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THE GENDER IMPACT OF SOCIAL SECURITY REFORM IN LATIN AMERICA

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Abstract

Recent multi-pillar pension reforms tighten the link between payroll contributions and benefits, leading critics to argue that they will hurt women, who have less continuous employment and earn lower wages than men. However, these reforms also remove distortions and target redistributions to low earners, which help women. This paper tests these conflicting claims in the case of three Latin American countries-Chile, Argentina and Mexico. We find that women's own-annuities are lower than those of men in multi-pillar pension schemes, but women are recipients of net public transfers and private intra-household transfers through joint pensions. As a result, women have gained more than men from the reforms.

Key words: social security, reform, gender.
Classification JEL: H55, J16.

Introduction[1]

Over the past two decades multi-pillar pension systems that include both a public defined benefit (DB) and private defined contribution (DC) pillar have been adopted in many countries. Critics of these pension reforms argue that the tight link between payroll contributions and benefits in the DC pillar will produce lower pensions for women. In contrast, supporters of these reforms argue

[1] This paper is part of a joint project carried out by James, Edwards, and Wong. It was financed by the Economics and Gender Trust of the World Bank, for which we express our appreciation. It is heavily based on an earlier version, James, Edwards and Wong 2003b. For earlier papers coming out of this project, see Edwards (2002, 2001a, 2001b, 2001c, 2000a, 2000b), Parker and Wong (2001), and Wong and Parker (2001). For an earlier expanded version see James, Edwards and Wong 2003a. Other papers have discussed 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 Arena de Mesa and Montecinos (1999), Barrientos (1998), Bertranou (2001) and Bertranou (1998).

that multi-pillar systems remove distortions that favored men and permit a more targeted public pillar that will help women. This debate is important because the majority of old people are women, pockets of poverty among the old are largest among very old women, and pension programs affect work incentives for women.[2]

To test these conflicting claims, 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. In all three cases, the new social security system includes two components: privately managed funded individual accounts (which are defined contribution) and a publicly managed and financed safety net (which is defined benefit). On the basis of household survey data, we simulate the wage and employment histories of representative men and women. We use these histories to project what their pensions will be under the new systems and what they would have been under the old system rules. We examine how the shift to the new systems affected women versus men and the differential effects on various subgroups of women — those with high versus low educational backgrounds, those who have continuous attachment to the labor market versus those who work primarily in the home, and single versus married women. We emphasize the key design features that determine these gender outcomes.

Gender equality in pension systems has many potential dimensions. It may refer to: the gap in monthly benefits of men and women (which exists in all contributory schemes because of women's lower market work, earnings and contributions);

•or the gap in lifetime benefits (which will generally be smaller because women live longer, on average);

•or differences in rates of return and redistributions (which will favor women in a progressive system);

•or differential wage replacement rates (which are lower for women if benefits depend on years of contributions);

•or differential poverty rates (which tend to be highest among very old women, unless the system contains provisions that directly address this issue).

Moreover in the context of system change one might measure whether women gain or lose in absolute terms, or relative to men with the same education, or relative to a common standard such as the benefits of men with the top level of education. In this paper we focus on the gender gap in monthly and lifetime earnings and its implications for net transfers as well as changes in the relative position of women when the social security systems changed.

We find the Latin American reforms have raised the expected level of benefits of women relative to men and of low earners—many of whom are women—relative to high earners. Although the own-annuity from the account is much smaller for women than for men, this effect is mitigated by better targeting of the new public pillars toward low earners, many of whom are women, and by

[2] In the United States, 60 percent of people over the age of 65 and 72 percent of those over age 85 are women, and this disparity has been increasing through time. The poverty rate of women over age 65 is 15 percent, compared with 7 percent for men over age 65. The poverty rate for women over age 85 is 20 percent and for divorced, separated or never-married elderly women 27 percent (See Shirley and Spiegler 1998; Street and Wilmoth 2001). Poverty rates for the elderly are more difficult to measure in developing countries, where older people are likely to live with their grown children in extended family arrangements, and we do not know how the total consumption of the household is distributed.

restrictions on payout provisions, particularly joint pension requirements. Married men are required, upon retirement, to purchase a pension that covers their widows as well as themselves, and widows are allowed to keep this joint pension as well as their own annuity from their own contributions. As a result of these public and intra-family transfers, low earning married women are the biggest relative gainers from the pension reform. In Chile and Mexico, those who work the most gain the most, so formal sector employment for women is encouraged.

Section1 of this paper outlines how the work histories and demographics of 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. Section 3 summarizes our methodology. Section 4 simulates expected annuities, public benefits and mandatory intra-family transfers for men and women. Section 5 evaluates which groups gained and lost the most from the shift to a new system. Section 6 points to key design features that determine the gender impact of pension reform and are applicable to other countries.

1. Why do Pension Systems and Pension Reforms have a Gender Impact?

In most public pension programs, workers receive benefits that depend on wages and years of work or more directly on their contributions. These contributory social security systems developed because pensions were viewed as a replacement for wages and people are more willing to pay the tax that finances the system if they receive a contingent monetary benefit in return. However, women are likely to have worked and contributed fewer years than men and earned lower wages when working, which gives them a smaller pension when retired. The labor market and demographic differences between men and women that affect their pensions are well known.

1.1 Labor market differences between women and men

Labor force participation rates. Women, especially married women, traditionally have less continuous employment than men due to the division of labor within the family. They are in the labor force roughly 50 to 70% as many years as men in our three sample countries. In industrialized countries, too, the female labor force participation rate is only 75 to 85% that of men (Ginn *et al*, 2001). Even when women work, it may be part-time, temporary, and in the informal labor market. Although women's labor market experience is becoming more like that of men—in part because women are becoming more educated and women with more education have higher participation rates—the process is gradual and traditional roles continue to dominate in many countries.

Wage levels and age profiles. In Chile, Mexico and Argentina, younger women who work earn almost as much as men, after controlling for education. However, earnings diverge with age—prime age male earnings rise 2 to 3 percent per year while female earnings rise 1 to 2 percent per year. This is likely due, at least in part, to the fact that the experience gap between men and women increases with age. By age 50 women earn only 60 to 70 percent as much as men, per month worked (James, Edwards and Wong, 2003a). In countries like the UK, Canada and Australia, women's hourly wage rates are 15 to 30 percent less than men's, controlling for age and education (Ginn *et al*, 2001; U.S GAO, 1997). 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. Moreover, the fact that women concentrate their contributions in their younger years means that they will be disadvantaged in defined benefit plans, where they fail to earn the compound interest that would benefit them after many years of accumulation.

Different retirement ages for men and women. Social security rules in many countries allow women to retire earlier than men. For example, women are permitted to retire five years earlier than men in Chile and Argentina, and also in many European countries. These differential rules started in traditional defined benefit systems and they frequently continue in reformed systems—but the penalty for early retirement is greater in a defined contribution system.

1.2 Demographic differences between men and women

Longevity. In most countries, women at age 60 have a life expectancy that is three to four years greater than that of men. In Chile, a woman who retires at age 60 can expect to live 7.5 years more than her husband when he retires at age 65, on average. Thus any given retirement accumulation yields lower annual pensions for women, especially if gender-specific mortality tables are used for annuitization, as in Latin America. (In the United States, unisex tables are implicitly used by the Social Security system and are required in employer-sponsored pension plans). Also, women are more likely to grow very old, by which time they have used up any voluntary saving and therefore are more likely to live in poverty. In the United States, for example, 72 percent of those over age 85 are women and 20% of them live in poverty.

Widowhood. Women tend to be younger than their husbands, yet live longer. Therefore, women are more likely to become widows than men are to become widowers. In the United States, 72 percent of women age 80 to 84 are widows but only 27 percent of men are widowers. In the 85-and-over age group, only 9 percent of women are living with their spouses (Posner, 1995). Hence survivors' pensions are of key importance to women. Without survivors' benefits, widows who didn't work in the labor market are likely to find themselves impoverished. Even widows who have a pension of their own would find their household incomes cut by as much as 70 percent without survivors' benefits. Since household costs fall by only 35 percent when the husband dies, due to household economies of scale, widows find their income falls far more than their cost of living. Survivors' benefits fill in this gap.[3]

1.3 Implications for multi-pillar reforms

Given this background, we conjecture that recent reforms 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 in Latin America contain public defined benefits, usually financed by general revenues, which are targeted toward low earners. We expect that these public elements will generate transfer payments that favor women, but detailed arrangements such as degree of targeting, years of work required for eligibility, retirement age, and indexation provisions dictate which women benefit and how much. The Latin American reforms also contain elaborate restrictions at the payout stage, especially regarding annuitization, that redistribute pensions between the

[3] For similar reasons, women are likely to serve as caregivers for their husbands, buth then outlive their spouses and need formal caregivers themselves. Thus, costs of and provisions for long-term care are especially important for women. This, however, goes beyond the scope of this paper.

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 transfers and mandatory private transfers on monthly and lifetime benefits and on implicit taxes and redistributions.

Finally, the new systems replaced pay-as-you-go DB systems where contributions and benefits were only loosely linked and where women often 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. Key Design Features of the Old and New Systems in Latin America

With some important variations that are described below, the system adopted in Chile was emulated in Mexico and Argentina, as well as other Latin American countries and Eastern and Central European countries that adopted multi-pillar systems.

2.1 Chile

In 1981 Chile replaced a mature traditional pay-as-you-go defined benefit system with an individual account buttressed by a government-financed minimum pension guarantee (MPG). Mandatory payroll contributions are paid to competing private investment managers (AFP's), rather than to a public fund. Workers contribute 10 percent of payroll for investment plus 2.5-3 percent for administrative fees and disability and survivors insurance (all data on insuance premiums and administrative costs are from James, Ferrier, Smalhout and Vitttas, 2001; and James, Smalhout and Vittas, 2001). Upon retirement (age 65 for men, 60 for women), workers can make gradual withdrawals spread over both spouses' lifetimes, or buy an annuity that must be joint (60 percent to survivor) for married men. (Lump sums are allowed only if the replacement rates exceed 70 percent).

Those who have worked at least 20 years are guaranteed a minimum pension (MPG) that is 25 percent of the average wage, rising to 27 percent after age 70. If the worker's pension from private retirement saving does not reach the MPG level, the government uses general revenues to top it up. The MPG is formally indexed to prices, therefore retaining a constant purchasing power, but so far has risen faster than prices, roughly at the same pace as average wages, due to *ad hoc* political decisions. Wages in Chile have been rising 2 percent faster than prices, because of productivity growth. De facto wage indexation of the MPG means that its purchasing power increases with wage growth over time. In our simulations below we usually assume price indexation but in some cases we show the striking difference implied by wage indexation. While we don't know what the future will hold, it will probably be somewhere between these two extremes.

2.2 Argentina[4]

In Argentina, workers contribute 11 percent of payroll, which includes 7.75 percent for investment in an individual account plus 3.25 percent to cover administrative costs and survivors and disability insurance fees.[5] Actually, the worker has a choice between applying this contribution toward a public defined benefit (called PAP) and a private DC plan that is similar to the Chilean model. PAP provides a benefit only to workers with more than 30 years of contributions — making it particularly inappropriate for women. As of 2001, over 80 percent of all affiliates were in the private DC rather than the public DB. Consequently, in this paper we focus on the private DC option.

Upon retirement (age 65 for men, 60 for women), the accumulated assets are taken out in the form of gradual withdrawals, annuities (joint annuities with 70 percent to the survivor for married men) or a lump sum for account balances above the specified threshold.

Instead of a Chilean-type minimum pension guarantee, Argentina provides a basic "flat" benefit that is fixed in nominal terms. It was originally financed by a payroll tax, but general revenues have now been partially substituted. The full flat benefit is paid to all eligible workers, making it much more expensive than the MPG top-up. To contain costs, eligibility is restricted to workers with at least 30 years of contributions—which excludes most women. Workers, mainly women, who reach age 70 with 10 years of contributions are granted a reduced flat pension that is 70 percent of the full benefit (but see note 4). Widows also inherit 70 percent of their husband's flat benefit (the "widow's flat") when the spouse dies.

2.3 Mexico

In Mexico, a contribution of 6.5 percent of payroll is made to individual accounts. (Disability and survivors' insurance while working are financed separately.) As in Chile and Argentina, workers have a choice among competing investment managers. Retirement income is further augmented by a 5 percent contribution of each worker's wage to a housing fund, called INFONAVIT. If a worker does not borrow the money in the housing fund to purchase a home, it becomes part of the worker's retirement assets.[6] Upon retirement—at age 65 for both genders—workers choose between an annuity (joint with 60 percent to the survivor) or gradual withdrawals spread over both spouses' lifetimes.

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[4] In Argentina the new system has been under re-examination as a result of the fiscal crisis. For example, the contribution to the accounts has been temporarily reduced and a new minimum pension that is about 45 percent of the average taxable wage has made the account accumulation and the flat benefit described in the text irrelevant for many retirees. About half of all current retirees receive the minimum benefit. (Personal communication with Rafael Rofman, World Bank, April 2005). Women are disproportionate recipients. (But note that most of these pensions are based on work and contributions to the old system since the new system has been in effect only ten years). The old system, too, changed frequently, was not always implemented as written, and several regimes co-existed. We base our analysis and discussion on the new system that was put in place in 1994 and the old system as written, for the main regime, shortly before the reform.

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[6] 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 0 real return.

The state helps finance this system in three ways. First, for each day of work it pays a flat "social quota" (SQ) to each account. The SQ was initially equal to 5.5 percent of one daily minimum wage, which was then 2.2 percent of the average wage. Since it was supposed to be price-indexed, this percentage will decline, as wages rise faster than prices over time. (It is also possible that *ad hoc* political decisions will lead to increases in the SQ, as happened to the MPG in Chile). 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 (40 percent of the average wage) indexed to inflation—providing they contribute for a total of 25 years. Third, although the new system is mandatory for new workers, those who were already in the labor force when the reforms were made can opt back into the old system upon retirement. In this paper we focus on new workers who are not entitled to this opt-back provision.

3. 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 systems have not been in place long enough to be mature, and longitudinal data are not available to produce actual employment histories of current workers or pension incomes of current retires to estimate entitlements or retirement accumulations.

3.1 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. We then simulated how the average man and woman in each educational 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 postsecondary. The median group has full secondary education in Chile, incomplete secondary education in Argentina, and middle school education (9 years) 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 educational level. In reality, 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 over time. Changing social norms are leading 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, so participation rates may be endogenous.

These potential changes in age-specific female labor force participation rates were not taken into account directly. However, in addition to the "average" woman with average work experience in each educational group, we also calculated pensions for "10-year women" who worked only 10 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 effects of increasing age- and education-specific labor force participation rates. The absence of longitudinal or

retrospective data meant that we could not estimate 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. 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.

3.2 Data

In constructing our synthetic men and women, we used national household surveys for urban areas for 1994 (Chile), 1996 (Argentina) and 1997 (Mexico).[7] These data do not coincide precisely with groups that are actually covered by the social security system. While most social security affiliates live in urban areas, some live in rural areas; and some urban residents are not covered by social security. In Chile, the wage and work data primarily cover full-time workers, but in Argentina and Mexico they cover full-time and part-time workers. Since many part-timers are not in the social security system, our data may understate wages and work of women who were covered by social security in Argentina and Mexico. Operating in the opposite direction, we attributed all working time as contributing time, but we know that some part of this work is outside the formal labor sector and the social security system. Our data would then overestimate lifetime contributions, annuities and women's eligibility for the public benefit and consequently misestimate the gender differential. However, this bias will probably diminish over time.

3.3 Simulations

In Parts 5 and 6 we use these employment histories to simulate the accumulations, annuities, and public benefit entitlements that different groups of men and women can expect under the new systems. We simulate the case of young workers, entering the labor market currently and retiring 40-45 years later. 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 percent per year and the real rate of return on net investments is 5 percent prior to retirement. (The actual return has been much higher than this so far—for example it has averaged over 10 percent real in Chile since the start of the system— but these high rates are unlikely to continue in the long run). The return during the payout stage is assumed to be 4 percent, given the likelihood that many will choose a lower risk or fixed-rate annuity (see James and Song, 2001; James and Vittas, 2001). Sensitivity analyses

[7] The Chile estimates are based on CASEN 94, a nationally representative household survey. Our estimates are based on the urban sample — approximately 100,000 individuals age 16 or older. The Argentine data are based on the micro data set of the Encuesta Nacional de Gastos de los Hogares (ENGH) for 1996-1997, a nationally representative household survey from urban areas. The sample contains 103,858 individuals, of whom 69,895 were 16 years or older. 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 percent of the sample. For more details on data sets, potential data problems and construction of tables see James et al 2003a and b.

assuming a 3 percent real rate of return during the accumulation stage, 2 percent during annuitization, and a 0 percent rate of wage growth were also carried out. The gender differentials in this "slow growth" case were very similar to the baseline, except that the relative role of the public benefit increases dramatically. In this paper our tables show only the baseline case. (For details on the slow growth case see James, Cox Edwards, and Wong, 2003a and 2003b). Severe portfolio restrictions in Latin America 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, this would lead to a lower gender ratio.[8] Finally, throughout this analysis we abstract from inflation. As discussed briefly below, this probably leads us to understate the gender improvement from the new system.

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.[9] If workers choose an annuity, it must be price-indexed. However the MPG has been rising faster than prices. Once the MPG rises above the annuity value, retirees start getting a top-up from the government. If workers choose a gradual withdrawal they draw down their accounts every year, with the MPG level setting a floor on the draw-down rate. Once the account is exhausted, the government pays retirees a pension equal to the full MPG. The majority of retirees in Chile have annuitized. For purposes of our discussion we assume that everyone annuitizes and and we convert the expected value of the lifetime MPG payment into an actuarially equivalent monthly top-up.

We assume that all men and women have lifetimes that correspond to the gender-specific national expected life spans. In this paper we do not differentiate longevity by educational or income level. This leads to an overestimate of lifetime system progressivity. Men and women are assumed to retire at the age that is specified in each country—lower for women than for men in Chile and Argentina. In reality, we know that early retirement is common, for both genders. This will reduce the size of pension, although not necessarily the gender differential. While we start by comparing monthly benefits, to analyze transfers from different source 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 in old old age.

3.4 Taxes and costs

Throughout, this analysis concentrates on the benefit side rather than the cost side, because we do not know the future cost of the public pillar, its intergenerational burden, or its gender incidence, either in the old or new systems. Our comments on net redistributions from public benefits (transfers received minus taxes implicitly paid to finance them) are based on the simplifying assumptions

[8] In the U.S. 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 U.S. context, see Burnes and Schulz (2000) and U.S. General Accounting Office (1997). The restrictions on portfolios in Latin America during the period of our study preclude this possibility. These problems may arise in the future as portfolio choice was introduced in Chile in 2002 and this is being emulated elsewhere.

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that each cohort covers its own bill and, within each cohort, the tax burden is distributed proportionally to earnings, as proxied by the present value of lifetime own-annuities. (These assumptions and results are discussed more fully in James, Edwards and Wong, 2003a and 2003b).

3.5 The counterfactual

In Part 5 we discuss the new systems only, so there is no counterfactual. In Part 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 and so could not have delivered their promised benefits. In the long run, all these countries faced the prospect of raising taxes (which were difficult to collect) and/or reneging on their pension promises. Chile was facing financial insolvency even in the short run and Argentina was already defaulting on payments to retirees. Given this uncertainty regarding benefit payments, what 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 by 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.

3.6 Projected versus actual outcomes

Every system works in practice somewhat differently from what was expected or what was initially written on paper. This is partly due to unexpected circumstances that require system modification and partly to behavioral responses to system incentives by workers and policy-makers. This was very true of the Latin American systems in the past and will certainly be true of the new systems as well.

For example, it is well known that labor force participation rates of women are increasing so younger female cohorts may have higher relative pensions than older cohorts. The new systems themselves may accelerate this process. We have already referred to the recent modifications of the Argentinian reform; these modifications (in particular the importance of the new minimum pension) are likely to be re-modified in the coming years as economic conditions change. Similarly, the political decision to raise the MPG in Chile on par with wages rather than prices means that it is much more pervasive than was initially envisaged; this too may not continue for many more years, as the fiscal costs become apparent. Finally, recent research has found that most Chilean workers contribute to the system for only part of their working life and start withdrawing before the "normal" pension age (Edwards and James, 2005; James, Martinez and Iglesias, 2004; Berstein, Larrain and Pino, 2005). This directly reduces their accumulations and pensions. Each of these changes is likely to change the gender gap in pensions as well as the redistributive and equalizing role of public benefits. We won't really know how the system has worked, as distinct from how it is projected to work for many years—after many workers have retired and data on their behavior and incomes have become available. In the meantime, we can examine how the systems that were put in place originally would work and, most important, which design features produce these

results. This in turn will inform us of how to create new systems that are most likely to give us the gender effects that we normatively prefer.

4. Retirement Income for Women versus Men in the New System

Using the methodology just described, we estimate the monthly and lifetime benefits representative women and men would receive from private annuities, public benefits and intra-household transfers. All monetary values have been converted to 2002 U.S. dollars. (For Argentina, this exchange rate was about 1/3 the rate that obtained during out study period, prior to Argentina's fiscal crisis).

4.1 Income from Women's Own Annuities

To simplify, we assume here that all workers retire at the legal retirement age, which is 60 for women in Chile and Argentina, 65 for women in Mexico and 65 for men in all three countries. Then, women with "average" employment experience receive annuities that are only 20-50% those of men with similar educations because of their lower lifetime work and wages and earlier retirement. The benefit gap is largest in Argentina (Tables 1a and 1b)

The lower benefits for women are due partially to their earlier allowable retirement age in Chile and Argentina. While women can postpone taking their pension beyond age 60 if they desire, few do so—possibly because they do not realize the large difference in pension amount that would accrue. If women in Chile and Argentina delayed pensioning until age 65, they would collect interest for five more years and their annuities would cover five fewer years. As a result, as shown in Tables 1a and 1b, their monthly pensions would increase by almost 50 percent and the gender ratio would narrow substantially. The increase would be even larger if they worked and contributed during this period. In an individual account system these additional contributions, plus interest on them, add to the final pension in an actuarially fair manner. The equal retirement ages for men and women in Mexico is the main reason why the female/male ratio of annuities is projected to be higher than in Argentina and similar to that in Chile, despite the relatively lower wages and work histories of Mexican women.

Some women work more than average — in fact, they may work as much as men. We call these women "full-career" women. The monthly annuities of full-career women are 60 percent to 70 percent as large as those of men. The remaining difference is due to the lower wage that women have received and the smaller contributions they have therefore made.

Women with higher education have higher labor force participation rates than others; they are more like "full-career" women (except that they continue to be adversely affected by their lower retirement age). As a result, gender ratios increase with educational level.

4.2 Income from the public benefit

As previously discussed, the new systems also provide a public benefit that goes disproportionately to low earners—the minimum pension guarantee in Chile, the flat benefit and widow's flat in Argentina and the social quota in Mexico. These public benefits are all targeted to low earners. They raise the total pension of low earners by a much higher percentage than that of high earners,

Table 1a
Simulated Future Monthly Annuities and F/M Ratios from Individual Accounts (Based on 5% real return in accumulation stage, 4% in annuity stage, 2% real wage growth, data in 2002 US'$)

		Education				
		Incomplete primary	Incomplete secondary	Complete secondary	Up to 4 post secondary	5+ yrs post degree
Chile	**Average marries males, RA=65**					
	Annuity	$203	$295	$440	$612	$1,410
	Females					
	Average woman if RA=60	66	91	160	266	487
	Average woman if RA=65	97	131	233	384	721
	Full career woman, RA=65	148	200	324	445	766
	10-year woman, RA=60	39	46	60	96	154
		Incomplete primary	Incomplete secondary	Complete secondary	Some post-secondary	University degree
Argentina	**Average marries males, RA=65**					
	Annuity	$175	$260	$389	$403	$799
	Females					
	Average woman if RA=60	36	53	104	144	283
	Average woman if RA=65	54	77	152	213	415
	Full career woman, RA=65	117	161	262	274	476
	10-year woman, RA=60	25	38	49	59	99
		0 - 5	6 -8	9	10 - 12	13 +
Mexico	**Average marries males, RA=65**					
	Annuity	$289	$336	$413	$520	$891
	Females					
	Average woman if RA=60	86	103	137	222	453
	Average woman if RA=65	181	224	275	405	622
	10 year woman, RA=65	51	56	66	94	136

Note: Joint annuities are given for married men, individual annuities for women, as required by law. RA=retirement age; FC=full career woman with same labor force participation rate as men; 10-year=woman who works for 10 years, prior to having children. Wives are assumed to be 3 years younger than their husbands. Gender-specific mortality tables are used, in accordance with the practice in Latin America. Using national mortality tables, this means wives have 3-4 years greater longevity than their husbands. MPG in Chile, flat benefit in Argentina and annuity from SQ in Mexico are not included in this table.

Table 1b
Female/Male Ratio of Simulated Monthly Annuities from Individual Accounts (Based on 5% real return in accumulation stage, 4% in annuity stage, 2% real wage growth, data in 2002 US'$)

		Education				
		Incomplete primary	Incomplete secondary	Complete secondary	Up to 4 post secondary	5+ yrs post degree
Chile	**Average marries males, RA=65**					
	Annuity	100%	100%	100%	100%	100%
	Females					
	Average woman if RA=60	32%	31%	36%	43%	34%
	Average woman if RA=65	47%	44%	53%	62%	51%
	Full career woman, RA=65	73%	68%	73%	72%	54%
	10-year woman, RA=60	19%	16%	14%	16%	11%
		Incomplete primary	Incomplete secondary	Complete secondary	Some post-secondary	University degree
Argentina	**Average marries males, RA=65**					
	Annuity	100%	100%	100%	100%	100%
	Females					
	Average woman if RA=60	21%	20%	27%	36%	35%
	Average woman if RA=65	31%	30%	39%	53%	52%
	Full career woman, RA=65	67%	62%	67%	68%	60%
	10-year woman, RA=60	14%	15%	12%	15%	12%
		0 - 5	6 -8	9	10 - 12	13 +
Mexico	**Average marries males, RA=65**					
	Annuity	100%	100%	100%	100%	100%
	Females					
	Average woman if RA=60	30%	31%	33%	43%	51%
	Average woman if RA=65	63%	67%	66%	78%	70%
	10 year woman, RA=65	18%	17%	16%	18%	15%

Note: See Table 1a for definitions and sources. F/M ratio is ratio of annuities of female to male in same educational and marital category.

which also means they raise the pensions of women proportionately more than men (Table 2). But the precise effect on women depends on the design of the benefit.

Chile. Chile's reformed system has a Minimum Pension Guarantee (MPG). If the MPG is price-indexed (as it is formally), it raises the total monthly pension of the average woman who has not completed primary school by 18 percent. Average women in higher educational categories do not receive this benefit, nor do full career women, because their own annuity is projected to be above the MPG floor, and for the same reason very few men are projected to receive the public benefit. Its impact is quite small because a price-indexed MPG that is 25% of the average wage today will be only 12% by the time today's young workers retire. Since the MPG is currently more than double the official poverty line, it will keep all eligible women out of poverty. But it won't help any except the lowest earners, it becomes less relevant as it falls further behind the average wage in the economy, and it costs very little.

However, if the MPG is wage-indexed (as it is in Chile de facto, by political decisions), the story is quite different. With expected wage growth of 2 percent yearly, the guaranteed minimum pension more than doubles over the working life of today's young worker. Since it grows at the same rate as wages, it remains 25% of the average wage. Now the majority of women (even some full career women and some men) are likely to receive some MPG top-up. For women with average work histories in the bottom educational category, a wage-linked MPG will more than double their own-annuities and bring their total retirement income very close to (85 percent of) that of their male counterparts. Of course, this increased size of and access to the MPG raises its fiscal cost substantially. Thus the choice between wage- and price-indexation of the public benefit is a crucial choice that determines its costs and benefits and how these change for future cohorts.[10] Some countries, like Switzerland, choose a half-way house and index their public benefit half to wages and half to prices. In the US the starting social security benefit for each cohort rises with wages but the benefit is price-indexed after retirement.

In the discussion below we assume price-indexation, unless age-indexation is explicitly mentioned. This biases our results against women, whose relative position would improve if wage-indexation continues.

Whether price or wage-indexation is used, high earners do not receive any income from the MPG. In this sense, the MPG is more narrowly targeted toward low earners and women than the flat benefit in Argentina or the social quota in Mexico. It narrows the gender gap at the bottom end, but does nothing at the middle or top end.

Twenty years of work are required to be eligible for the MPG. Some women do not qualify because they haven't worked 20 years.[11] However, the average woman in all educational categories meets this eligibility criterion. Moreover, low earning women will be encouraged by the MPG to work 20 years even if they didn't plan to do so otherwise—but they are discouraged from working marginally more than 20 years because if their own annuity increases marginally their public benefit will decrease commensurately. For the same reason, low earning women are unlikely to

[10] Some countries, like Switzerland, choose a half-way house and index their public benefit half to wages and half to prices. In the US the starting social security benefit for each cohort rises with wages but the benefit is price-indexed after retirement.

[11] Chile also offers a noncontributory social assistance program called PASIS, which pays about 50 percent of the MPG, funded out of general revenues. This is designed to keep out of poverty the elderly who are not eligible for contributory benefits. The vast majority of its recipients are women living in rural areas.

Table 2
Projected Impact of Public Benefits on Monthly Pensions
(2002 US$)

		Education				
		1	2	3	4	5
Chile	**Married Men**					
	Annuity, RA=65	$203	$295	$440	$612	$1,410
	% increase-MPG	0	0	0	0	0
	Women with average work histories					
	Annuity, RA=60	$66	$91	$160	$266	$487
	Annuity + MPG- if price-indexed	78	91	160	266	487
	Annuity + MPG- if wage-indexed	172	172	172	266	487
	% incr.-MPG p-ind	18%	0	0	0	0
	% incr.-MPG w-ind	160%	89%	7%	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	**Married Men**					
	Annuity, RA=65	$175	$260	$389	$403	$799
	Annuity + flat	251	337	466	480	876
	% increase by flat	44%	30%	20%	19%	10%
	Women with average work histories					
	Annuity, RA=60	$36	$53	$104	$144	$283
	Annuity + flat	89	107	158	221	360
	% increase by flat	147%	102%	52%	53%	27%
	Average female/male ratios					
	Own-annuity	0.21	0.2	0.26	0.35	0.35
	Own + flat (at 65)	0.15	0.16	0.22	0.46	0.41
	Own + flat (at 60)	0.35	0.3	0.33	0.46	0.41
Mexico	**Married Men**					
	Own-ann., no SQ	$289	$336	$413	$520	$891
	Annuity incl. SQ	394	441	519	620	986
	% increase by SQ	36%	31%	25%	19%	11%
	Women with average work histories					
	Own-ann., no SQ	$87	$103	$138	$222	$454
	Annuity incl. SQ	141	157	198	289	531
	% increase by SQ	62%	52%	44%	30%	18%
	Average female/male ratios					
	Annuity if no SQ	30	0.31	0.33	0.43	0.51
	Annuity incl. SQ	0.36	0.36	0.38	0.47	0.54

Note: See Table 1a for definition of 5 education categories and other notes. MPG is converted to actuarially equivalent monthly top-up. In Argentina average women in bottom 3 educational groups receive reduced flat at 70 while in 2 top education groups they work enough to receive full flat at 65.

work past the normal retirement age, once they meet the 20-year requirement. The incentive for strategic manipulation is greater if the MPG is wage-indexed. An MPG that rises for each year of work would avoid some of these moral hazard problems.

Argentina. In Argentina, by contrast, most men are eligible for the flat public benefit and receive it regardless of income. Most women work less than the 30 years required for the full flat benefit, but if they have worked ten years they get a reduced flat benefit that begins at age 70. (This exemplifies the importance of eligibility conditions in determining the gender impact). Even though this is a smaller absolute amount than men receive, it is a much larger increment to their own-annuity (Table 3). It more than doubles the pensions of women with primary and partial secondary education. Women with post-secondary education work long enough to get the full flat benefit at 65. Additionally, married women inherit 70 percent of their husband's flat benefit, when he dies.

Since the flat and widow's flat benefit are financed, in part, by a tax on wages, the fact that men earn more than women but get a smaller benefit compared with their wages means that most women get a positive net transfer. The largest subsidies go to women who work only 10 years, contribute little but get a relatively large public benefit (For calculations of imputed taxes and net benefits see James, Edwards and Wong 2003a and b). This large benefit for "ten-year" women makes the Argentine public benefit much like a non-contributory scheme. On the one hand, this transfer provides retirement income to older women who otherwise would have little resources of their own and therefore keeps them out of poverty. On the other hand, it may discourage market work among women and in the long run make them less financially independent.

Mexico. Finally, Mexico's Social Quota (SQ) adds a flat amount to every worker's account for each day worked. This flat amount is 5.5 percent of the minimum wage (initially 1.8 percent of the average male wage and 2.6 percent of the average female wage). While the public benefit in Chile and Argentina are financed on a pay-as-you-go basis, which may imply a large hidden liability for government, Mexico's SQ is pre-funded, paid into workers' accounts long before they retire, and invested by the worker with his or her own contributions.

Because the daily size of the SQ is uniform, the percentage increment to pensions falls for high earners, as in Chile and Argentina. It adds 40-60 percent to the annuities of women with primary or partial secondary education, but only 25-30 percent to counterpart men. Women with some university education get a larger total SQ (because they work more days) but a smaller percentage increment to their own-pensions (Table 2). Because Mexico's SQ gives an extra benefit for every day of work, it is less tilted toward women than Argentina's flat benefit. But it encourages work by women more than the public benefits in Chile or Argentina.

Mexico also offers an MPG, but 25 years of work are required for eligibility. Initially the MPG was 40 percent of the average wage—a relatively high minimum. However, since it is price-indexed it will fall to less than 20 percent by the time today's young workers retire. Since most low-earning women work less than 25 years, and most men have own-annuities that exceed the MPG floor, our projections indicate that it will have little impact—if it remains price-indexed. The choice between a 20-year eligibility rule as in Chile and a 25-year rule as in Mexico turns out to be crucial for women, given their current labor force behavior.

Table 3
The Impact of Joint Annuities
r = 5% during accumulations, 4% during annuity stage, real wage growth = 2%,
(2002 US$)

		Education				
		1	2	3	4	5
Chile	**Males, retiring at 65**					
	Individual	$234	$339	$505	$703	$1,621
	Joint	203	295	440	612	1,410
	Females, retiring at 60					
	Individual	$65	$91	$161	$265	$487
	Widow's benefit	122	177	264	367	847
	Widow's pensions as % of H+W pensions	70%	70%	71%	72%	70%
Argentina	**Males, retiring at 65**					
	Individual	$210	$320	$479	$497	$962
	Joint	$175	$260	$389	$403	$799
	Females, retiring at 60					
	Individual	$36	$53	$104	$144	$283
	Widow's benefit	$122	$182	$272	$282	$559
	Widow's pensions as % of H+W pensions	78%	77%	78%	79%	79%
Mexico	**Males, retiring at 65**					
	Individual	$449	$502	$590	$707	$1,122
	Joint	394	441	518	621	985
	Females, retiring at 60					
	Individual	$141	$157	$198	$290	$532
	Widow's benefit	236	265	311	372	591
	Widow's pensions as % of H+W pensions	70%	71%	71%	73%	74%

Note: See Table 1a for educational categories. The MPG and flat are not included in this table. SQ is included since it is part of annuity. All individuals are expected to live to national average and gender-specific mortality tables are used in annuity pricing. Husband purchases joint annuity and wife purchases individual annuity. Joint annuity assumes 60% to survivor (70% in Argentina). Husbands and wives are assumed to belong to same educational group. Last row for each country gives full public + private pensions of wife after husband dies relative to total pensions of husband + wife while husband was alive.

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The Impact of Joint Annuities
r = 5% during accumulations, 4% during annuity stage, real wage growth = 2%,
(2002 US$)

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4.3 Income from joint annuities

The gender gap in retirement income from women's own annuities is offset further by joint annuities (or widow's benefits) that husbands are required to provide for their surviving wives. In Chile and Mexico, the widow gets 60 percent and in Argentina 70 percent of the husband's annuity amount. The husband pays for this by getting a smaller payout initially. These intra-household transfers are an important part of the new systems. They 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 partial withdrawal from the labor market. Some men may be myopic and fail to make arrangements to continue this arrangement on a voluntary basis when their wives become widows (Bernheim *et al*, 2001). The joint annuity requirement is a way to enforce this contract after the husband's death. When the wife is 3 years younger than her husband, joint annuities pay him 15-17 percent less per month than individual annuities, while more than doubling the monthly pension that the average widow will receive (Table 3).

The joint annuity is especially important because a widow's cost of living is estimated to be roughly 70 percent that of a couple's cost, due to household economies of scale. The widow's benefit plus her own benefit maintains her purchasing power at 70 to 75 percent of the previous household level, so her standard of living is unchanged when her husband dies. The joint annuity requirement also applies to non-married mothers of the worker's children. It protects women who did not work at all in the formal market and augments the income of those who did work. Of course, it does not protect single unattached women.

Additionally, since her husband rather than the public treasury has paid for the joint annuity, the widow is allowed to keep her own annuity in addition to the survivor's benefit. This contrasts with the previous systems in Chile, Argentina and many other countries, where women have to give up their own benefit to get the widow's benefit. Since women got little or no additional benefit from their own contributions, their participation in the labor market is penalized and discouraged in many old DB systems (including the US). In contrast, the treatment of the joint annuity encourages work under the new systems.

It is also worth noting that, when joint annuities are involved, pensions are very similar whether gender-specific or unisex mortality tables are used (James, Edwards and Wong, 2003b). When purchasing individual annuities, unisex mortality tables produce higher payouts for women and lower payouts for men as compared with gender-specific tables, but in the case of joint annuities this choice of mortality tables makes little difference since joint annuity pricing takes into account the combined lifetimes of husband and wife. Thus, the joint annuity requirement helps defuse the issue of whether to require unisex tables, which is very controversial in many countries. Of course, this applies only to married couples or registered partners; the issue still remains important for single men and women.

4.4 Total lifetime pension from own-annuity, public benefit and joint annuity

Our discussion now shifts to total lifetime benefits, rather than monthly pension incomes, because the widow's benefit, and in Argentina the reduced flat benefit, start at a much later age than benefits based on own earnings. Moreover, in Chile and Argentina the retirement age for women is earlier than that for men and also earlier than that for Mexico women. And the normal retirement age

therefore ask: (1) did the gender gap in pensions get larger or smaller in the process of the reform? And (2) which sub-groups of women (and men) gained or lost the most? We find that, in general, the gender ratio is projected to improve as a result of the reform, and the greatest relative gains will be received by low earning married women (and single men). Full-career women gained more than ten-year women in Chile and Mexico, consistent with their emphasis on work incentives, but ten-year women gained more in Argentina.

5.1 A priori expectations about the new versus the old systems

The old systems provided defined benefits according to a formula that depended on wages and years of contributions. In general, the formula gave generous benefits to workers who contributed for only ten years and then withdrew from the labor market; these were disproportionately women.[13] Married women got a widow's benefit that was 50 percent of their husband's pension in Chile, 75 percent in Argentina, and 90 percent in Mexico. Implicitly, unisex tables were used. Women could retire five years earlier than men with no actuarial penalty in Chile and Argentina. A minimum

Table 4
Present Value of Lifetime Annuity, Joint Annuity and Public Benefit
r = 5% during accumulation, 4% during annuity stage, 4% discount rate after age 65,
real wage growth = 2%
(thousands of 2002 US$)

		Education				
		1	2	3	4	5
Chile	**Average man**					
	Individual annuity	$32.00	$46.30	$69.00	$96.10	$221.50
	Joint annuity (if married)	-4.1	-6	-9	-12.5	-28.7
	Average woman					
	Own annuity	$14.60	$20.30	$35.70	$58.90	$108.30
	MPG (if price-indexed)	2.4	0	0	0	0
	MPG (if wage-indexed)	23.5	17.8	2.4	0	0
	Jt. annuity (if married)	5	7.7	10.7	15	34.5
	% incr. from MPG (p-ind)	18%	0	0	0	0
	% incr from MPG (w-ind)	160%	89%	7%	0	0
	% incr. from joint ann.	31%	36%	30%	25%	32%
	Full Career woman					
	Own annuity	$23.30	$31.50	$50.90	$69.90	$120.30
	% incr. from joint ann.	19%	23%	21%	21%	29%
	10 year woman					
	Own annuity	$8.70	$10.20	$13.40	$21.30	$34.20
	% incr. due to joint ann.	57%	75%	80%	70%	101%

Note: For educational categories see Table 1a. Married FC and 10-year women get same joint annuity and other widow's benefits as average women, but this constitutes different percentages of their own-annuity.

[13] Several sub-systems co-existed in Chile and Argentina, but a common formula paid 50 percent of pensionable salary for the first 10 years of work plus 1 percent per year thereafter. In Mexico, the old system paid a proportion of the base salary for the first 10 years plus an increment for every year over 10. The proportion of base varied negatively with wages, ranging from 13 percent for high earners to 80 percent for low earners. The increment for additional years varied positively with wages, ranging from .56 percent to 2.45 percent per year (see James et al. 2003a and b for details).

Table 4 (Continued)

		Education				
		1	2	3	4	5
Argentina	Individual annuity	$27.40	$41.70	$62.40	$64.60	$125.20
	Flat	10	10	10	10	10
	Joint annuity (if married)	-4.6	-7.9	-11.8	-12.2	-21.2
	% incr. from flat	44%	30%	20%	19%	10%
	Average woman					
	Own-annuity	$8.00	$11.50	$22.70	$31.60	$62.00
	Flat	5.5	5.5	5.5	16.9	16.9
	Widow's flat	2.5	2.5	2.5	2.5	2.5
	Jt. annuity (if married)	5.6	8.3	12.5	12.9	25.7
	% incr. from flat	68%	47%	24%	53%	27%
	% incr. from widow's flat	31%	21%	11%	8%	4%
	% incr. from joint ann.	70%	72%	55%	41%	41%
	FC woman					
	Own annuity	$18.00	$24.80	$40.40	$42.30	$73.50
	Flat	11.9	$11.90	11.9	11.9	11.9
	% incr. from flat	66%	48%	29%	28%	16%
	% incr. from widow's flat	14%	10%	6%	6%	3%
	% incr. from joint ann.	31%	34%	31%	31%	35%
	10 year woman					
	Own annuity	$5.50	$8.30	$10.60	$12.90	$21.80
	Flat	5.5	5.5	5.5	5.5	5.5
	% incr. from flat	100%	66%	52%	43%	25%
	% incr. from widow's flat	45%	30%	24%	19%	11%
	% incr. From joint ann.	102%	100%	118%	100%	118%
Mexico	**Average man**					
	Individual annuity-no SQ	45.6	53.2	65.1	82.3	140.7
	SQ	16.6	16.6	16.6	15.7	14.9
	Joint annuity (if married)	-7.6	-8.4	-9.9	-11.9	-19
	% increase from SQ	41%	35%	29%	22%	12%
	Average woman					
	Own annuity if no SQ	13.5	15.9	21.3	34.4	70.4
	SQ to own-account	8.3	8.4	9.2	10.5	12
	Joint annuity (if married.)	8.6	9.6	11.3	13.5	21.6
	% incr. from SQ	62%	53%	44%	30%	17%
	% incr. from jt. annuity	64%	60%	53%	39%	31%
	Full career woman					
	Own annuity if no SQ	28	34.7	42.5	62.6	96.2
	SQ	16.6	16.6	16.6	15.7	14.9
	% incr. from SQ	59%	48%	39%	25%	15%
	% incr. from jt annuity	31%	28%	27%	22%	22%
	10 year woman					
	Own annuity if no SQ	8.2	8.9	10.7	15.1	21.8
	SQ	6.1	6.1	6.1	6.1	6.1
	% incr. from SQ	74%	69%	56%	40%	28%
	% incr. from jt. annuity	105%	108%	106%	89%	99%

Table 5
Female/Male Ratios of Expected Present Value of Lifetime Benefits in New vs. Old Systems

		Education				
		1	2	3	4	5
Chile	**Old system**					
	Av., single	0.66	0.58	0.91	0.95	0.74
	Av., married	0.67	0.62	0.91	0.95	0.75
	C, single	0.81	0.71	0.93	0.68	0.69
	FC, married	0.81	0.71	0.93	0.68	0.69
	10 yr, married	0.66	0.51	0.49	0.54	0.40
	New system					
	Av., single-own ann.	0.52	0.50	0.60	0.70	0.56
	Av., single	0.61	0.50	0.60	0.70	0.56
	Av., married	0.79	0.68	0.77	0.88	0.74
	FC, single	0.84	0.78	0.85	0.84	0.62
	FC, married	1.02	0.96	1.03	1.01	0.80
	10 yr, married	0.49	0.43	0.40	0.43	0.36
Argentina	**Old system**					
	Av., single	0.19	0.13	0.40	0.68	0.74
	Av., married	0.31	0.27	0.51	0.75	0.80
	C, single	0.74	0.60	0.57	0.81	0.74
	FC, married	0.76	0.65	0.63	0.81	0.76
	10 yr, married	0.31	0.29	0.24	0.29	0.27
	New system					
	Av., single-own ann.	0.35	0.34	0.45	0.60	0.60
	Av., single	0.41	0.39	0.47	0.78	0.75
	Av., married	0.66	0.63	0.71	1.02	0.94
	FC, single	0.91	0.84	0.86	0.87	0.81
	FC, married	1.16	1.08	1.11	1.11	1.00
	10 yr, married	0.58	0.56	0.51	0.54	0.49
Mexico	**Old system**					
	Av., single	0.35	0.29	0.26	0.30	0.53
	Av., married	0.58	0.53	0.5	0.54	0.76
	C, single	0.63	0.54	0.57	0.66	0.82
	FC, married	0.86	0.78	0.80	0.90	1.06
	10 yr, married	0.47	0.41	0.36	0.31	0.29
	New system					
	Av., single-own ann.	0.36	0.36	0.39	0.49	0.58
	Av., single	0.40	0.40	0.42	0.52	0.60
	Av., married	0.56	0.56	0.58	0.68	0.76
	FC, single	0.82	0.84	0.82	0.91	0.81
	FC, married	0.97	1.00	0.98	1.07	0.97
	10 yr, married	0.42	0.40	0.39	0.40	0.36

Note: Denominator is married man in same educational category. In new system single women get own-annuity + public benefit. Married women additionally get joint annuity. See text for methodology, Table 1a for educational categories.

pension protected low earning women who satisfied the eligibility requirements, in all three countries.

Contrary to these provisions that favored women, the old systems based their benefits on the wage earned during the last few working years, which favored men. A woman who worked at ages 20 to 30, before child-bearing, would find her pension based on wages that would appear to be very low compared with prevailing wages when she retired at age 60 to 65, because of inflation as well as real wage growth in the meantime. Moreover, this formula for the pensionable wage base favored workers with steep age-earnings profiles, who tended to be highly educated men. By contrast, in the new system contributions that are made in early adulthood add more to present value of lifetime benefits than contributions made in the final years, because of compound interest that far exceeds the growth rate of prices or wages.

In the old systems in Chile and Argentina women usually 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. In the new systems, women keep their own benefit as well as the requisite joint annuity. Further, as we have seen, the new public benefits are tilted toward low earners, who are predominantly women. Thus there are pushes and pulls in both directions a priori, so the impact of the reforms on gender ratios is an empirical question, which we shall explore.

It is also worth noting that pensions in the old system often were not indexed for inflation, yet inflation was high in these countries, devaluing the benefit. This especially hurt women, who lived longer and therefore experienced greater price increases. In contrast, annuities in the new system are price-indexed in Chile and Mexico plans to index them also. As described above, the public benefit in the new system is indexed for inflation or higher. We abstract from inflation because of its uneven nature and the unpredictable *ad hoc* responses that were made by the old systems. This biases our results against the new systems.

5.2 Comparing gender ratios under the new and old systems

We move on now to measure the ratios of lifetime benefits under the old and new systems for men and women with the same education. We find that (1) female/male ratios fall when only the own-annuity is taken into account; (2) results are mixed when both the public and private benefits are included; (3) these ratios rise dramatically when benefits from the joint annuity are added; and (4) in all three countries, for most educational categories and levels of labor force attachment, the relative position of married women rises in the new system compared with the old. This is due to the targeting of transfers to low earners, the fact that women do not have to give up their own pension to receive the widow's benefit and the heavier weight placed by the new system on early contributions made by women (Table 6). For example, in Mexico the female/male ratio of lifetime pension for a married full career woman with a middle school education is projected to rise from 65 percent based on her own annuity, to 82 percent including the social quota, to 98 percent when the joint annuity is added, compared with 80 percent for her counterpart in the old system.

5.3 Which sub-groups benefited (or lost) the most?

To further analyze which sub-groups benefited the most from the reform, we calculate the ratio of post-reform/pre-reform lifetime benefits for various marital and labor market groups. We focus on

changes in relative position, because we don't know what the absolute benefit would have been under the counterfactual. We analyze how the position of men and women change relative to men in the top education category. (Table 6). As expected, we found the biggest gainers to be:

1) low earners (as proxied by low educational category) of both genders, but especially women, who are the lowest earners in each category, and therefore benefit disproportionately from the public benefit;

Table 6
Ratios of Expected Present Value'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	1.4	1.4	1.1	1.1
	Women					
	Average single	1.3	1.0	0.8	0.7	0.8
	Average married	1.5	1.3	1.0	0.9	1.0
	Full career single	1.3	1.3	1.1	1.2	0.9
	Full career married	1.6	1.6	1.3	1.4	1.2
	Ten year married	1.0	1.0	1.0	0.8	0.9
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
	Women					
	Average single	3.2	3.7	1.1	1.2	0.9
	Average married	3.2	3.0	1.3	1.5	1.2
	Full career single	1.8	1.8	1.4	1.2	1.0
	Full career married	2.3	2.1	1.6	1.5	1.3
	Ten year married	2.8	2.5	1.9	2.0	1.8
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
	Women					
	Average single	2.1	2.1	2.0	1.5	1.1
	Average married	1.8	1.6	1.4	1.1	1.0
	Full career single	2.4	2.4	1.8	1.2	1.0
	Full career married	2.1	1.9	1.5	1.1	0.9
	Ten year married	1.6	1.5	1.4	1.2	1.2

Note: Includes lifetime benefits from own-annuity, public pillar and joint annuity (for married). Each cell i shows $(PVnew/PVold)_i/(PVnew/PVold)_k$ where (PVnew/PVold) = 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. For methodology see text.

2) married women who work in the labor market—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;[14]

3) And single men—because they no longer have to subsidize the widow's benefit that was financed from the common pool in the old systems.

In all three countries, workers in the two lowest educational groups gain more than those in the two highest groups. Married women and single men generally gain more than married men. In Chile and Argentina married women gain more than single women (but vice versa in Mexico—see note 14).

In Chile and Mexico, full-career women gain the most from the reform—and over time this may induce more women to participate in the labor market full career. In Chile, the relative position of ten-year women actually falls. But in Argentina, average and 10-year women register the largest relative gains because of that country's flat benefit for retirees with only ten years of work.

5.4 Single women

Given the importance of the joint annuity, how do single women fare? This question is important since an increasing proportion of women are divorced or never married. Divorce just became legal in Chile in 2004. Cohabitation is not uncommon among low educated groups in Latin America. 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.

In the new systems, in all three countries, lifetime pensions of full career single women are lower than those of men (because of their smaller wages and greater longevity) or of full career married women (because they don't gain from the joint annuity). In Argentina and Mexico, in the new system, the pension income of single full career women rises relative to that of single or married men in most educational categories. This occurs because of the relatively generous public benefit that flattens total benefits in these countries. In contrast, in Chile, where they have little likelihood of collecting an equalizing public benefit, their position falls relative to single men but rises relative to married men (Table 6).

Concerns about the situation of single women could be addressed through measures such as: the use of unisex mortality tables in pricing annuities (which redistributes from men in general to women in general), partial wage indexation of public benefits for the very old (which redistributes to those who live longer), or equalizing their retirement age with that of men (which requires them to work as long as men in order to be able to raise their old age consumption). Basically, the pensions of single women are likely to approach those of men only when their wages and work experience approach those of men.

[14] In Mexico we expect to find that single women will gain relatively more than married women, because married women previously got a survivor's benefit that was 90% of their husband's benefit and kept their own benefit as well. This does not change the fact that married women get higher lifetime benefits than single women with the same education and work histories, in the new system as well as the old, because of the widow's benefit.

6. Implications for Social Security Reform in Other Countries

Based on synthetic work and wage histories constructed out of data from household surveys, we have simulated the future retirement benefits of men and women in the new multi-pillar systems and compared them with counterfactual benefits in the old systems in Chile, Argentina and Mexico. Our empirical investigations show that (1) women's own-annuities are lower than those of men in multi-pillar pension schemes, as they would be in any scheme that ties benefits closely to contributions; but (2) women are recipients of net public transfers and private intra-household transfers through joint pensions that are required in the new systems. As a result of these forces, (3) women have gained more than men from the reforms—the lifetime gender ratio has improved. These ratios would improve still more if the retirement age for men and women were equalized. Indeed, for married full career women, who work as much as men and retire at the same age, lifetime ratios equal and sometimes exceed 100 percent.

Thus, individual account systems can improve relative outcomes for women and have done so in Latin America. But the gains to women are not inevitable. The favorable outcomes we have described for women in Latin America contrast with outcomes in the transition economies of Eastern and Central Europe, 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 survivor's benefits and the failure to require joint annuities (Castel and Fox, 2001; Woycicka, 2001). The gender impact of individual account systems is not preordained; it depends largely on detailed design features of these reforms. Other countries contemplating such reforms, as well as countries that are trying to improve traditional defined benefit systems, can draw a number of lessons on how to improve gender outcomes:

An indexed safety net and minimum pension are especially important for women. Because of their lower lifetime earnings, a redistributive public benefit is particularly important to women. The MPG in Chile, the social quota in Mexico and the flat benefit in Argentina are projected to improve women's lifetime pensions substantially and thereby narrow the gender gap. Two dangers to be avoided are: eligibility rules that largely exclude women (such as the 25-years required for the MPG in Mexico) and rules that discourage their participation in the formal labor market (such as the high offset rate for low earners who have just met the 20-year eligibility rule in Chile). The MPG and Argentina's flat benefit could be redesigned to increase with years worked, thereby providing positive work incentives. Mexico's SQ already does this.

It is essential that the public benefit should be price-indexed. Otherwise, its purchasing power will fall over the lifetime of the retiree, and this will be particularly harmful to women, who live longer than men. In the old Latin American systems the public benefit was not automatically price-indexed. In the reformed systems it is. But this may not be enough. Our simulations for Chile showed that if the MPG is price-indexed it will have a very limited equalizing role in the future, as wages and own-annuities grow so most retirees would have own-annuities that exceed a constant real MPG. Although the MPG now keeps all retirees above the poverty line, this would not be true in the future if the poverty line rises with the average standard of living in society. In practice, Chile's MPG has been increased by the government on par with wages over the past 20 years; in effect, it has been wage-indexed, so is likely to be received by many women (as well as men). But a wage-indexed MPG is costlier and produces larger work disincentives than a price-

indexed MPG. The issue of price versus wage indexation of the public benefit has recently surfaced in the US, as part of the debate over how to reform social security. Policy-makers and citizens will have to evaluate this trade-off between saving money versus maintaining the relevance of the safety net over time.[15]

6.1 Annuitization is important for women

Annuitization, which provides a guaranteed income for life, is especially important for women in view of their greater longevity. This is automatically achieved by a defined benefit system but it could also be built into an individual account system. In Latin America workers can either purchase an annuity or take gradual withdrawals; lump sum withdrawals are not allowed unless the person's pension exceeds a high threshold. However, if the person lives longer than expected, the gradual withdrawal may become very small, while voluntary savings have been used up. This problem can only be prevented by mandatory annuitization, at least up to a threshold that is well above the poverty line.

Inflation insurance is important for the income from the individual account, just as for the public benefit. In Latin America, during the accumulation stage account balances grow with the rate of interest, which is generally greater than the inflation rate. During the payout stage, annuities are price-indexed in Chile, and Mexico plans to do the same. This is facilitated in Chile by the prevalence of indexed bonds and other financial instruments in which insurance companies can invest. It will be more difficult and costly in many other countries because of the paucity of indexed instruments.

6.2 Joint pensions should be required in the payout stage

Women with low years of market work have often done so as part of an informal family contract in which the husband agrees to support the wife in exchange for the time she spends caring for the family. In Latin America this contract is enforced even after his death by requiring that all workers purchase survivors' insurance before retirement and husbands purchase joint pensions upon retirement. This is an important requirement to build into any individual account system. An added bonus of joint annuities is that they defuse the contentious unisex issue. The systems we are analyzing do not contain detailed mechanisms for how to handle accumulations and joint annuities in the case of divorce (in Chile divorce just became legal in 2004); these rights clearly need to be defined.

Financing spousal and widow's benefits from the common pool, as in defined benefit systems, penalizes single men and women, who must pay into the pool even though they are not eligible for

[15] The US social security system right now price indexes the benefit once the individual has retired, but wage indexes the first pension received so that successive cohorts start out with pensions that have gone up with wage growth. Some policy-makers have proposed full price indexation, so that the real benefit amount will be frozen in today's real value. Critics point out that this will lead the benefit to eventually become much smaller relative to the average wage and the average standard of living in society. One compromise would wage index for the bottom half while price indexing for the upper half. Another compromise would index the entire public benefit half to wages and half to prices (or to longevity increases, which is roughly equivalent).

this benefit.[16] In the United States, a spouse over the age of 65 receives a benefit that is 50%of her husband 's benefit, even if she hasn't worked and contributed, and after he dies she gets 100 percent of his benefit. This means that married couples receive larger benefits than (and are subsidized by) singles with the same total earnings and couples with one wage-earner get larger benefits than (and are subsidized by) couples in which both husband and wife work, with the same total earnings. Furthermore, the nonworking wife in a single-earner family gets a larger benefit than the wife in a dual earner family with the same total family income. For examples see Shirley and Spiegler, 1998.

It also penalizes working women. In the old Chilean and Argentinian schemes, as well as the current US system and many other countries, working women must choose between their own benefit or the widow's benefit — they can't get both. Thus, women who work in the market for much of their lives pay substantial taxes with little or no incremental benefit. In contrast, in the new Latin American systems the widow keeps her own annuity as well as the joint annuity, since the latter has been financed by the husband. Market work by the wife is rewarded rather than being penalized, but this does not impose an additional burden on the public treasury. Their right to keep their own annuity in addition to the joint annuity is a major reason for the narrowed gender gap in the new systems in these countries. (This could also be built into traditional DB systems, by reducing the benefits of husbands on an actuarially fair basis in order to finance the survivors' benefits to their wives. Widows could then keep their own benefit in addition to the survivors' benefit, thereby improving their well-being as well as the treasury's well-being).

6.3 Equalizing retirement ages for men and women and providing work incentives will substantially narrow the gender gap

Part of the reason for the lower own-annuities of women in Chile and Argentina is the fact that retirement age for women is 5 years earlier than that of men. This is very common in other countries as well. Under reasonable assumptions about rates of return, women's annuities would go up by 50 percent if they retired 5 years later (because they earn interest in the meantime and the annuity must cover fewer years). This would substantially narrow the gender gap in pensions, without requiring public or household transfers. It would ensure that lifetime retirement savings are allocated to old old age instead of young old age. This is especially important for single women, who will not receive a boost to their incomes from the joint annuity in old old age. It may encourage additional work by older women, who must postpone access to their retirement savings, and will therefore increase the country's productive capacity. For the same reason, as noted above, it is important to build work incentives into the public benefit, both in traditional and new multi-pillar systems.

[16] In the United States, a spouse over the age of 65 receives a benefit that is 50 percent of her husband's benefit, even if she hasn't worked and contributed, and after he dies she gets 100 percent of his benefit. This means that married couples receive larger benefits than (and are subsidized by) singles with the same total earnings and couples with one wage-earner get larger benefits than (and are subsidized by) couples in which both husband and wife work, with the same total earnings. Furthermore, the nonworking wife in a single-earner family gets a larger benefit than the wife in a dual earner family with the same total family income. For examples see Shirley and Spiegler, 1998.

6.4 Which women should benefit from redistributions?

Among low earners, each country must decide whether it wishes to target toward those who have chosen to work fewer years versus those whose productive capacity is low so they can only earn low wage rates. Many countries are very conflicted on this issue. As we have seen, Chile, Argentina and Mexico have made different decisions about which groups of women should be subsidized. In doing so, they also are encouraging different behaviors. In particular, their rewards for women who engage in market work versus home-work differ.

Mexico's SQ is a flat payment per day worked, so it is strongly pro-market work. It redistributes most to those who work a lot in the market, although at low wage rates. In contrast, Argentina subsidizes women who stay at home via a flat benefit that they receive so long as they have participated in the labor market for ten years. They get the same benefit whether they are married or single. This redistribution gives older women a subsidized income even if they had the educational capacity to work and earn high wages, but chose not to do so. Chile is ambivalent on this issue. Its MPG redistributes to women who have worked limited amounts and earned low wage rates while doing so (both conditions must be satisfied to have a pension that falls below the MPG)—but women get this subsidy only if they have worked in the market for at least 20 years. Other countries solve this problem by treating years spent caring for children as part of working time, even if women have not contributed. Along similar lines, husbands could be required to contribute to the individual accounts of their spouses who work in the home, through the income tax system. This would reduce the need for a public subsidy.

Women as a group gained in these three Latin American countries, but some gaps and potential problems emerge. Single women and those cohabiting 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 and retirement age remain relatively low. Regulations governing the disposition of assets in the case of divorced women still need to be spelled out. The earlier allowable retirement age of women in Chile and Argentina reduces their years of work and may leave them with a small income in very old age. If the public benefit is price-indexed rather than wage-indexed, eventually it may become so small compared with wages that it becomes irrelevant for future cohorts. As investment options expands, women may choose more conservative investment portfolios, which would yield them lower rates of return and pensions. In other ways—such as early retirement of men, rising participation rates of women and low density of contributions for both genders—results in the real world may differ from our simulations, but we will not know this for many years.

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. If the family system does not work for these women, a noncontributory program of some sort is needed to keep them out of poverty. How such a program should be structured and how it relates to the contributory scheme is a complex topic that goes beyond the purview of this paper.

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