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**SOCIAL SECURITY REFORM IN MEXICO: A GENDER  
PERSPECTIVE.**

### ***Abstract***

In 1997, the Mexican government implemented reforms to the pension system, switching from a pay as you go to a multi-pillar funded system of social security. This paper examines the gender impact of the social security reform implemented by comparing the retirement pensions received by men and women under the old and new social security systems. We construct a synthetic group based on a cross-section of individuals and obtain patterns of lifetime employment of earnings. We use these patterns to calculate the likely pension received based on the old and new systems of social security. In general, our estimates show that the gender gap in the estimated pension annuity will widen under the new social security rules for individuals with low levels of education (secondary school or less). Nevertheless, for those with higher education, the gender gap will remain comparable or even close under the new pension system.

### ***Resumen***

En 1997, el gobierno de México implementó una reforma del seguro social, que pasó de ser un sistema tradicional ("pay as you go") a ser un sistema de cuentas individuales capitalizables. El presente trabajo examina el impacto de esta reforma sobre la brecha de género en el terreno de las pensiones. Comparamos las pensiones que los hombres y las mujeres recibirían bajo el viejo sistema con las que recibirán bajo el nuevo. Para ello, construimos una cohorte sintética usando un corte transversal de individuos para obtener los patrones de ciclo de vida de los salarios. Usamos estos patrones para calcular la pensión probable que sería recibida por el individuo bajo el viejo y el nuevo sistema. En general, nuestras estimaciones muestran que la brecha por género será mayor bajo el nuevo sistema para personas que tienen bajos niveles de escolaridad (secundaria o menor). Sin embargo, para los individuos con mayores niveles de escolaridad, la brecha de género en pensiones será comparable o incluso se reducirá bajo el nuevo sistema de pensiones.

## *Introduction*

The age structure of the population in Mexico has undergone important transformations as a result of the demographic and epidemiological transitions of the last two decades. The population aged 65 or older in Mexico represented about 4.5 percent of the population in 1997, but its rate of growth is increasing over time: from 2 percent annual growth in 1970 to 3.7 in 1990, to 3.9 percent in 1998 (Tuirán 1998). It is expected that the population aged 60 or older will represent about 16 percent of the total by the year 2030. The speed at which the elderly population is growing implies future increasing demands in the areas of social services. Most notably, the financial resources needed to meet general consumption needs in old age in the form of old age pensions has received attention by policy makers (Cruz-Saco 1998).

In 1997, the Mexican government implemented reforms to the social security system that covers about 40 percent of the Mexican population, switching from a pay-as-you-go (PYG) to a multi-pillar system of social security. The new system has three components: a public pillar represented largely by a flat contribution and a minimum pension guaranteed from the government, a private pillar of individual accounts with mandatory contributions, and a third component of voluntary individual contributions. Previous work has documented the main differences between the two systems, the historical perspective and the fiscal burden of the reforms (Gomez de León and Parker 1998, Grandolini and Cerda 1998, Bertranou 1998, Valencia 1999).

In Mexico, many benefits such as having access to health care and receiving a pension at old age are associated with formal employment. Since women historically have participated in the labor market with vastly different patterns than men, with less participation, lower wages, and more interruptions or dropouts than men have, it is natural to expect that women would be found in worse conditions with respect to old age pensions. Studies that examine the effects of the pension system reforms on the gender gap are rare (Bertranou 1999). Traditionally, PYG systems with defined benefit are considered more gender neutral than the fully funded schemes (Cruz-Saco & Mesa-Lago 1998). This is because, for example, women tend to receive a subsidy from men because women live longer than men. However, there may exist a subsidy in the opposite direction, as many women would make contributions to the system without receiving any pension benefits because their lifetime labor force participation would be insufficient for eligibility. By modifying various aspects, some attributes of the new system may relatively favor women and others may benefit men, in addition to altering their position relative to the old system. Furthermore, the new Mexican system has multiple pillars, keeping aspects of the public as well as the private funding schemes. The overall effect on the gender gap can be difficult to predict in such cases.

This paper assesses the potential impact of the social security reform implemented in Mexico in 1997 by estimating the retirement pensions received by men and women under the old and new social security systems. We take into account two of the three pillars of the pension system, because the relative importance of the third pillar (voluntary contributions) is considered to be small.<sup>1</sup> The perspective adopted is that of the individual retirees, not that of the government or the IMSS, and the overarching hypothesis is that the gender gap widens with the reform, largely because of an increase in the number of years of contributions required to be eligible for a minimum pension.

We construct a synthetic group based on a cross-section of individuals, and obtain patterns of lifetime employment and earnings. We use these patterns to calculate the likely pension received based on the old and new systems of social security. While the objective of this procedure is not to predict future pensions or future retirement behavior, it allows us to assess the sensitivity of the new system to various changes such as interest rates, life expectancy, and administrative fees, and compare the gender gap under the new and old systems of pensions.

The organization of the paper is as follows: Section II summarizes the reforms to the social security systems, Section III describes the data set used for the analyses and provides an overview of the socioeconomic characteristics of the population and the work experience of the elderly population. Section IV summarizes the methodology used to simulate the impact of the reform to the pension system. Section V presents the estimated expected pensions under the new and old social security systems, examines the impact of the reform through a series of simulations, and estimates the gender gap in the estimated pensions. Section VI presents conclusions with an emphasis on gender differences.

### ***Reforms in social security***

The Mexican Institute of Social Security (IMSS) was created in 1943 as a decentralized unit resulting from workers' demands. The original model included dispositions to provide insurances and benefits to individuals with a working relationship and their dependents. In 1972, however, the Social Security Law was modified to include the voluntary incorporation of non-salaried workers to the mandatory regime of the IMSS. In 1992, a new addition was made to the Law, to incorporate the Retirement Savings System (SAR), as a complementary system to the pensions provided by IMSS and others such as ISSSTE.

The Institute for Social Security and Services of the State Workers (ISSSTE) was created in 1959, as a public decentralized unit to provide basic benefits to the state workers and their dependents, including medical care, pension guarantees, and

<sup>1</sup> For example, for the period of September 1998, the Comisión Nacional del Sistema de Ahorro para el Retiro (CONSAR 2001) reported that the voluntary contributions were only about 0.05% of the total contributions received for retirement.

personal and housing credit, among others. The ISSSTE law has not been modified regarding pension benefits, but starting in 1992 an additional contribution of 2% of the contributing salary base was added, through individual accounts, as well as 5% for housing benefits. These concepts were added into the ISSSTE Law in 1993, and the SAR contributions are considered a complement to the ISSTE pensions.

The IMSS and ISSSTE constitute the main social security institutions in Mexico and cover most individuals who have social security. IMSS provides health insurance, old age and disability pensions, child care, workplace risks insurance and other social services. Salaried workers are subject to mandatory affiliation (although there exists a large informal sector), and other individuals can apply voluntarily. IMSS currently has approximately 15 million affiliates<sup>2</sup> plus 1.8 million retirees, and through the coverage of these workers and their family members, provides insurance benefits to about 40 percent of the Mexican population (IMSS 2000).<sup>3</sup> Currently, ISSSTE has 6.2 million affiliates, of which 2.3 million are workers. In addition ISSSTE covers about 350,000 pensioners.

On July 1, 1997, a new Mexican Social Security Law went into effect, involving fundamental changes in all branches of IMSS, including pensions, health, workplace risks and child care centers (Grandolini and Cerda 1998, Montes de Oca 2000). Federal employees (covered by ISSSTE), the armed forces, and oil worker systems are excluded from this reform. This paper simulates the impact of the reforms made only to the IMSS pension system. One of the principal elements of the reform is a revamping of the old age pension system, moving from a pay as you go financing mechanism to individual accounts, which will now be described. Table 1 summarizes the main differences between the old and new pension systems.

### *Pensions*

Since the establishment of IMSS in 1943, the Mexican pension system has included pensions due to old age, old age unemployment, and disability and death (IVCM).<sup>4</sup> Prior to the reform of 1997, these pension payments were financed by a contribution of 8.5 percent of the worker's salary of which the worker pays 25 percent, the Federal Government 5 percent and the employer 70 percent. Additionally, in 1992, the SAR (Retirement Savings System) was implemented,

<sup>2</sup> This corresponds to approximately 42% of the economically active population in México (IMSS 2000).

<sup>3</sup> Workers without social security coverage may receive services at the clinics and hospitals of the Ministry of Health. Medical fees for services are charged according to income level but all medicines must be paid for out-of-pocket.

<sup>4</sup> The main difference between a pension given for old age and old age unemployment is the age at which one may retire, which is 65 under a pension for old age, and 60 for old age unemployment. The amount of the pension is reduced for early retirement.

involving an additional 2% contribution of a worker's salary, paid by the employer and deposited into a worker's individual account.<sup>5</sup>

The new system divides pensions into three separate branches, 1) old age and old age unemployment pensions; 2) disability and life insurance; and 3) medical expenses for retirees.

The old system required 500 weeks of contribution to receive a pension, and the system generated incentives to contribute for a low number of weeks, perhaps by beginning a formal sector job later in life, or working in the informal sector. Additionally, the old system exacerbated these incentive problems through the structure of pension payments, such that increased years of working resulted in very small increases in pension amounts, thereby reducing the incentives to contribute a larger number of years than the minimum required to receive a pension (IMSS, 1995).

The new pension system moved away from a pay-as-you-go to a funded system, where pension contributions are channeled to an individual worker's account, with the accounts being invested and managed by the AFORE (Retirement Funds Administrators). The contribution for Old Age and Old Age Unemployment Insurance is 6.5 percent of the worker's salary, with employers paying 5.15 percent, employees paying 1.125 percent and the State paying 0.225 percent. The federal government guarantees a minimum pension, equivalent to one minimum wage indexed to inflation in consumer prices. In order to receive this minimum pension, a worker must be at least 65 years old (under Old Age Retirement) or 60 years old (under Old Age Unemployment Retirement) but in either case, must have worked at least 1250 weeks during his/her career, compared with 500 under the old system. If the worker has worked less than 1250 weeks, he/she will still have the right to the funds in his/her account at retirement age. Or, should the worker choose to retire before the age of 60, he/she may retire the accumulated funds, assuming that the amount in the account will allow a pension of at least 130 percent of the value of a minimum salary.<sup>6</sup> At retirement, workers will choose between a gradual withdrawal option and buying an annuity from an insurance company.<sup>7</sup>

In addition, the contributions to the housing fund, INFONAVIT<sup>8</sup> (5% of a worker's salary), if not used for a credit to purchase housing, will be added to the accumulated funds in an individual's retirement account. These funds, however, will not be managed by an AFORE but by INFONAVIT, and according to the laws

<sup>5</sup> SAR was never integrated to the IMSS pension system and SAR faced significant problems due to its legal and administrative design. (See Grandolini and Cerda 1998 for further description).

<sup>6</sup> A minimum wage in October of 1997 was approximately 26 pesos per day, equivalent to 3.33 U.S. dollars, using an exchange rate of 7.8.

<sup>7</sup> One interesting feature of the new pension system, not analyzed here, is the creation of an unemployment insurance, in which workers may retire funds from their account (the maximum of 75 days of salary or 10% of the value of accumulated funds) in the event a worker experiences unemployment. These withdrawals may be made every 5 years.

<sup>8</sup> INFONAVIT (National Funds Institute for Worker's Housing) provides credits for housing for workers.

of INFONAVIT, the funds are not guaranteed to yield a real interest rate. In practice, the real rate of return on these funds has rarely exceeded 0.

Under the new rules the Federal Government plays an increased role in the IMSS pension system through the guarantee of the minimum pension and the "social quota" under which the State will contribute the equivalent of 5.5% of one minimum salary in the Federal District, indexed to the Consumer Price Index (INPC) to each individual retirement account. This social quota was designed to increase the pension levels of low-income workers, maintain a redistribution aspect in the new pension system, as well as increase the incentives for informal sector workers to establish their own individual account.

The main determinants of the pension levels expected under the new system compared with the old system, are likely to be the number of years of contribution and the real rate of return of the level of pensions actually received. Given the requirement of 25 years worked in order to receive a minimum pension, most workers who contribute for less than 20 to 25 years (but at least 10) are likely to receive less under the new system than under the old system, given reasonable assumptions on the rate of return (Martinez et al, 1996). Nevertheless, all other types of workers are likely to benefit. An interesting case is that of female workers, a significant number of which under the old system did not receive pensions as they either contributed for less than 10 years or were not working at retirement age. Under the new system, the minimum a worker will receive are the resources accumulated in their account.

#### *Retirement Fund Administrators (AFORE) and Regulation of the New Pension System*

The AFORES are responsible for administering and investing the funds in the individual accounts, which correspond to the retirement sub-account and a sub-account for voluntary contributions. As mentioned earlier, contributed funds to INFONAVIT are kept in a separate account and managed by INFONAVIT. Each worker may choose their AFORE and once he/she has chosen their AFORE, has the right to change AFORES once a year. AFORES are free to choose the commissions charged for management of the funds, which are based on an initial entrance fee and/or a percentage charge of account balances.

The Pensions Systems Law passed subsequent to the IMSS reforms, and sets out the regulatory and supervisory structure of the new pension system. The National Council for the Retirement Savings System (CONSAR) is the regulatory agency responsible for management of the new pension system. The CONSAR was originally established to regulate the SAR system (which disappears under the new law) but under the Pension Systems Law, was given authority to oversee the establishment, operation and supervision of the AFORES, as well as other institutions that participate in the new system, such as insurance companies. CONSAR has the authorization necessary both to grant the establishment of the

AFORES and revoke the authorization of an AFORE which does not comply with established regulations and/or remove any officer or member of the board of directors of an AFORE who is found to be unqualified or of questionable morality. CONSAR oversees all aspects of the system including such areas as portfolio composition of the retirement funds and marketing and advertising of the AFORES (currently, a number of AFORES have been fined for violations of marketing and advertising norms).

AFORES are permitted to invest in various investment funds (SIEFORES) although they must offer at least one in which the portfolio is composed principally of securities whose returns are indexed to the Consumer Price Index. There are, however, no minimum return requirements. Existing financial institutions, principally banks, own the majority of the AFORES that have been established. To prevent the concentration of funds in any single AFORE, a 17% limit on system accounts has been set, which will increase to 20% during the fifth year of operation. Currently, two AFORES (Bancomer and Banamex) are approaching this limit.

The new system was designed so that no worker would be adversely affected by the change from the new to the old system. Current retirees will continue to receive their pensions according to the old system. As of July 1, 1997, all actual workers, both new and currently active, were incorporated under the new pension system. Nevertheless, at the time of retirement, individuals who were already contributing at the time of implementation of the reform will have the opportunity to choose between the pension they would receive on the basis of the accumulated funds in their individual account and the pension they would have received if they had continued contributing under the old system. The Federal Government will assume the costs of paying both the pensions of current retirees and the costs of the transition. Costs of transition are those associated with the rights acquired by active workers at the time of the reform.

### *Data and overview of work patterns*

The paper uses primary data from the 1997 Mexican National Employment Survey (ENE-97) completed by INEGI (*Instituto Nacional de Estadística, Geografía e Informática*) in Mexico. This survey contained the standard employment survey questions, plus a module with employment history and job training questions. The sample contains information on 119,405 individuals aged 12 or older.

### *Work Patterns*

Table 2 presents the main work characteristics of the population, by age groups and separately for men and women. The patterns of 1997 employment exhibit a gender gap as expected. Almost 90% of men aged 16 through 59 declare being currently employed compared with 43% of women 16-49 and 34% of women



50-59. Few young women work in commerce and agriculture compared to their older counterparts, and instead, are employed in the financial sector. The manufacture and services sectors seem equally represented across all ages. More women than men tend to be employed in services at all ages (roughly 15% of women and 10% of men). Regarding the occupation of the currently employed, a large proportion of young ages (12-15) work in agriculture activities (55% of men and 37% of women). At all ages 16 or older, women tend to be employed in assistant/domestic occupations (about 35%) and in employees/sales occupations (about 30%). More than 50% of men in old age groups (60 or older) are employed in agriculture activities.

With respect to the position at work, the percentage of self-employed increases with age for both men and women. Almost 59% of women aged 60 or older and 64% of men 60 or older are self-employed. It is also worth noting that large proportions of minors (ages 12-15) who declare to be working are non-paid (53% of women and 56% of men). Also, the percentage of women working in non-paid activities is larger for all age groups than their male counterparts. For example, 21% of working women above age 60 are non-paid, compared to 2.2% of working men in the same age group. Table 2 presents also the job benefits received by those currently employed. Of those aged 16-49, the percentage receiving benefits are quite similar for men and women. About 24% of women and 27% of men receive IMSS, 9% of women and 5% of men receive ISSSTE, 30% of men and 28% of women receive SAR. In contrast, in the cohorts aged 50-59, a higher proportion of men seem to receive benefits: 19% of men receive IMSS compared to 10% of women, and 21% of men receive SAR compared to 16% of women.

Table 3 summarizes characteristics of ever-employment and current employment of men and women by age group. Ever-employment is much higher for men than women. Among men aged 30 and over, practically 100% report having worked at some point in their lives. Among women, younger cohorts (age 30-39) show higher propensities of ever-working than older cohorts (80% of ages 30-39 compared to 59% of ages 60 or older). The amount of time spent working, however, among those who have ever-worked, is higher for older cohorts. This is reflected in statistics on age at entry, age-adjusted months of work over their life, and number of interruptions since starting to work. For example, for men, 60% of those 60 or older started working before age 14, compared to 39% among those aged 30-39; 74% of those aged 60 and older have had no interruptions of 3 or more months in their working life, compared to 68% of those 30-39.

The percentage currently employed is highest at ages 30 through 49 for women (57-60%), and also for men (96-98%). The number of hours worked per month peaks at ages 20-29 for women (median of 181 hours per month), and at ages 30-49 for men (median of 212). The hourly wages reach the highest level for ages 30-39 for both men and women (median of 6.1 pesos for women, compared to 6.8 for men).

This brief summary of the current conditions of the labor force participants conveys that, as expected, lifetime patterns of work differ substantially across gender. Women tend to participate less in the labor market than men, and tend to work in informal sector occupations and non-paid positions more than men. These patterns could potentially lead to vastly different sets of retirement benefits for men and women, since these are closely tied to the work history of the individuals. The data shows also that there are cohort differences in work patterns. Younger cohorts of women have a higher propensity to work and the age at entry is greater than for older cohorts.

### ***Methodology***

In order to compare pension levels under the old and new system, ideally, we would like to have a data set that includes individuals of retirement age, with information on the periods worked by each individual throughout their working life, the wages earned at each period, and the rate of social security contributions made at each period. This would allow us to calculate the likely pension to be received under different sets of rules. This kind of data, however, is unavailable for Mexico. We calculate the effect of certain social security changes by constructing a "synthetic group" of individuals and applying the rules under varying assumptions. This approach seems adequate for the purposes of the paper, that is, to compare the impact of various sets of rules on men and women.

We calculate earnings at each age for prototypical workers, to calculate estimated contributions to the social security pension system, according to the old and new system rules. First, we define groups of prototypical workers. Second, we construct the average age-specific earnings for each prototypical worker. Third, based on these earnings, we calculate the estimated contributions to social security at each age until age 65 for each prototypical individual. Fourth, using these contributions, we estimate the expected annuity pension according to the old and new rules of the social security system. And fifth, we vary the parameters of the system to perform analyses of sensitivity to policy parameters by the prototypical men and women.

We next provide a brief description of the steps followed for the calculations.

### ***Groups of Prototypical Workers***

For the purposes of constructing a cross-section of representative individuals potentially eligible to receive a pension in old age, we take persons in the ENE97 between ages 16 to 65 who declared having ever been employed. We define sub-groups by the combination of four factors: 1) sex, classified as men and women; 2) age, divided into ten 5-year groups: 16-20, 21-25, 26-30, ..., 61-65; 3) education, divided into five groups of years of education: 0-5, 6-8, 9, 10-12, 13 or more; and 4)

area of residence, measured as more- and less-urban areas<sup>9</sup>. Because the number of cases in each cell must be sufficient to provide an average of time worked and earnings, we are able to estimate the averages for men and women of all education groups in more-urban areas, but there are insufficient cases with high-education in less-urban areas. Thus our analyses on less-urban areas are limited to prototypical individuals with low education only: 0-5 and 6-8 years of education.

### *Age-Specific Time Worked and Earnings*

We proxy the age-specific earnings with the total expected earnings of the person at each age, by multiplying the percentage of time worked times the annualized earnings. To do this, we calculate the average participation rate for each age, and assume that this average represents the percentage of time worked during the age period. We then obtain age-specific earnings by calculating the average annualized earnings received by persons currently employed for pay in each age<sup>10</sup>.

The sum of the percentage of time worked at each age, from ages 16 to 65, provides an estimate of the accumulated experience throughout the individual's work life. To assess the appropriateness of the estimated time worked at each age, we compare the estimated accumulated experience at age 65 obtained by summing the time worked at each age up to 65, with the observed response to the survey question: "how long have you worked over your lifetime?" among individuals of ages 61-65 in each prototypical group. The results are provided in Table 4. In general, we obtain that the estimated accumulated experience resembles the responses reported by the survey, thus we consider the estimated measure of time worked at each age as appropriate for our purposes.

Since time worked and earnings vary greatly by marital status, we estimate separate labor force participation and earnings patterns for single and married individuals in order to construct the prototypical individual's labor force participation and earnings. We assume that the typical individuals start their working life at age 16 as single, and then marry and remain married throughout their working life, until the retirement age of 65. Thus in order to obtain participation rates and earnings over the work life of prototypical individuals, we take for each group the patterns of the single individuals for the periods prior to marriage age, and the married patterns starting with the age at marriage and until retirement age. For this purpose, we estimate the age at marriage as the age at which the majority (more than 50%) of the individuals in the sample are currently married for each of the

<sup>9</sup> More-urban areas refer to communities with 100,000 people or more. Less-urban areas are the rest.

<sup>10</sup> This value may be an underestimate of the earnings of each prototypical worker, but it is adequate for the purposes of the paper. We use the same procedure to calculate earnings for men and women, and we use the same estimated earnings to calculate the pension under the new and old systems.

prototypical groups formed. The ages at marriage found with this procedure are given in Table 4.

We assume that all earnings are subject to social security contribution at each age for typical individuals.<sup>11</sup> Appendix A provides a summary of the age-specific labor force participation and earnings used for the calculations. All earnings are measured in 1997 pesos; thus all contributions and pension amounts are constant at 1997 pesos as well.

## *Results*

### *New system*

#### *Calculated Pension Annuity*

We use the estimated earnings at each age and calculate the contributions made from age 16 to 65 to the social security system for the typical individuals, by applying a series of assumptions that are congruent with the new rules of the pension system. See Appendix B for details of these calculations.

Appendix Table B.1 shows the capital accumulations at age 65 obtained for each prototypical individual. We take these accumulated contributions to obtain estimated annuities<sup>12</sup> using the life expectancy at age 65 (CONAPO 1998), which is 18.5 years for women and 15.8 years for men. We have no data on differential life expectancy for more- and less-urban areas, or by years of education, thus we adopt the same life expectancy for all residence and education groups. Note that life expectancy is likely to be lower in less urban areas, which would tend to "elevate" pension levels in less urban areas relative to those in more urban areas.

We assume as a baseline that the interest rate for accumulations is 3% per year. We obtain the expected annuities for each prototypical individual (i.e., each combination of sex/education/area of residence individual) using the assumptions mentioned above. Table 5 provides a summary of the calculated annuities in terms of Federal District minimum wages under the new system but excluding the minimum pension guarantee. These baseline results indicate that there are virtually no differences between women with low education who live in less versus more

<sup>11</sup> We assume that all labor force participation is subject to contribution to the pension system, but actually a large fraction of the population participates in informal sector activities and is not contributing to the social security system. To the extent that this practice differs by gender, the results presented here may be altered.

<sup>12</sup> Although workers have the option of choosing between annuities or scheduled withdrawals, we use the option of annuities for the purposes of this paper.

urban areas. All groups would obtain an estimated annuity of around 0.4 to 0.5 minimum wages. In urban areas, we find increasing annuities for women as education increases beyond 8 years. For men, the annuity increases with education, ranging from 1.4 to 3.4 in terms of minimum wages. Again, the more urban-less urban differences are quite small.

Gender differences are observed in all residence areas and across all education groups. We will examine the gap in more detail later. Women with 13 or more years of education in urban areas would expect annuities equivalent to 1.6, compared with 3.4 minimum wages that are obtained for men of similar education and residence area.

### *Replacement Rates*

Table 5 also presents the estimated wages at age 65 and the replacement rates (the ratio of this annuity to the age-65 wages). We obtain that the replacement rate is higher for low education groups and for more-urban compared to less-urban groups. Women in more urban areas with 0-5 years of education obtain a replacement rate of 2.2, compared to 1.0 for their less-urban counterparts. In more-urban areas, the replacement rate for those with 13 or more years of education is 0.5 compared to 2.0 for those with 9 years of education. Although we present more detailed comparisons by gender later, here we simply note that the replacement rates are higher for women than for men.

### *Sensitivity of New Pension to Various Interest Rates, Administrative Fees and Social Quota*

Table 6 shows the results of relaxing the assumptions on the interest rate (from 3% to 5%), reducing the administrative fee to half (from 1.9% to 0.95%), and the presence of a social quota contributed to the individual accounts (from government contribution towards social quota to *no* contribution).

As expected, the results indicate a sizable increase in the annuity received by the prototypical individual with a higher interest rate (from 3 to 5%). The gains, however, seem to be proportionately higher for those in low education groups. This is a result of the relatively higher contributions that are made by women in lower education groups relatively early in their lifetime, compared to the relative size of the contributions of women with more education whose contributions are higher towards the end of their careers. For example, women in more urban areas with 0-5 years of education improve from 0.45 to 0.92 minimum wages, (a gain of over 100% in their calculated annuity). In comparison, the estimate for women with 13 or more years of education rises from 1.6 to 2.9 minimum wages (a gain of only 80%).

For the rest of the simulation exercise, we assume a more conservative interest rate of 3%. Holding all else at the baseline values, the effect of decreasing the administrative fee to half of the assumed rate (from 1.9% to 0.95% of earnings) is fairly small on the estimated annuity for all the prototypical individuals, the gains representing only 8 to 11% of the estimated annuity.

Next, we examine the effect of assuming away the flat contribution from the federal government towards the retirement accounts (i.e., the social quota). In relative terms, the new social quota contribution is more beneficial to the groups with low education, and to women more than men, as expected. The results show that not having a social quota would reduce the estimated pension in terms of minimum wages by 18% to 48% among women, compared to reductions of 12% to 37% for comparable men, depending on the level of education. For example, among more urban women with 0-5 years of education the estimated loss is of 42% compared to 18% for those with 13 or more years of education. The change for their male counterparts is of 31% among those with 0-5 years of education, and of 12% for those with 13 years or more. For women with low education, the social quota contribution essentially doubles the estimated annuity.

For men of low education, the additional contribution increases the estimated annuity by 50%. Once again, the benefit from the social quota is proportionately higher among women and among those with low education, because these are the groups with relatively higher labor force participation in earlier years, compared to their behavior in the later years of their life.

#### *Gender Gap due to differences in longevity, in labor force participation, and in earnings*

There are three main factors that are cited in the literature as sources of the gender gaps observed in the pensions received by men and women (Bertranou 2001). Two of them affect the contributions made and hence the total accumulations: the labor force participation and the wage history used as the basis for the contributions. A third one affects the way in which the annuity distributions are calculated: the life expectancy or the expected number of years that the retiree is assumed to survive from the time of retirement.

In this section we calculate the estimated pension for each prototypical individual, relaxing the assumptions made for men and women for each of the three factors mentioned. The analysis is done using only the estimated pension under the new rules, and we examine the sensitivity of the sex ratio of the calculated pensions to these assumptions.

First, we assume that the prototypical man is married and is survived by his wife by the difference between the life expectancy of men and women at age 65<sup>13</sup>. The surviving spouse is assumed to receive 60% of the full annuity.<sup>14</sup> We then adjust the estimated pension for men to take into account the survival of the wife. With the adjustment, the gender gap closes because the men's annuities are deducted to afford their widows' annuities. We take this adjusted pension as the baseline to perform the simulations.

Second, Table 7 shows that if we replace the life expectancy of women with those of men, the gender gap in the estimated pension closes by a negligible amount. The gap closes because women receive a higher annuity amount but not much higher than the baseline. This is to be expected because the accumulations are simply distributed over slightly fewer years. This result indicates that the move towards using unisex life tables would leave the relative position of men versus women virtually unchanged<sup>15</sup>.

Third, if we use the labor force participation of men instead of that for women, leaving all else constant in the baseline, the gender gap closes by a larger amount than the unisex life table simulation. For example, for less urban individuals with 0-5 years of education, the men to women ratio of the estimated annuity declines from 2.7 to 2.0. The gap closes by less among the prototypical individuals with more-education. Among those with 13 or more years of education, the gender gap remains the same (going from 1.9 to 2.0). This exercise is suggestive of what could occur if women's labor force participation were to increase in the future, rather than our assumption that these rates remain the same as current rates.

If we replace the wages of women by those assumed for men, the gender gap closes by the largest amount of the three factors simulated, and this holds for all education and area of residence prototypical individuals. The sex ratio in estimated annuity closes from 2.83 to 1.34 for those with 0-5 years of education. Among those with 13 or more years of education, the gap closes from 1.9 to 1.2.

In summary, these results indicate that of the three main sources of gender differences that affect the gender gap in estimated pensions, the gap is largely due to earning differences, followed by labor force participation differences, and only modestly due to differences in longevity between men and women. These results are suggestive of the reverberating consequences that potential life-long inequalities in women's wages relative to men's wages may have, not just on current earnings but on the future level of income during retirement.

<sup>13</sup> A difference of about 2.7 years as mentioned previously.

<sup>14</sup> This is a convention adopted for the illustrative purposes of this exercise. According to the rules, the retiree would contract or purchase the survivor benefit at the time of calculating the pension annuity based on the balance in his individual retirement account. Thus in practice, the survivor pension may range from 0 to 100% of the man's pension.

<sup>15</sup> This result may not hold to the same extent if we assume that the prototypical worker is single at retirement and until death.

### *Gender Gap due to Economic Growth*

Another source of difference between the amount that men and women receive could be due to the assumed economic growth in the simulations. Although the rate of growth of wages should in principle be gender-neutral, it could potentially affect the relative position of women if for example, the social quota, which tends to benefit women, loses value with respect to wages as economic growth proceeds. Since the social quota is indexed to a consumer price index, and the contributions are assumed to be applied over the lifetime, however, the effect could be null.

Table 8 shows that the gender gap closes but by negligible amounts with higher economic growth. The table presents the sex ratios of the adjusted (by spouse survival) new pension assuming economic growth rates of 1 or 2% and with interest rates of 3 and 5%. As expected, the men/woman ratio of the calculated annuity or the replacement rates changes little with a change in the assumption of economic growth.

### *Comparison of new and old systems*

#### *Pension Amounts*

We compare the likely pension received under the new and old systems, assuming first that no minimum pension rules are applied. That is, according to the rules of both systems, we obtain the annuity each person would expect without the benefit of the minimum pension guarantee. Note that it is clear that a change from 10 years to 25 years for the minimum pension guarantee is likely to have a substantial impact on pension levels (and imply a large difference in fiscal cost). By separating it out initially from our analysis, we can analyze its overall importance for pensions. The assumptions made for labor force participation and earnings are held the same for both systems; we change only the set of rules applied to calculate the expected annuities. Appendix C presents a summary of the calculations made to estimate the pension annuity using the old system rules.

Table 9a includes the percent gains in the calculated annuity using the new rules with respect to the old rules. All groups (men and women) with low education obtain a higher calculated pension under the new system compared to the old one, with gains ranging from 12% for women in less urban areas to 158% for women in more urban areas. The groups with more education, however, actually exhibit a loss under the new system, ranging from 26% to 48%. The pension gains are relatively high for more-urban and less-educated women because their participation in the labor force is lower during the late years of their career and high in the early years. The new system counts these early contributions and accumulates them whereas the



old system would give more weight to the late-years salary and would penalize those with this early-life pattern of participation.

All groups with high education exhibit a loss with the new system as mentioned. This is because the old system favored those who were active late in life and with higher base salaries to calculate the pension, and this tends to be true in high-education groups. The new system does not have these attributes. The results in Table 9a for the replacement rates (the ratio of pension amount to the wage at age 65) follow the same patterns as the results presented for the estimated pension amounts, thus we omit the discussion of these results.

If the minimum pension guarantee (MPG) is taken into account, Table 9b shows that the gains found above for almost all women under the new versus old system are no longer present. First, we assign the MPG to all prototypical persons that qualify using two criteria: the number of years worked and the calculated annuity being below the MPG under the old system. This is the case for all women except for the prototypical woman in more-urban areas and 13 or more years of education. The MPG is not applied to any prototypical man because none qualifies according to both criteria. No prototypical worker qualifies using both criteria for MPG under the new system either. Second, we compare the new and old pensions, and we find that all groups of women now exhibit a loss under the new system. Those with lower calculated old pensions lose more, because they would receive the MPG in the old system but cannot qualify for the MPG under the new. Thus their calculated pension is lower with the new rules (less than one minimum wage) than with the old ones (the MPG of one minimum wage).

All the comparisons remain the same for men, thus the only groups that continue to exhibit a gain with the new system are men with low education, that is, those receiving the lowest pension amounts, but not low enough to qualify for the MPG in the old system.

### *Gender Gap in Pension Amount*

The results up to now have examined how the reforms affect men and women, and we now turn to further elaborate the changes in the gap between men and women under the two systems. Table 10 shows the men-to-women ratios. While the ratio of accumulated experience in years is around 2 for groups with low education, this ratio declines among individuals with higher education in urban areas. Among those with 13 or more years of education, the sex ratio is only 1.3.

Figure 1 shows the sex ratios of the estimated new and old annuities for more urban populations, which are similar to those for the less-urban groups. The gender gap is wider using the new rules for low education groups. The calculated pension for men is 3 times larger than that of women, declining to a ratio of 2.11 among those with high education. Under the old rules, the sex ratio is lower, ranging from 1.14 to 2.5 among groups with low education. We obtain a different pattern for those with higher education. Among those with 10-12 years of education in more urban

areas, the sex ratio is higher in the old system (4.3) compared to the new one (2.4). For the prototypical individuals with the highest education, the sex ratio is similar under the old and new system (around 2.1).

In conclusion, these results indicate that the gender gap in the estimated annuity widens with the new social security rules among individuals with low education regardless of area of residence. For those with high education, the gap remains the same or closes with the new rules.

### *Gender Gap in Replacement Rates*

The gender gap of the replacement rate (the ratio of the calculated pension to the earnings at age 65) is in general in favor of women. Table 10 provides the calculated sex ratios. All men/women ratios are less than one with the exception of the high-education group. For example, under the new system, the sex ratio in the replacement rate for urban women with 0-5 years of education is 0.5 (that is, the replacement rate for women is 2 times the one for men). Using the old rules, the replacement rate may be in favor of women because they receive the minimum pension guarantee benefit. Under the new rules, this could be because the wages at age 65 are much lower for women than for men<sup>16</sup>, resulting in a more favorable replacement rate for women. As mentioned, the exception are the prototypical persons with 13 or more years of education, for whom the gender gap in wages and in estimated pension is not as wide as the other groups, and the gender gap in replacement rates is slightly in favor of men (sex ratio of 1.3 under both the new and old systems).

Figure 2 illustrates the replacement rates of men and women using the new and old rules. The gender gap in favor of women closes with the new rules for all groups, but in particular for those with low education. The closing of the gap is due to the fall in the women's replacement rates. Similar to the patterns obtained for the annuity amounts, the sex ratio in replacement rates remains for those with high education when the new rules are applied.

### *Proportion eligible to receive the guaranteed minimum pension*

We turn from examining the situation of prototypical individuals to the group of men and women in each group. In order to compare the proportion of women and men who could potentially receive the benefit of the public support, we estimate the percentage of the population in each of the groups that would be eligible for the minimum pension guaranteed by the government.

<sup>16</sup> The sex ratio in wages at age 61-65 ranges from 3-4 for less urban individuals, and from 5-8 among those in more urban areas. The sex ratio is relatively low (1.6) for those in the group with 13 or more-years of education.

Thus far we have used the estimated number of years worked and estimated pension annuity for each of the sex/education/area of residence groups. These numbers represent the "average" or prototypical individual in each group. We construct a distribution around the number of years worked to estimate the proportion in each group that meets the minimum required. Similarly, we construct a distribution around the estimated annuity for each group, to calculate the proportion in each group that meets the threshold of the minimum pension guaranteed. For this purpose, we assume that the coefficient of variation (variance divided by mean) exhibited by the calculated earnings for each group across the working ages (16 to 65) can be used as a rough proxy for the variation in the years worked and in the estimated annuity. We apply this coefficient of variation to the estimated years of experience and the estimated annuity for each group and, assuming a normal distribution, calculate the proportion of the population that would fall below the thresholds indicated by the minimum requirements.

Table 11 presents the results for each of the groups, comparing the proportions meeting the minimum requirements under the old and new systems of social security. For *less urban women*, under the old rules, virtually all women meet the requirement of having worked at least ten years, and 100% of the women would have a calculated pension of less than one minimum wage. Under the new rules, about 60% of the women fail to meet the minimum requirement of 25 years worked, and also 100% would have annuities below one minimum wage. The results imply that for this group, their estimated annuity is below the MPG under both systems, but the old rules were more favorable to them because more of them would have met the minimum period to be eligible to receive at least the MPG.

For *more urban women*, also virtually all women would meet the 10-year minimum requirement under the old system. Only 6% of women with 0-5 years of education and 8% of those with 6-8 years of education fail to meet the minimum period required. Again, 100% of the women at all education levels have a calculated pension below MPG, with one exception. Among women with 13 or more years of education, only 2% has a calculated pension below one minimum wage. Under the new system rules, 50-75% of women fail to meet the 25-year requirement, with the exception again of women with high education. In this latter group, 23% fail to meet the requirement. The percentage of women with calculated annuities below the MPG falls with increasing education. All women with 0-9 years of education have a pension lower than one minimum wage, compared to 70% among women with 10-12 years of education, and 9% of those with 13 or more years of education. The results imply that for this group of women, in particular those with low levels of education, the old rules were more favorable because more of them would meet the minimum period required to receive the MPG.

Among *less urban men*, we find that virtually all meet the time requirement to receive the MPG under the old and new systems, but almost none would make use of the benefit because almost all would receive a pension amount above the MPG

(only 2-5 % would fail to meet the MPG amount). A slightly different pattern emerges for *more urban men*. Almost all meet the 10-year minimum requirement of the old system, but the proportion failing to meet the 25-year requirement of the new system increases with education: 1-4% among those with 9 or fewer years of education, and up to 14% among those with 13 or more years. While the proportion of men failing to meet the period requirement increases with education, the proportion of those needing to use the MPG benefit falls with increasing education. With the new rules, the proportion of men with an estimated pension below the MPG falls among those with low education. Among those with 0-5 years of education, 26% would receive pensions below the MPG under the old rules, compared to only 7% under the new rules. This could be the effect of the social quota contribution.

In summary, this analysis indicates that in terms of the population that is eligible to receive the MPG benefits, the gender gap of the new system compared to the old has widened in one way and narrowed in another. The change in the minimum time requirement from 10 to 25 years, not surprisingly, punishes women and in particular those with low education. With the new rules, the gender gap in the percentage below the time-threshold has widened because fewer women qualify for MPG with this criterion. The gap in the minimum amount required has closed slightly: fewer women have a calculated pension below one-minimum-wage with the new rules.

### ***Conclusions***

We assess the impact of the social security reform in Mexico on men and women by examining jointly the effect of two of the three pillars of the pension system on typical individuals defined by sex, education, and area of residence. Although the prototypical individuals do not represent the population at large, the procedure facilitates the comparisons across gender. The prototypical individuals resulted from assuming that the patterns of labor force participation and earnings exhibited by the Mexican population aged 16 to 65 in 1997 apply throughout their lifetime.

We examined the sensitivity of the estimated pension to factors that could be sources of gender gaps. Some factors affect the determination of pension benefits by modifying the formula design, eligibility conditions, or entitlements. The modifications may be to the gender specific life tables, administrative fees charged, interest rates, economic growth rates, or years of contribution required for minimum pension benefits. Other factors that we examined affect the level and patterns of contributions made, such as the new social quota, the patterns of labor force participation, and earnings history.

We estimate that over their lifetime, in both less- and more-urban areas, with men participating in the labor market an average of twice the number of years that women do, the calculated retirement annuity under the new social security system is

about 3 times the amount for men and women. This is perhaps surprising given that the estimated earnings at advanced and retirement ages are much higher for men than for women, with ratios ranging from 3 to 8. This result may be a consequence of the fact that the annuity is not dependent on the salary earned during the last years of work, a characteristic of the old system, and to the redistributive nature of the new social quota.

We find, not surprisingly, that the returns of the new system are sensitive to the assumed interest rates. Our results show that variations in the rate used for administrative fees had a relatively minor impact on the annuities obtained. In contrast, the social quota plays a major role in the amount estimated for the annuity, and the quota represents a larger share of the estimated annuity of women than that of men, reaching a 2:1 ratio between men and women of low education levels.

One area of major difference between men and women is the percent of the population likely to reach the minimum thresholds required to receive a guaranteed minimum pension. Even if we make the unlikely assumption that women spend their lifetime working according to our cross-sectional data from 1997 and that individuals contribute to social security all the time they are working, we estimate that in less urban areas about 60% of the women do not reach the minimum required by the new rules (25 years), in contrast to 1-15% of men. Under the new rules, if individuals do not reach the minimum number of years worked to receive a guaranteed minimum pension, they would still receive the balance of their accumulated contributions. Because of this, we find that the social security reform results in a narrower gender gap in the proportion of people whose pensions are below the minimum threshold. In contrast, the gender gap in the proportions that reach the minimum number of years worked has widened.

The labor force participation of women has experienced vast changes in the last decade and they are likely to continue in the future, as female education levels continue to rise. As our results show, the gender gap in expected pension annuities narrows only among highly educated groups (with 13 or more years of education). This type of change may come about slowly, and as education levels increase, our results also show that women are likely to spend a shorter part of their life working. The system may consider the possibility of extending the benefits of individual accounts for retirement pensions to non-workers. As research has shown (Parker and Wong, 2000), the institutions in Mexico are protecting women in old age through the network of spouses and children. Those same individuals, their family members, may be willing to invest in the future welfare of the non-working women, and help contribute to women's retirement accounts as part of the social contract within families to secure the welfare of their members, in particular women, during old age.

On the other hand, it is clear that to the extent that women rely on their own pensions for income in old age, any discrimination that might occur with respect to their overall earnings will carry over to pensions received. One of the largest factors associated with the difference in the levels of male to female pensions is the difference in earnings between men and women. Whereas we have not attempted to

isolate the part of differences in wages that may be due to discrimination (rather than differences in human capital investment), it is likely to be important.

Finally, the paper has made some simplifications that should be presented as caveats. We have assumed that all labor force participation is counted towards years of contribution, whereas in reality a large fraction of the population participates in informal work and is not covered by social security. To the extent that women participate more in informal activities than men, this would tend to increase the gender gaps presented here. While a provision exists for workers to make voluntary contributions to their retirement account during years spent in the informal sector, the extent to which workers are taking advantage of this is not yet clear.

The reforms may create incentives to participate in the labor market at rates that differ substantially from the ones assumed for the exercise in this paper, and the behavioral response to the incentives may vary by gender. Although such changes may be slow to occur, particularly if the Mexican economy cannot absorb increasing labor force participation rapidly, it would be worth repeating the exercise as new cohorts enter the labor force, and new patterns of employment and earnings become available. Policy makers working on further reforms to the pension system may find that a focus on gender may be useful for fine-tuning the pension system. Many of the problems that reformed pension systems still face have to do with poor coverage. The Mexican system needs to create incentives for individuals to affiliate, and when affiliated, to report earnings accurately for contributions. This paper has assumed away these issues but the incentives could affect men and women differently. Further research is needed to document the gender gaps in the response to new incentives as reformed pension systems evolve. For this purpose, it would be useful to have access to individual-level data to study responses to new incentives longitudinally.

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**Table 1.**  
**Comparison of Old and New Systems of Old-Age Pensions. IMSS - Mexico.**

<i>Attribute</i>	<i>Old System</i>	<i>New System</i>
Main characteristic	Combined old age, severance, disability and life benefits	Separated into two: a) old age and severance, and b) disability and life benefits.
Financial mechanism	Pay as You Go	Individual accounts with "social quota" (government contribution) component.
Contribution period required for eligibility	500 weeks (about 10 years)	1250 weeks (about 25 years)
Pension received if worked less than minimum period	0	Accumulations in account
Institutions responsible for contributions	IMSS	Selected pension fund administrator (AFORE)
Institutions responsible for payment of pension	IMSS	New workers: AFORE. Transition generation: at retirement, choice of new system (AFORE) or old system (IMSS).
% salary contributions	8.5% of salary (5.95 employer, 2.125 worker, 2.125 government), plus 2% employer (since 1992)	6.5% for old age and severance (5.15 employer, 1.125 worker, 0.225 government), plus 5% for INFONAVIT funds
Minimum pension guaranteed by government	One minimum wage indexed to minimum wage	One minimum wage indexed to consumer price index (CPI)
Social quota (government flat contribution)	0	5.5% of one minimum wage indexed to CPI
Calculation of Pension	Formula (a function of years worked, late salary)	Annuity or gradual withdrawal (amount a function of total accumulations in account)

**Table 2.**  
*Main Characteristics of Current-Work of the Population,  
 By Sex and Age Group. Mexico Weighted Data. (Percent)*

Current Employment Characteristics	Age By Sex (years)							
	Women				Men			
	12-15	16-49	50-59	60+	12-15	16-49	50-59	60+
% Currently Employed	12.8	42.7	34.5	19.0	28.2	87.2	89.8	60.6
% Current Sector Employment								
Agriculture	36.3	10.3	19.9	18.9	54.4	24.7	35.8	55.5
Extraction/Mining	0.0	0.1	0.0	0.0	0.0	0.4	0.5	0.1
Manufacture	14.9	18.9	11.4	16.5	10.0	18.2	11.5	8.0
Construction	0.0	0.7	0.6	0.2	3.4	8.2	7.6	3.7
Commerce	30.5	29.9	37.3	42.4	20.7	16.7	14.5	14.7
Transportation	0.0	1.1	0.2	0.1	0.7	6.3	6.0	2.5
Finances	1.4	19.8	12.1	6.4	0.4	9.3	9.1	4.7
Services	16.6	14.5	15.6	14.5	10.0	10.7	10.4	8.3
Government	0.2	4.4	2.3	1.0	0.3	4.9	4.3	2.2
International	0.1	0.2	0.4	0.1	0.0	0.5	0.3	0.1
% Current Occupation								
Professional/education/ Supervisory	0.8	19.7	10.8	6.5	0.2	16.1	15.8	7.4
Agriculture/hunting/fishing	36.0	9.7	19.0	18.8	54.6	23.8	34.8	54.6
Assistant/domestic/security	36.9	35.8	35.1	35.2	28.4	44.1	34.5	25.0
Employees/sales	22.1	31.0	29.9	30.2	10.5	13.4	11.9	9.3
Mobile sales	4.2	3.8	5.2	9.3	6.1	2.5	3.1	3.7
% Type of Job								
Boss/Owner	0.0	1.5	2.7	2.7	0.0	5.3	10.5	10.6
Self-employed	1.6	18.5	39.6	58.6	4.6	20.5	43.4	64.2
Salaried	40.7	59.2	29.7	15.1	31.2	57.8	40.5	20.1
By item <sup>b</sup>	4.2	4.8	4.6	2.2	6.2	7.6	4.7	2.8
Non-paid	53.5	16.0	23.2	21.3	57.8	8.7	0.9	2.2
% Receives Benefits								
End-of-year bonus	3.4	36.5	18.1	21.4	2.3	32.5	24.6	9.4
Paid vacations	2.6	34.2	17.7	6.3	1.6	29.7	22.6	7.6
Profit sharing	1.3	8.6	2.9	0.9	0.3	10.4	5.8	1.8
IMSS <sup>a</sup>	3.4	23.9	10.1	3.9	2.0	26.8	18.7	6.2
ISSSTE <sup>a</sup>	0.0	9.2	6.0	2.1	0.1	4.9	5.1	2.5
SAR <sup>a</sup>	2.6	30.1	15.5	5.0	0.8	27.7	20.8	6.9
Housing credit	0.6	13.4	6.8	2.6	0.3	11.9	8.5	2.5
Private medical insurance	1.7	3.4	1.4	0.7	0.2	2.8	1.9	0.6

Author's calculations.

a. IMSS - Social Security Institute, ISSSTE - Federal Workers Social Security Institute, SAR - Retirement Savings.

b. Paid by units of finished product, for example crafts, garments, etc.

Source: National Employment Survey (ENL 1997), INEGI Mexico.

Table 3. Main Characteristics of Ever-Work and Current-Work of the Population, By Sex and Six Age Groups, Mexico Weighted Data.

Employment Characteristics	Age By Sex (years)											
	Women			Men								
	12-19	20-29	30-39	40-49	50-59	60+	12-19	20-29	30-39	40-49	50-59	60+
<b>Ever-Work Status</b>												
% Ever-Work	32.6	74.4	80.5	75.5	70.7	59.2	52.6	94.1	99.4	99.6	99.9	99.9
Number Months Ever-Work												
Mean	27.7	66.3	139.8	218.0	275.9	392.2	37.8	106.9	228.2	348.5	472.6	633.9
(S.D.)	(32.3)	(49.8)	(89.5)	(134.9)	(170.1)	(228.7)	(34.8)	(59.6)	(70.8)	(73.2)	(78.6)	(18.5)
Median	18.0	60.0	132.0	228.0	300.0	420.0	27.0	104.0	228.0	354.0	480.0	632.0
Number Months Ever-Work Per year of Age												
Mean	1.5	2.6	4.0	4.9	5.1	6.0	2.2	4.3	6.5	7.8	8.7	9.1
(S.D.)	(1.6)	(1.9)	(2.4)	(2.9)	(3.1)	(2.9)	(1.8)	(2.1)	(1.8)	(1.4)	(1.3)	(1.4)
Median	1.0	2.4	4.0	5.2	5.4	6.8	1.8	4.3	6.7	8.0	8.9	9.4
Age at First Job (years)												
% 7-13	40.4	18.5	21.7	28.1	29.6	34.5	58.1	32.6	39.0	44.5	54.1	60.1
% 14-16	42.7	27.9	22.7	23.6	22.4	17.5	32.8	32.1	26.5	26.4	22.9	23.3
% 17 or Over	16.8	53.6	55.6	48.3	48.0	48.0	9.2	35.3	34.5	29.1	23.0	16.6
Number of Job Interruptions												
% with 0	72.6	64.1	59.7	56.4	60.6	65.8	76.6	68.8	68.1	66.4	68.4	73.9
% with 1-3	22.6	29.6	30.7	33.4	27.2	21.9	17.9	25.3	24.5	24.5	22.7	17.7
% with 4 or over	4.8	6.3	9.7	10.3	12.2	12.3	5.5	5.9	7.4	9.1	8.9	8.4
<b>Current-Work Status</b>												
% Current-Work	67.4	57.1	59.7	59.6	48.9	32.2	83.2	93.4	97.7	96.4	89.9	60.8
Monthly Hours Worked												
Mean	147.9	168.4	157.9	155.4	147.2	141.5	162.4	205.4	212.6	212.2	209.9	193.3
(S.D.)	(78.1)	(70.3)	(73.6)	(74.1)	(82.9)	(84.3)	(78.4)	(63.3)	(63.5)	(63.0)	(64.1)	(73.3)
Median	154.8	180.6	172.0	154.8	150.5	129.0	180.6	206.4	206.4	206.4	206.4	206.4
Hourly Wages <sup>a</sup>												
Mean	3.0	7.8	9.7	9.7	6.8	7.3	2.9	7.6	10.7	11.2	10.2	8.2
(S.D.)	(4.7)	(9.9)	(1.7)	(14.7)	(10.8)	(31.2)	(4.7)	(11.5)	(13.1)	(15.8)	(15.0)	(17.4)
Median	2.5	5.3	6.1	5.3	3.9	2.9	2.3	5.5	6.8	6.5	5.7	3.8

a. Author's calculations; S.D. indicates standard deviation.  
 a. Minimum wages in 1997: 24.3 NPesos per day.

Source: National Employment Survey (ENE 1997), INEGI Mexico.

**Table 4. Estimated Age at Marriage, Estimated Experience, and Observed Experience <sup>a</sup>, By Sex, Area of Residence and Education Group. Mexico.**

<i>Age of Marriage and Experience By Sex, Area of Residence and Education Group</i>	<i>Education Level (years)</i>				
	0-5	6-8	9	10-12	13+
<b>Women Less Urban</b>					
Age at Marriage	19.0	20.0	...	...	...
Estimated experience at age 65	23.6	23.2	...	...	...
Observed experience at age 65	24.8	25.3	...	...	...
<b>Women More Urban</b>					
Age at Marriage	20.0	21.0	23.0	25.0	28.0
Estimated experience at age 65	20.9	19.9	21.9	24.3	31.7
Observed experience at age 65	21.1	17.5	17.0	24.1	31.2
<b>Men Less Urban</b>					
Age at Marriage	23.0	23.0	...	...	...
Estimated experience at age 65	47.5	46.7	...	...	...
Observed experience at age 65	49.6	46.5	...	...	...
<b>Men More Urban</b>					
Age at Marriage	24.0	23.0	23.0	25.0	29.0
Estimated experience at age 65	45.0	44.3	44.5	43.9	42.8
Observed experience at age 65	48.1	45.8	44.8	43.2	40.5

... Not Applicable.

Authors' calculations.

- a. Age at marriage is obtained by examining in each group the proportion that is married at each individual age. The age at marriage is fixed as the age at which more than 50% of the individuals in the groups declare to be married. The estimated experience was obtained, as explained in the text, by adding the age-specific participation in the labor market from ages 16 to 65. The observed experience was obtained as the average number of years worked over their lifetime by individuals aged 61-65 in each group.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 5.**  
**Estimated Pre-retirement Wages, New Pension Annuity,**  
**and Replacement Rate**  
**(without minimum pension guarantee)**

<i>Wages, New Pension Annuity, and Replacement Rate By Sex and Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>Women Less Urban</i>					
Wages 61-65 (# Minimum Wages)	0.394	0.507	...	...	...
New Pension					
# Minimum Wages	0.416	0.497	...	...	...
Replacement Rate <sup>b</sup>	1.057	0.980	...	...	...
<i>Women More Urban</i>					
Wages 61-65 (# Minimum Wages)	0.202	0.257	0.308	0.629	3.620
New Pension					
# Minimum Wages	0.449	0.494	0.617	0.892	1.616
Replacement Rate <sup>b</sup>	2.218	1.922	2.000	1.418	0.446
<i>Men Less Urban</i>					
Wages 61-65 (# Minimum Wages)	1.225	2.005	...	...	...
New Pension					
# Minimum Wages	1.267	1.505	...	...	...
Replacement Rate <sup>b</sup>	1.035	0.750	...	...	...
<i>Men More Urban</i>					
Wages 61-65 (# Minimum Wages)	1.148	1.378	2.553	4.425	5.911
New Pension					
# Minimum Wages	1.426	1.582	1.839	2.181	3.413
Replacement Rate <sup>b</sup>	1.242	1.148	0.720	0.493	0.577

... Not Applicable.

a. Replacement rate is the ratio of pension to wages at age 65.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 6. Estimated Annuities by Various Assumptions of Interest Rate, Administrative Fee, and Social Quota. Annuities Expressed in Number of Minimum Wages (1997 annual = 9,522 NPesos). Mexico.**

Estimated Annuities by various assumptions By Sex and Area of Residence	Education Level (years)				
	0-5	6-8	9	10-12	13+
<b>Women Less Urban</b>					
Baseline annuity <sup>a</sup>	0.42	0.50			...
Percentage changes from baseline annuity: <sup>b</sup>					
If interest rate equals 5%	95.24	94.00			
If Administrative Fee 0.95%	7.14	8.00			
If no Social Quota	-42.62	-40.00			
<b>Women More Urban</b>					
Baseline annuity <sup>a</sup>	0.45	0.49	0.62	0.89	1.62
Percentage changes from baseline annuity: <sup>b</sup>					
If interest rate equals 5%	104.44	104.08	100.00	95.51	79.63
If Administrative Fee 0.95%	8.89	10.20	8.06	10.11	11.11
If no Social Quota	-42.22	-36.73	-33.87	-25.84	-17.90
<b>Men Less Urban</b>					
Baseline annuity <sup>a</sup>	1.27	1.50			
Percentage changes from baseline annuity: <sup>b</sup>					
If interest rate equals 5%	88.98	84.00			
If Administrative Fee 0.95%	8.66	10.00			
If no Social Quota	-36.22	-30.00			
<b>Men More Urban</b>					
Baseline annuity <sup>a</sup>	1.43	1.58	1.84	2.18	3.41
Percentage changes from baseline annuity: <sup>b</sup>					
If interest rate equals 5%	86.01	84.18	79.35	73.85	66.57
If Administrative Fee 0.95%	9.09	10.13	10.33	10.55	11.73
If no Social Quota	-30.77	-27.85	-23.91	-19.27	-11.73

... Not Applicable.

a. Baseline assumes interest rate of 3%, administrative fees equal 1.9%, with social quota included.

b. All else at baseline values.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 7.**  
**Sex Ratios of Adjusted New Pension Annuities.**  
**Men's Annuities Adjusted by Spouse Survival <sup>a</sup>, Women's Annuities Adjusted**  
**by**  
**Life Expectancy, Labor Force Participation and Earnings <sup>b</sup>**

<i>Estimated New Pension Annuity, By Sex Ratio and By Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>New Pension Men/Women Ratios</i>					
<i>Less Urban</i>					
Adjusted New Pension <sup>a</sup>					
# Minimum Wages	2.71	2.69			...
Change in Women's Life Expectancy <sup>b</sup>					
# Minimum Wages	2.69	2.68			...
Change in Women's Labor Force Participation <sup>b</sup>					
# Minimum Wages	2.03	2.16		...	
Change in Women's Earnings <sup>b</sup>					
# Minimum Wages	1.39	1.33	...		...
<i>More Urban</i>					
Adjusted New Pension <sup>a</sup>					
# Minimum Wages	2.83	2.85	2.65	2.18	1.88
Change in Women's Life Expectancy <sup>b</sup>					
# Minimum Wages	2.81	2.84	2.64	2.16	1.87
Change in Women's Labor Force Participation <sup>b</sup>					
# Minimum Wages	2.20	2.28	2.31	2.11	2.02
Change in Women's Earnings <sup>b</sup>					
# Minimum Wages	1.34	1.32	1.27	1.22	1.16

... Not Applicable.

- a. New Pension Adjusted: Men annuities are adjusted by spouse survival. The years survived is assumed to be the difference between men and women's life expectancy. The surviving spouse is assumed to receive 60% of the full annuity.
- b. The value of life expectancy, LFP and earnings for men are used instead of those for women. The changes are made one at a time, holding all else at Baseline (Adjusted New Pension) value.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 8.**  
**Sex Ratios of Adjusted New Pension Annuities.**  
**Earnings are Adjusted by Economic Growth Rates and Interest Rates.**

<i>Estimated New Pension Annuity, By Sex Ratio and By Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>New Pension Men/Women Ratio</i>					
<i>Less Urban</i>					
Economic Growth Rate=0.01, and r=0.03					
# Minimum Wages	2.94	2.96	...	...	
Replacement Rate <sup>a</sup>	0.95	0.75	...	...	
Economic Growth Rate=0.02, and r=0.03					
# Minimum Wages	2.85	2.90	...	...	
Replacement Rate <sup>a</sup>	0.92	0.73	...	...	
Economic Growth Rate=0.01, and r=0.05					
# Minimum Wages	2.83	2.77	...	...	...
Replacement Rate <sup>a</sup>	0.91	0.70	...	...	...
Economic Growth Rate=0.02, and r=0.05					
# Minimum Wages	2.74	2.70	...	...	
Replacement Rate <sup>a</sup>	0.88	0.68	...	...	
<i>More Urban</i>					
Economic Growth Rate=0.01, and r=0.03					
# Minimum Wages	3.12	3.18	2.98	2.48	2.12
Replacement Rate <sup>a</sup>	0.55	0.59	0.36	0.35	1.30
Economic Growth Rate=0.02, and r=0.03					
# Minimum Wages	3.06	3.13	2.97	2.51	2.11
Replacement Rate <sup>a</sup>	0.54	0.58	0.36	0.36	1.29
Economic Growth Rate=0.01, and r=0.05					
# Minimum Wages	2.84	2.86	2.64	2.20	1.95
Replacement Rate <sup>a</sup>	0.50	0.53	0.32	0.31	1.20
Economic Growth Rate=0.02, and r=0.05					
# Minimum Wages	2.77	2.81	2.62	2.21	1.94
Replacement Rate <sup>a</sup>	0.49	0.52	0.32	0.31	1.19

... Not Applicable.

a. Replacement rate is the ratio of pension to wages at age 65.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.



**Table 9a.**  
**Estimated Percentage Gains in Pension Annuities and**  
**Replacement Rates from Old to New Social Security System.**  
**(without minimum pension guarantee)**

<i>Percentage Gains By Sex and Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>Women Less Urban</i>					
Percentage Change:					
Pension Annuity	20.580	11.937	...	...	...
Replacement Rate <sup>a</sup>	20.525	12.128	...	...	...
<i>Women More Urban</i>					
Percentage Change:					
Pension Annuity	158.046	124.546	131.086	61.011	-36.528
Replacement Rate <sup>a</sup>	157.907	126.118	129.885	61.136	-36.286
<i>Men Less Urban</i>					
Percentage Change:					
Pension Annuity	2.342	-26.262	...	...	...
Replacement Rate <sup>a</sup>	2.475	-26.471	...	...	...
<i>Men More Urban</i>					
Percentage Change:					
Pension Annuity	24.650	9.254	-26.645	-48.839	-38.259
Replacement Rate <sup>a</sup>	24.200	9.333	-26.531	-48.646	-37.957

... Not Applicable.

a. Replacement rate is the ratio of pension to wages at age 65.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 9b.**  
**Estimated Percentage Gains in Pension Annuities and**  
**Replacement Rates from Old to New Social Security System.**  
**(with minimum pension guarantee)**

<i>Percentage Gains By Sex and Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>Women Less Urban</i>					
Percentage Change:					
Pension Annuity	-58.4	-50.3	...	...	...
Replacement Rate <sup>a</sup>	-58.4	-50.3	...	...	...
<i>Women More Urban</i>					
Percentage Change:					
Pension Annuity	-55.1	-50.6	-38.3	-10.8	-36.5
Replacement Rate <sup>a</sup>	-55.2	-50.6	-38.4	-10.8	-36.4

... Not Applicable.

a. Replacement rate is the ratio of pension to wages at age 65.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 10. Sex Ratios of Accumulated Experience, and Estimated New and Old Pension Annuity. New and Old Social Security Systems in Mexico.<sup>a</sup>**

<i>Wages, Experience and Estimated New and Old Pension Annuity By Sex and Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13 +</i>
<i>Men/Women Ratios</i>					
<i>Less Urban</i>					
Accumulated Experience (years)	2.01	2.01			
New Pension					
# Minimum Wages	3.04	3.02		...	
Replacement Rate <sup>b</sup>	0.98	0.76	...	...	
Old Pension (without MPG) <sup>c</sup>	3.58	4.60	...	...	
# Minimum Wages					
Replacement Rate <sup>b</sup>	1.15	1.16	...	...	
Old Pension (with MPG) <sup>d</sup>					
# Minimum Wages	1.24	2.04	...	...	
Replacement Rate <sup>b</sup>	0.40	0.52	...	...	
<i>More Urban</i>					
Accumulated Experience (years)	2.15	2.22	2.03	1.80	1.35
New Pension					
# Minimum Wages	3.18	3.20	2.98	2.44	2.11
Replacement Rate <sup>b</sup>	0.56	0.60	0.36	0.35	1.29
Old Pension (without MPG) <sup>c</sup>					
# Minimum Wages	6.56	6.58	9.38	7.70	2.17
Replacement Rate <sup>b</sup>	1.15	1.23	1.13	1.09	1.33
Old Pension (with MPG) <sup>d</sup>					
# Minimum Wages	1.14	1.45	2.51	4.26	2.17
Replacement Rate <sup>b</sup>	0.20	0.27	0.30	0.61	1.33

... Not Applicable.

a. See Table 1 for the difference between the new and old social security systems.

b. Replacement rate is the ratio of pension to wages at age 65.

c. MPG = minimum pension guarantee

d. Adjusted by assuming one minimum wage as the pension annuity if the calculated annuity falls below this threshold. This is the case for women in all groups except those in more urban areas, with 13+ education.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Table 11. Estimated Proportion of Individuals by Minimum Requirements for Eligibility. New and Old Social Security Systems in Mexico. <sup>a</sup>**

<i>Eligibility in New and Old Social Security Systems, By Sex and Area of Residence</i>	<i>Education Level (years)</i>				
	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13+</i>
<b><i>Women Less Urban</i></b>					
Mean Experience (years)	23.65	23.24	...	...	...
Proportion < 25 years	0.578	0.625	...	...	...
Proportion < 10 years	0.023	0.008	...	...	...
Pension					
New: proportion < One Minimum Wage	1.000	1.000	...	...	...
Old: proportion < One Minimum Wage	1.000	1.000	...	...	...
<b><i>Women More Urban</i></b>					
Mean Experiences (years)	20.933	19.919	21.904	24.355	31.707
Proportion < 25 years	0.716	0.762	0.676	0.545	0.228
Proportion < Under 10 years	0.062	0.082	0.039	0.006	0.008
Pension					
New: proportion < One Minimum Wage	1.000	0.998	0.978	0.698	0.090
Old: proportion < One Minimum Wage	1.000	1.000	1.000	1.000	0.016
<b><i>Men Less Urban</i></b>					
Mean Experience (years)	47.511	46.738	...	...	...
Proportion < 25 years	0.000	0.013	...	...	...
Proportion < 10 years	0.000	0.000	...	...	...
Pension					
New: proportion < One Minimum Wage	0.022	0.055	...	...	...
Old: proportion < One Minimum Wage	0.033	0.007	...	...	...
<b><i>Men More Urban</i></b>					
Mean Experience (years)	45.001	44.330	44.553	43.887	42.836
Proportion < 25 years	0.013	0.026	0.040	0.078	0.144
Proportion < 10 years	0.000	0.000	0.001	0.005	0.025
Pension					
New: proportion < One Minimum Wage	0.067	0.051	0.034	0.037	0.036
Old: proportion < One Minimum Wage	0.263	0.084	0.008	0.006	0.018

... Not Applicable.

a. See Table 1 for the differences between the new and old Social Security Systems.

Source: National Employment Survey (ENE 1997), INEGI, Mexico.

**Figure 1. Pension Annuity in Minimum Wages. New Social Security System in Mexico.  
(for more urban population)**

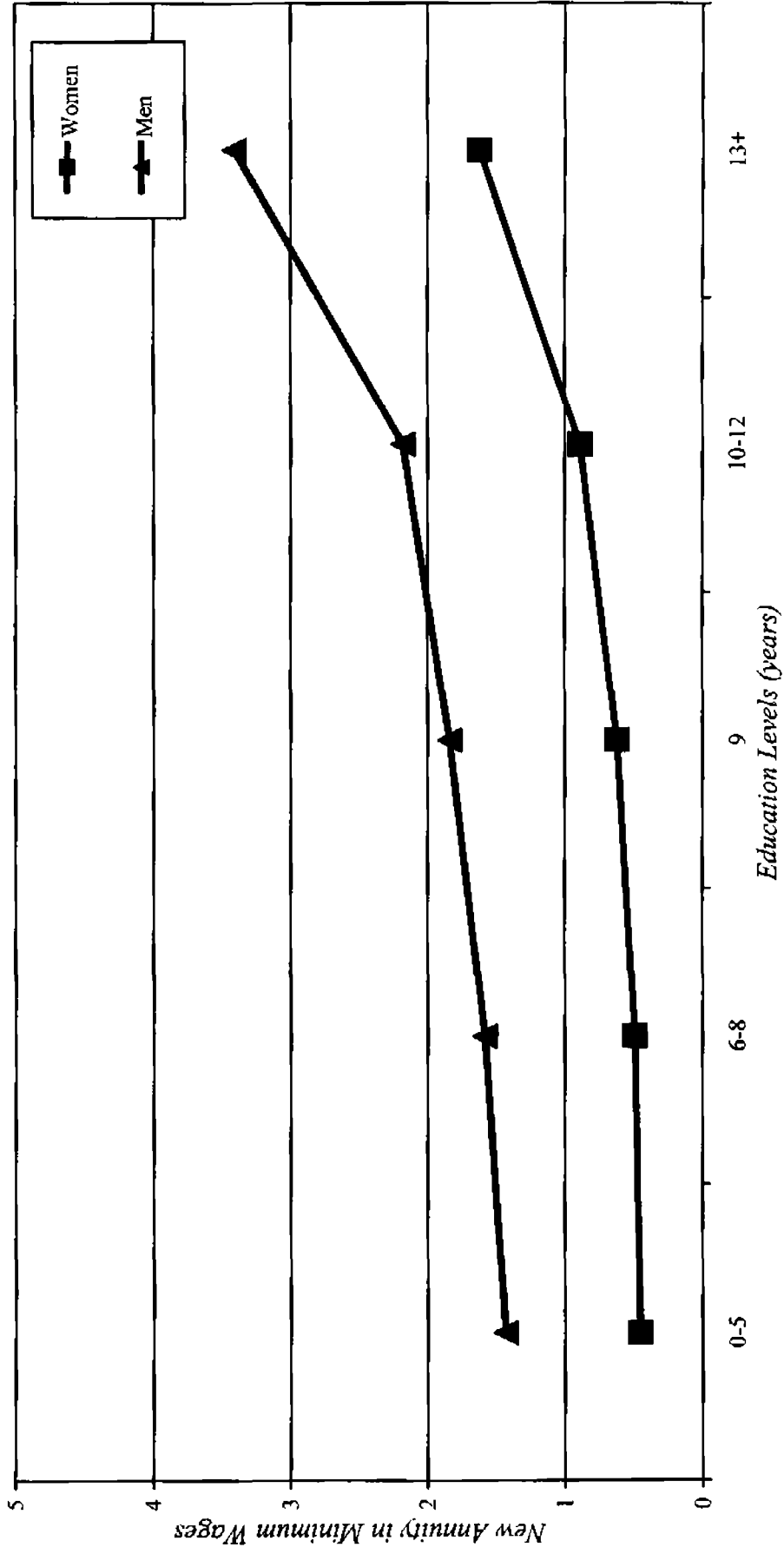


Figure 2. Replacement Rate of New Pension.  
Mexico. (for more urban population).

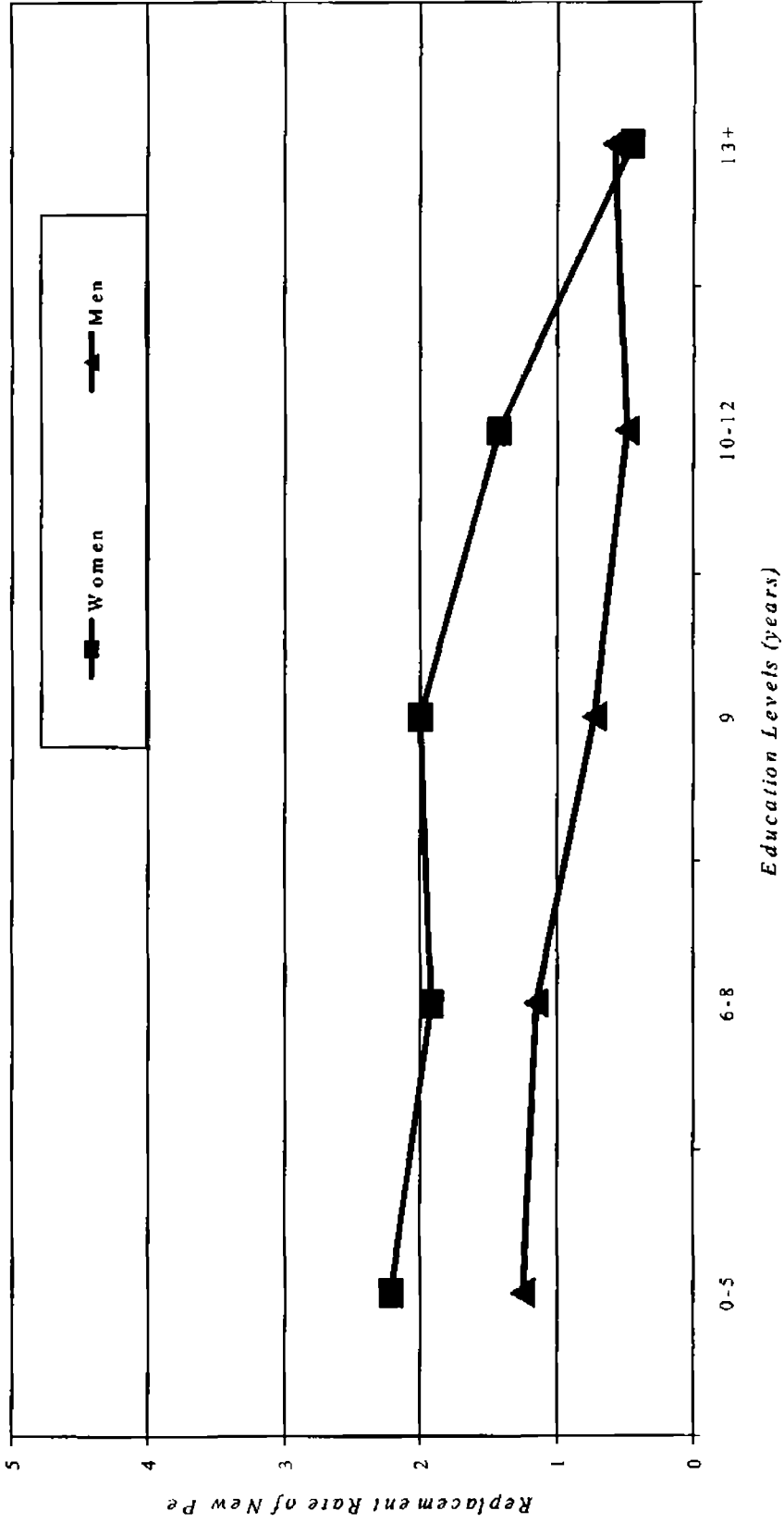


Figure 3. Percentage Change in Baseline Annuity with 5% Interest Rate. Annuities in Minimum Wages. Mexico. (for more urban population).

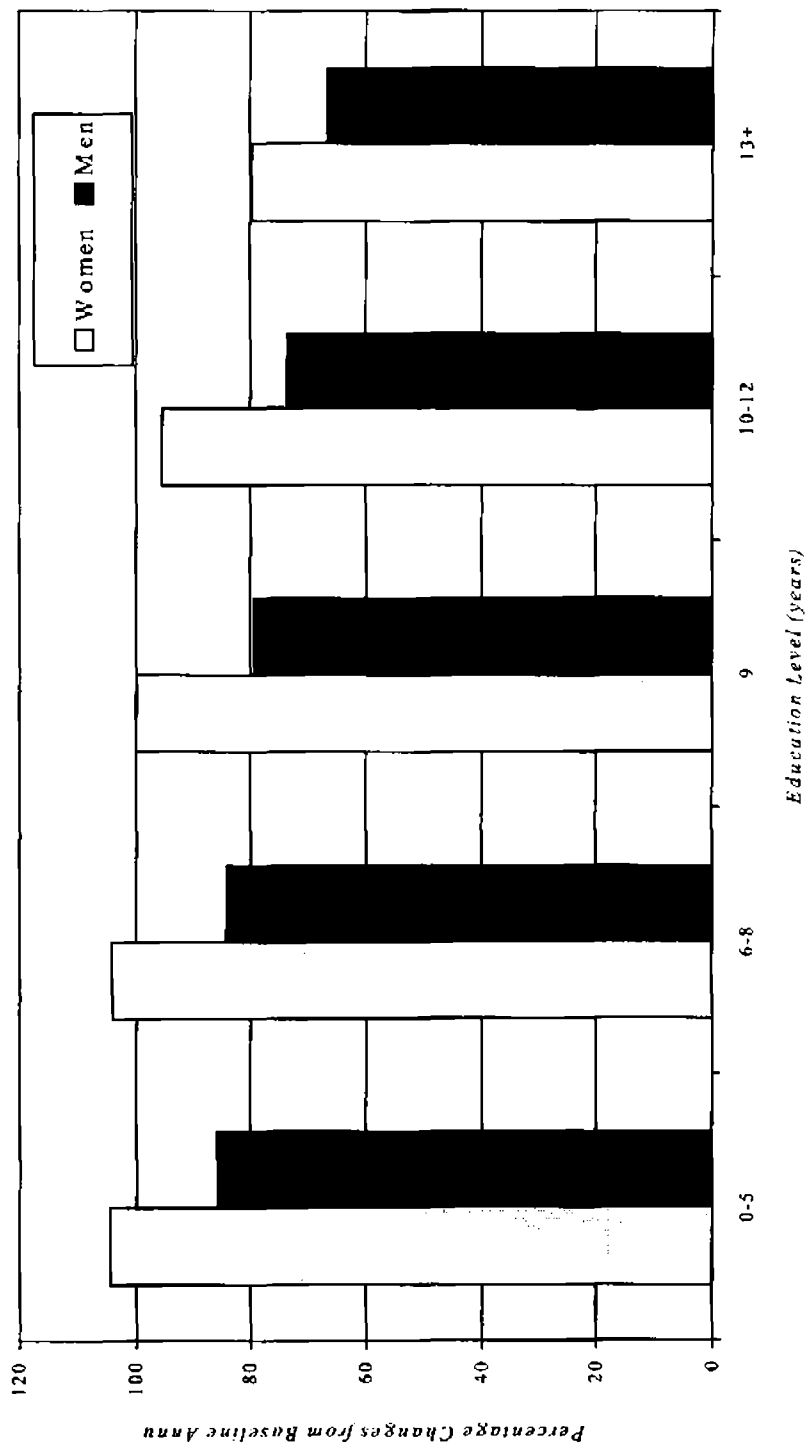


Figure 4. Percentage Change in Baseline Annuity if No Social Quota. Annuities in Minimum Wages, Mexico. (for more urban population).

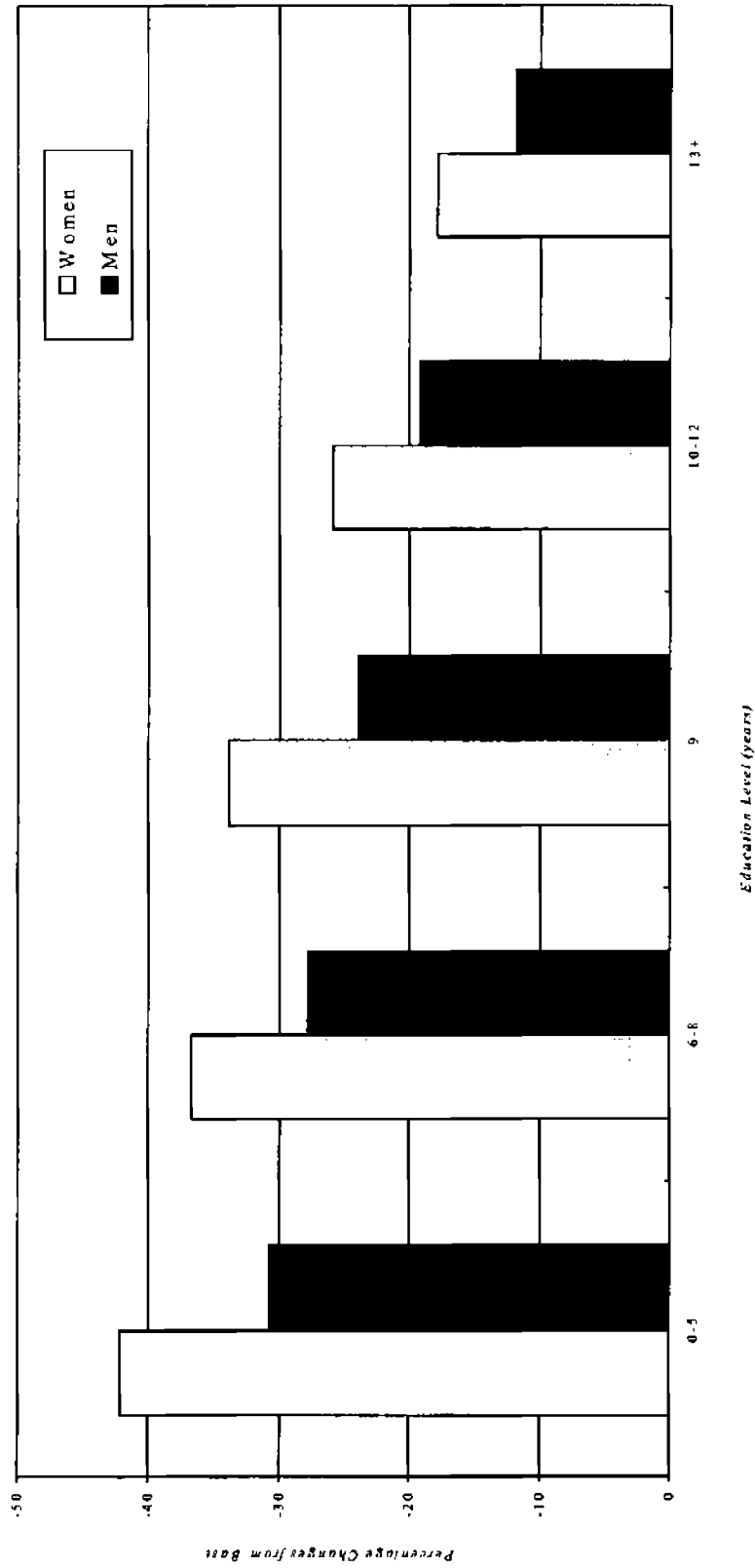




Figure 5. Sex Ratios of New Pension Annuities, with Women's Annuities Adjusted by Men's Labor Force Participation and by Men's Earnings. Mexico. (for more urban population).

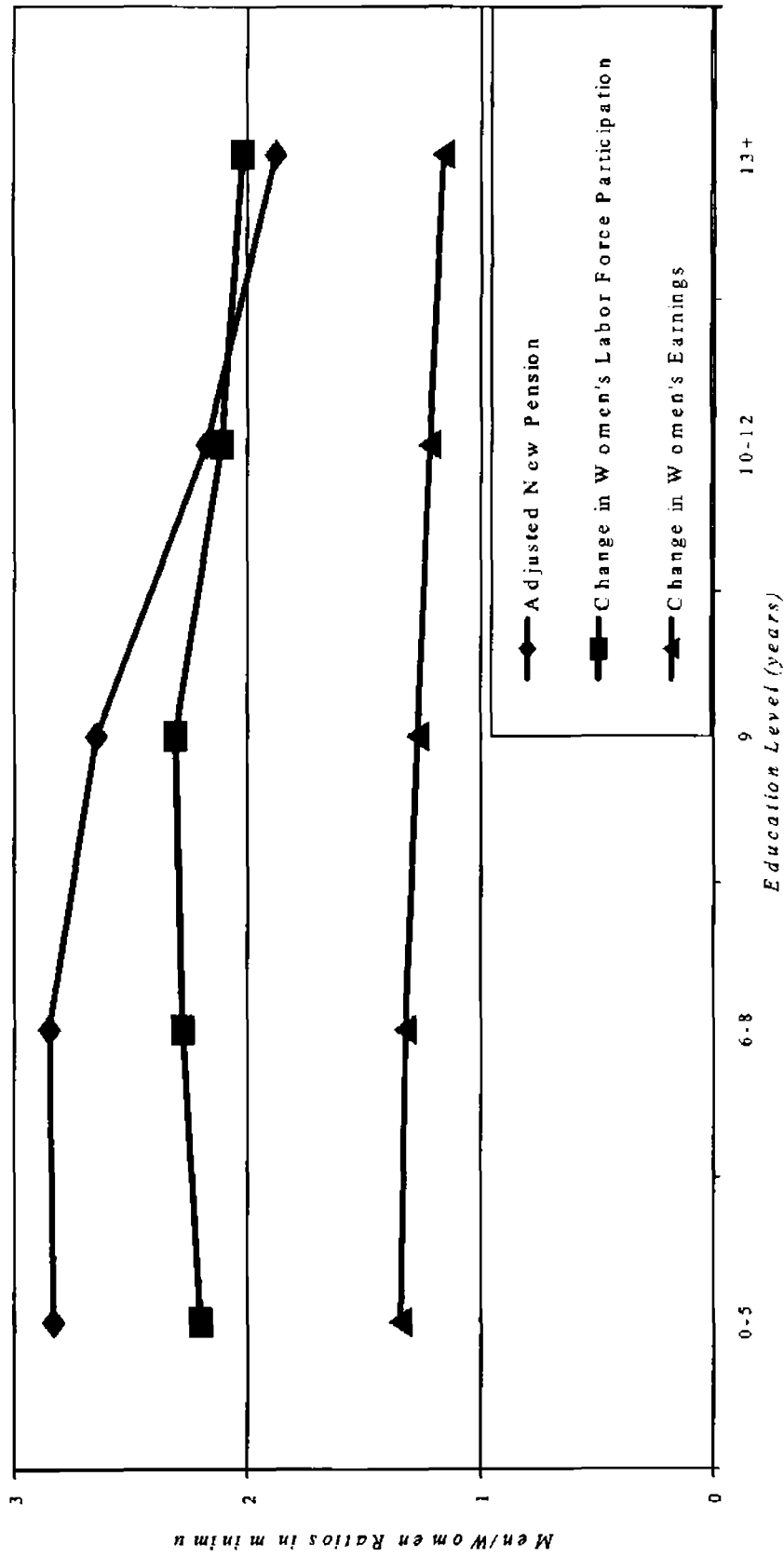


Figure 6. Sex Ratios of Pre-retirement Wages, Total Experience, New Pension Annuity and Replacement Rate. Mexico. (for more urban population).

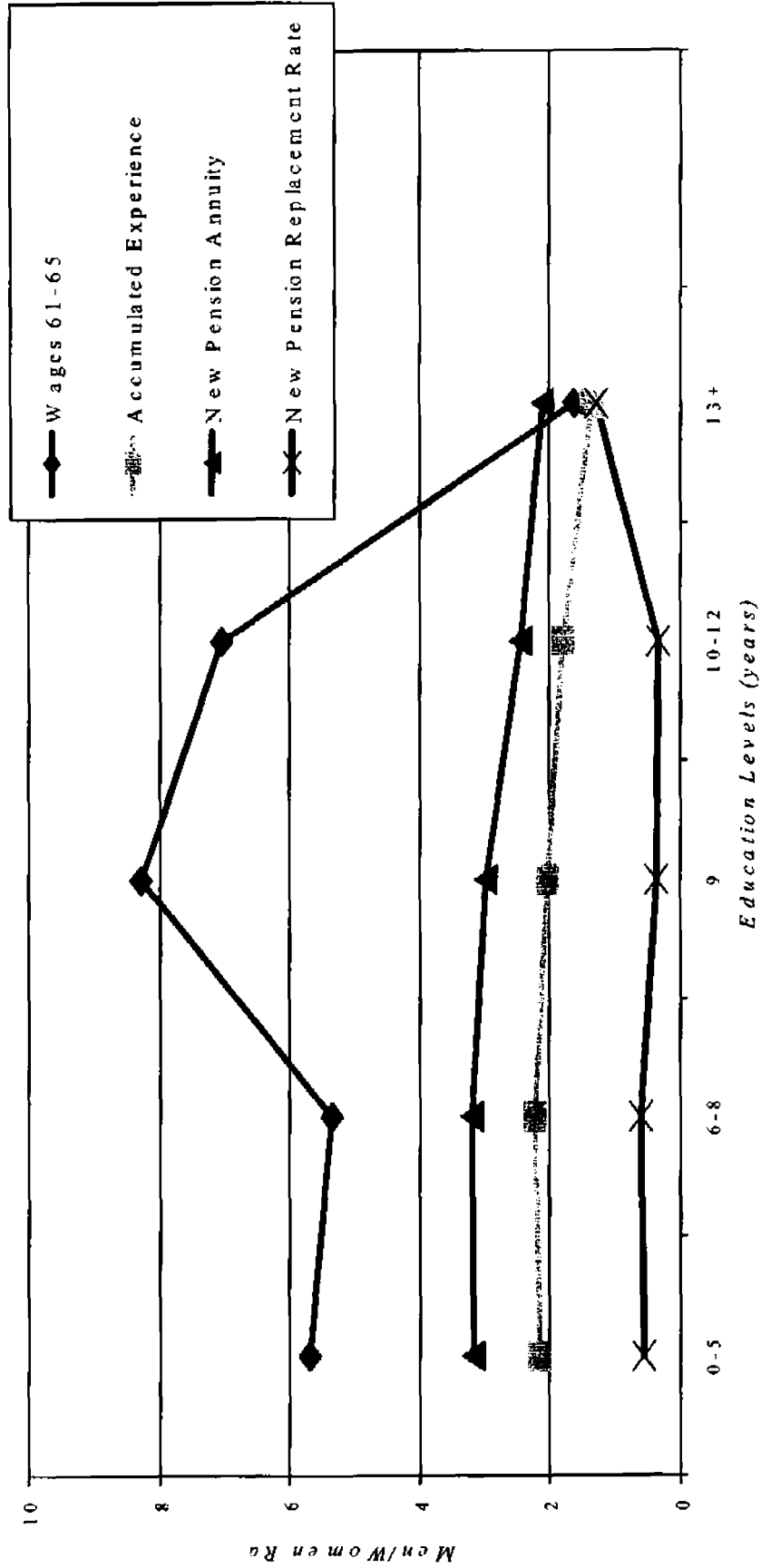


Figure 7. Sex Ratios of Estimated New and Old Pension Annuity. New and Old Social Security Systems in Mexico. (for more urban population)

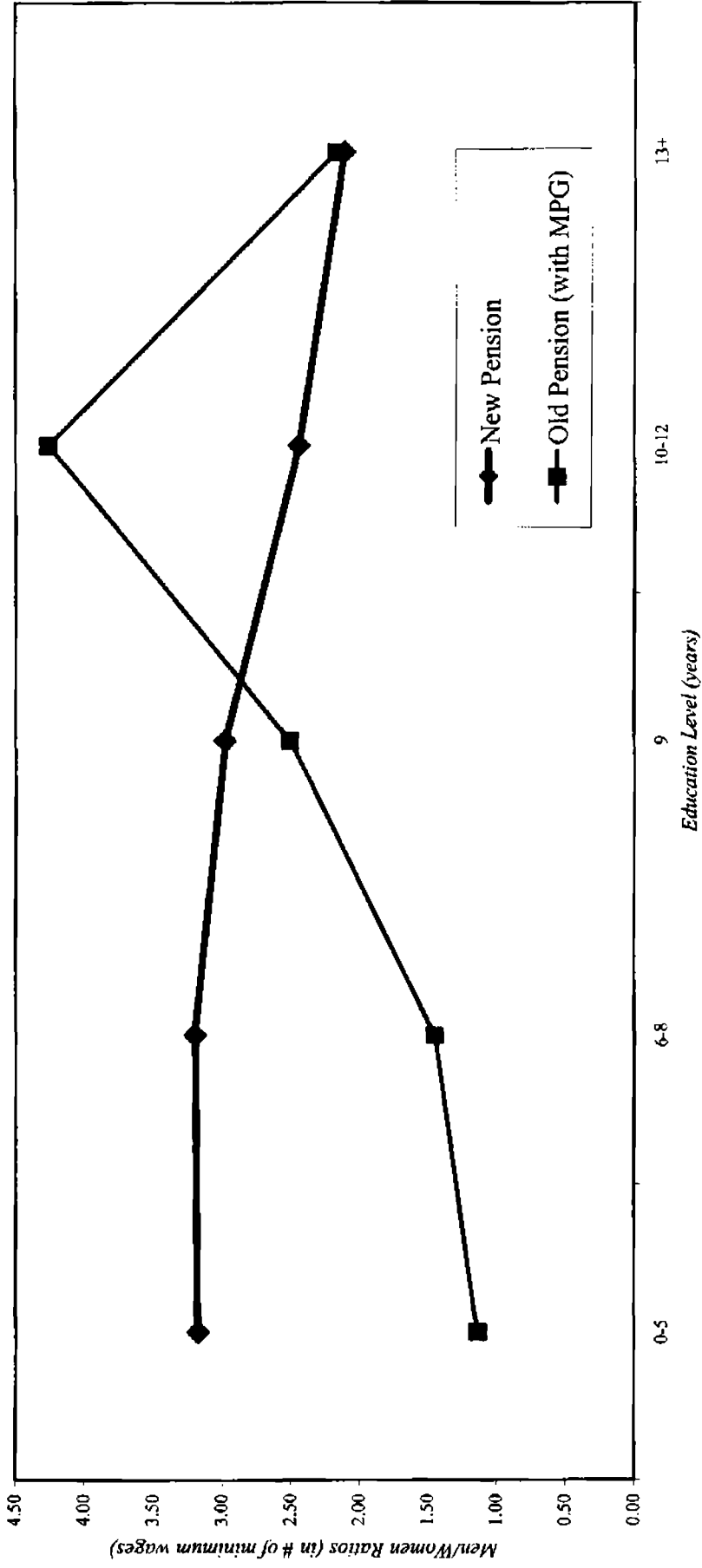


Figure 8. Estimated Replacement Rates for Women and Men. New and Old Social Security Systems. (for more urban population)

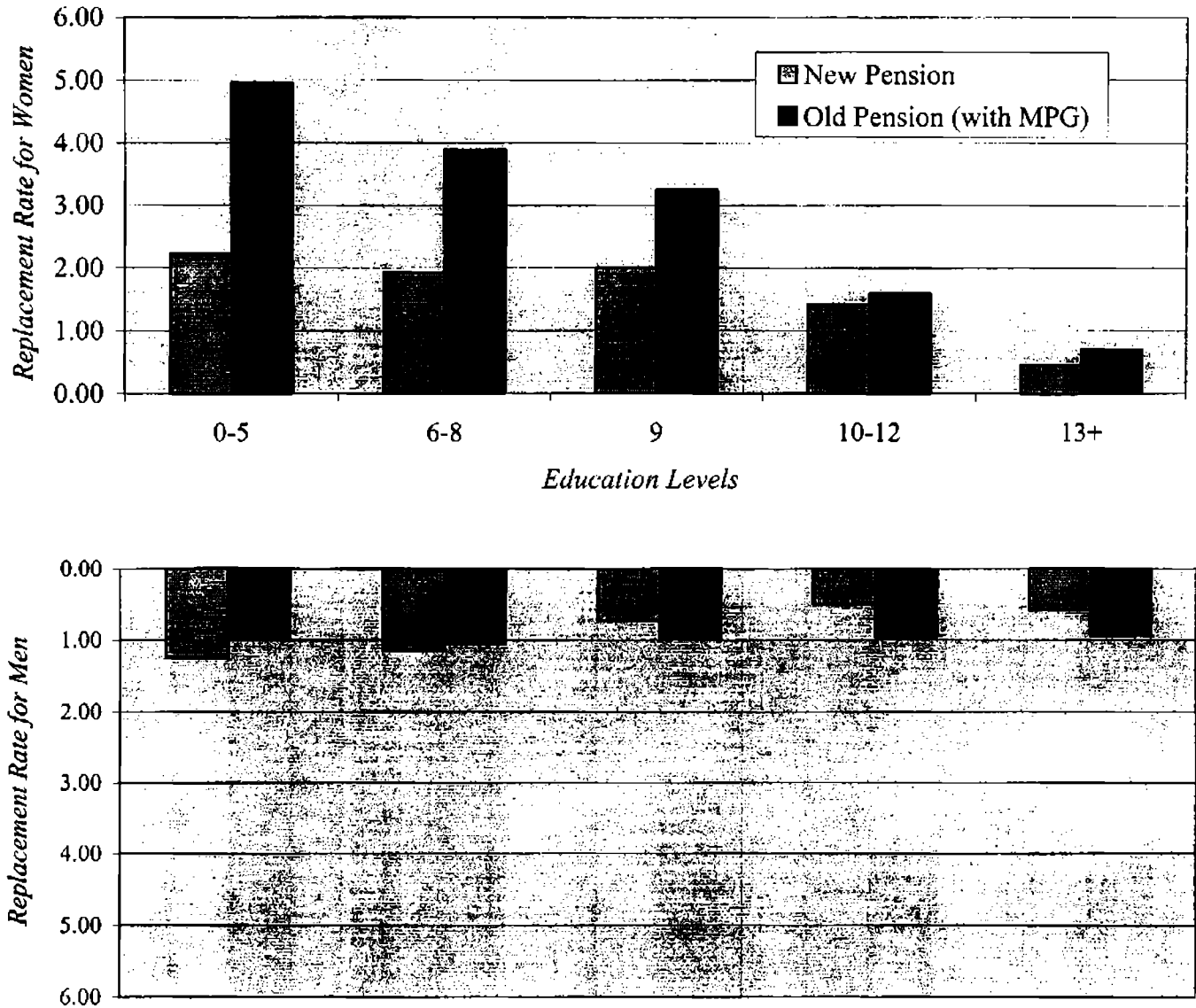


Figure 9. Replacement Rates for Women and Men. New and Old Social Security Systems without M.P.G. Mexico. (for more urban population).

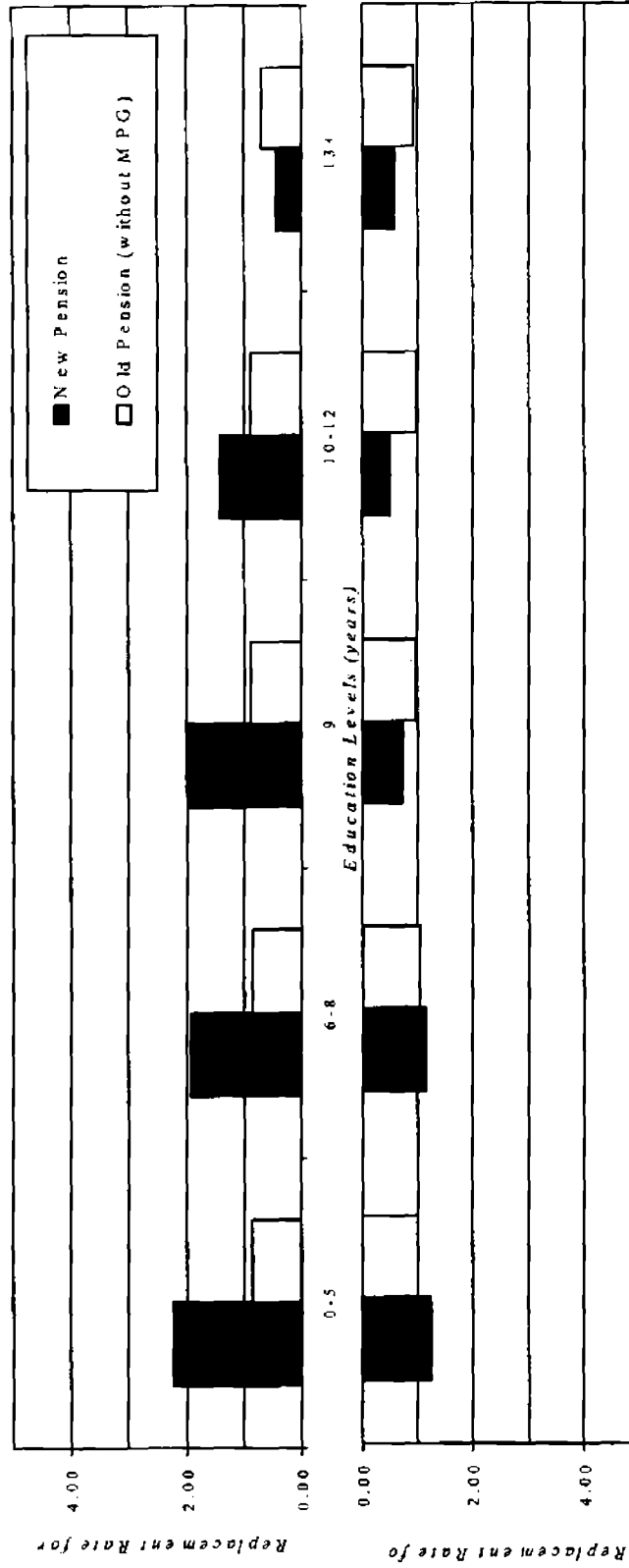
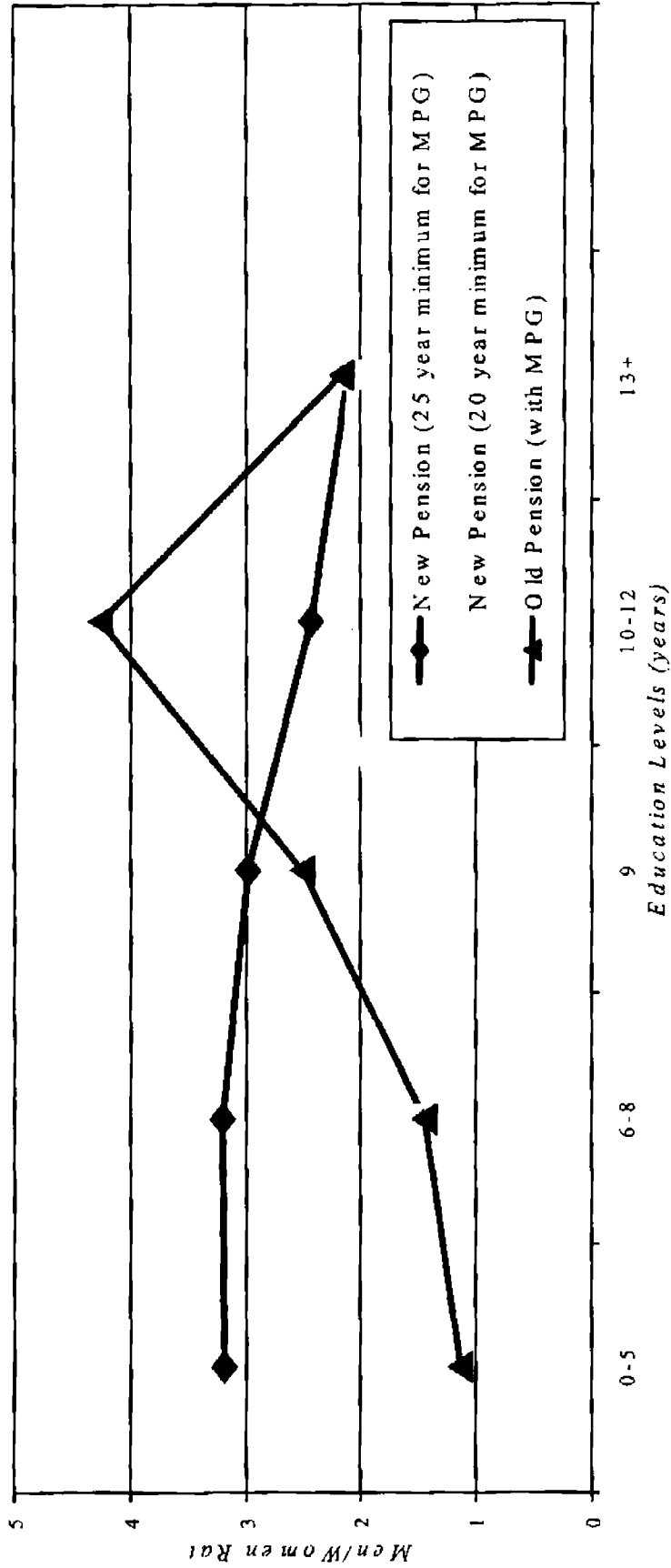


Figure 10. Sex Ratios of New and Old Pension Annuity with Minimum Pension Guarantee. Mexico. (for more urban population).



**Appendix A.**

**Appendix Table A1.  
Estimated Labor Force Participation for Age  
Groups by Sex, Education, and Area of  
Residence.**

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Estimated LFP by Age Group.  
Women-Less Urban

<i>Age married:</i>	<i>19</i>	<i>20</i>			
<i>Yrs. of</i>	<i>0-5</i>	<i>6-8</i>	<i>9</i>	<i>10-12</i>	<i>13+</i>
<i>Educ.:</i>					
Age: 16	0.7661	0.7483	....	....	....
17	0.7661	0.7483	....	....	....
18	0.7661	0.7483	....	....	....
19	0.2857	0.7483	....	....	....
20	0.2857	0.25	....	....	....
21	0.2612	0.2835	....	....	....
22	0.2612	0.2835	....	....	....
23	0.2612	0.2835	....	....	....
24	0.2612	0.2835	....	....	....
25	0.2612	0.2835	....	....	....
26	0.4671	0.3977	....	....	....
27	0.4671	0.3977	....	....	....
28	0.4671	0.3977	....	....	....
29	0.4671	0.3977	....	....	....
30	0.4671	0.3977	....	....	....
31-35	2.2247	2.7056	....	....	....
36-40	2.4375	3.0046	....	....	....
41-45	2.6955	2.3563	....	....	....
46-50	2.7593	2.337	....	....	....
51-55	2.5505	2.2807	....	....	....
56-60	2.2754	2.439	....	....	....
61-65	2.1963	1.4706	....	....	....
Total LFP at age 65:	23.65	23.243			

**Appendix Table A1. (cont.)  
Estimated Labor Force Participation for Age Groups by Sex, Education, and Area of Residence.**

Estimated LFP by Age Group. Women-More Urban					
<i>Age married:</i>	20	21	23	25	28
<i>Yrs of Educ:</i>	0-5	6-8	9	10-12	13+
Age: 16	0.8042	0.7973	0.7784	0.7279	0.6463
17	0.8042	0.7973	0.7784	0.7279	0.6463
18	0.8042	0.7973	0.7784	0.7279	0.6463
19	0.8042	0.7973	0.7784	0.7279	0.6463
20	0.2237	0.7973	0.7784	0.7279	0.6463
21	0.3081	0.2978	0.7784	0.8279	0.7708
22	0.3081	0.2978	0.7784	0.8279	0.7708
23	0.3081	0.2978	0.3402	0.8279	0.7708
24	0.3081	0.2978	0.3402	0.8279	0.7708
25	0.3081	0.2978	0.3402	0.4031	0.7708
26	0.3826	0.3397	0.3837	0.4638	0.9081
27	0.3826	0.3397	0.3837	0.4638	0.9081
28	0.3826	0.3397	0.3837	0.4638	0.6106
29	0.3826	0.3397	0.3837	0.4638	0.6106
30	0.3826	0.3397	0.3837	0.4638	0.6106
31-35	2.5706	2.0222	2.0975	2.4159	3.4027
36-40	2.2955	2.231	2.4232	2.732	3.2569
41-45	2.3409	2.2383	2.6031	2.593	3.4896
46-50	2.0674	2.0496	2.0522	2.5412	3.4063
51-55	2.1068	1.6527	1.8116	1.7488	2.809
56-60	1.5723	1.3855	1.7391	1.6509	2.3171
61-65	1.0849	1.1656	0.7895	1	2.2917
Total LFP at age 65:	20.933	19.919	21.904	24.355	31.707



**Appendix Table A1. (cont.)  
Estimated Labor Force Participation for Age Groups by Sex, Education, and Area of Residence.**

Estimated LFP by Age Group.					
Men-Less Urban					
Age married:	23	23			
Yrs. of Educ:	0-5	6-8	9	10-12	13+
Age: 16	0.9618	0.9002	....	....	....
17	0.9618	0.9002	....	....	....
18	0.9618	0.9002	....	....	....
19	0.9618	0.9002	....	....	....
20	0.9618	0.9002	....	....	....
21	0.928	0.9519	....	....	....
22	0.928	0.9519	....	....	....
23	0.9805	0.9721	....	....	....
24	0.9805	0.9721	....	....	....
25	0.9805	0.9721	....	....	....
26	0.991	0.987	....	....	....
27	0.991	0.987	....	....	....
28	0.991	0.987	....	....	....
29	0.991	0.987	....	....	....
30	0.991	0.987	....	....	....
31-35	4.9449	4.9432	....	....	....
36-40	4.9396	4.9708	....	....	....
41-45	4.8378	4.8945	....	....	....
46-50	4.7664	4.7838	....	....	....
51-55	4.6866	4.771	....	....	....
56-60	4.5904	4.2857	....	....	....
61-65	4.1837	3.8333	....	....	....
Total LFP at age 65:	47.511	46.738			

**Appendix Table A1. (cont.)**  
**Estimated Labor Force Participation for Age Groups by Sex, Education, and Area of Residence.**

Estimated LFP by Age Group.					
Men-More Urban					
Age married:	24	23	23	25	29
Yrs. of Educ:	0-5	6-8	9	10-12	13+
Age: 16	0.875	0.8571	0.833	0.7025	0.5929
17	0.875	0.8571	0.833	0.7025	0.5929
18	0.875	0.8571	0.833	0.7025	0.5929
19	0.875	0.8571	0.833	0.7025	0.5929
20	0.875	0.8571	0.833	0.7025	0.5929
21	0.8832	0.9181	0.9185	0.8765	0.7645
22	0.8832	0.9181	0.9185	0.8765	0.7645
23	0.8832	0.9816	0.977	0.8765	0.7645
24	0.9934	0.9816	0.977	0.8765	0.7645
25	0.9934	0.9816	0.977	0.9714	0.7645
26	0.9668	0.9901	0.9842	0.9897	0.9213
27	0.9668	0.9901	0.9842	0.9897	0.9213
28	0.9668	0.9901	0.9842	0.9897	0.9213
29	0.9668	0.9901	0.9842	0.9897	0.9824
30	0.9668	0.9901	0.9842	0.9897	0.9824
31-35	4.8852	4.8818	4.9267	4.9038	4.9454
36-40	4.8929	4.8715	4.9306	4.8794	4.8678
41-45	4.8214	4.8848	4.8576	4.8455	4.9147
46-50	4.7113	4.6341	4.6809	4.7751	4.8036
51-55	4.4813	4.4123	4.3902	4.4643	4.4855
56-60	4.0992	3.8361	3.85	4.04	4.2396
61-65	3.264	2.7922	3.0625	3.0405	3.0634
Total LFP at age 65:	45.001	44.33	44.553	43.887	42.836

**Appendix Table A2.**  
**Estimated Annual Earnings by Sex, Education, and Area of Residence.**

	Estimated Annual Earnings. Women-Less Urban				
	Yrs of Education				
	0-5	6-8	9	10-12	13+
Age: 16	5726.4	5944.9	....	....	....
17	5726.4	5944.9	....	....	....
18	5726.4	5944.9	....	....	....
19	2250.1	5944.9	....	....	....
20	2250.1	2390.3	....	....	....
21	1995.9	3723.2	....	....	....
22	1995.9	3723.2	....	....	....
23	1995.9	3723.2	....	....	....
24	1995.9	3723.2	....	....	....
25	1995.9	3723.2	....	....	....
26	2974.8	4176.5	....	....	....
27	2974.8	4176.5	....	....	....
28	2974.8	4176.5	....	....	....
29	2974.8	4176.5	....	....	....
30	2974.8	4176.5	....	....	....
31-35	19438	27186	....	....	....
36-40	22822	35462	....	....	....
41-45	29453	30220	....	....	....
46-50	24269	26835	....	....	....
51-55	22477	39038	....	....	....
56-60	17269	23376	....	....	....
61-65	18763	24163	....	....	....

**Appendix Table A2. (cont.)  
Estimated Annual Earnings by Sex, Education, and Area of Residence.**

		Estimated Annual Earnings Women-More Urban				
		Yrs. of Education				
		0-5	6-8	9	10-12	13+
Age:	16	7919	8940.6	9119.7	10112	9199.9
	17	7919	8940.6	9119.7	10112	9199.9
	18	7919	8940.6	9119.7	10112	9199.9
	19	7919	8940.6	9119.7	10112	9199.9
	20	1760.2	8940.6	9119.7	10112	9199.9
	21	3390.7	3663.1	11170	14664	19705
	22	3390.7	3663.1	11170	14664	19705
	23	3390.7	3663.1	4912.1	14664	19705
	24	3390.7	3663.1	4912.1	14664	19705
	25	3390.7	3663.1	4912.1	7625.8	19705
	26	4243.5	4000.6	5491.5	10739	30486
	27	4243.5	4000.6	5491.5	10739	30486
	28	4243.5	4000.6	5491.5	10739	20608
	29	4243.5	4000.6	5491.5	10739	20608
	30	4243.5	4000.6	5491.5	10739	20608
	31-35	29084	25584	34781	58224	131435
	36-40	24027	29181	41011	74121	136813
	41-45	23749	33879	49660	72958	164640
	46-50	21757	36684	43442	71267	151691
	51-55	25063	28451	35001	49924	145949
	56-60	16632	17663	27795	63691	108036
	61-65	9632.5	12233	14684	29944	172333

**Appendix Table A2. (cont.)  
Estimated Annual Earnings by Sex, Education, and Area of Residence.**

	Estimated Annual Earnings Men-Less Urban				
	Yrs. of Education				
	0-5	6-8	9	10-12	13+
Age: 16	11119	9400.7	...	...	...
17	11119	9400.7	...	...	...
18	11119	9400.7	...	...	...
19	11119	9400.7	...	...	...
20	11119	9400.7	...	...	...
21	10568	13898	...	...	...
22	10568	13898	...	...	...
23	11426	13905	...	...	...
24	11426	13905	...	...	...
25	11426	13905	...	...	...
26	12993	17097	...	...	...
27	12993	17097	...	...	...
28	12993	17097	...	...	...
29	12993	17097	...	...	...
30	12993	17097	...	...	...
31-35	74522	90325	...	...	...
36-40	73906	89009	...	...	...
41-45	66310	108642	...	...	...
46-50	66535	108530	...	...	...
51-55	72487	105665	...	...	...
56-60	64466	79156	...	...	...
61-65	58305	95470	...	...	...

**Appendix Table A2. (cont.)  
Estimated Annual Earnings by Sex, Education, and Area of Residence.**

		Estimated Annual Earnings				
		Men-More Urban				
Age:		Yrs. of Education				
		0-5	6-8	9	10-12	13+
16	10523	10778	11060	9570.7	9220	
17	10523	10778	11060	9570.7	9220	
18	10523	10778	11060	9570.7	9220	
19	10523	10778	11060	9570.7	9220	
20	10523	10778	11060	9570.7	9220	
21	12659	14190	15695	17042	23214	
22	12659	14190	15695	17042	23214	
23	12659	17074	19117	17042	23214	
24	17280	17074	19117	17042	23214	
25	17280	17074	19117	23180	23214	
26	16862	18859	21804	29693	40458	
27	16862	18859	21804	29693	40458	
28	16862	18859	21804	29693	40458	
29	16862	18859	21804	29693	45767	
30	16862	18859	21804	29693	45767	
31-35	89178	103490	117175	158799	290990	
36-40	94128	106789	125884	158346	314667	
41-45	93421	107554	148673	181785	356605	
46-50	98958	114293	150541	174984	364088	
51-55	85542	123620	157240	174843	363221	
56-60	73853	93547	109718	181204	319759	
61-65	54645	65623	121541	210682	281408	

## ***Appendix B***

### ***Value of Retirement Pension according to New (multi-pillar) Rules – IMSS***

#### ***Mexico***

The new system is based on a multi-pillar approach. The first pillar is publicly managed with a redistributive purpose guaranteeing a minimum pension (equivalent to one minimum wage indexed to consumer price index), for low income workers. The second pillar is a fully funded scheme of mandatory individual savings accounts, managed through competitive but exclusive mutual funds (AFORES). The third pillar consists of voluntary savings.

We assume that all earnings are subject to the pension contributions because none of our prototypical individuals exceeded the maximum limit for contributions (15 times the minimum wage). We calculate the total contributions made to the individual accounts (taking into account only the first and second pillar), making the following assumptions (Grandolini and Cerda 1998):

- 1) 5% of earnings are contributed to the housing fund, INFONAVIT, with 0% return.
- 2) 6.5% of earnings are contributed to the individual's account for retirement benefits.
- 3) 1.9% of earnings are deducted from the contributions as administrative fees.
- 4) 5.5% of one Federal District minimum wage is contributed to the individual's account by the government, as the "social quota." This amounts to 523.71 (in 1997 pesos) per year. This is applied proportionate to the time worked during the year.

We calculate the value of the total contributions from age 16 to 65, assuming an interest rate of 3% for our baseline estimates. We use the total accumulations to obtain estimated annuities using a life expectancy at age 65 of 18.5 years for women and 16 years for men (CONAPO 1998). The assumptions for the calculations are relaxed throughout the paper, to examine the impact of each parameter on the calculated pensions, as well as on the gender gap in pensions.

**Appendix Table B1.**  
**Contributions and Total Accumulation to Age 65. New Social Security Rules.**

K =	ACCUMULATIONS TO AGE 65.
	Assuming: 0.03 interest rate
	Assuming: 0.05 of earnings are contributed to INFOVAVIT (with 0% return).
	Assuming: 0.046 contribution rate accumulated at the rate assumed above(*).
	Assuming: 0.055 of 1 Min Wage is contributed as Social Quota, accumulated as above
	523.71 per year prop to time worked at year.
	Assuming: (*) .065 accumulation rate -.019 administrative fees deducted from contributions.

Women Less Urban, Mexico.

Age	0-5	6-8	9	10-12	13+
16	\$3,115.18	\$3,129.20	...	...	...
17	\$3,032.79	\$3,046.71	...	...	...
18	\$2,952.79	\$2,966.63	...	...	...
19	\$1,098.48	\$2,888.88	...	...	...
20	\$1,069.76	\$1,030.44	...	...	...
21	\$939.10	\$1,360.00	...	...	...
22	\$914.66	\$1,325.81	...	...	...
23	\$890.92	\$1,292.61	...	...	...
24	\$867.88	\$1,260.39	...	...	...
25	\$845.51	\$1,229.10	...	...	...
26	\$1,356.79	\$1,476.94	...	...	...
27	\$1,321.61	\$1,440.01	...	...	...
28	\$1,287.45	\$1,404.15	...	...	...
29	\$1,254.28	\$1,369.33	...	...	...
30	\$1,222.08	\$1,335.53	...	...	...
31-35	\$6,279.25	\$8,234.43	...	...	...
36-40	\$6,313.16	\$8,898.01	...	...	...
41-45	\$6,778.18	\$6,543.51	...	...	...
46-50	\$5,450.83	\$5,408.50	...	...	...
51-55	\$4,505.41	\$6,218.89	...	...	...
56-60	\$2,789.89	\$3,450.85	...	...	...
61-65	\$3,075.90	\$3,206.17	...	...	...
K =	\$57,361.91	\$68,516.11			
e(65)=18.5	18.5	18.5			
Annuity =	\$3,966.39	\$4,737.67			



**Appendix Table B1. (Continued)**

**Contributions and Total Accumulations to Age 65. New Social Security Rule.**

**ACCUMULATIONS TO AGE 65. Women More Urban, Mexico.**

65.

Assuming: 0.03 interest rate

Assuming: 0.046 contribution rate

Age	0-5	6-8	9	10-12	13+
16	\$3,738.96	\$3,974.59	\$3,976.51	\$4,107.86	\$3,701.91
17	\$3,641.59	\$3,871.84	\$3,873.97	\$4,002.94	\$3,607.48
18	\$3,547.05	\$3,772.09	\$3,774.42	\$3,901.08	\$3,515.81
19	\$3,455.27	\$3,675.24	\$3,677.76	\$3,802.18	\$3,426.80
20	\$837.19	\$3,581.22	\$3,583.92	\$3,706.16	\$3,340.39
21	\$1,334.66	\$1,374.34	\$3,941.69	\$4,801.52	\$5,795.27
22	\$1,300.72	\$1,339.65	\$3,843.15	\$4,683.02	\$5,655.17
23	\$1,267.77	\$1,305.96	\$1,644.15	\$4,567.98	\$5,519.15
24	\$1,235.79	\$1,273.26	\$1,603.42	\$4,456.28	\$5,387.10
25	\$1,204.73	\$1,241.51	\$1,563.87	\$2,214.18	\$5,258.89
26	\$1,464.98	\$1,346.28	\$1,710.93	\$2,870.82	\$7,471.90
27	\$1,428.49	\$1,312.90	\$1,669.09	\$2,802.84	\$7,298.67
28	\$1,393.06	\$1,280.48	\$1,628.47	\$2,736.85	\$4,814.90
29	\$1,358.67	\$1,249.01	\$1,589.04	\$2,672.77	\$4,704.67
30	\$1,325.28	\$1,218.46	\$1,550.76	\$2,610.57	\$4,597.65
31-35	\$8,372.11	\$7,041.86	\$8,693.67	\$13,075.06	\$26,747.18
36-40	\$6,331.17	\$7,041.06	\$9,066.16	\$14,467.26	\$24,624.34
41-45	\$5,633.60	\$6,930.74	\$9,478.28	\$12,688.32	\$26,261.02
46-50	\$4,534.71	\$6,401.45	\$7,255.88	\$11,188.25	\$22,078.95
51-55	\$4,472.89	\$4,525.24	\$5,401.46	\$7,080.30	\$18,977.15
56-60	\$2,372.49	\$2,375.16	\$3,513.39	\$6,865.11	\$11,399.38
61-65	\$1,555.42	\$1,857.32	\$1,890.46	\$3,515.85	\$18,308.50
K =	\$61,806.60	\$67,989.65	\$84,930.4	\$122,817.2	\$222,492.2
			5	0	8
e(65)=18.5	18.5	18.5	18.5	18.5	18.5
5					
Annuity =	\$4,273.73	\$4,701.27	\$5,872.67	\$8,492.42	\$15,384.63

**Appendix Table B1. (Continued)**

**Contributions and Total Accumulation to Age 65. New Social Security Rules.**

		ACCUMULATIONS TO AGE 65. Men Less Urban, Mexico.				
		Assuming: 0.03 interest rate				
		Assuming: 0.046 Contribution rate				
Age	0-5	6-8	9	10-12	13+	
16	\$4,876.70	\$4,317.08	...	...	...	
17	\$4,750.86	\$4,205.03	...	...	...	
18	\$4,628.67	\$4,096.24	...	...	...	
19	\$4,510.05	\$3,990.63	...	...	...	
20	\$4,394.88	\$3,888.08	...	...	...	
21	\$4,097.51	\$4,872.48	...	...	...	
22	\$3,993.56	\$4,750.81	...	...	...	
23	\$4,167.39	\$4,670.70	...	...	...	
24	\$4,062.65	\$4,554.91	...	...	...	
25	\$3,960.96	\$4,442.49	...	...	...	
26	\$4,186.17	\$4,982.59	...	...	...	
27	\$4,083.16	\$4,862.37	...	...	...	
28	\$3,983.16	\$4,745.64	...	...	...	
29	\$3,886.07	\$4,632.32	...	...	...	
30	\$3,791.80	\$4,522.30	...	...	...	
31-35	\$19,235.75	\$21,897.07	...	...	...	
36-40	\$17,004.85	\$19,340.96	...	...	...	
41-45	\$14,024.08	\$19,932.07	...	...	...	
46-50	\$12,519.31	\$17,829.85	...	...	...	
51-55	\$11,885.12	\$15,784.85	...	...	...	
56-60	\$8,431.63	\$9,666.81	...	...	...	
61-65	\$8,089.57	\$11,568.34	...	...	...	
K =	\$154,563.8	\$183,553.63	...	...	...	
	8					
e(65)=15.	15.8	15.8				
8						
Annuity =	\$12,064.86	\$14,327.73				

**Appendix Table B1. (Continued)**

**Contributions and Total Accumulations to Age 65. New Social Security Rules.**

ACCUMULATIONS TO AGE 65.		Men More Urban, Mexico.				
Assuming:		0.03 interest rate				
Assuming:		0.046 contribution rate				
	0-5	6-8	9	10-12	13+	
Age						
16	\$4,536.83	\$4,559.63	\$4,575.28	\$3,918.27	\$3,587.72	
17	\$4,420.02	\$4,442.52	\$4,458.13	\$3,818.09	\$3,496.65	
18	\$4,306.60	\$4,328.83	\$4,344.39	\$3,720.82	\$3,408.23	
19	\$4,196.49	\$4,218.44	\$4,233.96	\$3,626.38	\$3,322.39	
20	\$4,089.59	\$4,111.27	\$4,126.75	\$3,534.70	\$3,239.05	
21	\$4,469.02	\$4,871.28	\$5,201.48	\$5,415.60	\$6,551.23	
22	\$4,357.29	\$4,750.06	\$5,072.84	\$5,282.68	\$6,394.22	
23	\$4,248.82	\$5,350.85	\$5,769.90	\$5,153.63	\$6,241.79	
24	\$5,282.77	\$5,219.87	\$5,629.68	\$5,028.35	\$6,093.80	
25	\$5,154.07	\$5,092.70	\$5,493.55	\$6,296.89	\$5,950.11	
26	\$4,903.28	\$5,332.52	\$5,899.14	\$7,451.87	\$9,445.09	
27	\$4,785.03	\$5,204.67	\$5,759.08	\$7,278.06	\$9,228.91	
28	\$4,670.21	\$5,080.54	\$5,623.09	\$7,109.32	\$9,019.03	
29	\$4,558.74	\$4,960.03	\$5,491.07	\$6,945.50	\$9,881.27	
30	\$4,450.52	\$4,843.02	\$5,362.89	\$6,786.44	\$9,660.11	
31-35	\$21,625.56	\$24,033.37	\$26,400.63	\$33,385.74	\$55,723.63	
36-40	\$20,029.59	\$21,932.59	\$24,909.02	\$29,792.36	\$53,581.54	
41-45	\$17,754.95	\$19,771.91	\$25,428.06	\$29,992.52	\$54,225.35	
46-50	\$16,560.10	\$18,426.88	\$23,038.14	\$26,202.02	\$50,072.20	
51-55	\$13,241.36	\$17,593.23	\$21,464.60	\$23,555.62	\$45,355.86	
56-60	\$9,070.30	\$10,800.12	\$12,337.23	\$19,197.78	\$32,409.26	
61-65	\$7,216.44	\$8,039.11	\$13,716.66	\$22,515.50	\$29,518.98	
K =	\$173,927.5	\$192,963.44	\$224,335.5	\$266,008.1	\$416,406.4	
	9		7	5	2	
e(65)=15.	15.8	15.8	15.8	15.8	15.8	
8						
Annuity =	\$13,576.35	\$15,062.24	\$17,511.06	\$20,763.92	\$32,503.63	

**Appendix C**

*Value of Retirement Pension according to Old (Defined Benefit) Rules – IMSS Mexico*

In order to be eligible for a retirement pension, a person must be 65 years old and have registered a minimum of 500 weeks of contributions (equivalent to about 10 years) to IMSS. The annual retirement pension is calculated 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

CB= percentage of base salary to calculate the base amount

Y= additional years contributed beyond the 10 year requirement

AI= annual increase for each additional year contributed beyond 10 years.

In addition, the IMSS would provide 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.

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

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

S	CB	AI	Y	Estimated annual pension
1 minimum wage	80%	0.563%	20	13/12* S * (96.9%)
6 minimum wages	13%	2.45%	20	13/12* S * (86.5%)