urban areas (see Appendix A). These data do not coincide precisely with groups that are actually covered by the social security system. Some social security affiliates live in rural areas while some urban residents are not covered by social security. In Chile our data cover only those affiliated to social security, which means they were in the system at some points in their lives. This helps explain why the labor force participation rates of women appear to be higher in Chile than in Argentina and Mexico, where all urban workers are included. Also in Chile the wage and work data primarily cover full-time workers while in Argentina and Mexico they cover full-time plus part-time workers. For both reasons, these data may understate wages and work of women who were covered by social security and therefore overstate the pension gender differential in Argentina and Mexico for this group. Counteracting this bias, we attributed all working time as contributing time, but it is quite likely that part of this work is outside the formal labor sector and the social security system. These data would then overestimate lifetime contributions, especially for women, and underestimate the gender differential in pensions for the average woman stemming from the private pillar. However, this bias will probably diminish through time.

**Simulations.** In Sections 3, 4 and 5 we use these employment histories to simulate the accumulations, annuities and public pillar entitlements that different groups of men and women can expect under the new systems. Accumulations and annuities under DC plans are very sensitive to rates of return on investments and rates of wage growth. In our baseline simulations, we assume a ‘moderate growth’ scenario in which economy-wide real wage growth is 2% per year and the real rate of return is 5% prior to retirement. The return during the payout stage is assumed to be 4%, given the likelihood that many will choose a lower risk or fixed rate annuity (see James and Song, 2001). Sensitivity analyses assuming a 3% real rate of return during the accumulation stage, 2% during annuitization and a zero rate of wage growth were also carried out. The results in this ‘slow-growth’ case were very similar to the baseline, except that the relative role of the public pillar increases dramatically, especially in Chile. In this paper our tables show only the baseline case (for details on the slow-growth case see James, Cox Edwards, and Wong, 2003). Portfolio restrictions ensure that rates of return will be similar for all workers. If yields were lower for women
because they tend to choose a risk-averse portfolio or if their discount rates were higher because of their lower earnings, this would lead to a lower gender ratio.\textsuperscript{6}

Although both gradual withdrawals and annuities are permitted at the payout stage, to impute a stable annual flow for purposes of this analysis, we assume that these accumulations are fully annuitized upon retirement. For simplicity in calculating the value of the annuity, we assume that these average people all have a certain lifetime, which corresponds to the national expected life spans. Life expectancies are differentiated by gender. In this paper we do not differentiate longevity by educational or income level, although in future work we hope to do so. This leads to an overestimate of lifetime system progressivity in this paper. Men and women are assumed to annuitize at the retirement age that is specified in each country – lower for women than for men in Chile and Argentina. While we start by comparing monthly benefits, for the analysis of transfers we shift to a comparison of lifetime benefits, since retirement age and expected age of death vary by gender and country and benefits from the joint annuity start flowing to widows late in old age.

\textbf{The counterfactual.} In Sections 3–5 we discuss the new systems only, so there is no counterfactual. In Section 6 we apply the DB formulae of the old systems to compare the gender impact of the new versus the old systems. This introduces an additional set of methodological problems. The old systems were actuarially unbalanced so could not have delivered their promised benefits. What, then, is the counterfactual to the new system? We avoid this problem by applying the DB formulae that were in place just prior to the reform, and focusing on relative rather than absolute gains and losses to different gender–education–marital groups. Thus we abstract from efficiency effects that might lead everyone to be better or worse off. Instead we ask: Which groups gained or lost the most from the reform? Did gender ratios improve or deteriorate? Implicitly, this means our counterfactual is any system in which the fiscal adjustment to the pre-existing insolvency is distributionally neutral – involving equi-proportional benefit cuts or tax increases for each group, while leaving relative positions unchanged.\textsuperscript{7}

\textbf{Taxes and costs.} Throughout, this analysis concentrates on the benefit side rather than the cost side, because we do not know what the full cost of the public pillar, its intergenerational burden or its gender incidence will turn out to be, either in the old or new systems. Our comments on net redistributions (transfers minus taxes) are based on the assumption that within each cohort, the tax burden is distributed proportional to earnings.

\textsuperscript{6} In the US and European contexts, where portfolio choice might be greater, it has sometimes been argued that women will be more conservative investors than men. For examples of the mixed evidence on this point in the US context, see US GAO (1997) and Burnes and Schulz (2000). The restrictions on portfolios in Latin America preclude this and also mean that moral hazard with respect to investment choice is not a big problem in the face of a minimum pension guarantee in Chile.

\textsuperscript{7} In reality most adjustments to insolvency have not been distributionally neutral. For example, inflation with indexation applied only to a minimum pension hurts high earners disproportionately, while raising the payroll tax rate subject to a fixed maximum hurts low earners, and equalizing retirement ages for the two genders hurts women, especially in a DB plan. We have no way of knowing which adjustments would have been chosen in these three countries, if they had not shifted to a multi-pillar structure.
3 Annuities for men and women from the private pillar

3.1 Work and wage experience of men versus women

Based on our cross-sectional analysis we find that, on average, women affiliates in Chile work and contribute to the system only 70% as many years as men. In Argentina men tend to work more and women less, so the relative experience of women is lower – 60% for secondary school graduates and less than 50% for the majority who didn’t even finish secondary school. In Mexico the gender ratio of experience is less than 50%. In all cases, the gender gap narrows substantially for the minority with higher education but it never completely disappears. By the age of 65, the average woman without a university degree in all these countries has accumulated 18–27 years of experience, while the average man has accumulated 38–44 (Table 1).

In all three countries younger women who work earn almost as much as men. However, earnings diverge as they age – the age–earnings profile is much steeper for men, perhaps because of the return to experience. Prime age male earnings profiles rise 2–3% per year while female profiles rise 1–2% per year. Thus, by the time they reach age 50, women earn barely 60% as much as men per month worked, in most educational categories.

3.2 Gender ratios in pension accumulations and monthly own-pensions

We now proceed to estimate the gender ratio of retirement savings and annuities under the new system (Table 2). In this section we discuss the pure DC plan, based on contributions by workers and employers. (In Mexico we exclude the government’s contribution, the social quota.) We would expect women’s simulated retirement accumulations to be far lower than those of men, as a result of lower labor force
participation and lower earnings while working. Converting these accumulations into an annuity, women’s benefits will be further depressed by their greater longevity – but this is offset by the fact that married men who annuitize must purchase a joint annuity that covers their wife’s life as well as their own. We would further expect women’s annuities to be relatively the highest in Chile, where their relative labor force participation and earnings are highest, and lowest in Mexico for the converse reason. In fact, we find that the average woman ends up with an own-annuity that is

### Table 1B. Average monthly wage by gender, age and education–urban

| Education       | Incomplete primary | Incomplete secondary | Complete secondary | up to 4 post secondary | 5+ year post secondary |
|-----------------|--------------------|----------------------|--------------------|------------------------|------------------------|
| **Chile**       |                    |                      |                    |                        |                        |
| Males           |                    |                      |                    |                        |                        |
| 16–20           | $119               | $150                 | $176               | $184                   | $758 (21–5)            |
| 46–50           | 227                | 347                  | 535                | 653                    | 1556                   |
| 61–65           | 197                | 297                  | 391                | 582                    | 1242                   |
| Females         |                    |                      |                    |                        |                        |
| 16–20           | $117               | $116                 | $152               | $161                   | $433 (21–5)            |
| 46–50           | 147                | 202                  | 326                | 506                    | 514                    |
| 61–65           | 142                | 152                  | 283                | 381                    | 883                    |
| **Argentina**   |                    |                      |                    |                        |                        |
| Males           |                    |                      |                    |                        |                        |
| 16–20           | $177               | $264                 | $314               | $391                   | $1083 (21–5)           |
| 46–50           | 504                | 700                  | 1105               | 1471                   | 2103                   |
| 61–65           | 370                | 581                  | 871                | 888                    | 2192                   |
| Females         |                    |                      |                    |                        |                        |
| 16–20           | $174               | $207                 | $303               | $238                   | $712 (21–5)            |
| 46–50           | 280                | 349                  | 666                | 704                    | 1349                   |
| 61–65           | 249                | 360                  | 1114               | 982                    | 1630                   |
| **Mexico**      |                    |                      |                    |                        |                        |
| Males           |                    |                      |                    |                        |                        |
| 16–20           | $125               | $131                 | $138               | $142                   | $162                   |
| 41–50           | 210                | 243                  | 327                | 386                    | 773                    |
| 61–65           | 174                | 245                  | 413                | 722                    | 957                    |
| Females         |                    |                      |                    |                        |                        |
| 16–20           | $98                | $117                 | $122               | $145                   | $148                   |
| 41–50           | 109                | 172                  | 210                | 293                    | 478                    |
| 61–65           | 92                 | 109                  | 194                | 312                    | 783                    |

Notes: For data and definitions see Appendix A. Argentine and Mexican data include full-time and part-time workers; Chile includes full time only. Some non-contributing years may be included. Wages are in US$’s, using exchange rates from 1994 (Chile), 1996 (Argentina) and 1997 (Mexico).
Table 2. Estimated monthly annuities from individual accounts  
(Based on 5% return in accumulation stage, 4% in annuity stage, 2% real wage growth)

Chile, 1994 US$  

| Education | Incomplete primary | Incomplete secondary | Complete secondary | Up to 4 post secondary | 5+ yrs post secondary |
|-----------|--------------------|----------------------|-------------------|------------------------|-----------------------|
| Annuity, RA = 65 | $236                | $342                 | $510              | $710                   | $1636                 |
| Average females, RA = 60 | 76 (32%)            | 106 (31%)            | 186 (37%)         | 308 (43%)              | 565 (35%)             |
| Average woman if RA = 65 | 112 (47%)           | 152 (45%)            | 270 (53%)         | 445 (63%)              | 836 (51%)             |
| Full career woman, RA = 65 | 172 (73%)           | 232 (68%)            | 376 (74%)         | 516 (73%)              | 888 (54%)             |
| 10-year woman, RA = 60 | 31 (13%)            | 42 (12%)             | 56 (11%)          | 89 (14%)               | 158 (10%)             |

Argentina, 1996 US$  

| Education | Incomplete primary | Incomplete secondary | Complete secondary | Some post-secondary | University degree |
|-----------|--------------------|----------------------|-------------------|---------------------|------------------|
| Annuity, RA = 65 | 507                | 772                  | 1156              | 1198                | 2319             |
| Average woman, RA = 60 | 107 (21%)          | 154 (20%)            | 304 (26%)         | 424 (35%)           | 830 (36%)        |
| Average woman if RA = 65 | 158 (31%)          | 227 (29%)            | 447 (39%)         | 624 (52%)           | 1217 (52%)       |
| FC, RA = 65 | 342 (67%)          | 471 (61%)            | 770 (67%)         | 805 (67%)           | 1300 (56%)       |
| 10-year, RA = 60 | 54 (11%)           | 68 (9%)              | 63 (5%)           | 106 (9%)            | 200 (9%)         |
| Education | 0–5  | 6–8  | 9    | 10–12 | 13+  |
|-----------|------|------|------|-------|------|
| Annuity   | 216  | 251  | 309  | 389   | 665  |
| Females   |      |      |      |       |      |
| Average woman | 65 (30%) | 77 (31%) | 103 (33%) | 166 (43%) | 339 (51%) |
| FC woman  | 135 (63%) | 167 (67%) | 205 (66%) | 302 (78%) | 464 (70%) |
| 10-year woman | 38 (18%) | 43 (17%) | 50 (16%) | 66 (17%) | 89 (13%) |

Notes: See Appendix A. MPG in Chile, flat benefit in Argentina and part of annuity from SQ in Mexico are not included in this table. Numbers in parentheses give average female/male ratio of annuities for each cell. For comparison, the poverty line was $73 in Chile, $156 in Argentina.
approximately the same in Chile and Mexico – 30–50% that of the average man – and less than 30% in Argentina (Figure 1). Mexico jumps ahead of Argentina and on par with Chile because it has decreed equal retirement ages (65) for men and women, unlike the other countries. These ratios rise at higher educational levels, because of the positive correlation between education and female labor force participation. Gender ratios are all a bit higher in the slow-growth scenario, where wage differentials and pension accumulations remain more compressed.

3.3 Impact of retirement age on own-annuities

Equality of the retirement age for men and women is the main reason why Mexico has the same gender ratio as Chile, despite its lower female work experience. If we postponed the age of annuitization for women to 65 (equality with men) in Chile and Argentina, this would raise their monthly annuity by almost 50%, even with work experience unchanged, because interest accumulates for five years more and the annuity is paid for five years less. This is the major policy change that would raise women’s monthly own-annuities. But even full career women who work as much and retire at the same age as men get only 65–75% as much as men because of large wage disparities. The unavoidable conclusion: policy regarding retirement age is very important, but even with equal retirement ages own-pensions from the DC pillar will
be far lower for women than for men, due to their lower labor force participation and wage rates, as well as their greater longevity.

4 Impact of transfers from the public pillar

However, this wide disparity in own-pensions is narrowed by transfers that occur through the public pillar – the minimum pension guarantee (MPG) in Chile, the social quota (SQ) and MPG in Mexico and the flat pension in Argentina – and by restrictions on payouts in the private pillar, especially the joint annuity. Each of these public pillars redistributes to low educational groups, especially to the women in each group, and women who are eligible for the public benefit consequently end up well above the poverty line (Table 3 and Figure 2). These transfers raise the female/male ratio of total retirement income and produce a higher rate of return on contributions for women than for men.

Low lifetime earnings stem from (a) low wage rates and/or (b) low work experience. Targeting toward low earners may therefore reward low labor force participation. Each country has chosen a different way to deal with this potential trade-off between equality and poverty-prevention on the one hand versus work incentives on the other. This shows up in differing eligibility rules, work–benefit linkages and retirement age provisions. As a result, they provide different relative subsidies to different subgroups of women, particularly to those who specialize in home-work versus formal labor market work.

4.1 Chile’s MPG

The MPG as an income floor. The MPG sets a floor on the real value of pensions of workers who qualify by attaining 20 years of contributions. The MPG floor in 1994, the year our data were gathered, was $91 per month, about 27% of the average male wage, 37% of the average female wage and 125% of the poverty line at that time. In effect, it truncates the lower tail of the pension distribution. Gender ratios are narrowed for those below the truncation point, who get raised to the MPG level. Those above the truncation point are unaffected. Given this narrow targeting of Chile’s MPG, its fiscal cost will be extremely low in the baseline case (see footnote 4). In virtually all scenarios, women are the major recipients – they are the least well off (Table 3).

The MPG as insurance against partial labor force attachment. Since the average male worker in every educational category accumulates an own-pension far above the floor set by the price-indexed MPG, he never needs a top-up. In contrast, the average female with primary education or less gets a small top-up to own-pension from the MPG (equivalent to 20% or $15 monthly), which helps to narrow the gender gap for low earners. Women who work full career (like men) do not get the MPG in any case.

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8 Workers whose accumulations do not allow them to purchase an annuity that exceeds the MPG level must use up their own accumulations by withdrawing an amount equal to the MPG monthly. When they run out of money the state provides the MPG. For purposes of our discussion we convert the expected value of the lifetime state payment into an actuarially equivalent monthly top-up.
### Table 3. Impact of public pillar on gender ratios of monthly pensions

| Education* | 1 | 2 | 3 | 4 | 5 |
|------------|---|---|---|---|---|
| **Chile, 1994 US$’s** |   |   |   |   |   |
| **Married Men** |   |   |   |   |   |
| Annuity, RA = 65 | $236 | $342 | $510 | $710 | $1636 |
| % increase − MPG | 0 | 0 | 0 | 0 | 0 |
| Annuity, RA = 60 | $76 | $106 | $186 | $308 | $565 |
| Annuity + MPG − av. | 91 | 106 | 186 | 308 | 565 |
| Annuity + MPG − av. if wage-indexed | 200 | 200 | 200 | 308 | 565 |
| % incr. − MPG − av. | 0% | 0% | 0% | 0% | 0% |
| % MPG if RA = 65, if FC or if 10-year | 0 | 0 | 0 | 0 | 0 |
| **Women** |   |   |   |   |   |
| Annuity, RA = 65 | $236 | $342 | $510 | $710 | $1636 |
| Annuity, RA = 60 | $76 | $106 | $186 | $308 | $565 |
| Annuity + MPG − av. | 91 | 106 | 186 | 308 | 565 |
| Annuity + MPG − av. if wage-indexed | 200 | 200 | 200 | 308 | 565 |
| % incr. − MPG − av. | 0% | 0% | 0% | 0% | 0% |
| % MPG if RA = 65, if FC or if 10-year | 0 | 0 | 0 | 0 | 0 |
| **Average female/male ratios** |   |   |   |   |   |
| Own-annuity | 0.32 | 0.31 | 0.37 | 0.43 | 0.35 |
| Annuity + MPG | 0.39 | 0.31 | 0.37 | 0.43 | 0.35 |
| − if wage-indexed | 0.85 | 0.58 | 0.39 | 0.43 | 0.35 |
| **Argentina, 1996 US$’s** |   |   |   |   |   |
| **Married men** |   |   |   |   |   |
| Annuity, RA = 65 | $507 | $772 | $1156 | $1198 | $2319 |
| Annuity + flat | 707 | 972 | 1356 | 1398 | 2519 |
| % increase by flat | 40% | 26% | 17% | 17% | 9% |
| Annuity, RA = 60 | $107 | $154 | $304 | $424 | $830 |
| Annuity + red. flat | 247 | 294 | 444 | 564 | 1030 |
| % incr. by flat | 131% | 91% | 46% | 33% | 24% |
| **Average female/male ratios** |   |   |   |   |   |
| Own-annuity | 0.21 | 0.20 | 0.26 | 0.35 | 0.36 |
| Annuity + flat (at 65) | 0.15 | 0.16 | 0.22 | 0.30 | 0.41 |
| Annuity + flat (at 70) | 0.35 | 0.30 | 0.33 | 0.40 | 0.41 |
| **Mexico, 1996 US$’s** |   |   |   |   |   |
| **Married men** |   |   |   |   |   |
| Own-ann., no SQ | 216 | 251 | 309 | 389 | 665 |
| Annuity incl. SQ | 294 | 329 | 387 | 463 | 736 |
| % increase by SQ | 36% | 31% | 25% | 19% | 11% |
| Own-ann., no SQ | 65 | 77 | 103 | 166 | 339 |
| Annuity incl. SQ | 105 | 117 | 148 | 216 | 396 |
| % incr. by SQ | 62% | 52% | 44% | 30% | 17% |
| **Average female/male ratios** |   |   |   |   |   |
| Annuity if no SQ | 0.30 | 0.31 | 0.33 | 0.43 | 0.51 |
| Annuity incl. SQ | 0.36 | 0.36 | 0.38 | 0.47 | 0.54 |

**Notes:** *See Table 1 for definition of five education categories. Public benefits begin at varying ages. MPG is converted to actuarially equivalent monthly top-up. See Appendix A. In Argentina average women in the top education group receive full flat benefit.*
educational category, because their own pensions exceed the MPG. Thus, the MPG is mainly directed toward workers who (a) earn low wage rates and (b) work less than full career. It is insurance against transient labor force attachment, mainly by women. Moral hazard regarding work decisions is obviously present (see below). Chile counters these issues by imposing a requirement that at least 20 years of contributions are needed to be eligible; this limits the number of eligible women and the size of the top-up needed.

*b*Years required for eligibility and strategic behavior.* The 20-year requirement for eligibility turns out to be a fortuitous choice. In practically every educational category, the average woman has more than 20 years of work. If the bar had been placed at ten years, as in Argentina for the reduced flat benefit, many lower-class married women who chose to stay at home might have qualified for a large top-up, a subsidy that would be much more expensive. If the bar were raised to 25 years, as in Mexico, the average woman with less than a secondary degree (the very group that qualifies on own-pension grounds) would fail the test for eligibility – demonstrating the extreme sensitivity of gender impact to this policy variable. Given the 20 years required for eligibility in Chile, it is likely that over time contributory years for low earners will converge around that point, as a result of strategic behavior. Women with slightly less than 20 years will increase their working time while those with a bit more than 20 years may cut their working time down, because their marginal public pension for the additional years of contributions is negative; their own larger private accumulation simply displaces the MPG supplement. Thus we can expect a clustering of

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*Figure 2. Low earners, especially women, get biggest % increment from public pillar*
pensions for women with low educational levels around the neighborhood of the MPG in the future – a kind of poverty-level trap.

**The MPG as a deterrent to postponed retirement.** Closely related, the current retirement age for women is only 60, as compared with 65 for men. If the female retirement age were raised to parity with that of men (to age 65), this would increase women’s own-annuity by almost 50%– from $76 to $112 monthly in the lowest educational category. This brings her above the MPG level so she would lose the MPG top-up for her entire period of retirement. Because of this crowding out effect, the MPG poses a strong disincentive to low-earning women to postpone their retirement beyond age 60.

**Wage versus price-indexation of MPG: do future cohorts of women benefit?** The low level of eligibility for the MPG and its low projected cost is due in large part to the fact that it is formally price-indexed, remaining fixed in real amount (adjusted for price inflation), hence expected to decline through time as a percentage of wages and own-pensions. Given our projected real wage growth of 2% per year, in 40 years, when today’s young workers retire, the $91 MPG would be only 12% of the average wage, if it remains price-indexed. Ten years later the need for the MPG top-up would virtually disappear as wages and accumulations continue to grow relative to a price-indexed MPG. Price indexation protects retirees from inflation but the protected floor falls relative to average wage for future cohorts, and it eventually becomes irrelevant. Thus, a price-indexed MPG will do little to improve gender ratios in the future. A wage-indexed MPG, in contrast, would maintain the current ratio between the protected floor and the average wage – but it would cost much more and poses much greater moral hazard problems. (Mexico and Argentina also have a price-indexed safety net that will diminish over time compared with the average wage and hence will give less relative protection to future cohorts of older women.)

Chile is apparently ambivalent on the choice between price and wage indexation, so we have modeled both provisions. So far, the MPG has kept pace with wage growth through *ad hoc* increases. By the end of 2001 it had reached $110 for pensioners below age 70 and $121 for pensioners above age 70 (in 2001 $’s). If wage indexation continues, it will reach $200 by the time young workers retire. A much broader group of women (and even some men) would receive some top-up. The top-up for women in the lowest educational category would rise from $15 to $124 monthly and the gender ratio in that category would rise from 39% to 85%. Differentials between high- and low-earning women would be compressed. Of course, this would raise the fiscal cost substantially. It would also lead to much greater strategic manipulation and incentive to work in the informal sector once eligibility is established. This could be countered by tying the MPG level continuously to work experience, as in Mexico.

**Insurance against prolonged slow growth.** These results are very sensitive to assumptions about investment returns and wage growth. In a slow-growth environment (real rate of return = 3%, real wage growth = 0), the $91 price-indexed MPG is much higher relative to workers’ own annuity. Consequently, expenditures on the MPG rise and the gender ratio is narrowed dramatically. If the MPG can be debt financed,
cohorts who live in such periods are, in effect, cross-subsidized by cohorts who live in more fortunate periods, which smooths the pensions of cohorts over time. And the majority of the recipients are women (for fuller discussion see James, Cox Edwards, and Wong, 2002).

Summary for Chile. In sum, the MPG in Chile is inexpensive, well targeted toward low earners, especially women, and insures workers against prolonged periods of slow growth. It reduces the gender gap at the low educational end but not at the low- or high end, nor does it help women who worked in the formal labor market less than 20 years. It distorts and discourages marginal work effort beyond 20 years and beyond age 60 for low-earning women, hence leaving them in a ‘near-poverty trap’. As real wages increase the guarantee will decline relative to the average wage and it will have a smaller and disappearing impact on gender differentials if it remains price-indexed; if wage-indexed, cost and moral hazard rise. Work effort by women would be increased and gender gap decreased if retirement age were equalized for the two genders and the MPG were partially wage-indexed but tied positively and continuously to work.

4.2 The two-tiered flat benefit in Argentina

Eligibility for the full flat benefit – not for women. Argentina pays a flat benefit of US$200 as an add-on rather than a top-up to the worker’s own-pension. It is price-indexed but initially equivalent to 30% of the average male wage, 45% of the average female wage and 130% of the poverty line. Thirty years of contributions are required for eligibility. Most men in all educational categories meet this requirement and receive this benefit, starting at age 65. Because it adds a substantial constant amount to a disparate wage-based annuity, it is very effective at equalizing pensions between high- and low-earning men. In contrast, most women are ineligible for this flat benefit because they work less than 30 years – except for those with a university degree, who can begin receiving the full flat benefit at age 60. This is the converse of the eligibility situation in Chile (Table 3).

Reduced basic benefit for women. Most women are eligible for a reduced basic benefit of $140 at age 70, which accrues to workers who have more than ten years of contributions. Compared with the woman’s own wage and annuity, this reduced flat benefit is very large. It doubles the monthly pension of the average woman with less than secondary education and trebles the monthly pension of the ‘ten year woman’, at age 70. This leads to a sharply contrasting situation between women at ages 65 and 70: at age 65 the female/male ratio of monthly pension is much lower than in Chile or Mexico, but it jumps up to the same range as Chile and Mexico – 30–45% – at age 70, with the added cost borne by the public sector. The flat benefit is the same in absolute value but much larger relative to own-annuity during periods of slow growth, thereby providing insurance that pays off to both genders, but especially to

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* Our Argentinean data are from 1996-97 and use 1997 exchange rates, 1 peso = 1US$. At 2002 exchange rates these amounts would be only 25–30% as high – much closer to Mexico. The choice of exchange rates should not affect gender ratios.
women, living during prolonged economic slowdowns. It will diminish in relative importance over time since it is price-indexed, but will remain a significant factor for many years, given the high starting point.

*Discontinuous link to years worked.* Argentina’s attempt to extend a minimum benefit to all, while also rewarding work to some extent, leads to puzzling pattern of work (dis)incentives. Women face a large reward for working ten years in the formal labor market, but no marginal benefit from contributing to the public pillar over years ten – 29; then in year 30, the public benefit jumps discontinuously – to full flat benefit beginning at age 60. The equity of this arrangement is questionable, nor does it seem consistent with positive work incentives over the range where most women are now (18–25 years of work). Argentinean policy makers apparently reached this conclusion and recommended linking the flat benefit more continuously to years of work in the year 2000 reforms (not yet implemented).

### 4.3 Mexico: MPG versus social quota

*The social quota* (SQ). The main tool of the public pillar in Mexico is the social quota (SQ) – a uniform payment by the government into each worker’s individual account, per day worked. This daily payment is independent of his or her own wage rate and of how many years the worker has contributed. The SQ is 5.5% of the minimum wage (initially 1.8% of the average male wage and 2.6% of the average female wage), for every day worked. Thus it is roughly a one-third match to each worker’s contribution to the private pillar. It is more expensive than Chile’s MPG but far less expensive than Argentina’s flat benefit. It should produce an annuity that is about 10% of the average wage for the full career worker. Mexico’s SQ gives the most equal treatment per day of work to all educational and gender groups. In this sense, it is less tilted toward women than Argentina’s flat benefit but more effective at incentivizing work and contributions. Although it equalizes less than Chile at the lowest level, it equalizes more at other levels. Since it is indexed to prices, it will decline over time relative to the average wage (Table 3).

Public benefits are sometimes criticized on grounds that they incur a large unfunded liability that future generations will have to meet. If funded, the government may misuse the money in the meantime. The Mexican SQ deals with these issues by pre-funding the benefit and putting the money into each worker’s account to invest. Flat benefits (as in Argentina) or MPG’s with an on–off switch (as in Chile) contain work disincentives and create inequitable cliff effects. The Mexican SQ avoids this problem by making the payments a continuous function of days worked. This means it redistributes primarily to people who are poor because of their low wage rates, rather than people who are poor because they only worked part of their lives.

*Irrelevance of the MPG.* For poverty prevention, Mexico also has an MPG, but it is far less relevant than that in Chile. In our baseline case, largely because of their equal retirement ages, both the average man and woman in all educational categories accumulate an own-pension that exceeds the MPG floor. In contrast, under slow growth, men continue to exceed the MPG while the average woman is below the
MPG line all the way up to the university level. But none of these average women have enough years of contributions for eligibility. Thus neither the average man nor woman receive Mexico’s MPG, but for diametrically opposite reasons. The choice between a 20- and 25-year eligibility rule turns out to be crucial, given current labor force behavior of women.

4.4 Comparing the lifetime public transfers across sub-groups

The public pillars in all three countries compress monthly pension differentials and improve the gender ratio. They all increase disproportionately the monthly pensions of workers in the low educational categories, especially the lowest earners in these categories, who are predominantly women. They ensure that workers eligible for the public benefit are kept well above the poverty line in old age. However, the different forms that these public pillars take have quite different distributional effects on sub-groups among women. To analyze these effects across countries and sub-groups we shift to a lifetime rather than a monthly unit of comparison. This is necessary because the retirement age and age of death vary across countries and sub-groups. In each case, we calculate the expected present value (EPV) of the total lifetime stream of income, as valued at age 65 and using expected age of death at age 65. In Chile only low-wage women with transient labor force attachment receive a gross benefit from the public pillar, while in Argentina and Mexico all workers receive some gross benefit, and the gross benefit is larger for men than for women.

To determine net benefits we must take account of taxes that are used to finance these benefits. Recall that these public benefits are financed out of general revenues in Chile and Mexico, and out of a combination of payroll and other special taxes in Argentina. We do not know the level of these lifetime taxes for each cohort, but in the following discussion we assume they are distributed within each cohort proportional to lifetime wages and we use lifetime own-annuity as a proxy that is highly correlated with lifetime wage. Since the public benefit in these three countries adds a much larger percentage increment to lifetime own-annuity for low earners and women, these two groups receive a net transfer and the subsidy component is largest for women in the lowest educational categories (Table 4 and Figure 2).

However, formal labor force attachment is rewarded differentially in these three countries. Specifically, only the average woman in the lowest educational group, who retires early with about 20 years experience, gets a positive net transfer in Chile. Neither ten-year women nor full career women nor average women who postpone retirement get the MPG. In contrast, in Mexico, which offers the most consistent rewards for work, full career women in the bottom educational groups get the largest total net transfers.\(^{10}\) And in Argentina ten-year women get a substantial net subsidy (as well as the highest rate of return). The formal-sector work disincentives from the public pillar in Argentina and, to a lesser extent, Chile partially offset the positive work incentives stemming from the DC pillar and the joint annuity. (For calculations of imputed taxes and net benefits see James, Cox Edwards and Wong, 2003.)

\(^{10}\) SQ yields a slightly higher rate of return to the ten year woman, because that woman is assumed to work when she is young; at that point the SQ is larger relative to the wage than it becomes later on due to price indexation.
## Table 4. PV of lifetime benefits from own-annuities and lifetime transfers from joint annuities and public pillar (US$000’s)

(r = 5% during accumulation, 4% during annuity stage, real wage growth = 2%)

| Education         | Incomplete primary | Incomplete secondary | Complete secondary | Up to 4 post sec. | University degree + |
|-------------------|--------------------|----------------------|--------------------|------------------|---------------------|
| Chile             |                    |                      |                    |                  |                     |
| **Individual annuity** | $37.1              | $53.7                | $80.0              | $111.5           | $256.9              |
| **Joint annuity (if marr.)** | $-4.8             | $-7.0                | $-10.4             | $-14.5           | $-33.3              |
| Average man       |                    |                      |                    |                  |                     |
| **Own annuity**   | 16.9               | 23.5                 | 41.4               | 68.3             | 125.6               |
| MPG               | 2.8                | 0                    | 0                  | 0                | 0                   |
| Jt. annuity (if married) | 5.8               | 8.4                  | 12.5               | 17.4             | 40.1               |
| % incr. due to MPG | 17%               | 0                    | 0                  | 0                | 0                   |
| % incr. due to joint ann. | 31%             | 36%                  | 30%                | 25%              | 32%                 |
| Average woman     |                    |                      |                    |                  |                     |
| **Own annuity**   | 19%                | 23%                  | 21%                | 21%              | 29%                 |
| **Full Career woman** | 27.0              | 36.5                 | 59.0               | 81.1             | 139.5               |
| % incr. due to joint ann. | 19%             | 23%                  | 21%                | 21%              | 29%                 |
| Women             |                    |                      |                    |                  |                     |
| **Own annuity**   | 6.9                | 9.3                  | 12.4               | 21.4             | 35.0                |
| % incr. due to joint ann. | 84%             | 90%                  | 100%               | 81%              | 114%                |
| **Argentina**     |                    |                      |                    |                  |                     |
| **Individual annuity** | 80.3              | 122.3                | 183.1              | 189.7            | 367.5               |
| Flat              | 26.0               | 26.0                 | 26.0               | 26.0             | 26.0                |
| Jt. annuity (if marr.) | $-14.3            | $-21.9               | $-32.7             | $-33.8           | $-65.7              |
| % incr. from flat (marr.) | 39%             | 26%                  | 17%                | 17%              | 9%                  |
| Average woman     |                    |                      |                    |                  |                     |
| **Own annuity**   | 23.5               | 33.8                 | 66.6               | 92.9             | 181.9               |
| Flat              | 14.2               | 14.2                 | 14.2               | 14.2             | 43.8                |
| Jt. annuity (if married) | 16.3             | 24.8                 | 37.1               | 38.4             | 74.5                |
| % incr. from flat | 61%                | 42%                  | 21%                | 15%              | 24%                 |
| % incr. from joint ann. | 69%             | 73%                  | 56%                | 41%              | 41%                 |
| **FC woman**      |                    |                      |                    |                  |                     |
| **Own annuity**   | 52.7               | 72.6                 | 118.7              | 124.1            | 215.7               |
| Flat              | 30.8               | 30.8                 | 30.8               | 30.8             | 30.8                |
| % incr. from flat | 58%                | 42%                  | 26%                | 25%              | 14%                 |
| % incr. from joint ann. | 31%             | 34%                  | 31%                | 31%              | 35%                 |
| **10 year woman** |                    |                      |                    |                  |                     |
| **Own annuity**   | 11.8               | 14.9                 | 13.8               | 23.2             | 58.1                |
| Flat              | 14.2               | 14.2                 | 14.2               | 14.2             | 14.2                |
| % incr. from flat | 120%               | 95%                  | 103%               | 61%              | 24%                 |
| % incr. from joint ann. | 138%            | 167%                 | 270%               | 165%             | 128%                |
5 Gender impact of annuity requirements – intra-household transfers

By far the largest impact on lifetime gender differentials stems not from public transfers but from private intra-household transfers through the joint annuity. All three countries include rules regarding annuitization and survivors’ benefits, which

| Education   | Incomplete primary | Incomplete secondary | Complete secondary | Some post-secondary | University degree + |
|-------------|--------------------|----------------------|--------------------|---------------------|--------------------|
| Education   | 0–5                | 6–8                  | 9                  | 10–12               | 13+                |
| Individual annuity – no SQ | 34.0               | 39.7                 | 48.6               | 61.4                | 105.0              |
| SQ          | 12.4               | 12.4                 | 12.4               | 11.7                | 11.1               |
| Joint annuity (if married) | −5.7               | −6.3                 | −7.4               | −8.9                | −14.2              |
| % incr. from SQ | 41%                | 35%                  | 29%                | 22%                 | 12%                |

Average man

| Education   | Own annuity if no SQ | SQ to own-account | Joint annuity (if mar.) | % incr. from SQ | % incr. from joint annuity |
|-------------|----------------------|------------------|-------------------------|----------------|--------------------------|
| Average woman | 10.1               | 6.2              | 6.4                     | 62%            | 64%                      |
| SQ          | 11.9                | 6.3              | 7.2                     | 53%            | 60%                      |
| Joint annuity (if mar.) | 15.9               | 6.9              | 8.4                     | 44%            | 53%                      |
| % incr. from SQ | 25.7               | 7.8              | 10.1                    | 30%            | 39%                      |
| % incr. from joint annuity | 41%                | 16.1             | 16.1                    | 17%            | 31%                      |

Women

| Education   | Own annuity if no SQ | SQ | Joint annuity (if mar.) | % incr. from SQ | % incr. from joint annuity |
|-------------|----------------------|----|-------------------------|----------------|--------------------------|
| FC woman    | 20.9                 | 12.4 | 12.4                   | 59%            | 31%                      |
| SQ          | 25.9                 | 12.4 | 12.4                   | 48%            | 28%                      |
| Joint annuity (if mar.) | 31.7               | 12.4 | 12.4                   | 39%            | 27%                      |
| % incr. from SQ | 46.7               | 11.7 | 11.7                   | 25%            | 22%                      |
| % incr. from joint annuity | 71.8               | 11.1 | 11.1                   | 15%            | 22%                      |

10 year woman

| Education   | Own annuity if no SQ | SQ | Joint annuity (if mar.) | % incr. from SQ | % incr. from joint annuity |
|-------------|----------------------|----|-------------------------|----------------|--------------------------|
| Own annuity if no SQ | 5.9                 | 4.7 | 4.7                    | 80%            | 109%                     |
| SQ          | 6.7                  | 4.8 | 5.1                     | 72%            | 108%                     |
| Joint annuity (if mar) | 7.7                 | 5.1 | 5.3                     | 66%            | 109%                     |
| % incr. from SQ | 10.2                | 5.3  | 5.3                     | 52%            | 99%                      |
| % incr. from joint annuity | 13.8               | 5.3  | 5.3                     | 38%            | 117%                     |

Notes: Expected age of death of 65-year old cohort is used in these calculations. Husbands and wives are assumed to belong to the same educational group. Absolute amount of joint annuity benefit is same for average, full career and ten-year woman but it varies as percentage of own annuity. Public pillar benefit varies by labor force attachment. In Chile MPG top-up for married woman stops when MPG floor is reached due to joint annuity. Therefore percentage increment from MPG is less on lifetime than on monthly basis. PV of loss through joint annuity to a man is less than PV of joint annuity benefit to a woman because PV is measured as of age 65, which the wife reaches three years later than the husband. Average man and FC and ten-year women get no MPG. In Mexico part of the subtraction to the husband and increment to the wife from the joint annuity is due to the husband’s SQ. SQ has much larger percentage increment to ten-year woman than to other women, because that woman is assumed to work when she is young; at that point the SQ is larger relative to the wage than it becomes later on due to price indexation of SQ and rising age-earnings profiles. Same factor leads percentage SQ to be slightly lower for full career woman.
generate large transfers from husbands to wives. In periods of moderately high growth, these transfers are much larger than those through the public pillar, especially for middle- and high-income groups (Table 4 and Figure 3). They are the main mechanisms by which the new social security systems protect older married women. Single women and those cohabiting without a formal marriage do not benefit from this transfer.

5.1 Survivors’ benefits while husband is working

In traditional DB systems female survivors’ benefits are paid out of the common pool and are a fixed percentage of the husband’s potential benefit. This means that husbands with young wives or with high pension returns are subsidized by others, including single and low-income households. In contrast, in the new Latin American multi-pillar systems, husbands are required to purchase survivors’ insurance for their wives, which ends this inter-household subsidy. They pay a small amount (less than 1% of payroll) for this insurance. Cost and benefits of survivors’ insurance are internalized within each household. In this paper we do not include the value of survivors’ benefits during the working stage, as our representative men and women are all assumed to live an ‘average’ lifetime and to die after retirement. To this extent we understate the transfer from men to women.

5.2 Joint annuities after retirement

Additionally, all three countries require that, when husbands retire and annuitize, they purchase joint annuities (or take gradual withdrawals spread over both lives), further protecting their wives. In Chile and Mexico the survivor gets at least 60% and in Argentina 70% of the primary benefit. The requirements of survivors’ insurance and joint withdrawals can be viewed as a formalization of the informal family contract, in which men agree to provide monetary support to their wives in return for non-monetary household services and a partial withdrawal from the labor market by women; the joint annuity is a way to enforce this contract after the husband’s death.11 When we assume that the wife is three years younger than the husband, joint annuities pay 12–17% less per month than individual annuities. The average annual widow’s benefit after the husband’s death is greater than her own-pension and it adds 30–70% to her own-annuity on a lifetime basis (Table 4; for further details see James, Cox Edwards, and Wong, 2003).

Joint annuities are especially important because the cost of living of a couple is not very different from the cost of living of a single widow, due to household economies of scale. Without such annuities, a woman’s standard of living would drop precipitously after her husbands’ death – even if the woman had a pension of her own. The widow’s benefit plus own-benefit maintains household purchasing power at 70–80% of the previous level, so her standard of living is roughly unchanged. The joint annuity also protects women who did not work at all in the formal market, maintaining

11 Consistent with this interpretation, wives and single men are not required to purchase joint annuities. For quantification of non-monetary household services see Apps 2002.
The requirement of joint annuities or withdrawals scheduled over the joint lifetime of husbands and wives means that lifetime transfers and rates of return vary strongly by gender and marital status. Married men lose relative to singles because they must purchase a joint annuity. Of course, this income foregone by the husband is eventually received by his wife. So from the vantage point of the married household, in the long run this positive and negative transfer cancels out. However, from the vantage point of each individual member, the joint annuity requirement shifts income to the woman, later in life. The lifetime transfer through the joint annuity far exceeds the transfer from the public pillar, in all three countries. It is a major means of support of very old women who have worked mainly in the home. It raises the average female/male ratio of total lifetime benefits to 60–90%, and for full career women, to over 100% (Tables 4 and 6 and Figure 5). In contrast, full career single or
divorced women or those cohabiting without a formal marriage are estimated to have lifetime benefits 70–80% those of single men. Unless joint annuities are extended to these groups, either through legal or voluntary arrangements, they will have relatively low pensions in old age as a corollary to their relatively low wages while working.\textsuperscript{12}

5.3 The interaction between joint annuities and unisex tables

One reason for the lower annual annuities of women is their greater longevity. To eliminate this impact, some countries specify that unisex mortality tables must be used for pricing annuities that are part of their mandatory systems. Unisex tables

\textsuperscript{12} In several European countries marriage is becoming the exception rather than the norm. However, in some countries partners are required to register even if not married and joint annuities could be applicable then. Additional problems may occur in the case of divorce. For the reasons we have just discussed, legal arrangements for the splitting of retirement accounts and the continuation of joint annuities are important in such cases. While half the marriages end in divorce in some countries, at present the divorce rate is relatively low in Latin America and it is prohibited in Chile (although marriage can be ‘nullified’ in Chile). It should also be noted that for families that would have saved optimally for widows in other ways, the joint annuity might crowd out this voluntary saving. To the extent that such households exist, our numbers overstate the incremental income to wife and the decreased consumption of the husband brought about by the joint annuity. However, the savings and insurance behavior of households indicates that many do not engage in consumption smoothing over the wife’s lifetime (Bernheim et al., 2003).
apply the average mortality rates of men plus women to both genders, in contrast to gender-specific tables that apply different (higher) life expectancies to women. They reduce men’s payouts and increase women’s by 5–10%, when individual annuities are involved. The public pillar implicitly uses a unisex concept, as annual benefits are not tied explicitly to gender. Requiring unisex tables in the private pillar is very controversial, since it implies discarding information relevant to risk categorization and redistributing from men (both high and low earners) to women (both high and low earners). In a competitive insurance market, the unisex requirement may lead to creaming, selection and market instability problems.

Since none of our three countries requires unisex tables, we do not discuss it in this paper. Instead, we simply note that when joint annuities are involved unisex tables matter much less, since the payout extends over both lifetimes in either case. For married men and women, monthly and lifetime payouts and gender ratios of pensions stemming from joint annuities are very similar whether unisex or gender-specific tables are used. To the degree that married couples or registered partners predominate, requiring joint annuities may be a less divisive alternative to unisex tables as a way to avoid market problems in the context of a unisex requirement (for further discussion of the unisex issue and broader annuities market issues, see James and Vittas, 1999a and b; James and Song, 2001).

6 Gender impact of the shift from the old to the new systems

6.1 New methodological problems

Comparison of the new and old social security systems in Latin America is difficult because the old systems were insolvent and unable to provide the promised benefits. This was true in the long run of all three countries, it was true even in the short run in Chile, and Argentina was already defaulting on payments. Since we do not know what the counterfactual would have been (higher taxes, lower benefits, whose taxes or benefits?), it is impossible to determine absolute gains or losses from the change. To avoid this problem we focus on the relative positions of men and women in different educational–marital groups in the new and old systems. We ask: (1) Who gained or lost the most from the reform, in a relative sense? (2) Did the gender ratio get larger or smaller in the process of the reform? As noted earlier, these questions are consistent with any counterfactual in which the fiscal adjustment would have involved equi-proportional benefit cuts or tax increases for each group within a given cohort, so relative positions would have been unchanged.

In addressing question (1), we compare the ratios of post-reform to pre-reform expected lifetime benefits for each sub-group, normalizing according to the ratio for the married man in the top educational group; that is, we examine how much each sub-group gained or lost relative to the change experienced by the high-income married man (Table 5). This enables us to focus on relative rather than absolute gains or losses, which is necessary given our counterfactual. In addressing (2), we compare the old and new gender ratios to see if these ratios improved or deteriorated due to the reform (Table 6). We focus on lifetime benefits because retirement age changed as
Table 5. *Ratios of expected PV’s of post-reform/pre-reform lifetime benefits (relative to ratio for married men in top educational group)*

(*r = 5% during accumulation, 4% during annuity stage, real wage growth = 2%)*

| Education | 1 | 2 | 3 | 4 | 5 |
|-----------|---|---|---|---|---|
| Chile     |   |   |   |   |   |
| Average Man |   |   |   |   |   |
| Married Man | 1.3 | 1.2 | 1.2 | 0.9 | 1.0 |
| Single Man | 1.5 | 1.40 | 1.40 | 1.1 | 1.1 |
| Average married | 1.5 | 1.3 | 1.0 | 0.9 | 1.0 |
| Full career married | 1.8 | 1.8 | 1.5 | 1.6 | 1.3 |
| Full career single | 1.5 | 1.5 | 1.2 | 1.30 | 1.0 |
| Ten year married | 1.2 | 1.1 | 1.1 | 1.0 | 1.1 |
| Men + women: Average household | 1.4 | 1.2 | 1.1 | 0.9 | 1.0 |
| Argentina |   |   |   |   |   |
| Average Man |   |   |   |   |   |
| Married Man | 1.5 | 1.3 | 0.9 | 1.1 | 1.0 |
| Single Man | 1.7 | 1.5 | 1.1 | 1.3 | 1.2 |
| Average married | 3.0 | 2.8 | 1.2 | 1.2 | 1.1 |
| Full career married | 2.1 | 2.0 | 1.6 | 1.4 | 1.3 |
| Full career single | 1.8 | 1.7 | 1.4 | 1.2 | 1.0 |
| Ten year married | 2.5 | 2.2 | 1.4 | 1.4 | 1.5 |
| Men + women: Average household | 1.8 | 1.6 | 1.0 | 1.1 | 1.1 |
| Mexico |   |   |   |   |   |
| Average Man |   |   |   |   |   |
| Married Man | 1.9 | 1.5 | 1.2 | 0.9 | 1.0 |
| Single Man | 2.1 | 1.7 | 1.4 | 1.0 | 1.1 |
| Average married | 1.8 | 1.6 | 1.4 | 1.1 | 1.0 |
| Full career married | 2.1 | 1.9 | 1.5 | 1.1 | 0.9 |
| Full career single | 2.4 | 2.4 | 1.8 | 1.2 | 1.0 |
| Ten year married | 1.6 | 1.5 | 1.4 | 1.2 | 1.2 |
| Men + women: Average household | 1.8 | 1.6 | 1.3 | 1.0 | 1.0 |

*Notes*: Includes lifetime benefits from own-annuity, public pillar and joint annuity (for married). Each cell i shows \((PV_{new}/PV_{old})_i/(PV_{new}/PV_{old})_k\) where \((PV_{new}/PV_{old}) = \) ratio of present value of lifetime benefits in new vs. old systems for group i. This is normalized by the ratio for reference group k, where k = married men in highest educational category. If the number in a cell > 1, this means it gained more than top married men. For educational categories see Table 1A.

part of the reform, it differs across countries and sub-groups within each country, and the widow’s benefit starts at a much later age than own-benefits. We carry out this calculation for workers who entered the labor market after the reform, thereby avoiding all transition arrangements.
Table 6. *F/M* ratios of expected PV of lifetime benefits in new vs. old systems

| Education | 1   | 2   | 3   | 4   | 5   |
|-----------|-----|-----|-----|-----|-----|
|           |     |     |     |     |     |
| **Chile** |     |     |     |     |     |
| Av., own pension | 0.66 | 0.58 | 0.91 | 0.95 | 0.74 |
| Av., own + widow  | 0.69 | 0.62 | 0.91 | 0.95 | 0.75 |
| FC, own pension   | 0.81 | 0.71 | 0.93 | 0.68 | 0.69 |
| FC, own + widow   | 0.81 | 0.71 | 0.93 | 0.68 | 0.69 |
| 10 yr, own + wid. | 0.44 | 0.40 | 0.37 | 0.38 | 0.32 |
| Av., PV own ann.  | 0.47 | 0.44 | 0.52 | 0.61 | 0.49 |
| Av., own + MPG    | 0.55 | 0.44 | 0.52 | 0.61 | 0.49 |
| Av., own + MPG + jt. | 0.79 | 0.68 | 0.77 | 0.88 | 0.74 |
| FC, own annuity   | 0.73 | 0.68 | 0.74 | 0.73 | 0.54 |
| FC, own + joint   | 1.02 | 0.96 | 1.03 | 1.01 | 0.80 |
| 10 yr, own + joint | 0.39 | 0.38 | 0.36 | 0.40 | 0.34 |
| **Argentina** |     |     |     |     |     |
| Av., own pension  | 0.16 | 0.13 | 0.4  | 0.67 | 0.75 |
| Av., own + widow  | 0.29 | 0.26 | 0.51 | 0.75 | 0.81 |
| FC, own pension   | 0.74 | 0.60 | 0.57 | 0.81 | 0.74 |
| FC, own + widow   | 0.76 | 0.65 | 0.63 | 0.81 | 0.76 |
| 10 yr, own + wid. | 0.29 | 0.26 | 0.26 | 0.35 | 0.29 |
| Av., PV own ann.  | 0.3  | 0.28 | 0.37 | 0.44 | 0.53 |
| Av., own + flat   | 0.35 | 0.32 | 0.39 | 0.50 | 0.57 |
| Av., own + flat + joint | 0.59 | 0.57 | 0.67 | 0.80 | 0.92 |
| FC, own + flat    | 0.79 | 0.70 | 0.72 | 0.72 | 0.63 |
| FC, own + flat + joint | 1.09 | 1.01 | 1.06 | 1.06 | 0.98 |
| 10 yr, own + flat + joint | 0.46 | 0.43 | 0.37 | 0.42 | 0.40 |
| **Mexico** |     |     |     |     |     |
| Av., own pension  | 0.35 | 0.29 | 0.26 | 0.3  | 0.53 |
| Av., own + widow  | 0.58 | 0.53 | 0.50 | 0.54 | 0.76 |
| FC, own pension   | 0.63 | 0.54 | 0.57 | 0.66 | 0.82 |
| FC, own + widow   | 0.86 | 0.78 | 0.80 | 0.90 | 1.06 |
| 10 yr, own + wid. | 0.47 | 0.43 | 0.36 | 0.30 | 0.28 |
| Av., own − no SQ  | 0.30 | 0.30 | 0.33 | 0.42 | 0.5  |
| Av., own incl. SQ | 0.35 | 0.35 | 0.37 | 0.46 | 0.53 |
| Av., own + SQ + joint | 0.56 | 0.56 | 0.58 | 0.68 | 0.76 |
| FC, own incl. SQ  | 0.72 | 0.74 | 0.72 | 0.80 | 0.71 |
| FC, own + flat + joint | 0.97 | 1.00 | 0.98 | 1.07 | 0.97 |
| 10 yr, own + SQ + joint | 0.42 | 0.41 | 0.40 | 0.40 | 0.34 |

Notes: For educational categories see Table 1A.
Denominator is married man for rows with joint annuity; single man if no joint annuity.
6.2 Description of old systems

In general, the old systems provided a benefit of the following sort

\[ B = aYS. \]

Where \( B \) = annual pension benefits, \( Y \) = number of contributory years, \( S \) = average salary during last few years of work, \( a \) = incremental benefit per year of work. This formula provided a generous benefit for women who worked for only a short time and then withdrew from the labor market, because \( a \) was often very high for the first ten years of work. In all three countries, the first ten to 20 years of contributions produced a very high replacement rate. Women were more likely than men to

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Footnote 13: In Chile, \( a = 5\% \) for each of the first ten years and \( 1\% \) per year thereafter up to a maximum replacement rate of 70\%, so the old system paid 50\% of pensionable salary for the first ten years of work. The pensionable salary was the average of the last five years of work, of which the last three years were indexed up according to inflation. Pensions began at age 60 for women, 65 for men. In Argentina, the old system paid (a) 70\% of base salary for 20 years of contributions (or 30 years of work) plus an additional 1\% for every year over 30, with base salary defined as the average of the last ten years; or (b) 50\% of base for those who worked only ten years, plus an additional 1\% for every year over ten, with base salary the best three out of ten years. Workers qualifying for (a) could retire early at age 60 for men, 55 for women, but (b) started at age 65. In Mexico, the old system paid a proportion of the base salary for the first ten years plus an increment for every year over ten, where the base salary was the average of earnings during the last 250 working weeks. The proportion of base varied negatively with wages, ranging from 13\% for high earners to 80\% for low earners. The accrual rate for additional years varied positively with wages, ranging from 0.56\% to 2.45\% per year. Moreover, the monthly pension was paid for 13 months instead of 12 (see James et al., 2002 for details). Retirement age was 65.
work for ten to 20 years and then leave the formal labor market. Married women got a widow’s benefit that was 50% of their husband’s pension in Chile, 75% in Argentina and 90% in Mexico. Implicitly, unisex tables were used. Women could retire earlier than men with no actuarial penalty in Chile and Argentina.

In contrast to these provisions that favored women, the old systems based their benefits on the last few working years, which favored full career workers, especially men. A woman who worked at ages 20–30, before child-bearing, would earn no interest on her contributions and would find her pension based on wages that would appear to be very low compared with prevailing wages when she retired at age 60–65 (e.g. in our baseline scenario of 2% real wage growth per year the average wage rate would have doubled over that period). In addition, using final years’ salary as the reference wage especially favored workers with steep age–earnings profiles, who tended to be highly educated men. Furthermore, in Chile and Argentina women had to give up their own pension to get the widow’s pension, so women who worked much of their lives in the labor market got little or no incremental benefit from their contributions. In the new systems, women keep their own benefit as well as the joint annuity. Contributions that are made in early adulthood add more to present value of lifetime benefits than contributions made in the final years. Further, as we have seen, the new public pillars are tilted toward low earners, who are predominantly women. These provisions play an important role in comparisons of new and old systems.

6.3 Inflation

Finally, the failure of the old systems to index for inflation was a major disadvantage to all workers, but especially to women. Pensionable salaries were based on past wages that were usually not indexed up for inflation. Once a person retired, the initial benefit was usually not indexed for inflation. Yet, these countries had very high levels of inflation that often made their pensions worthless. Ad hoc adjustments were made, but these always lagged the pace of inflation. This created problems for all workers, but particularly for women, who may have done their market work many years in the past (prior to marriage and children) and who, after retirement, lived many years into the future. For example, with inflation at 10% per year (a conservative estimate) the base salary that a woman earned at ages 20–30 would have fallen to 3% of its original real value by the time she retired at age 60. And her pension would have fallen further to 10% of its initial real value by the time she died at 83. Abstracting from inflation is equivalent to assuming zero inflation or full-price indexation – both of which are far from reality and, if true, would have vastly increased the financial insolvency of the old systems.

In contrast, in the new systems: (1) Public pillar benefits are price-indexed. (2) Financial instruments (stocks, bonds and mortgages) held by the private pillar generally earn a positive real rate of return (that is, above the rate of inflation) in the long run. (3) In Chile private annuities acquired upon retirement are indexed, as are all medium- and long-term financial transactions – a response to a history of high

14 Chile indexed three out of the five years that were averaged in the reference wage.
inflation. In Mexico regulations call for annuities to be indexed, but it is not clear whether private insurance companies will be able to provide this product or at what cost (see James, Smalhout, and Vittas, 2001; James, Song, and Vittas, 2001). If we had taken inflation into account, the real value of expected benefits in the old systems would have been far lower, especially for women, and the increment in gender ratios from the new systems would show up as much higher.

6.4 Comparison of lifetime benefits under new and old systems

Using the old system formulae to generate the expected present value (at age 65) of lifetime pensions, we start with our first question: Who gained or lost the most from the change in systems? To address this question we calculate the ratio of post and prereform lifetime benefits and normalize according to the ratio for male workers in the top educational group. Based on the discussion to this point, we would expect the following groups to be the biggest gainers:

1. low earners (as proxied by low educational category) of both genders but especially women, who are the lowest earners in each category – due to the targeted public pillar;
2. single men – because they no longer have to subsidize the widow’s benefit that was financed from the common pool in the old systems;
3. married women – because they can now keep their own annuity plus the joint annuity whereas previously, in Chile and Argentina, they had to give up one or the other.

In fact, that is exactly what we find. In all three countries, workers in the two lowest educational groups gain more than those in the two highest groups and married women generally gain more than married men (Figure 4). In Chile married full career women gain the most, because they had lost the most when they had to choose between the widow’s benefit and their own benefit in the old system. In Mexico both single and married full career women gain the most, due to the work-related SQ. Over time this may induce women in general to increase their labor force participation rates and thereby to end up with higher pensions, a process that is already underway for exogenous reasons. But in Argentina the largest gains are registered by average and ten-year women, due to its relatively large flat benefit.

Thus, moving on to the second question, the comparison of female/male ratios of lifetime benefits under the old and new systems, we find that (1) gender ratios fall when only the own-annuity is taken into account; (2) results are mixed when the public and private pillars are both included; (3) these ratios rise dramatically when benefits from the joint annuity are added; and (4) in all three countries, for almost all educational categories and levels of labor force attachment, the relative position of women who get both the public benefit and joint annuity rises in the new system compared with the old, and a major reason is the fact that they do not have to give up their own pension to receive the widow’s benefit (Table 6 and Figure 5).

Given this rationale, how do single women fare? This is important since an increasing proportion of women are divorced or never formally married. Informal cohabitation is not uncommon among low educated groups in Latin America and, more
recently, among high educated groups in the US and Europe. While our data do not allow us to model their wage and work histories directly, we use full career women without joint annuity or widow’s benefit as a proxy. (Recall, however, that if wages are a function of experience rather than age we may be understating the earnings and pensions of full career women.) In Argentina and Mexico gender ratios improve in the new system for single women in the bottom three to four educational categories, because of the generous public benefit that low earners receive. In Chile, where full career women don’t get the MPG, their relative position falls at the bottom end but rises at the top end (Tables 5 and 6). Concerns about the relative position of single women could be addressed through the use of unisex tables (which redistributes from men to women), through partial wage indexation of public benefits for the very old (which redistributes to men or women who live longer), or through later retirement age at least equalized with that of men (which reallocates one’s own income from early to later old age).

7 Conclusion

Our empirical investigations have shown that (1) women’s own-annuities are lower than those of men in multi-pillar pension schemes, but (2) women are recipients of net public transfers and private intra-household transfers. Consequently, (3) women have gained more than men from the reforms – the lifetime gender ratio has improved. These redistributions and improved gender ratios stem from the targeting of the public pillars toward low earners and, even more important, from regulations over payouts from the private pillar, especially joint annuity or withdrawal requirements. Women tend to be low earners, hence beneficiaries of targeting in the new public pillars. Women tend to outlive men, so restrictions on payouts systematically redistribute from husbands to wives – perhaps in compensation for household services previously provided by women. In the new systems women who work in the labor market are not required to give up their own benefit to receive the widow’s benefit. As a result, women get a higher rate of return than men in the new systems and a higher relative benefit than they did in the old systems.

Some caveats: While women as a group gained in these three Latin American countries, different groups of women benefited the most in each case and some gaps emerge. These caveats concern single women, work incentives, indexation and the status of non-contributing women. Single women and those cohabiting without a formal marriage contract receive much lower lifetime benefits than men or married women, because they have lower wages and greater longevity than men and don’t gain from the joint annuity, as do married women. Even if they work full career, their pensions will be relatively low so long as their wage rates remain relatively low. (They can, however, improve their situation substantially by raising their retirement age to parity with that of men).

The fact that women can keep their own-annuity in addition to the joint annuity encourages formal sector work for married women and may induce an increase in their labor force participation rates and pensions over the long run. The
emphasis on defined contribution plans that reduce the pure tax element adds to this incentive, particularly in Chile. But the terms of the reduced flat benefit in Argentina and the MPG in Chile could discourage such work by low earning women after 10 and 20 years of contributions, respectively. Moreover, the earlier allowable retirement age of women in Chile and Argentina further reduces their incentive to work and may leave them with a relatively small income in very old age.

All workers, and especially women, benefit from the fact that their pension from the public pillar is price-indexed after they retire and therefore doesn’t fall in real value. However, price rather than wage-indexation of the public benefit received by successive cohorts means that it doesn’t rise in real value through time, it is gradually diminished in size relative to workers’ wage and own-annuity, and its equalizing impact will disappear for future generations. (Chile has wage-indexed on an ad hoc basis, perhaps facilitated by the relatively low cost of its MPG).

Finally, this paper deals with women who are in or have husbands in the contributory social security system. It does not deal with the large group of rural women in low-income countries who do not meet these criteria and may have little income or savings when they become old. A non-contributory program is needed to supplement the family system and keep these women out of poverty. This complex topic goes beyond the purview of this paper.

The favorable outcome we have described for women in Latin America contrasts with outcomes in the transition economies of Eastern Europe and the former Soviet Union, where preliminary investigations suggest that women lost relative to men from the reform, due to the removal of privileges they had in the old system, the maintenance of earlier retirement age for women, the absence of a targeted public pillar in the new system, the weakening of survivors benefits and the failure to require joint annuities, as of yet (Castel and Fox, 2000; Woycicka, 2001).

Thus, the gender impact of multi-pillar systems is not pre-ordained; it depends on detailed design features of these reforms. Specifically:

1. Because of labor market factors, a redistributive public pillar is particularly important to older women.
   - Dangers to be avoided are eligibility rules that exclude women or discourage their formal sector work.
   - Indexation provisions determine whether old old women and future cohorts of women will continue to benefit from the public pillar.

2. Because of demographic factors, joint annuities play a major role in maintaining the living standards of older married women, who are likely to become widows.
   - This role is particularly constructive if the joint annuities are additive to the own-annuity and therefore do not penalize formal work by women.
   - Careful attention needs to be given to joint payout rules in cases of divorce or cohabitation without marriage.
Equalizing the retirement age between men and women substantially narrows the gender gap in monthly pensions, without requiring public or private transfers.

- It ensures that lifetime retirement savings are allocated to old old age instead of young old age, and may encourage additional work and savings.
- It is especially important for single women who will not receive a boost to their incomes from the joint annuity.
- It increases the country’s labor supply and GDP.

Single women, who don’t get the joint annuity, will have lower pensions than men, so long as their wages are lower. Proposals for improving their relative position require careful evaluations of the rationale and impact of alternative instruments:

- Unisex tables redistribute from men to women, in general;
- A bonus for the very old redistributes to a subset of women who live longer;
- A strong safety net in the public pillar redistributes to low earning women;
- Greater labor force participation and postponed retirement increase and re-allocate one’s own pension income toward older age, making redistributions less necessary – providing the pension system rewards this work.

Within this broad framework, details of the “best” design pattern will vary, depending on a country’s social objectives and redistributive priorities. Chile, Argentina and Mexico have implicitly defined gender equity differently and have made different trade-offs between equality, work incentives and fiscal cost. Pension reforms in all three cases have improved the relative position of women, especially low earning women, but their rewards for market work and fiscal costs of subsidy for home work differ widely. These consequences of alternative designs are broadly generalizable to all countries that are adopting multi-pillar systems (and many are relevant to traditional systems as well).

References
Apps, P. (2002) Gender time use and models of the household. World Bank Discussion Paper.
Arenas de Mesa, A. and Montecinos, V. (1999) The privatization of social security and women’s welfare: gender effects of the Chilean reform. Latin American Research Review, 3: 7–37.
Barrrientos, A. (1998) Pension reform, personal pensions and gender differences in pension coverage. World Development, 26(1): 125–137.
Bernheim, D., Forni, L., Gokhale, J., and Kotlikoff, L. (2003) Mismatch between life insurance holdings and financial vulnerabilities – evidence from the health and retirement survey. American Economic Review, forthcoming.
Bertranou, F. (1998) Pension reform and gender in Latin America: discussion of relevant issues. World Bank Working Paper.
Bertranou, F. (2001) Pension reform and gender gaps in Latin America: what are the policy options? World Development, 29(5).
Burnes, K. and Schulz, J. (2000) Older women and private pensions in the United States. National Center on Women and Aging, Brandeis University.
Castel, P. and Fox, L. (2001) Gender dimensions of pension reform in the former Soviet Union. In Holzmann, R. and Stiglitz, J. (eds), *New Ideas About Old Age Security*. World Bank.

Cox Edwards, A. (2000a) Pension projections for Chilean men and women: estimates from social security contributions (translated into Spanish as ‘El Futuro de las Pensiones en Chile’). *Estudios Publicos*, 79(Winter). CEP (Centro de Estudios Públicos) Santiago, Chile.

Cox Edwards, A. (2000b) A close look at the living standards of Chilean elderly men and women. Manuscript.

Cox Edwards, A. (2001a) Social security reform and women’s pensions. Policy Research Report on Gender and Development, Working Paper Series 17, The World Bank.

Cox Edwards, A. (2001b) Gender inequities in the pension and social protection systems in the region. Presented in Santiago, Chile, in conjunction with Annual Meeting of Board of Governors of Inter-America Development Bank and Inter-American Investment Corp.

Cox Edwards, A. (2001c) A close look at the living standards of Argentinean elderly men and women. Manuscript.

Cox Edwards, A. (2002) Gender-differentiated effects of social security reform: the case of Chile. *The World Bank Economic Review*, 16(3).

Falkingham, J. and Rake, K. (2001) Modelling the gender impact of British pension reforms. In Ginn, J., Street, D., and Arber, S. (eds), *Women 2001: Work and Pensions*. Buckingham: Open University Press.

Ginn, J., Street, D., and Arber, S. (eds) (2001) *Women 2001: Work and Pensions*. Buckingham: Open University Press.

James, E. and Vittas, D. (1999a) Annuities markets in comparative perspective: do consumers get their money’s worth? Conference on New Ideas for Old Age Security, World Bank.

James, E. and Vittas, D. (1999b) The decumulation (payout) phase of defined contribution pillars. Presented at APEC meeting, Chile, 1999, and published in conference volume.

James, E., Ferrier, G., Smallhout, J., and Vittas, D. (2000) Mutual funds and institutional investments: what is the most efficient way to set up individual accounts in a social security system? In Shoven, J. (ed.), *Administrative Costs and Social Security Privatization*. University of Chicago Press.

James, E., Smallhout, J., and Vittas, D. (2001) Administrative costs and the organization of individual account systems: a comparative perspective. In Holzmann, R. and Stiglitz, J. (eds), *New Ideas About Old Age Security*. Washington DC: World Bank, 2001; revised version published in *Private Pensions Systems: Administrative Costs and Reforms*. Paris: OECD, 2001.

James, E. and Song, X. (2001) Annuities markets around the world: money’s worth and risk intermediation. CERP Working Paper 16/01.

James, E., Song, X., and Vittas, D. (2001) Annuities markets around the world. American Economic Association meetings, January.

James, E., Cox Edwards, A., and Wong, R. (2003) The gender impact of pension reform: a cross country comparison. Discussion paper. Washington, DC: The World Bank.

Parker, S. and Wong R. (2001) Welfare of male and female elderly in Mexico: a comparison. *The Economics of Gender in Mexico: Work, Family, State, and Market*. Washington, DC: The World Bank.

US GAO (1997) Social security reform: implications for women’s retirement income. GAO/HEHS-98-42.

Wong, R. and Parker, S. (2001) Social security reform in Mexico: a gender perspective. Paper presented at the Population Association of America Meetings, Washington, DC; and at Interamerican Conference on Social Security, Brazil, 2001.

Woycicka, I. (ed.) (2001) Gender impact of social security reform in central and Eastern Europe. Warsaw: Gdansk Institute for Markov Economics. Manuscript.
Appendix A: Data sources and methodology

Tables 1A and 1B. The Chile estimates are based on CASEN 94, a nationally representative survey that provides information on current labor force participation, working status, affiliation to social security and contributory status. The estimates used are based on the urban sample – approximately 100,000 individuals age 16 or older. The work patterns reported are those of affiliates (workers who have contributed at some point) in urban areas. The self-employed are not required to contribute. Our data indicate that 73% of all male workers and 55% of female workers affiliate (most of the others are self-employed) and 90% of male affiliates (91% of women affiliates) who are employed contribute to social security. Thus, in Chile our estimates are close to the behavior of the average affiliate but do not apply to women who never worked in the formal labor market. Work experience is estimated based on current employment of affiliates. Wages reflect pay for full-time work (most work is full time or 35 hours per week, in Chile). For some analyses data on the distribution of wages within each cell were used to estimate dispersion of pension accumulations for that cell.

The Argentine data are based on the micro data set of the Encuesta Nacional de Gastos de los Hogares (ENGH) for 1996–97, a nationally representative household survey. The sample contains 103,858 individuals, of whom 69,895 were 16 years or older. All regions covered are considered urban. Our data do not allow us to distinguish between affiliates and non-affiliates or between full timers and part timers. In Argentina all workers, including the self-employed, are supposed to affiliate and contribute. From other sources, we know that 90% of private sector workers and 50% of public sector workers were affiliated in the mid 1990’s but the over-all contribution rate is only 50% of employment in urban areas (compared with 68% in Chile). Thus some work years may be non-contributing years. Work experience is estimated based on current employment status of urban population, including both full-time and part-time workers. Wages reflect pay for full-time and part-time work, hence understate the true full-time wage rate. Because we cannot distinguish between non-affiliates and affiliates, who have a higher labor force participation rate, we probably understimate the labor force attachment of affiliates. However, we probably overstate contributions of affiliate when working, because of the 50% evasion rate.

The Mexican data come from the 1997 Mexican National Employment Survey (ENE-97) completed by INEGI (Instituto Nacional de Estadística, Geografía e Informática), the Mexican Statistical Bureau. The sample contains information on 119,405 individuals aged 12 or older. We use the sub-sample corresponding to more urban areas (communities of 100,000 people or more), which is about 78% of the sample. This survey contained the standard employment survey questions, plus a module with employment history and job training questions. The ENE97 does not allow for the identification of social security affiliates (about 42% of the economically active population) and/or the contributions made to retirement plans. Work experience is estimated based on current employment (both part time and full time) of more urban population in relevant age–education cells. Wages reflect pay for full-time and part-time work in each cell. For some analyses we used the observed coefficient of
variation on earnings for each cell as an estimate of the distribution of years worked and resulting annuity within that cell.

For all countries, using these cross-sectional statistical data, we divided men and women into gender–age–education–marital status cells. A typical cell, for example, might consist of all married women with high school degree age 30–35. For each cell we obtained the average employment rates and wage rates for the current population. Data on marital state enabled us to identify the age, $M$, at which the probability of being married $>50\%$. In constructing our synthetic men and women, we used the employment probability and wage rate of the single individual up to age $M$, and the married individual after age $M$. The labor force participation rate of women typically declined sharply when they got married. In some (high education older age) cells the number of single women is very small so we could not profile women who remained single throughout life.

Table 2. We assumed that for each educational level, an average man or woman who enters the labor force today proceeds through life with the age-specific employment probabilities and wage rates that were derived from the cross-sectional data. For simulations where positive economy-wide wage growth was assumed, we multiplied the age-specific wage rate by the projected growth factor. For all three countries our simulations use three different labor attachment patterns for women: ‘Full career women’ are those who have same labor force participation rates and retire at same age (65) as men. ‘Ten-year women’ are women who work only ten years, early in their adult lives, before children are born. ‘Average women’ have average work and wage for each education cell. ‘Average women if RA = 65’ are women who start their annuity at age 65 but have same work experience as average women.

Contributions and fund accumulations are based on estimated annual earnings and work experience for each age–education–gender cell. In baseline, real rate of wage growth is 2\% annually and rate of return is 5\% during accumulation stage, 4\% during payout stage. All work years are treated as contributing years although this probably overstates accumulations. Annuitization upon retirement is assumed. Gender-specific mortality tables are used. Joint annuity with 60\% to survivor (70\% in Argentina) is required for married men who annuitize. Wives are assumed to be three years younger than and have three- to four-year longevity greater than their husbands. In Chile males retire at age 65, survive for 15.5 years and purchase a joint annuity that covers their wives for an additional 6.4 years. Females retire at age 60, survive for 22.8 years and purchase individual annuities. In Argentina men at age 65 survive 14.5 years and joint annuity covers their wives for another seven years. Women survive for 22.5 years at age 60. In Mexico both men and women retire at 65. Male and female life expectancies at 65 are 15.8 and 18.5, respectively, Women collect joint annuity for 5.7 years. Pesos are converted into S’s according to 1994 rates for Chile (413/1), 1996 for Argentina (1/1) 1997 for Mexico (8/1). In Argentina, current rate of exchange is only 25–30\% as much as 1996 rate, so would yield much lower annuities.

Table 3. Own-annuities are from Table 2. Chile’s MPG was $91 in 1994, starting at age 65 for men, 60 for women. Twenty years of contributions are required for
eligibility. Currently it is formally price-indexed, but *ad hoc* adjustments have been made that keep it roughly on par with wage growth. If it became wage-indexed it would rise to $200 in 40 years. In Table 3 the MPG is converted to an actuarially equivalent monthly top-up, although in reality retirees must use up their own accumulation by withdrawing an amount equal to the MPG monthly, and then get the full $91 from the state after they run out of money. The flat benefit in Argentina is $200, starting at age 65 for men and 60 for women. The reduced flat benefit is $140, starting at age 70. These benefits are price-indexed. In Argentina 30 years of contributions are required for the full flat benefit and ten years for the reduced flat. The full flat benefit is received by the average male and full career woman in every educational category. The ten-year woman and average woman get only the reduced flat, except at the top educational level, where she meets the years of service requirement. Mexico’s SQ is a uniform payment by the government into each worker’s account per day worked. It is 5.5% of the minimum wage or 2.2% of the average wage, indexed to prices. All workers are eligible. Payouts start at age 65.