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The Gender Impact of Pension Reform

A Cross-Country Analysis

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Abstract

Pension systems may have a different impact on gender because women are less likely than men to work in formal labor markets and earn lower wages when they do. Recent multipillar 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 it will help women by the removal of distortions that favored men and the better targeted redistributions in the new systems.

To test these conflicting claims and to analyze more generally the gender effect of alternative pension systems, James, Edwards, and Wong examine the differential impact of the new and old systems in three Latin American countries—Argentina, Chile, and Mexico. Based on household survey data, they simulate the wage and employment histories of representative men and women, the pensions they are likely to generate

under the new and old rules, and the relative gains or losses of men and women because of the reform.

The authors find that women do accumulate private annuities that are only 30–40 percent those of men in the new systems. But 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 of these transfers, total lifetime retirement benefits for women reach 60–80 percent those of men, and for "full career" women they equal or exceed benefits of men. Also as a result, 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 in all three countries. Private intra-household transfers from husband to wife in the form of joint annuities play the largest role.

The Gender Impact of Pension Reform: A Cross-Country Analysis*

by

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The majority of old people are women and poverty among the old is concentrated among very old women. Therefore, in designing a pension system and pension reform it is essential to take account of the gender impact. Employment-based old age systems pose a problem in this regard, since women are less likely than men to work in formal labor markets and earn lower wages when they do. Recent multi-pillar pension reforms include a defined contribution (DC) pillar that tightens the link between payroll contributions and benefits, which leads critics to argue that they will fail to protect 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. They hypothesize separating the redistributive and earnings-related parts of the systems into two pillars—one DC and one DB—makes the new DB smaller, more transparent and more redistributive toward low earners such as women.

In order to test these conflicting claims about multi-pillar reforms, 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. Based on household survey data, we simulate the wage and employment histories of representative men and women, and the pensions that these are likely to generate under the new and old rules.[1] Our basic intent is to examine the gender impact of alternative pension system designs, with policy implications that would apply more broadly. While both efficiency and equity considerations are involved, our emphasis is on relative rather than absolute changes, on distributional rather than efficiency effects.

We ask four basic questions:

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. Which 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?

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 redistributions 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, 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 in all three countries. 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. Women who live though periods of prolonged slow growth receive more protection but 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, so pension reformers must think about which women and families have priority needs for redistributions. Moreover, transfers and taxes become incentives, so policy-makers must think about which behaviors they want to encourage as efficient.

These differential outcomes stem from four major design features that we discuss in detail:

o   Relative retirement ages for men and women;

o   Targeting and eligibility conditions for the public pillar;

- Indexation provisions; and
- Restrictions on payouts--in particular, survivors' benefits and joint annuity requirements.

These are the design features upon which policy-makers concerned with gender impact should focus.

Part I starts with an outline of how men and women typically differ, and how alternative pension systems might therefore be expected to affect them differentially. Part II describes the multi-pillar reforms in Latin America, with particular reference to provisions that have differential gender impacts, and summarizes our methodology. Part III simulates expected annuities for men and women from the new private pillar. Parts IV and V 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. Part VI evaluates which groups gained and lost the most from the shift to a new system. Part VII briefly compares the outcomes in Latin America with those in the transition economies, where the policy choices have been quite different. The Conclusion points to key design features that determine the gender impact of pension reform, applicable to other regions as well.

This paper focuses on women who are in the formal social security system. Many women, particularly in rural areas, are not in the system at all. While some are protected by the joint annuity, many members of this group are dependent on the extended family for support, supplemented by social assistance. How non-contributory schemes can best be structured to benefit those who need it—without incurring high costs or tax evasion and crowding out personal saving or family support—is a vital question that should be the topic of another study.

I. Why Do Pension Systems and Pension Reforms Have a Gender Impact?

Most public pension programs—both the traditional DB and the newer multi-pillar 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.[2] These social security systems have developed for a variety of reasons:

- o If benefits are linked to earnings and contributions, workers may be willing to contribute over and above the taxes they would otherwise pay, since they perceive this as a payment for private services that are earmarked for them rather than a tax for the provision of public goods.

- o They may be less likely to evade these contributions, a consideration which is particularly important in developing countries where tax enforcement mechanisms are weak.

- o Payroll taxes are relatively easy to collect, particularly from large employers.

- o Pensions are viewed as a source of income that replaces part of the wage, when old age makes work difficult or less productive, hence a connection between pension benefits and wages seems logical.

However, these contributory employment-based systems pose a problem for women, who are less likely to have worked and contributed for many years, have earned lower wages when working, and are likely to outlive their husbands who provide the family income. As a result of these socio-economic and demographic differences, the same pension policy may have different effects on men and women and pension reform can have important gender effects. Moreover, social security systems often include rules that reflect these social norms and explicitly differentiate between men and women.

Differential labor force histories

Labor force participation rates. Women traditionally have less continuous labor force attachment than men. The intra-family division of labor has typically resulted in men working in the market, women in the home. Even when women work in the market, this attachment tends to be temporary and part-time. It is more likely to be in the informal sector, which is not covered by formal social security schemes. Women's work may be interrupted to have children and raise them, care for elderly parents or sick members of the family, etc. These behaviors may be thought of as voluntary individual decisions, or as the result of social norms over which the individual has limited control. In either case, the consequence is that women, especially married women, are in the system for far fewer years over their lifetimes—roughly 50-70% as many years in our three sample

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countries (Table 3). Although women's labor market experience is converging to that of men, the process is gradual and traditional roles continue to dominate in many developing countries.[3]

Wages. Women typically earn less per week or year of work than men, even after controlling for age and education. This may be due in part to their lower labor force attachment (past experience and expected future tenure), in part to occupational segregation, and in part to social norms that condone lower pay to women. In our 3 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 (Table 4). The combination of fewer years of work and lower wage rates means that 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 women.[4]

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 5 years earlier than men in Chile and Argentina. This enables them to retire at the same time as their husbands, who tend to be several years older. Early retirement may seem to be a privilege—that women who derive disutility from work appreciate--but it is a privilege that costs in terms of lower pension rights earned. This cost may not be fully realized until the woman is too old to reverse her decision to retire early. It may also discourage employers from hiring or promoting older women, for fear they will retire soon. 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.

Demographic and biological differences

Longevity. Besides these labor market and policy differences are important demographic-biological differences between men and women. Women at age 60 have a life expectancy that is 3-5 years greater than that of men, in most countries. In Chile a 60-year-old women is likely to live another 23 years, while a 60-year-old man lives another 19 and a 65-year-old man lives another 15.5. 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 annuitization, that provides longevity insurance, is especially important to

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women. But 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 also means that they are more likely to become widows than men are to become widowers; hence survivors' pensions are of key importance to women. The social custom for husbands to be older than wives exacerbates this importance of survivors' benefits. In Chile women in urban areas were almost as likely as men to receive a pension. However, for women the pension is a widow's or social assistance pension in almost half the cases, while for men it is almost always an own-earned pension. In Mexico the disparity is even greater (Table 2). 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 when their husband dies, due to scale economies. As a result of women's greater longevity, during which they outlive their husbands and use up their family savings, poverty among the old tends to be concentrated among women, when they are very old—unless provisions are included making that outcome less likely. Survivors' benefits are often included in social security systems, but the precise arrangements vary. Joint annuities play a major role in the new Latin American systems.

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-pensions for women, especially women who specialize in home-work. Of course, in pure defined contribution systems, a lower pension is directly attributable to lower contributions, if men and women have both been subject to the same rate of return on investments. In this sense, lower pensions for women might be interpreted as "equal treatment." However, it also may signal a very low standard of living for older women, which social security was designed to avoid.

In part to mitigate this eventuality, all multi-pillar systems 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, eligibility

rules, 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 between the genders. We expect that the common requirement of survivors' benefits and joint annuities will generate an important intra-family redistribution toward women, including women who have not worked in the formal labor market themselves. In most European countries as well as the US, unisex tables are required for employment-related annuities, to equalize annual pension amounts despite gender differences in life expectancy. This is not yet required in Latin America. We examine the degree to which joint annuities serve as an alternative to unisex tables.

Finally, the new systems replaced pay-as-you-go DB systems where contributions and benefits were only loosely linked. The old systems favored women in some ways but hurt them in others; thus the net impact of the change I uncertain a priori. We examine this question empirically. We also briefly compare the gender impact of the reforms in Latin America with that in the transition economies, where policy choices and outcomes appear to be quite different

II 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. Each new system includes a public DB that takes the form of a minimum pension guarantee (MPG) in Chile, a "social quota" (plus an MPG) in Mexico,

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and a flat benefit in Argentina. Each country restricted payout arrangements. We focus on urban workers, because social security coverage in rural areas is very limited.

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). The old system was insolvent, having promised benefits that exceeded contributions, with the disparity differing across individuals in uneven ways that encouraged evasion. The object of the reform was to make the system largely funded (except for the MPG), and therefore fiscally sustainable; to link benefits more closely to contributions, thereby reducing the tax element and the incentive to evade; and to make the redistributive element very explicit and targeted.

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 2001). Affiliation with the new system is mandatory for new employees in the labor force, voluntary but encouraged for workers already in the labor force at the date of the reform and for the self-employed. Almost all employees are now in the new system. 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. (Earlier retirement and lump sum distributions are permitted if the account balance is large enough to finance an annuity that exceeds a specified floor). 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. The MPG is not formally indexed but so far has risen over time faster than prices, on par with wages, on an ad hoc basis. It is based purely on the individual's own pension, without taking other income or family circumstances into account.[5]

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 of all, instead of a minimum pension guarantee Argentina provides a basic "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. To help keep costs under control, eligibility is restricted to workers with at least 30 years of contributions—a provision that excludes most women. As an alternative that applies mainly to women, workers who reach age 70 with 10 years of contributions are granted a reduced flat pension that is 70% of the regular amount. The flat benefit is not formally indexed and so far has remained constant over time. Given the fiscal problems that Argentina has been experiencing in recent years, its public pillar has been under major revision and the government is considering tightening eligibility conditions for the reduced flat. However, 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 to 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) or lump sum for amounts in excess of a specified floor.

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.[6] Upon retirement at age 65 for both genders, married workers have a choice between a gradual withdrawal spread over both spouse's lifetimes and a joint annuity.

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, a percentage that will decline as wages rise faster than prices over time. Adding the SQ to the worker's 6.5% contribution brings the total 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 the incentive for informal sector workers 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 back into the old system upon retirement. In this paper we focus on new workers who are not entitled to this opt-back provision.

Table 1 presents a brief summary of the new and old systems in the three countries and Table 2 presents some key data on wages, employment and retirement income.

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 don't 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 building up individual accounts 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. 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.[7] While we focus on the average person in each category, we also make some attempt to estimate the dispersion within each cell. 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 (Appendix A). With the exception of young women in Chile, fewer than a quarter of our sample had any post-secondary education. 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 (Table 3). 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 changes in age-specific female labor force participation rates were not taken into account. 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 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 B on data sources). 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. 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. 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. Thus full time equivalent years are smaller and full time wages are larger for urban working women than the numbers given for the latter two countries. 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. For this reason we may have underestimated the gender differential in pensions for the average woman stemming from the private pillar. However, this bias will probably diminish

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age and age of death vary by gender and country and benefits from the joint annuity start flowing to widows late in old age.

The counterfactual. In Parts III-V we discuss the new systems only, so there is no counterfactual. In Part VI we apply the DB formulae of the old systems to assess 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 in the long or medium term. Argentina was already defaulting on its payments. 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 is tantamount to a counterfactual in which the fiscal adjustment to insolvency in the old systems is distributionally neutral, involving equi-proportional benefit cuts or tax increases for each group, while leaving relative positions unchanged.[9]

Taxes. Throughout, this analysis concentrates on the benefit side rather than the finance side, because we don't 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 roughly proportional to earnings.

III. Annuities for Men and Women from the Private Pillar

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 (Table 3). Using secondary school graduates as an example, by the time they reach the age of 65 the average male affiliate has contributed 38 years while the average female affiliate has contributed only 27 years. 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

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than 50% for the majority who didn't even finish secondary school. In Mexico, too, the gender ratio of experience is less than 50%. In all cases, the experience disparity is smaller for young women, before they marry. Also 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.

In all three countries younger women who work earn almost as much as men (Table 4). However, earnings diverge as they age—the age-earnings profile is much steeper for men—perhaps because of the returns 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. For example, a Chilean man with a secondary degree age 46-50 earns US$535 monthly, while a comparable woman earns $326. The pattern is similar in Mexico, although absolute amounts are lower. In Argentina a male secondary school graduate in his late 40's earns US$1105 while a comparable female earns $666. (Our Argentinean data are from 1996-97 and use 1997 exchange rates. 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). While highly educated women work almost as much as men, their monthly earnings do not converge and, in fact, they diverge further in the highest educational category in Chile.[10]

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 5). 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

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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 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.[11]

Impact of retirement age on own-annuities

Equality of 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 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.

IV. 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 (and MPG) in Mexico and the flat pension in Argentina—and by restrictions on payouts in the private pillar, especially the joint annuity. 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. Each country reflects a different ethos in its public

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pillar: poverty-prevention in Chile, equalization but at different levels for those with weak and strong labor force attachment in Argentina, and equal pensions for equal work in Mexico. Also, these public pillars have very different costs and different cost-containment techniques, which impact women in particular. Chile's narrowly targeted MPG is the least expensive and it raises the gender ratio only for women in the lowest group; Mexico's work-related SQ increases gender ratios in all educational categories, but by smaller amounts; and Argentina's flat benefit raises gender ratios more substantially in all income groups—but only after age 70, and at the greatest cost. 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 6 and Figure 2).

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 hand. This shows up in differing eligibility rules, work-benefit linkages and retirement age provisions. As a result, they provide different relative subsidies to different sub-groups of women, particularly to those who specialize in home-work versus formal labor market work.

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. Since it goes (only) to the least well off (among those in the formal labor market), it may be considered an application of Rawles' principle for redistribution. Gender ratios are narrowed for those below the truncation point, who get raised to the MPG level. Those above the truncation point are unaffected. As we shall see, this poverty prevention emphasis is different from the concept of equity embodied in the Mexican and Argentinean plans. Given this narrow targeting of Chile's MPG, its fiscal cost will be extremely low in the baseline case. The

estimated cost of a price-indexed MPG in a moderate growth scenario is about 1%of payroll.[12] In virtually all scenarios in Chile, women are the major recipients—they are the least well off (Table 6).

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 (20% or $15) monthly top-up to own-pension from the MPG, helping to narrow the gender gap for low earners.[13] Her pension is consequently 39% of her male counterpart's, rather than 32% that she would get without the MPG, and she also improves her position relative to females with more education (Table 6).[14]

Women who work full career (like men) do not get the MPG in any educational category, because their own pensions exceed the MPG. Thus, the MPG is mainly directed toward low earners who earn low wage rates *and* b) work less than full career. It is insurance against transient labor force attachment, mainly by women. Since labor market attachment is volitional, to a large extent, some would question this as an equitable and efficient arrangement. In the presence of a minimum pension guarantee, moral hazard regarding work decisions is obviously present (see below). Chile counters these issues by imposing a requirement that women work at least 20 years to be eligible; this limits the number of eligible women and the size of the top-up needed.[15]

Years required for eligibility and strategic behavior. The twenty-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 10 years, as in Argentina for the reduced flat, many middle class married women who chose to stay at home might have qualified, a subsidy that would be expensive and that many would consider ill-targeted. If the bar were raised to 25 years, as in Mexico, the average woman with less than a secondary degree would fail the test for eligibility. In that case, the very group that qualifies on own-pension grounds would be ruled out on years of contributions grounds and no one would get the MPG— 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 adjust and converge around that point, as a result of strategic behavior. Women with slightly less than 20 years will increase their working time to qualify for the MPG. In contrast, women 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 pensions for women with low educational levels around the neighborhood of the MPG in the future—a kind of poverty-level trap. Although in general Chile's scheme rewards formal sector work through its private pillar (DC plan) and through the treatment of the widow's pension (see below), the MPG encourages strategic behavior and discourages work for low earning women.[16] This potential for strategic behavior and work disincentive could be avoided if the guaranteed pension increased continuously with years of work above a floor, rather than simply being a target level with an on-off switch for eligibility.

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, in Chile. One possible policy change that is under discussion is to raise the female retirement age to parity with that of men (to age 65). This policy change would push ahead by 5 years the date when women can begin drawing on their retirement savings, it would increase by 5 the years during which investment earnings accrue, and it would reduce by 5 the years during which they collect annuities. The combination of these forces would increase women's own-annuity by almost 50%--from $76 to $112 monthly in the lowest educational category—even if women don't do any additional work during that 5-year period. This brings the average woman in all educational categories above the MPG level so she loses the MPG for her entire period of retirement. Because of this crowd-out effect, the MPG poses a strong disincentive to these women to postpone their retirement beyond age 60—for every dollar of monthly pension income they earn, they get a commensurate cut in their MPG.[17]

Wage versus price-indexation of MPG: do future cohorts of women benefit? The low projected cost of the MPG is due in large part to the fact that it is expected to remain constant in real value and 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 10% of the average wage instead of 25%, as it is now, under these assumptions. Ten years later the need for the MPG top-up would virtually disappear as wages and accumulations continue to grow relative to a constant MPG. If it were formally price indexed this would protect retirees from inflation but the protected floor would fall relative to average wage for future cohorts, and it would eventually become 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. (The safety net in Mexico and Argentina also 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 this issue, so we have modeled both price and wage indexation. 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. If ad hoc wage indexation continues, it would reach $200 by the time today's young workers retire. 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%. A much broader group of women (and even some men) would receive some top-up. Differentials between high and low earning women would be compressed (Table 6A). Of course, this increase in transfers would increase 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—for men as well as women. This could be countered by tying the MPG level continuously to work experience, as in Mexico.[18]

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. Accumulations simply do not build up very far under low wage growth and investment returns. The MPG makes up the difference, up to $91, so total expenditures on the MPG escalate sharply. Consequently, under slow

growth we find that some men with low educational levels qualify for an MPG top-up, and most women qualify, including many with university education (Table 6B and Appendix C). The gender ratio is narrowed dramatically; in some categories it almost disappears. Of course, the government might encounter a financing problem, under these circumstances. But 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.[19]

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 middle or high end, nor does it help women who worked in the formal labor market less than 20 years. It distorts marginal work decisions 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. Its impact will be maintained if it rises with wage growth, but then its monetary and moral hazard costs also rise. Work effort by women might be increased, gender gap decreased and future cohorts better protected if retirement age were equalized for the two genders and the MPG were partially wage-indexed but tied positively and continuously to work.

The two-tiered flat benefit in Argentina

Eligibility for the basic 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. (Recall that we are using 1997 exchange rates in converting to US $'s.) It was initially equivalent to 30% of the average male wage, 45% of the average female wage and 130% of the poverty line. It is not formally indexed and has remained constant over time. 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. Among men, the flat benefit increases their total pension by percentages ranging from 25-40% for those without secondary education, to 10-20% for those with university education. Because it adds a substantial uniform amount to a disparate wage-based annuity, it is very effective at

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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 university education, who can begin receiving the full flat at age 60. This is the converse of the eligibility situation in Chile (Table 6 and Figure 2).

Reduced basic benefit for women. Most women are eligible for the reduced basic benefit of $140 at age 70, which accrues to workers who have more than 10 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 pensions is lower than in Chile or Mexico. But it jumps up to the same range as Chile and Mexico—30-45%--at age 70.[20] The flat benefit is the same in absolute value during periods of slow growth, but much larger relative to own-annuity, thereby providing insurance that pays off to both genders, but especially to women, living during prolonged economic slowdown. Both the flat and reduced flat benefits will diminish in relative importance over time as wages rise, but will remain significant factors 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 10 years in the formal labor market, but no marginal benefit from contributing to the public pillar over years 10-29: a person who has worked for 10 years gets the same reduced flat benefit and a much larger subsidy than one who has contributed for 29 years. Then, in year 30, the public benefit jumps discontinuously to full flat beginning at age 60. the equity of this arrangement is questionable, nor does it seem consistent with positive incentives to participate in the formal sector over the range where most women are now (18-25 years of work). Since the public benefit is a large part of the total system in Argentina, these equity, efficiency and evasion problems stemming from eligibility conditions and discontinuities also loom large. 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).

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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, in toto. 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 the 6.5% contributed toward the private pillar. It is more expensive than Chile's MPG but far less expensive than Argentina's flat. 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 the least tilted toward women but the most effective at incentivizing work and contributions (Table 6). 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

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) are criticized on grounds that they 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.[21] 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.

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 all reduce old age poverty among women. However, the different forms that these public pillars take have quite different distributional effects on sub-groups among women. These variations reflect different concepts of equity and different trade-offs between equality and work incentives.

To analyze these effects, we shift to a lifetime rather than a monthly unit of comparison. This is necessary because the retirement age varies across countries and sub-groups. In Chile women retire at age 60 while men retire at 65. In Argentina high earning women are eligible for the full flat at age 60 while men get it at 65 and low earning women, who typically work fewer years, are eligible for the reduced flat at 70. In Mexico both men and women retire at 65. In each case, we calculate the expected present value (EPV) of the lifetime stream of income from the public and private pillars, as valued at age 65.[22] In all three countries, lifetime pension gender differentials are smaller than monthly differentials because women live longer than men and (in Chile and Argentina) retire earlier. In Chile only low wage women with transient labor force attachment receive a benefit from the public pillar (the rest only receive money from the private pillar), while in Argentina and Mexico all workers receive some public 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 don't 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

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groups receive a net transfer and the subsidy component is largest for women in the lowest educational categories (Table 7).

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.[23] And in Argentina ten-year women get the highest rate of return. The formal sector work disincentives from the public pillar in Argentina and Chile partially offset the positive work incentives stemming from the DC pillar and the joint annuity, especially for low earners.

VI. 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. From the viewpoint of gender equality, this is the biggest innovation in the new systems. Women live longer than men and are typically younger than their spouses. Thus annuitization, including price-indexation of benefits, is very important to women, who may otherwise run out of money before they die. Thus also, widows are more common than widowers, so survivors' benefits are particularly important to women when the husband is working and joint annuities are vital after retirement. For these reasons, all three countries include rules regarding annuitization and survivors' benefits, which 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 (Figure 3). They are the main mechanisms by which the new social security systems protect older women. Single women and those cohabiting without a formal marriage do not benefit from this transfer.

Survivors' benefits while husband is working

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In traditional DB systems 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 (far 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, as our representative men and women are all assumed to live an "average" lifetime. To this extent we understate the transfer from men to women in the new systems.

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 annuities 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; the joint annuity is a way to fulfill this obligation after the husband's death.[24] In our main simulations given above we therefore assumed joint annuities for married men (but not for women). The cost of the joint annuity (in terms of lower payout to the husband) depends on the age of the wife. When we assume that the wife is 3 years younger than the husband, joint annuities pay 12-17% less per month than individual annuities (Table 8). The average annual widow's benefit after the husband's death is usually greater than her own-pension.

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 she had a pension of her own. The widow's 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 household purchasing power at 60-70%

of previous levels. This could, of course, be achieved without a joint annuity if each household were far-sighted, rational and took the welfare of both members fully into account. However, if households are myopic, or if the husband places greater weight on consumption during the period when he will be alive, the household may not save and insure enough voluntarily and may, in fact, use up its pre-retirement savings as well (for empirical evidence see Bernheim et al 2003). A similar objective could be achieved through earning-sharing or if husbands were required to fund separate accounts for non-working wives; however, this might be difficult to enforce. The joint annuity is easily monitored and it ensures that something is left over for the surviving wife. It postpones consumption and places greater income under the direct control of the woman, when she becomes a widow. It is likely to reduce the incidence of poverty among very old women. It accomplishes this without putting a burden on single men and women through the common pool, as the old systems did. The clear equity principle in societies that impose this requirement is that it is a family responsibility to support very old women, where they can afford to do so.

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 (Table 7). 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, just at the point when she most needs it most, to avoid a drastic drop in household income. The lifetime transfer through the joint annuity far exceeds the transfer from the public pillar, in practically every educational group in all three countries. It adds about 30-70% to the lifetime benefit of the average woman in all educational categories. For ten-year women, the joint annuity almost doubles the wife's own-annuity in Chile and more than doubles it in Argentina and Mexico--this is the main 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%. In contrast, full career single or divorced women or those cohabiting

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without a formal marriage are estimated to have lifetime benefits 70-80% those of single men (Tables 7 and 10). 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.[25]

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. None of our three countries require this, but it is likely to be required in Europe and the US and is under consideration in Latin America. Unisex tables 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 (Table 8). The public pillar implicitly uses a unisex concept, as annual benefits are not tied explicitly to gender.

Gender is one of the main dimensions of risk categorization used by insurance companies, unless regulations require unisex risk rating. Requiring unisex tables 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, as (1) each company tries to attract the better risks (men), (2) companies that end up with a disproportionate number of the bad risks (women) will make losses, and (3) men are discouraged from purchasing annuities because their expected lifetime payments are less than the premiums they are charged.

The decision about whether or not to require unisex mortality tables in view of these potential problems depends in part on a value judgment about whether to redistribute from one gender to another and in part on whether other more efficient ways have been adopted to achieve social goals such as poverty prevention among older women. If unisex tables are required they should probably be accompanied by a risk-adjustment mechanism—imposing a tax per man and using it to finance a subsidy per woman, in order to make both genders equally profitable to the insurance company and

alleviate the supply side problems mentioned above (points #1 and 2). However, the demand side selection problem will still remain if annuitization is voluntary, and may lead the market for individual annuities to be dominated by women. In that case, unisex tables that are based on average annuitant mortality will effectively use gender-specific female rates, and men will be worse off without making women better off.

Fortunately, 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 (Table 8). To the degree that married couples predominate, requiring joint annuities may be a less divisive alternative to unisex tables or a way to avoid selection and market instability problems in the context of a unisex requirement. (Annuities market issues are discussed further in James et al 1999a and b and 2001a and b).

VI. Gender Impact of the Shift From the Old to the New Systems

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 don't know what the counterfactual would have been (higher taxes? lower 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, so relative positions would have been unchanged (see previous discussion of counterfactual).

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 9). 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 10). We focus on lifetime benefits because retirement age changed as 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.

Description of old systems

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

B = aYS, where:
B = monthly pension benefits,
Y = number of contributory years,
S = average salary during last few years of work,
a = incremental benefit per year of work.

Often, a was quite high for the first ten years or so, and much lower thereafter. Sometimes it provided a minimum benefit for ten years of contributions.[26] Thus, this formula often provided a generous benefit for women who worked for only a short time and then withdrew from the labor market. In our three sample countries, the first ten years of contributions produced a very high replacement rate, but additional years added relatively little. Women were more likely than men to work for 10-20 years and then leave the formal labor market. Married women who spent little time in the formal labor market 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 five years 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 who are predominantly 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

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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 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 own contributions. Contributions represented a pure tax for most working women, thereby discouraging their participation in the labor force. This was also the law in Argentina (law 18-037, article 68 #33) although it was very unevenly enforce there. 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 at retirement age 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.

Inflation

Finally, the failure of the old systems to index for inflation was a major disadvantage to all workers, but especially to women. In these simulations we do did not take inflation into account, although inflation played a large role in discrediting the old systems of these countries. Pensionable salaries were based on past wages that were usually not indexed up for inflation. Once a person retired, benefits were 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. In fact, such lags were the major way that governments created the appearance of solvency in the old systems that were actually insolvent. The impact of inflation was very idiosyncratic, depending exactly on how adjustments were made. Usually inflation posed a particular problem 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. But if a minimum pension existed and was adjusted more readily than higher pensions, this would have given an advantage to women.

In contrast, in the new systems: (1) 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. (2) International diversification of investments is permitted, which further protects pension funds from country-specific inflation; (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 inflation. In Mexico public pillar benefits are price-indexed and regulations call for annuities to be indexed-- but it is not clear whether private insurance companies will be able to provide this product and if they do, whether it will be credible and cost-effective (see James et al 2001a, 2001b).

We abstract from inflation because both the rate of price increase and the type and speed of pension adjustment were not consistent across countries and even within a given country they varied considerably over time—but these effects were always strong and negative. If we had taken inflation into account, the real value of expected benefits in the old systems would have been far lower, the increment in value from the new system would show up as much higher, and often these effects were particularly beneficial for women.

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 pre-reform 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 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.

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 (Table 9 and 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 relative 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) they 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 10 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 3-4 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. 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 those who live longer), or through later retirement age--at least equal to with that of men (which reallocates one's own old age income from early to old old age).

VIII. The Gender Impact of Pension Reform in the Transition Economies[27]

At the same time that the Latin American countries were reforming their systems, the transition economies of Eastern and Central Europe and the former Soviet Union were facing huge financial strains in their systems, which required them to reform also. Thus far, Kazakhstan, Poland, Hungary, Latvia and Croatia have instituted multi-pillar reforms and several others are in the process of doing so. The data in these countries do not allow the same sort of detailed analysis that we have described above, but some preliminary effects are apparent and the contrast with Latin America is illuminating.

On the one hand, the magnitude of the gender gap in DC pensions is much smaller in the transition economies, due to higher work propensities and more uniform wages for women in this region. On the other hand, women do not benefit from offsetting transfers from the public pillar or regulations over payouts from the private pillar to the same extent as in Latin America or in the old Communist system. In most cases (Kazakhstan being the exception) the public pillar is far larger and less targeted than those in Latin America. And unlike Latin America, the joint annuity has not yet become an equalizer of lifetime pensions between the genders. As a result, in the transition economies, projected monthly and lifetime pensions for women are less than those for men in the new systems, while they were very close previously. Gender inequality appears to be increasing as a result of the new systems interacting with new labor market behaviors.

While the details of the pension reforms vary across the different transition economies, they have certain features in common: 1) a closer linkage between benefits and contributions through the adoption of a DC pillar; 2) a public pillar that is smaller than it was before but is nevertheless (except for Kazakhstan) much larger and less

targeted toward low earners than that in most Latin American countries; 3) a higher—but still quite low and not equalized--retirement age for women and men; 4) a reduction in special privileges for women that previously existed, such as pension credits for time spend on maternity leave or child care; 5) a weakening and in some cases elimination of survivors' benefits and a continuation of the old system prohibition on receiving own-pension and widow's pension simultaneously; and 6) an absence of firm decisions, so far, on how the annuity stage of the private pillar will be handled.

Thus, the public pillar in most of these countries is not meant to be an instrument of redistribution to women and low earners, as in Latin America. Rather, equity has been defined as personal responsibility and payment in line with work and contributions, in both pillars. As for private intra-household transfers, it is expected that unisex and joint annuities will play a large role, but this has not yet been legislated in most of the region. Moreover, many couples live together without legal marriage, and divorce is more common than in Latin America, so the problem of single older women looms larger in the transition economies. Finally, unlike Chile, these countries lack the indexed financial instruments that would enable low cost indexed annuities.

Given the close linkage between benefits and contributions both in the public and private pillars, labor force participation rates, wage rates and retirement age now matter. Yet, just as they begin to matter, a growing gap has appeared in the work histories of men and women. This combination of forces means that projected pension gender ratios have fallen to 50-60% or even less. Simulations for Poland (by Chlon in Woycicka 2001) indicate that pensions received by women would be only 45% as much as those of men if gender-specific mortality tables are used for annuitization. This increases to 57% if unisex mortality tables are used for annuitization, and 73% if retirement age is equalized at 65 and women work 4 out of the 5 extra years. The remaining differential of 27% is due mainly to wage disparities between men and women. These gender ratios may be compared with much higher numbers under the old system: 81% based on current labor market behavior and 95-100% with old behavior.

In Poland and several other transition economies, joint annuities are not yet required, although they are under consideration. In general, it is not clear whether indexed annuities and unisex tables will be mandated and, if so, whether the necessary ancillary

steps (such as issuing indexed government bonds and setting up a risk adjustment mechanism) will be taken to make them feasible. If survivors' benefits are weakened, if joint annuities are not required, if women must choose between own benefit and the widow's benefit from the public pillar, and if fewer women are married anyway, then older women may face a problem in maintaining their standard of living and very old women may find themselves living close to the poverty line.

VIII. Conclusion

Our empirical investigations show 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 that raise their rate of return on contributions above that of men. As a result of these forces (3) women are the major recipients of redistributions and 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. 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. Joint annuity requirements play the largest role. These transfers, taken together, raise women's lifetime pensions to a level that is 60-80% that of men and 100% or more for full career married women. 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. The gender gap is narrowed further for women who live during periods of slow growth, since disparate own-accumulations are smaller and the equalizing public pillar is relatively larger.

Some caveats: While women as a group gained in our three Latin American countries, different groups of women benefited the most in each case and some gaps emerge. 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 and

retirement age remain relatively low. 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. 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 the private pillar earns a rate of return that will generally exceed the rate of inflation and, in Chile, can be converted into a price-indexed annuity upon retirement. They also benefit from the price-indexed public benefit in Mexico. However, automatic price indexation is still missing in Chile and Argentina, which could hurt very old women. Moreover, since the public benefit isn't wage-indexed it will not rise in real value through time, it will gradually diminish in size relative to workers' wage and own-annuity, and its equalizing impact will disappear for future generations. (Chile has increased the MPG with wages on an ad hoc basis, perhaps facilitated by the relatively low cost of its MPG, and offers a 10%r MPG increment for very old pensioners).

Finally, this paper has dealt 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 that we have just 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 from the reform, due to the removal of privileges they had in the old system, 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:

- 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.
- 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.

These policy implications are broadly generalizeable to all countries that have adopted multi-pillar systems.[28]

For those who are married, a key social choice concerns the division of responsibility between the family and society at large for the welfare of older women who have spent much of their lives providing household services. Solutions such as joint annuities, earnings-sharing and viewing retirement savings as community property in case of divorce come down squarely in favor of family responsibility that is legally enforced. In contrast, solutions that grant generous credits for the first 10 years of contributions and additional credits for years of child-care or elder care, financed by the common pool, are implicitly a statement that much of the benefits from these activities are external to the family directly involved, so the costs should also be borne externally.

For single women who do not benefit from the joint annuity, solutions are more difficult because the pension differential stemming from the wage differential will remain, even if they work full career. This applies to any earning-related scheme, whether public or private. Both for single and married women, a complex collective choice must be made about competing social objectives and redistributive goals. Is the main policy objective to: 1) keep older women out of absolute poverty, 2) keep them out of relative poverty (compared with the average wage level in society) or 3) achieve greater gender equality in monthly pensions, even above the poverty line? Which design pattern is "best" depends on value judgments that are inherent in these differing definitions of "equity" and the willingness to trade-off equity for work incentives and lower fiscal costs. In our sample countries women as a group have gained substantially from the targeted public pillar and the formalization of family responsibility in the new systems, but different sub-groups have benefited the most in each case and controversial issues concerning work incentives for women and protection for single, very old and future generations of women still remain.

Table 1—Main features of Old and New Systems[1]

A. Chile

	Old System	New System
Structure	PAYG DB	Pillar II: funded individual accounts (IA's) Pillar I: minimum pension guarantee (MPG)
Contribution rate	26%	13% to Pillar II;[1] MPG financed from general revenues
Benefits	50% of base salary + 1% for every year > 10 up to maximum of 70% base salary	Pillar II: annuity from IA Pillar I: MPG
Base salary	Average of last 5 years (final 3 years indexed)	Not relevant
Pensionable age	Men-65; women-60	Men-age 65; women-60
Years for eligibility	10 years	20 years for MPG; no minimum for IA
Pension if worked fewer years	0	Annuity from IA accumulation
Indexation provisions	No indexation	Price indexation of annuity in Pillar II Ad hoc increases of MPG
Minimum pension	No minimum	MPG (about 27% of male average wage) after 20 years
Widows	50% of husband's pension *or* own pension	60% of husband's pension (joint annuity) + own annuity

Notes:

1. Contribution rates given for individual accounts for Chile and Argentina include approximately 3% of payroll for survivors and disability insurance plus administrative costs. For Mexico the contribution rate does not include survivors and disability insurance, which are handled separately.

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B. Argentina[1]	Old System	New System
Structure	PAYG DB	Pillar II: funded individual accounts (IA's) or public DB Pillar I: flat or reduced flat benefit
Contribution rate	27% (lower before 1994)	11% to Pillar II 6-16% to Pillar I (varies by region and time)
Benefits	JO: 70% of base salary + 1% for every year over 30; JEA: 50% of base + 1% for every year over 10	Pillar II: Annuity from IA; or public DB (.85%*years of service*salary) Pillar I: flat = about 30% of male average wage+1% extra for yrs > 30; or reduced flat at age 70 (21% of average wage)
Base salary	Average of 3 highest annual salaries within last 10 yrs	For public Pillar II: average of last 10 years wage; not relevant for private Pillar II
Pensionable age	JO: Men-age 60; women-55 JEA: age 65	Men-age 65; women-60; Reduced flat: age 70
Years for eligibility	JO: 20 years contributions (15 before 1991); JEA: 10 years service	30 years for flat benefit 10 years for reduced flat no minimum for IA
Pension if worked fewer yrs	0	Annuity from IA accumulation
Indexation provisions	Ad hoc	Public benefit ad hoc (has been constant); Private annuity not indexed
Minimum pension	$150 after 10 years' service	$140 after 10 years' service
Widows	75% of husband's pension and/or own pension	70% of husband's pension (joint annuity) + own annuity

Notes:

1. Argentina had special provisions for the self-employed and many special regimes. We focus here on the main schemes for employees: JO= Jubilacion Ordinaria; JEA = Jubilacion por Edad Avanzada. The JO applied to those with 20 years of contributions, while the smaller JEA applied to those with 10-20 years of contributions. However, the old scheme changed frequently and wasn't always implemented as written, especially in the absence of records. Widow's benefit was treated unevenly. The new system also has an ordinary flat benefit for 30+ years of service and a reduced flat for 10-30 years of service. However, the government is considering tightening conditions for the reduced flat.

C. Mexico

	Old System	New System
Structure	PAYG DB	Pillar II: Funded individual accounts (IA's) Pillar I: Social quota (SQ) + minimum pension guarantee (MPG)
Contribution rate	8.5% (incl. .425% from govt.) + 2% (SAR, 1992)	6.5% (incl. .225% from govt.) + 5.5% of minimum wage from govt (SQ) + 5% to INFONAVIT; SQ + MPG financed from general revenues[1]
Benefits	DB: 80-100% of base salary (formula on separate page)	Pillar II: annuity from IA + INFONAVIT Pillar I: annuity from SQ + MPG
Base salary	Average of last 250 working weeks	Not relevant
Pensionable age	65	65
Years for eligibility	10 years	25 years for MPG; no minimum requirement for IA
Pension if worked fewer yrs	0	Annuity from IA accumulation
Indexation provisions	none	Annuity, SQ and MPG are price-indexed[2]
Minimum pension	1 minimum wage after 10 years' contributions[2]	1 minimum wage after 25 years' contributions[2]
Widows	90 % of husband's pension + own pension	60% of husband's pension (joint annuity) + own annuity

Notes:

1. The social quota started at 2.2% of the average wage. In the future, if the minimum wage goes up with price inflation while the average wage rises faster because of real wage growth, this percentage will fall. INFONAVIT is a housing fund from which workers can borrow to help finance the purchase of a home. This existed before the pension reform. As part of the reform, any balance in the worker's INFONAVIT account at time of retirement is incorporated into the person's retirement account. The rate of return on INFONAVIT has been very low—less than the rate of inflation. Thus, INFONAVIT will add something to the worker's pension, but much less than a 5% contribution to the retirement account would.

2. Under the old system the minimum pension = minimum wage. Linkage of minimum wage to average wage was ad hoc. Under new system, SQ and MPG are formally linked to CPI. Mexico also plans for private annuity to be price-indexed but feasibility and cost remain to be determined.

TABLE 2: Basic Demographic and Economic Data

Summary Data	Argentina		Chile		Mexico	
	men	women	men	women	men	women
1. Among working age population (16-65):						
% currently employed	70.8%	40.0%	75.2%	38.0%	83.7%	44.1%
% ever employed	n.a.	n.a.	89.8%	70.5%	92.6%	78.5%
% affiliated to SSS	75.5%		66.6%	41.6%	31.6%	14.6%
2. Among older popul. (60+):						
% who receive own pension	49.7%	48.3%	67.6%	35.4%	30.5%	5.4%
% who receive other pensions			4.4%	25.6%	.03%	9.4%
% who live in extended families	22.3%	36.6%	42.8%	52.5%	35.9%	44.6%
% who get monetary transfers from extended family	7.7%	6.2%	NA	NA	15.0%	17.5%
3. Life expectancy:						
At age 60 (gender specific)	17.8	22.5	19.1	22.8	19.2	22.3
At age 65 (gender specific)	14.5	18.4	15.5	18.9	15.8	18.5
Unisex at retirement age	16.5	20.2	17.2	21.0	17.0	17.0
4. Wages and pensions:						
Average monthly wage (US$s)	$661	$445	$335	$245	$299	$214
Minimum W. (as % of average)	30.3%	44.9%	37.6%	51.4%	33.1%	46.3%
MPG or flat (as % of av. wage)	30.3%	44.9%	27%	37.2%	33.1%	46.3%
Social Assistance Pension	NA	NA	12.8%	17.6%	NA	NA
Poverty line (as % of av. Wage)	23.6%	35.1%	21.8%	29.9%	NA	NA

Data sources and notes:

For section 1, numbers are for urban population in household surveys described in Appendix B. Data are from 1994 (Chile), 1996-97 (Argentina), and 1997 (Mexico). Affiliation to the social security system in Argentina is from SAFJP: "Proyecto Indicadores de Control Previsional Etapa 2 - Informe Final." (1999).

For section 2, Chile and Argentina, numbers are from surveys described in Appendix B. For Argentina breakdown between own and other pensions is not available. For Mexico, data refer to country as a whole, from Parker and Wong (2001), using household survey data. Own pensions refer to old age, disability and severance; other pensions refer to widows and survivor benefits.

For section 3 data are for population as a whole; for Chile and Argentina from CELADE (1998), "American Latina: Proyecciones de Poblacion 1970-2050," Demographic Bulletin 61; for Mexico from Partida, Virgilio, 1998 (CONAPO, Mexico).

For section 4, data refer to our sample and sample dates, as described in Appendix B (minimum wage, MPG and flat decline through time as % of average wage due to price indexation). In Argentina and Mexico there is no social welfare program targeted towards the elderly. The Mexican program (Progresa) is targeted towards families with children.

Argentinean currency is converted to US$s at 1997 exchange rates, 1 for 1. In 2002, peso fell to 25-30% of US$, so wage and pension values would be 25-30% of stated values. Exchange rate for Chile was Ch$413.45=US$1 and in Mexico 8 pesos=US$1.

Table 3: Estimated Years of Contributions by Age, Education and Gender

A. Chile[1]

Males

Age	Schooling				
	Incomplete primary	Incomplete secondary	Complete secondary	up to 4 post secondary	5+ year post secondary
16 – 20	3.37	3.02	1.65	1.28	0.00
21 – 25	3.65	3.89	4.19	4.07	2.79
26 – 30	3.63	4.13	4.49	4.32	4.46
31 – 35	3.84	4.29	4.70	4.70	4.87
36 – 40	3.97	4.30	4.69	4.62	4.90
41 – 45	4.40	4.35	4.53	4.47	4.75
46 – 50	3.89	4.24	4.12	4.23	4.71
51 – 55	3.74	4.20	3.97	4.01	4.77
56 – 60	3.03	3.32	3.70	3.83	4.66
61 – 65	2.46	2.31	2.25	3.34	3.06
Total 16-65	35.98	38.05	38.29	38.97	38.97

Females

Age					
16 – 20	3.64	2.85	1.39	1.21	0.00
21 – 25	3.20	3.66	3.92	3.91	3.26
26 – 30	2.96	3.52	3.33	3.78	4.61
31 – 35	1.64	1.92	2.94	3.74	4.23
36 – 40	2.35	2.83	3.37	3.71	4.82
41 – 45	2.44	2.91	3.37	4.37	4.61
46 – 50	2.09	2.21	3.38	3.36	4.65
51 – 55	2.54	2.331	2.47	3.44	4.63
56 – 60	1.63	1.85	2.38	4.16	3.96
61 – 65	0.93	0.11	0.25	0.24	1.28
Total 16-65	23.42	24.17	26.80	32.92	36.05

Notes:
1. Based on labor force experience of a cross-section of adults in urban areas who worked at some points and are affiliated to the social security system.
We assume that the "typical" man and woman within each schooling category accumulates contributions as a single person first, gets married, and continues to accumulate contributions as a married person afterwards. The marriage age for the "typical" man and woman is the age at which 50% of the corresponding category is married. See Appendix B for more details on data sources.

B. Argentina[1]

Males

Age	Schooling				
	Incomplete primary	Incomplete secondary	Complete secondary	up to 4 post secondary	5+ year post secondary
16 – 20	3.25	2.33	3.85	1.67	0.00
21 – 25	3.94	4.53	4.53	3.17	4.69
26 – 30	4.27	4.78	4.85	4.39	4.92
31 – 35	4.20	4.87	4.93	4.73	4.94
36 – 40	4.66	4.75	4.89	4.97	4.90
41 – 45	4.68	4.80	4.87	4.94	4.89
46 – 50	4.54	4.68	4.86	4.86	4.93
51 – 55	4.29	4.51	4.42	4.64	4.81
56 – 60	3.86	3.99	3.96	3.88	4.65
61 – 65	1.24	1.41	1.66	1.89	2.08
Total 16-65	38.93	40.74	42.82	39.14	40.86

Females

Age					
16 – 20	1.60	1.31	3.27	1.16	0.00
21 – 25	1.11	2.44	4.32	2.92	4.58
26 – 30	1.87	1.91	2.22	3.72	4.63
31 – 35	2.10	2.30	2.62	3.61	4.31
36 – 40	2.32	2.47	2.65	2.89	4.18
41 – 45	2.58	2.55	2.93	3.98	4.18
46 – 50	2.37	2.53	2.93	3.75	4.61
51 – 55	2.12	1.88	2.29	3.15	3.97
56 – 60	1.38	1.70	1.63	2.54	3.31
61 - 65	0.47	0.44	0.40	0.77.	1.34
Total 16-65	17.92	19.53	25.26	29.49	34.43

Notes:
1. Based on labor force experience of a cross-section of adults in urban areas covering most of the Argentine population. On marital status see footnote for Chile. For data sources see Appendix B.

C. Mexico[1]

Age:	0-5	Schooling 6-8	9	10-12	13+
Men					
16-20	4.38	4.29	4.17	3.51	2.96
21-25	4.62	4.78	4.78	4.47	3.80
26-30	4.85	4.95	4.90	4.95	4.72
31-35	4.89	4.88	4.93	4.90	4.95
36-40	4.89	4.87	4.93	4.88	4.87
41-45	4.82	4.88	4.86	4.85	4.91
46-50	4.71	4.63	4.68	4.78	4.80
51-55	4.48	4.41	4.39	4.46	4.49
56-60	4.10	3.84	3.85	4.04	4.24
61-65	3.26	2.79	3.06	3.04	3.06
Total 16-65:	45.00	44.33	44.55	43.89	42.83
Women					
Age:					
16-20	3.44	3.99	3.89	3.64	3.23
21-25	1.55	1.50	2.55	3.72	3.85
26-30	1.90	1.70	1.90	2.30	3.65
31-35	2.57	2.02	2.10	2.42	3.40
36-40	2.30	2.23	2.42	2.73	3.26
41-45	2.34	2.24	2.60	2.59	3.49
46-50	2.07	2.05	2.05	2.54	3.41
51-55	2.11	1.65	1.81	1.75	2.81
56-60	1.57	1.39	1.74	1.65	2.32
61-65	1.08	1.17	0.79	1.00	2.29
Total 16- 65:	20.93	19.92	21.90	24.36	31.71

Notes:
Based on data from "more urban" areas defined as communities with 100,000 people or more. On marital status see footnote for Chile. For data sources see Appendix B.

Table 4: Average Monthly Wage by Age, Education and Gender

A. Chile—Urban areas (in 1994 US$'s)[1]

Males

Age	Schooling				
	incomplete primary	incomplete secondary	Complete secondary	up to 4 post secondary	5+ year post secondary
16 – 20	$119	$150	$176	$184	
21 – 25	148	176	215	288	$758
26 – 30	163	204	261	376	866
31 – 35	169	230	323	473	1,166
36 – 40	184	251	367	541	1,268
41 – 45	214	280	423	601	1,307
46 – 50	227	347	535	653	1,556
51 – 55	220	310	488	599	1,441
56 – 60	224	329	479	681	1,313
61 – 65	197	297	391	582	1,242

Females

Age					
16 – 20	$117	$116	$152	$161	
21 – 25	120	147	183	231	$433
26 – 30	129	143	200	405	561
31 – 35	128	160	220	315	629
36 – 40	126	169	260	334	737
41 – 45	141	192	332	435	756
46 – 50	147	202	326	506	514
51 – 55	152	183	379	374	537
56 – 60	154	227	408	363	686
60 – 65	142	152	283	381	883

Notes:

1 In 1994, US$1 = $413.45 Chilean.

Wage estimates are for full time workers in urban areas. Monthly wages would be somewhat lower if part-timers were included; however, most affiliates who work, work full time. For sources see Appendix B.

B. Average Monthly Wage, Argentina—Urban Areas (in 1996 US$'s)[1]

Males

Age	Schooling				
	incomplete primary	incomplete secondary	Complete secondary	up to 4 post secondary	5+ year post secondary
16 – 20	$177	$264	$314	$391	
21 – 25	314	425	466	504	$1,083
26 – 30	357	509	696	743	1,305
31 – 35	461	599	854	961	1,635
36 – 40	427	612	992	1,126	1,847
41 – 45	475	711	1,009	1,089	2,327
46 – 50	504	700	1,105	1,471	2,103
51 – 55	470	677	1,324	1,163	2,082
56 – 60	457	707	833	821	2,014
61 – 65	370	581	871	888	2,192

Females

Age					
16 – 20	$174	$207	$303	$238	
21 – 25	200	304	366	433	$712
26 – 30	214	320	440	548	948
31 – 35	315	348	620	586	965
36 – 40	339	385	638	647	985
41 – 45	308	388	643	827	1,021
46 – 50	280	349	666	704	1,349
51 – 55	309	368	589	835	1,416
56 – 60	264	369	684	593	967
60 – 65	249	360	1,114	982	1,630

Notes:
1. In 1996, US$1 = 1$ Argentinean. In 2002, US$1 = 3-4$Argentinian .
Wage estimates are based on all workers (both full time and part time) in metropolitan areas. For sources see Appendix B.

C. Average Monthly Wage, Mexico-- More-Urban Area (in 1997 US$)[1]

Men — Years of education

Age	0-5	6-8	9	10-12	13+
16-20	$125	$131	138	142	162
21-30	172	186	212	262	392
31-40	195	225	257	338	643
41-50	210	243	327	386	773
51-60	193	273	335	438	815
61-65	174	245	413	722	957

Women

Age	0-5	6-8	9	10-12	13+
16-20	$98	117	122	145	148
21-30	115	125	150	214	309
31-40	113	134	175	267	420
41-50	109	172	210	293	478
51-60	117	156	184	350	513
61-65	92	109	194[2]	312[2]	783[2]

Notes:
1 In 1997 1 US$ = 8 Pesos. Estimates are for average monthly wages received by persons employed for pay in more urban areas in 1997.
2 Average in the cell obtained from fewer than 30 observations; numbers should be used with caution.

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Table 5: Estimated Monthly Annuities from Individual Accounts[1]
(Based on 5% return in accumulation stage, 4% in annuity stage, 2% real wage growth)

Chile, 1994 US$	Incomplete primary		Incomplete secondary		Complete secondary		Up to 4 post secondary		5+ yrs post secondary	
Average married males										
Annuity, RA=65	$236		$342		$510		$710		$1,636	
Females										
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$	Incomplete primary		Incomplete secondary		Complete secondary		Some post-secondary		University degree	
Average married males										
Annuity, RA=65	507		772		1,156		1,198		2,319	
Females										
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%)

Mexico—more Urban, 1997 US$, RA=65 for men and women	0-5		6-8		9		10-12		13+	
Average married males										
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%)

For notes see Appendix B. 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, poverty line was $73 in Chile, $156 in Argentina.

Table 6A: Impact of public pillar on gender ratios of monthly pensions
(Fast growth: 5% return in accumulation stage, 4% in annuity stage, 2% real wage growth)

Education*	1	2	3	4	5
Chile, 1994 US$'s					
Married Men					
Annuity, RA=65	$236	$342	$510	$710	$1,636
% increase-MPG	0	0	0	0	0
Women					
Annuity, RA=60	$76	$106	$186	$308	$565
Annuity+MPG-av.	91	106	186	308	565
Ann.+MPG-av. if wage-indexed	200	200	200	308	565
% incr.-MPG-av.	20%	0	0	0	0
% MPG if RA=65, if FC or if 10-year	0	0	0	0	0
Average female/male ratios					
Own-annuity	.32	.31	.37	.43	.35
Annuity + MPG	.39	.31	.37	.43	.35
-if wage-indexed	.85	.58	.39	.43	.35
Argentina, 1996 US$'s					
Married men					
Annuity, RA=65	$507	$772	$1,156	$1,198	$2,319
Annuity + flat	707	972	1,356	1,398	2,519
% increase by flat	40%	26%	17%	17%	9%
Women					
Annuity, RA=60	$107	$154	$304	$424	$830
Annuity+red. flat	247	294	444	564	1030
% incr. by flat	131%	91%	46%	33%	24%
Average female/male ratios					
Own-annuity	.21	.20	.26	.35	.36
Ann. + flat (at 65)	.15	.16	.22	.30	.41
Ann. + flat (at 70)	.35	.30	.33	.40	.41
Mexico, 1996 US$'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%
Women					
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	.30	.31	.33	.43	.51
Annuity incl. SQ	.36	.36	.38	.47	.54

*See Table 5 for definition of 5 education categories. Public benefits begin at varying ages. MPG is converted to actuarially equivalent monthly top-up. See Appendix B. In Argentina average women in top education group receives full flat.

Table 6B: Impact of public pillar on gender ratios of monthly pensions
(Slow growth: 3% return in accumulation stage, 2% in annuity stage, 0% real wage growth)

Education*	1	2	3	4	5
Chile, 1994 US$'s					
Married Men					
Annuity, RA=65	$82	119	178	248	571
% increase-MPG	11%	0	0	0	0
Women					
Annuity, RA=60	$28	$40	$70	$115	$212
Annuity+MPG-av.	91	91	91	115	212
Ann.+MPG-av. if wage-indexed	91	91	91	115	212
% incr.-MPG-av.	225%	128%	30%	0	0
% MPG if FC	50%	12%	0	0	0
Average female/male ratios					
Own-annuity	.34	.33	.39	.46	.37
Annuity + MPG	1.00	.76	.51	.46	.37
-if wage-indexed	1.00	.76	.51	.46	.37
Argentina, 1996 US$'s					
Married men					
Annuity, RA=65	$177	$269	$402	$417	$807
Annuity + flat	377	469	602	617	1007
% increase by flat	113%	74%	50%	48%	25%
Women					
Annuity, RA=60	$40	$58	$114	$159	$311
Annuity+red. flat	180	198	254	259	511
% incr. by flat	350%	241%	123%	88%	64%
Average female/male ratios					
Own-annuity	.23	.22	.28	.38	.39
Ann. + flat (at 65)	.11	.12	.19	.26	.51
Ann. + flat (at 70)	.48	.42	.42	.48	.51
Mexico, 1996 US$'s					
Married men					
Own-amm., no SQ	$79	$91	$112	$141	$241
Annuity incl. SQ	114	126	147	174	273
% increase by SQ	44%	38%	31%	23%	13%
Women					
Own-amm., no SQ	24	29	38	61	124
Annuity incl. SQ	42	46	57	83	150
% incr. by SQ	75%	59%	50%	36%	21%
Average female/male ratios					
Annuity if no SQ	.30	.31	.34	.44	.51
Annuity incl. SQ	.37	.36	.39	.47	.55

*See Table 5 for definition of 5 education categories. Public benefits begin at varying ages. MPG is converted to actuarially equivalent monthly top-up. See Appendix B. In Argentina average women in top education group receives full flat.

Table 7. PV of lifetime benefits from own-annuities and lifetime transfers from joint annuities and public pillar (US$000's) [1]

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

Chile					
Education*	Incomplete primary	Incomplete secondary	Complete secondary	Up to 4 post sec.	University degree +
Average man					
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
Women					
Average woman					
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%
Full Career woman					
Own annuity	27.0	36.5	59.0	81.1	139.5
% incr. due to joint ann.	19%	23%	21%	21%	29%
10 year woman					
Own annuity	6.9	9.3	12.4	21.4	35.0
% incr. due to joint ann.	84%	90%	100%	81%	114%
Argentina					
	Incomplete primary	Incomplete secondary	Complete secondary	Some post-secondary	University degree
Average man					
Individual annuity	80.3	122.3	183.1	189.7	367.5
Flat	26.0	26.0	26.0	26.0	26.0
Joint annuity (if marr.)	-14.3	-21.9	-32.7	-33.8	-65.7
% incr. from flat (marr.)	39%	26%	17%	17%	9%
Women					
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%

Mexico					
Education	0-5	6-8	9	10-12	13+
Average man					
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%
Women					
Average woman					
Own annuity if no SQ	10.1	11.9	15.9	25.7	52.5
SQ to own-account	6.2	6.3	6.9	7.8	9.0
Joint annuity (if marr.)^2	6.4	7.2	8.4	10.1	16.1
% incr. from SQ	62%	53%	44%	30%	17%
% incr. from joint annuity	64%	60%	53%	39%	31%
FC woman					
Own annuity if no SQ	20.9	25.9	31.7	46.7	71.8
SQ	12.4	12.4	12.4	11.7	11.1
% incr. from SQ	59%	48%	39%	25%	15%
% incr. from joint annuity	31%	28%	27%	22%	22%
10 year woman					
Own annuity if no SQ	5.9	6.7	7.7	10.2	13.8
SQ	4.7	4.8	5.1	5.3	5.3
% incr. from SQ	80%	72%	66%	52%	38%
% incr. from joint annuity	109%	108%	109%	99%	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 10 year woman but it varies as % 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 % increment from MPG is less on lifetime than on monthly basis. PV of loss through joint annuity to man is less than PV of joint annuity benefit to woman because PV is measured as of age 65, which woman reaches 3 years later than man. Average man and FC and 10 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 % increment to 10 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 % SQ to be slightly lower for full career woman.

Table 8: The impact of joint annuities and unisex tables[1]
(r = 5% during accumulations, 4% during annuity stage, g = 2%)

Education	1	2	3	4	5
Chile					
Males, retiring at 65					
Individual-gen. spec.	$271	$393	$586	$816	$1880
Individual—unisex	252	365	544	758	1746
Joint--gender spec.[2]	236	342	510	710	1,636
Joint—unisex	236	342	509	709	1,634
Females, retiring at 60					
Individual-gen.spec.[2]	$76	$106	$186	$308	$565
Individual-unisex	80	111	196	324	595
Widow's benefit	142	205	306	426	982
Widow+own	218	311	492	734	1547
--% of husband+wife	70%	70%	71%	72%	70%
Argentina					
Males, retiring at 65					
Individual-gen. spec.	617	940	1407	1458	2824
Individual— unisex	562	856	1282	1328	2572
Joint--gender spec.[2]	507	772	1156	1198	2319
Joint—unisex	518	789	1181	1225	2371
Females, retiring at 60					
Individual-gen.spec.[2]	107	154	304	424	830
Individual--unisex	115	165	326	454	888
Widow's benefit	355	540	809	838	1623
Widow+own	462	694	1113	1262	2453
--% of husband+wife	75%	75%	76%	78%	78%
Mexico					
Males, retiring at 65					
Individual-gen. spec.	$335	$375	$440	$528	$838
Individual— unisex	316	354	416	498	791
Joint—gender spec.[2]	294	329	387	463	736
Joint—unisex	296	331	389	466	740
Females, retiring at 65					
Individual-gen.spec.[2]	105	117	148	216	398
Individual- unisex	111	124	156	228	419
Widow's benefit	177	198	232	278	441
Widow+own	282	315	380	494	839
--% of husband+wife	71%	71%	71%	73%	74%

Notes:
1. The MPG and flat are not included in this table. SQ is included since it is part of annuity. Life expectancy is based on national averages; full mortality tables are not used. Joint annuity assumes 60% to survivor. Given deterministic assumptions, woman would never purchase joint annuity.For education categories see Table 1A.
2. Corresponds to own-pensions in Tables 5 and 6 for Chile and Argentina, own+SQ for Mexico.

Table 9: 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
Women					
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
Women					
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
Women					
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 $(PVnew/PVold)_i/(PVnew/PVold)_k$ 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. Bold indicates biggest gainers.

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Table 10: F/M ratios of expected PV of lifetime benefits in new vs. old systems

Education	1	2	3	4	5
Chile					
Old system					
Av., own pension	.66	.58	.91	.95	.74
Av., own+widow	.69	.62	.91	.95	.75
FC, own pension	.81	.71	.93	.68	.69
FC, own+widow	.81	.71	.93	.68	.69
10 yr, own+wid.	.44	.40	.37	.38	.32
New system					
Av, PV own ann.	.47	.44	.52	.61	.49
Av., own+MPG	.55	.44	.52	.61	.49
Av, own+MPG+jt.	.79	.68	.77	.88	.74
FC, own annuity	.73	.68	.74	.73	.54
FC, own+joint	1.02	.96	1.03	1.01	.80
10 yr, own+joint	.39	.38	.36	.40	.34
Argentina					
Old system					
Av., own pension	.16	.13	.4	.67	.75
Av., own+widow	.29	.26	.51	.75	.81
FC, own pension	.74	.60	.57	.81	.74
FC, own+widow	.76	.65	.63	.81	.76
10 yr, own+wid.	.29	.26	.26	.35	.29
New system					
Av, PV own ann.	.3	.28	.37	.44	.53
Av., own + flat	.35	.32	.39	.50	.57
Av, own+flat+joint	.59	.57	.67	.80	.92
FC, own + flat	.79	.70	.72	.72	.63
FC,own+flat+joint	1.09	1.01	1.06	1.06	.98
10 yr, ann.+joint	.46	.43	.37	.42	.40
Mexico					
Old system					
Av., own pension	.35	.29	.26	.3	.53
Av., own+widow	.58	.53	.50	.54	.76
FC, own pension	.63	.54	.57	.66	.82
FC, own+widow	.86	.78	.80	.90	1.06
10 yr, own+wid.	.47	.43	.36	.30	.28
New system					
Av, own-no SQ	.30	.30	.33	.42	.5
Av., own incl. SQ	.35	.35	.37	.46	.53
Av, own+SQ+joint	.56	.56	.58	.68	.76
FC, own incl. SQ	.72	.74	.72	.80	.71
FC,own+flat+joint	.97	1.00	.98	1.07	.97
10 yr, ann.+joint	.42	.41	.40	.40	.34

Denominator is married man for rows with joint annuity; single man if no joint annuity.

Appendix A: Distribution of sample by schooling and selected ages (as % of rows)

CHILE—URBAN AREAS				
Age	Incomplete primary	Incomplete secondary	Secondary	4 years post-secondary	5+ yrs post-secondary
MALES					
31 – 35	12.85	28.04	31.94	14.76	12.41
46 – 50	34.64	16.23	23.43	13.63	12.07
61 – 65	56.92	12.76	17.86	4.39	8.07
Total	26.33	24.53	26.45	14.07	8.62
FEMALES					
31 – 35	9.01	22.21	33.21	23.13	12.43
46 – 50	35.45	16.33	20.1	17.67	10.45
61 – 65	64.76	8.49	13.69	7.68	5.38
Total	24.58	19.09	26.61	20.88	8.84

ARGENTINA—FULL LABOR FORCE				
Age	Incomplete primary	Incomplete secondary	Secondary	Some post-secondary	University degree
MALES					
31-35	7.18	49.70	19.78	14.65	8.7
46-50	15.1	51.60	14.24	10.01	9.05
61-65	24.28	52.01	12.40	5.27	6.04
Total	11.65	52.95	17.00	12.37	6.03
FEMALES					
31-35	5.93	36.21	19.04	28.48	10.34
46-50	13.88	42.80	17.51	15.07	10.74
61-65	34.04	46.78	8.30	8.78	2.11
Total	9.88	40.65	18.61	23.58	7.29

MEXICO—MORE-URBAN AREAS				
Age	0-5 years	6-8 years	9 years	10-12 years	13+ years
MALES					
31 – 35	8.49	21.85	20.23	23.33	26.10
46 – 50	20.66	29.55	11.61	13.43	24.75
61 – 65	43.48	32.97	5.71	6.70	11.14
Total	13.75	25.68	18.78	19.69	22.09
FEMALES					
31 – 35	9.60	20.22	12.61	28.79	28.78
46 – 50	22.45	32.24	8.42	23.35	13.54
61 – 65	57.50	17.86	3.13 (a)	7.31 (a)	14.20 (a)
Total	14.35	22.47	13.79	28.42	20.97

(a) Estimated on cell sample size < 30.

Appendix B on data sources and methodology

Tables 3 and 4. 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 understate 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.

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, $\underline{M}$, 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 $\underline{M}$, and the married individual after age $\underline{M}$. 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 5. 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. "10-year women" are women who work only 10 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 3 years younger than and have 3-4 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 7 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 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 6: 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 is $140, starting at age 70. These benefits are price-indexed. In Argentina 30 years of contributions are required for the full flat and 10 years for the reduced flat. The full flat is received by the average male and full career woman in every educational category. The 10-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.

Appendix C. Estimated fund accumulations by decile, gender and schooling,

Chile* (estimated accumulations given for deciles that do not meet MPG target)

Baseline (r = 5% during accumulation stage, 4% during annuitization, g = 2%)

	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years Post Sec	more than 4 years post sec
Men at 65: MPG Target--$5,432,000- All deciles met MPG target					
Women at 60: MPG Target = $6,605,000					
1st decile	$2,640,371	$3,583,689	$5,581,615		
2d decile	$4,187,835	$5,351,228			
3d decile	$5,083,753	$6,298,100			
4th decile	$5,793,417				
5th decile	$6,267,608				
Women at 65: MPG Target = $5,926,000					
1st decile	$3,451,569	$4,580,462			
2d decile	$5,467,425				

Slow growth scenario (r = 3%, g = 0)

	Incomplete Primary	Incomplete Secondary	Secondary	up to 4years Post Sec	more than 4 years post sec
Men at 65: MPG Target = $6,468,000					
1st decile	$3,582,019	$4,550,527	$5,579,140		
2d decile	$4,788,407	$5,501,859			
3d decile	$5,309,888	$6,312,167			
4th decile	$5,952,367				
Women at 60: MPG Target = $8,018,000					
1st decile	$1,212,817	$1,647,376	$2,564,196	$3,927,087	$7,669,210
2d decile	$1,923,563	$2,458,496	$3,357,370	$5,250,964	
3d decile	$2,334,777	$2,893,717	$3,925,008	$6,500,917	
4th decile	$2,661,036	$3,204,034	$4,505,003	$7,588,586	
5th decile	$2,878,844	$3,543,527	$5,390,867		
6th decile	$3,196,751	$4,030,192	$6,408,994		
7th decile	$3,665,575	$4,808,575	$7,402,749		
8th decile	$4,299,426	$5,371,644			
9th decile	$5,076,339	$7,165,566			
Women at 65: MPG Target = $ 7,000,000					
1st decile	$1,439,545	$1,912,497	$3,015,529	$4,655,162	
2d decile	$2,280,273	$2,851,713	$3,936,752	$6,189,899	
3d decile	$2,773,762	$3,356,664	$4,601,668		
4th decile	$3,168,764	$3,718,733	$5,291,210		
5th decile	$3,421,263	$4,112,709	$6,318,169		
6th decile	$3,803,227	$4,679,214			
7th decile	$4,356,189	$5,581,573			
8th decile	$5,118,443	$6,240,895			
9th decile	$6,052,656				

* MPG target is accumulation that yields annuity higher than MPG and therefore makes top-up unnecessary. Accumulation dispersion estimates are based on actual wage dispersion and average labor force participation rates.

Appendix D: Dispersion in Years of Experience and Eligibility for MPG in Mexico
(% under MPG eligibility requirement, by schooling level)[1]

Baseline scenario, real interest rate = 5%, real wage growth = 2%

Years of school	0-5	6-8	9	10-12	13+
Men					
Mean experience	45	44.3	44.6	43.9	42.8
% under 10 years	0	0	0	0	0
% under 20 years	0	0	0	0	.1
% under 25 years	0	.1	0	.2	1.
% eligible for MPG	100	99.9	100	99.8	99
% own-annuity <minimum pension[2]	0	0	0	0	0
Women					
Mean experience	20.9	19.9	21.9	24.4	31.7
% under 10 years	25.5	28.5	24.5	16.8	5.9
% under 20 years	47.8	50.2	45.6	38.5	19.9
% under 25 years	59.7	61.5	57.1	51.7	31.4
% eligible for MPG	40.3	38.5	42.9	48.3	68.6
% own-annuity <minimum pension[2]	47	43	34	19	4

Notes:
1. Dispersion is calculated using coefficients of variation of the accumulated years of experience for women and men, ages 61-65, from ENE97, more urban areas.
2. MPG = US$99 in 1997 US$'s. Own-annuity is estimated using assumptions given in Table 5, for given years of experience. Probably there is a positive correlation between years worked and size of own-annuity, so those whose own-annuity are less than the minimum pension are likely to be included among those who worked less than 25 years and are therefore ineligible for the MPG top-up.

Appendix E: Old system formula in Mexico

NOTE: OLD SYSTEM
The annual retirement pension is based on:
a) base amount given by a percentage of the income earned during the last 5 years of contribution,
b) an increase for each additional year contributed, and
c) the number of years of contribution in excess of the minimum 10 year requirement.

The value of the annual pension is calculated according to the following expression:

$$S * [(CB) + (Y)^* (AI)]$$

S= base salary used for the last 5 years of contribution
Base%= percentage of base salary in base amount
Y= additional years contributed beyond the 10 year requirement
AI= annual increment as % of S, for each additional year contributed beyond 10 years.

In addition, the IMSS provides retirees with a yearly bonus equivalent to
one month of the pension payment they were receiving.
Thus the total annual amount received would be
13/12 of the value obtained by the expression given above.

Base% and AI are rates determined in a table (IMSS, 1993), which vary according to the
amount S expressed in number of minimum wages. The Base% is inversely related to S,
and ranges from 80% to 13%. The annual increment,
AI, is directly related to S, and ranges from 0.563% to 2.45%.

Below we provide an example of the calculation for levels S of 1 and 6 minimum wages,
assuming a total of 30 years of contribution to IMSS.

S	Base%	AI	Y	Estimated annual pension	
1 minimum wage	80%	0.56%	20	13/12* S * (96.9%)	=105%
6 minimum wages	13%	2.45%	20	13/12* S * (86.5%)	=93.7%

Replacement rates of base salary range between 94% and 105% for high and low wage worker, respectively, who has worked for 40 years. For 10 years of work these replacement rates would be 14% and 87%, respectively.

Figure 1: Male annuities from DC are more than double female annuities*
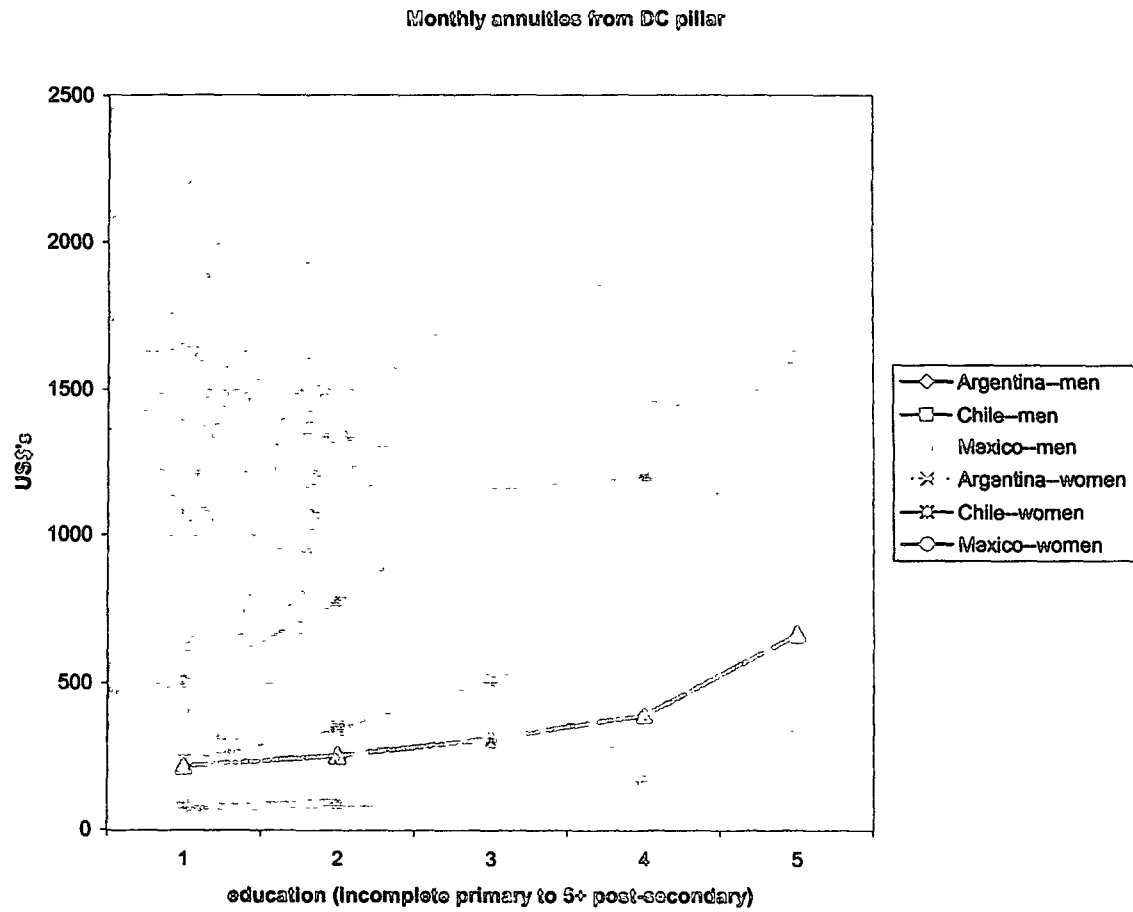(based on private contributions; does not include any public benefits)

Monthly annuities from DC pillar

education (Incomplete primary to 5+ post-secondary)

Figure 2: Low earners, especially women, get biggest % increment from public pillar

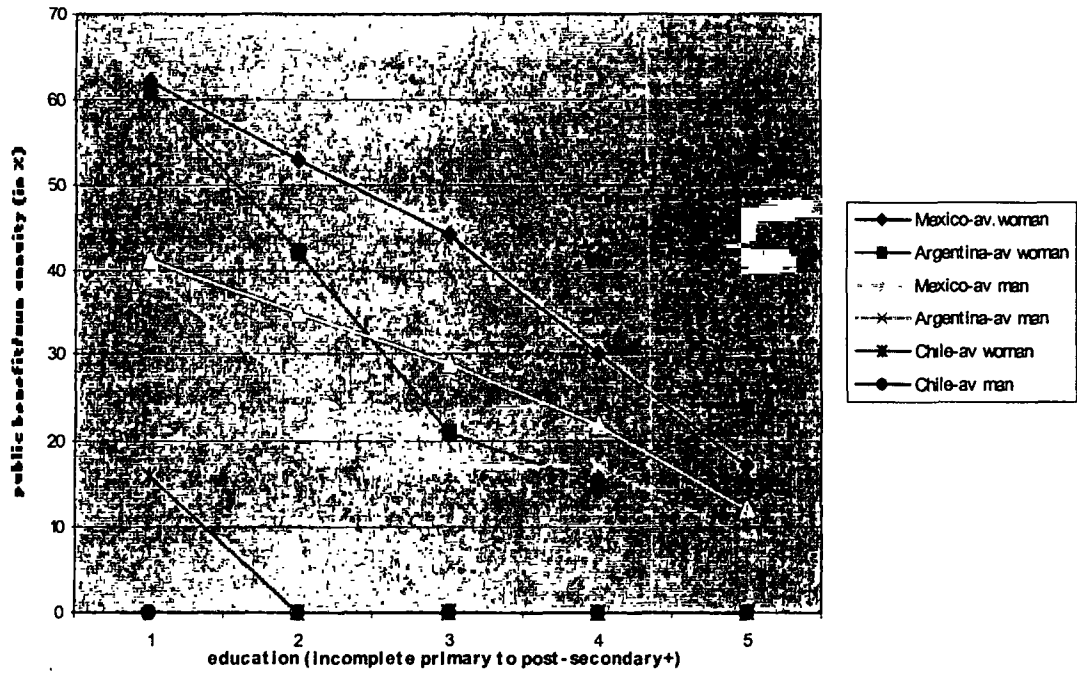## % increment to own-annuity from public pillar--lifetime benefits

Figure 3: Lifetime transfers from joint annuity exceed transfers from public pillar

Lifetime transfers--joint annuities vs. public pillar
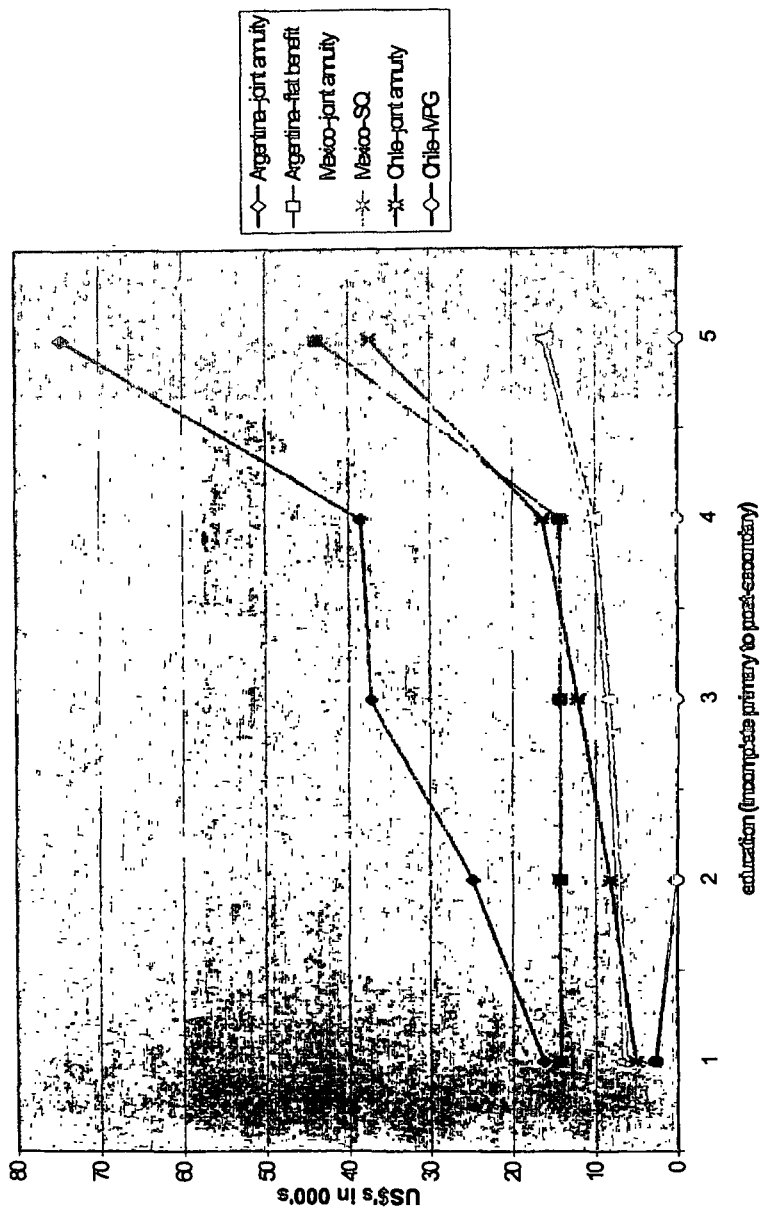
Figure 4: PV of post-reform/pre-reform lifetime benefits, normalized*

Low earning married women get largest lifetime gain from reform
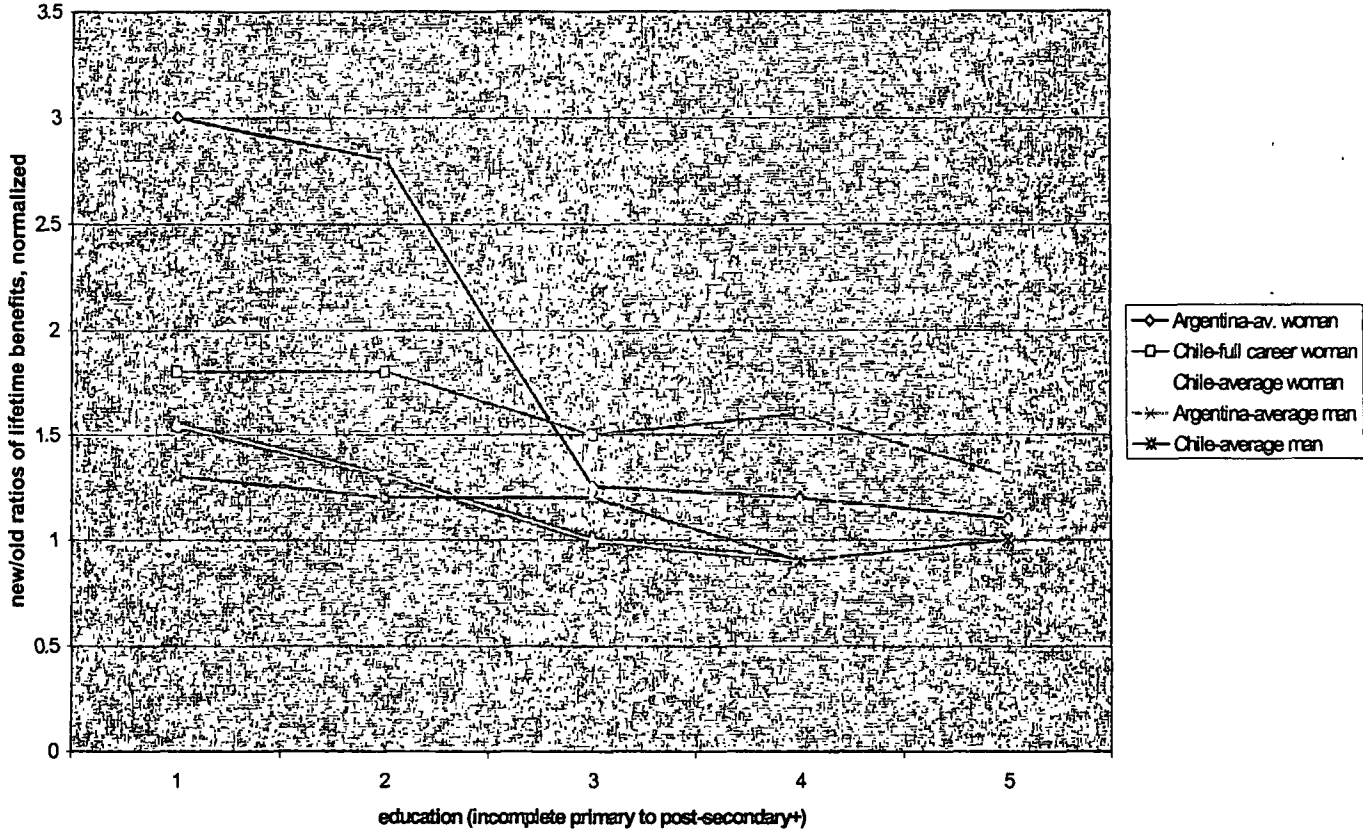
*Based on joint annuity for men and includes joint annuity received by women; normalized by setting new/old ratio for man in top education category =1, separately for each country.

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Figure 5: Gender ratios improve due to the reform

F/M ratios of PV of lifetime benefits, Mexico

Legend:
- New -DC+SQ+joint annuity (FC)
- Old-own+widow (FC)
- New -DC+SQ+joint annuity (av.)
- Old-own+widow (av)
- New -DC+SQ+joint annuity (10 yr)
- Old-own+widow (10 yr)

y-axis: gender ratios of PV

x-axis: education (preprimary to postsecondary) 1 ... 5
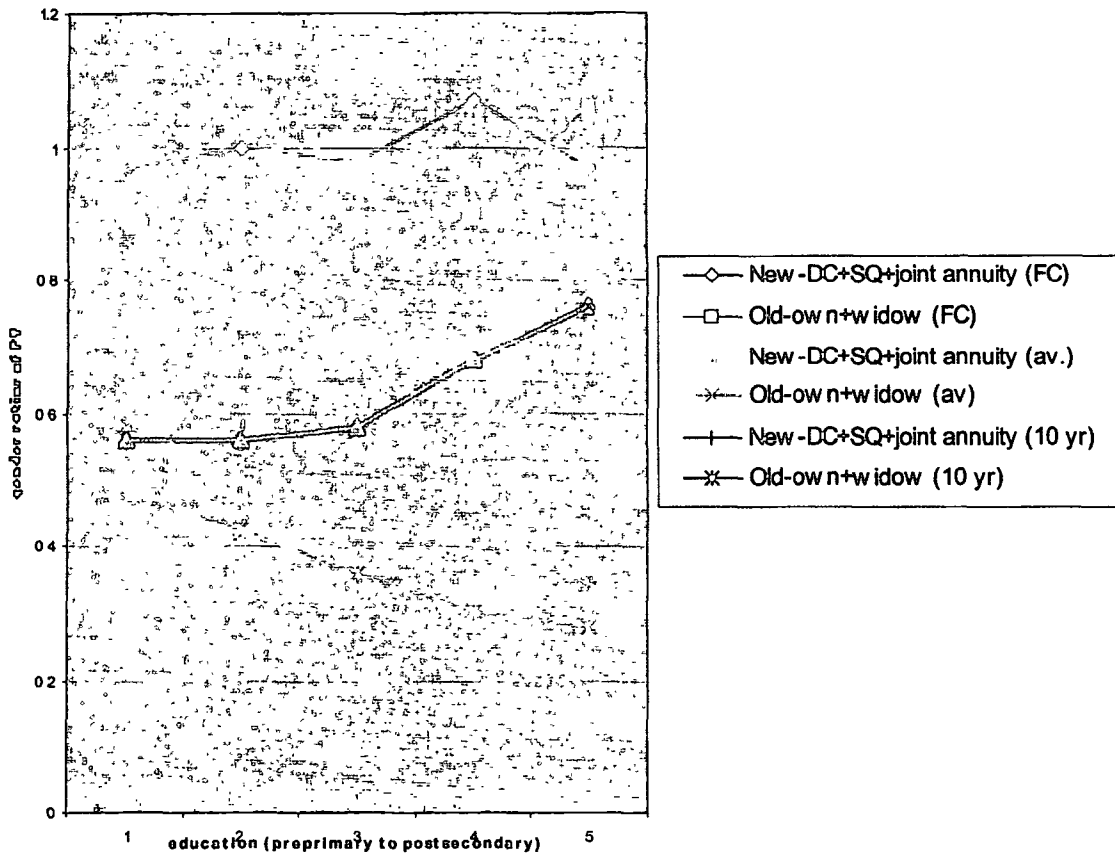
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[1] The Latin American studies were part of a joint project carried out by James, Cox-Edwards and Wong. For earlier papers coming out of this project see CoxEdwards (2002, 2001a,b,c, 2000a,b), Parker and Wong (2001), Wong and Parker (2001). Other papers have discussed the projected replacement rates of men and women in Chile and Argentina, but none have systematically used actual labor market behavior to construct expected annuities plus public benefits under the new systems and compare this with defined benefits under the old systems. See Bertranou (2001), Arena de Mesa and Montecinos (1999), Barrientos (1998). Bertranou (1998) reviews the earlier literature.

[2] A small number of industrialized countries view pensions as a universal entitlement based only on age and residence and usually financed by general revenues. These are discussed briefly in Part VIII. This paper focuses on contributory schemes, where the contributions are employment-related.

[3] Some DB plans are structured to grant generous pensions for partial years of work and give credit for child-rearing years, which yields more equal years credited and therefore pensions. In DC systems the state could, if it wished, subsidize these activities by placing a specified amount into the DC accounts for child-rearing years. This would make the cost explicit (in contrast to DB plans where the costs are implicit and hidden). Perhaps for this reason, few DC plans provide this subsidy.

[4] 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 et al 2001, US General Accounting Office 1997).

[5] 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 of poverty 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.

[6] INFONAVIT has rarely provided a positive real rate of return, but the hope of the reformers was that this would change in the future. In our simulations we assume a 0 real return.

[7] Specifically, using available 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. We then 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. Contributions depend on these employment histories. 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. Table 3 shows that a sharp decline in the labor force participation rate of women typically occurred when they got married.

[8] 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.

[9] In reality most adjustments to insolvency were not 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. An infinite number of such reforms, with divergent distributional effects, are possible and many have been used in different countries. Each of these parametric non-neutral reforms could then be compared with a distributionally neutral reform, as we do here for the multi-pillar reforms that were actually chosen in these countries.

[10] Our sample of workers grows small and selective, hence less representative for workers over the age of 60, especially in the higher educational categories. Hence, the wage numbers in these cells must be viewed with caution.

[11] However, this is not necessarily good news for women. The lower pensions that obtain for everyone under slow growth imply that many women receive own-pensions that lie well below the poverty line.

[12] 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.

[13] 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.

[14] Of course, all workers are not "average" with respect to wage rates and years worked. When we take wage dispersion into account we find that half of all women with primary education and one third of women with incomplete secondary education receive a top-up from the MPG in the baseline situation. For most of these, the top-up accounts for 10-20% of their final pension. However, virtually no men will have own-pensions below the MPG floor because of their longer years of work (Appendix Table C).

[15] Some analyses of the Chilean scheme have ignored the crucial role of the MPG in setting an income floor for low paid women who work part time with time out for child-rearing. See, for example, Evans and Falkingham 1997, who understate by 50% the benefit such women will receive, because the MPG is ignored.

[16] The moral hazard problem is much smaller for men, because most men are far ahead of the MPG level, due to their higher wages and full careers.

[17] Note that raising the retirement age (without additional work) does not increase the present value of lifetime retirement income of women; it simply shifts consumption to later ages. In fact, to the degree that this policy reduces access to the MPG, it actually decreases total retirement income for low earning women and increases the gender gap in lifetime pensions. In this sense, the MPG and a higher retirement age are alternative ways of raising the monthly level of female benefits to socially acceptable levels, with very different distributional and fiscal consequences. This policy would save the government money, which could be spent to compensate the losing group and other women in other ways.

[18] Whether price or wage indexation of the public benefit is preferable depends, in part, on how high it is to begin with and how great is the moral hazard problem. In Argentina and Mexico it started at a much higher level than in Chile, and goes to many more people since it is an add-on to all rather than a selective top-up, so drawing costs down relative to revenues through price indexation may be more necessary than in Chile, for fiscal sustainability. But the structure of Chile's MPG entails greater moral hazard than Mexico's work-related social quota and possibly more than Argentina's flat.

[19] The fact that the MPG insures against low investment returns was probably a means of winning political acceptance for the new Chilean system, when it introduced the multi-pillar system concept in 1980. This insurance might pose a moral hazard problem— workers accept risky investments because they know they will be protected on the downside by the MPG. However, given the limited portfolio choice allowed by regulations in Chile until now, moral hazard concerning risky investment has not been a danger. Instead, it appears that a major consequence of the MPG is to provide inter-generational insurance against prolonged periods of low interest rates. The minimum

pension remains at the same fixed level even during a depression, so the top-up from the public pillar increases at these times.

[20] At age 65, pensions for these women, based exclusively on their own-annuities, are only 15-30% those of men. They are relatively lower than in Chile because wages and employment are less equal than in Chile, and lower than in Mexico because retirement age is equalized for men and women in Mexico.

[21] These conclusions are reinforced when we examine data on dispersion in projected pensions stemming from variations in labor force participation rates. Fewer than 1% of all men would be excluded by eligibility rules but practically none of them have own-pensions below the MPG. In contrast, about 30% of all women have own-annuities below the MPG, but they probably overlap with the 60% who fail the eligibility test (Appendix Table D).

[22] That is, using the expected future lifetime of the average man and woman, we add up the projected public and private benefits, discounted at 4% in the baseline case and 2% in the slow growth case. In this analysis we calculate *the present value, as of age 65*, of the sum of discounted benefits *from the actual age of retirement until expected age of death*. In effect, we examine a person who lives until age 65 and therefore has the expected age of death of the age 65 retiree, even if she actually retired at an earlier age. We take into account all years of actual retirement.

[23] SQ yields a slightly higher rate of return to the 10 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.

[24] Consistent with this interpretation, wives and single men are not required to purchase joint annuities. For quantification of these non-monetary household services see Apps 2002.

[25] 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. For evidence that the savings and insurance behavior of households indicates that they do not engage in consumption smoothing over the wife's lifetime, see Bernheim et al. (2003).

[26] In the largest component of Chile's fragmented old system, the Servicio de Seguro Social (SSS),, a = 5% for the first ten years and 1% thereafter, 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 5 years of work, of which the last 3 years were indexed up according to inflation. In Argentina, the old system paid (a) the JO--70% of base salary for 20 years of contributions with an additional 1% for every year over 30 or (b) the JEA--50% of base + an additional 1% for every year over 10 for those who contributed for 10-20 years. Base salary was defined as the average of the best three out of the last ten years of wages, with no indexation. Women qualifying for (a) could retire early at age 55, men at 60, but (b) started at age 65. A minimum pension further protected women after ten years of contributions. 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 .56% to 2.45% per year. Moreover, the monthly pension was paid for 13 months instead of 12. A minimum pension tied to the minimum wage was also applied after ten years of contributions (see Appendix E for precise formula and arithmetic example).

[27] Data in this section are from Castel and Fox (2001) and Woycicka (2001). These data were augmented by personal communications with Agnieszka Chlon, who carried out simulations for Poland, and Paulette Castel, who did simulations for several other countries.

[28] A recent simulation of the UK system and its proposed reforms comes to similar conclusion as our paper about the importance of the redistributive public benefit for women, the fact that its equalizing impact will diminish through time because it isn't wage-indexed, and the need to include strong survivors' benefits, as in joint annuities. (Falkingham and Rake 2001).

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