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**Financing Social Security Programs  
in Mexico:**

**Who Bears the Cost?**

**By**

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# 1 INTRODUCTION

This paper studies the effects of social security regulation on wages and employment when there is a large prevalence of non-compliance. First, it derives an analytical framework that separates equilibrium effects on wages of reducing social security taxes from the effects of tying workers' benefits to their contributions. Second, I answer the following empirical questions using Mexican data: What fraction of the cost of the regulation is shifted to wages? And, does the regulation have any impact on the employment and composition of the uncovered sector?

Previous empirical studies on labor regulations in economies with a large prevalence of non-compliance use uncovered workers as a control group to measure the effects of the regulation on wages through changes in the wage differential between covered and uncovered workers. In the analytical framework I develop in this paper, I show that this approach implicitly assumes that compliance with regulation is uniform across economic sectors. I find evidence that shows this is not a reasonable assumption<sup>2</sup>, social security coverage varies widely among economic sectors and skill groups. Specifically, firms that decide not to comply must restrict their size in order to avoid regulatory agencies. Because the cost of restricting firm size varies among economic sectors, in equilibrium there are economic sectors that are typically covered by social security as well as economic sectors without coverage. As a result, workers select into the covered sector based on their preferences for coverage, but also based on their comparative advantage. Moreover, some workers would have to give up their comparative advantage in order to be in a sector that is typically covered by social security. This paper focuses on the role that comparative advantage has to determine how the regulation is shifted to wages.

The point of departure is Harberger's two-sector general equilibrium model. In this model labor taxes apply to only one sector, the covered sector. I extend the model by allowing workers self-select into the covered sector and by allowing firms to pay lower wages in exchange for benefits. Because coverage is not uniform across economic sectors, I build the model allowing covered and uncovered sectors to demand different types of skills. One result of the model is that if the complying and the non-complying sectors have different technologies, then the Social Security tax distorts the efficient allocation of factors across sectors, even if wages between the covered and the uncovered sector adjust completely for differences in benefits.

A second result of the model is that when benefits are not completely tied to contributions the equilibrium wage differential between the covered and the uncovered sectors depends on the

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<sup>2</sup> In Mexico, about 37 percent of full time private sector workers work at a firm that does not comply with the regulation. The rate of non-compliance in the service sector is more than three times the rate of non-compliance in the manufacturing sector

distribution of workers across sectors and therefore, tax incidence cannot be calculated based solely on changes in the wage differential.

The model is used to identify the determinants of the fraction of the tax that firms can shift to the worker in the form of lower wages. The shifting of the cost of the regulation to wages will depend on how tax revenues are allocated among social security programs. I use the analytical framework to separate wage effects of reducing social security taxes from the effects of tying workers benefits to their contributions.

Evidence from the Social Security reform in Mexico<sup>3</sup> suggests that contrary to evidence in other studies, Social Security taxation is not fully shifted to wages<sup>4</sup>. In fact, social security taxation reduces labor demand by complying firms. Two years after the new legislation was implemented 1997, evidence suggests that there have been employment effects. First, labor has shifted away from small firms, with relatively low cost of non-compliance, into larger firms that presumably have the highest cost of non-compliance. Second, coverage increased more among those demographic groups that benefited the most from the new retirement system. In fact, there is no change in the share of labor employed in the non-complying sector among workers who will retire under the old regime. Third, the share of labor employed in the non-complying sector decreased across all economic sectors.

Using evidence from Mexico, I find that the firms are able to shift a fraction of the social security tax to wages without increasing benefits. An increase of 10 percent of the social security tax will reduced wages in the covered sector by 4.3 percent even if benefits received exclusively by covered workers remain constant. The model shows social security programs reduce the producer surplus because factors are misallocated between sectors. In the case of labor, there is a misallocation when regulation affects the effective comparative advantage among sectors when taxes are used to finance programs not exclusive to covered workers. In order to reduce this distortion is it required that benefits in the covered sectors to be proportional to earnings potentials.

The paper is organized as follows. Section 2 presents related literature on the evaluation of labor reforms in economies these regulations are not strictly enforced. Section 3 describes the main features of the Social Security programs in Mexico. Section 4 presents an overview of the patterns of social security coverage across economics sectors and skill. Section 5 presents the model and derives determinants of the shifting of taxes and benefits to wages. Section 6 describes the empirical methods used to estimate parameters that determine the incidence of Social Security regulation. Section 7 concludes the paper and suggests directions for future research.

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<sup>3</sup> Marrufo (2001).

<sup>4</sup> Gruber(1997) find that in Chile social security tax is 100 percent shifted to wages.

## 2 LITERATURE REVIEW

Empirical studies that evaluate the effects of labor regulation in economies where these regulations are not strictly enforced include Gruber (1997), Mondino and Montoya (2000), Kugler (1999) and Paes de Barros (1997).

Gruber (1997) estimate the incidence of the Social Security taxation by estimating changes in wages paid by covered sector after the reform in Chile in 1981. He finds that a reduction in the employee's contribution to Social Security increased wages paid by complying firms by the same amount, indicating full shifting of taxes to wages. His strategy presents one important limitation: he does not consider effects that changes in social security benefits have on equilibrium wages. Chile privatized its Social Security system in the same year and also increased employee's contribution by almost the same amount of the employer tax cut. The reform in Chile was about bonding benefits to contributions, rather than changing the cost of providing Social Security.

This paper recognizes that to the extent that the revenues are used to finance programs whose only beneficiaries are workers that work at firms that pay the tax, the Social Security taxation can be viewed as a mandatory transfer from firms to workers. In the model I incorporate social security benefits and explicitly separate the effects on wages of reducing the social security tax from the effects of tying benefits to contributions.

There is empirical work that recognizes that labor regulations can be viewed as mandatory transfers from firms to workers. For example, Mondino and Montoya (2000) estimate wage differentials for the Argentinean labor market for three different groups of workers: self-employed, registered and unregistered workers. They use a latent variable index to correct for the self-selection of two sequential decisions: labor force participation and leaving unemployment. They find that male workers receiving the fringe benefits mandated by the legislation earned 8 percent less than male employees without benefits. Their results, however, depend heavily on the parametric assumptions about the unobserved heterogeneity and may not hold under different assumptions. Mondino and Montoya (2000) claim that labor regulation does not have an important impact because they find a compensating differential between the covered and the uncovered sector. However, they do not use the wage differential to answer the key empirical question that the analysis of the incidence of the Social Security taxation requires: What fractions of the cost of Social Security regulation can the firm shift to workers in the form of lower wages?

This paper improves their work by controlling for selection non-parametrically, but most importantly by defining a framework to relate changes in the wage differential with measures of tax incidence.

### 3 An Overview of Social Security Programs in Mexico

The Mexican Social Security System provides three main benefits: a retirement pension, life and disability insurance, and medical insurance. The new legislation introduced in July 1997 reduced the payroll tax for the median worker by 6 percent while simultaneously substituting the Pay-As-You-Go system for a retirement plan based on Individual Retirement Accounts

Table 1 shows the payroll tax for each of the different insurance program<sup>5</sup> before and after substitution of Pay-As-You-Go to Individual Retirement Accounts. In the case of the firm, since participation to all programs is mandatory, the relevant tax is just the sum of the individual taxes. The last two rows of Table 1 show how the total tax rate for the median worker<sup>6</sup> breaks into these two categories. In the case of the worker, the division of Social Security contribution between individual accounts and the rest of the programs is relevant.

Medical benefits include up to two years of unlimited medical treatment for each illness. Treatment is provided by the public sector. These benefits are offered during the working life and continue after retirement. The medical benefits extend to the worker's spouse and children under age 16. If children are attending to school at age 16, their benefits are extended until they reach 21. It is also possible to extend the benefits to a worker's parents if their parents live in the same household.

Although the medical benefits from participating in the formal sector are considerable, there are several features that make this system more similar to a public good than to an amenity the individual has to buy through a Social Security sector job. First, eligibility requirements are not strictly followed. Second, since the medical benefits are extended to all immediate family members of the insured worker, the marginal gain of insuring an additional member in the family is zero. Second, since the medical benefits are extended to all immediate family members of the uninsured worker, the marginal gain of insuring an additional member in the family is zero. Third, an old individual can always find a way to be eligible for medical treatment as long as one of his descendants participates in social security.

The medical insurance does not operate as insurance at all. There is no limit on the medical expenses that a family can incur, there is not deductible, no co-payment and there are not health prerequisites for treatment. A worker can decide to take a job at the covered sector after he learns that some member of his family has a chronic disease.

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<sup>5</sup> There are additional taxes used to fund day care centers for working mothers and to cover the expenses derived from on the job accidents. The specific amount of the tax depends on the accident incidence of the firm.

<sup>6</sup> The median worker earns three times the minimum wage.

The life and disability insurance have stricter eligibility rules<sup>7</sup>, and benefits are related to contributions since replacement rates under depend on the amount a worker's contributions. However, both systems are designed to deliver higher replacement rates to low-income workers. In consequence, the replacement rates for the workers earning more than the average wage were particularly low, less than 25 percent. In addition, benefits were not indexed by inflation, which implies serious losses in real terms for economies with two digits inflation rates.

The new legislation introduced in July 1997 reduced the payroll tax for the median worker by 6 percent while simultaneously substituting the Pay-As-You-Go system for a retirement plan based on Individual Retirement Accounts.

Workers registered in the Social Security sector before 1997 are allowed to choose when they retire the program that yields higher replacement rates. Regardless of what would be their choice, all workers stopped paying the Social Security retirement tax in July 1997. Instead, firms deposit a fraction of their employee earnings in their Individual Retirement Accounts. If at the retirement date, a worker decides to be paid according to the Pay-As-You-Go rules, he has to forgo his balance on the Individual Retirement Accounts and give them to the government. Therefore, the fiscal cost of the reform is determined by the difference between the worker's savings and the net present value of the retirement benefits according to the old regime.

The new pension system is however not entirely private. First, there is a minimum pension that the government guarantees regardless of the amount of savings the worker has in his individual account<sup>8</sup>. Second, the government contributes a fixed amount to the Individual Retirement Accounts every time the firm pays the Social Security tax. Third, according to the regulation, at least 65 percent of the funds must be invested on government debt instruments during the first 10 years.

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<sup>7</sup> In order to be eligible to receive a retirement pension a worker has to be at least 65 years old, be out of the labor force and show that he has contributed to the SS for at least 10 years. To be eligible for the life and disability pension a worker must have paid SS taxes for 3 years at least. In both cases, contributions do not need to be continuous. A worker can alternate jobs in the formal and informal sector and receive a retirement pension, as long as he satisfies the minimum time required before he reaches 65 years of age.

<sup>8</sup> Workers have to pay Social Security taxes for at least 25 years of their working life.

## 4. Social Security Coverage

### 4.1 Data

The empirical evidence is based on data from the ENEU (Encuesta Nacional de Empleo Urbano). The ENEU is a quarterly household survey that covers the largest urban areas in Mexico. This survey covers approximately 61 percent of urban population and 92 percent of the cities with populations greater than 100,000. The sample includes non-agricultural private sector employees from 16 to 65 years old, who worked more than 30 hours during the week previous to the interview. The sample size is approximately 60,000 individuals for each quarter from 1994 to 1999<sup>9</sup>.

#### 4.2.1 Covered and Uncovered Sectors

The most extensive definition of the non-complying or uncovered sector includes all employees that have a job without labor protection and the self-employed. Approximately 50 percent of the Mexican labor force falls into to this category. The incidence of non-compliance is still high even if the self-employed are excluded from the sample. About 37 percent of full time private sector workers belong to this more narrow definition of the non-complying sector.

About 24 percent of the labor force is self-employed. I excluded self-employed from the sample for several reasons. First, individuals become self employed to avoid other regulations as well. Maloney (1998) shows that micro-enterprises avoid federal and state treasury regulation<sup>10</sup> in addition to labor regulation. Second, earnings can only be computed with large measurement error. The survey reports the total income, which includes in addition to earnings, the return for capital investment and may include earnings of the unpaid labor of relatives.

I restrict the sample to private sector employees, and then I classified them according to the degree of protection received from the firms they work. The highest form of compliance constitutes jobs that provide both social security and severance payment coverage (SS+SP). This group includes workers covered by social security that either have a permanent contract or do not have a written contract<sup>11</sup>. The

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<sup>9</sup> The survey starts in 1987, but I restricted the sample to the years 1994-1999 since the question about contractual form is added until the fourth quarter of 1999. In addition, occupations and economic sectors are coded differently

<sup>10</sup> Maloney (1998) using a survey for self-employed shows that only 34.6 percent of micro-enterprises pay Social Security taxes, but only 34.6 pay some taxes to the federal or local treasury and only 15.6%.

<sup>11</sup> Individuals without a written contract are included in this group because the Conciliation Board assumes the existence of a permanent contract whenever there is no written contract, as long as the employee can prove that an employment relationship exists. Once a firm registers a worker in the social security administration, it gives the employee the necessary documents to demand all benefits of a permanent contract at the Conciliation Board. Therefore, an effective way to avoid severance regulations is to offer a temporary contract rather than not offering a written contract.

second group constitutes employees who have social security coverage but are hired under a temporary contract so that the severance payment regulation does not apply to them (SS). The last group, which I define as the "uncovered sector" is comprised of employees who do not have neither social security nor temporary contract.

Since I want to compare wages in the covered and uncovered sectors, I first need to identify which groups of workers are represented in both sectors. Table 2 shows the worker's characteristics according to the group they belong. Workers in the covered and uncovered sector are comparable in sex, age and experience, but workers in the covered sector have on average more years of schooling.

Most of workers employed in the covered sector have severance payment benefits in addition to Social Security benefits. Workers with Social Security benefits but without severance payment benefits constitute an ideal control group to analyze the effect of the reform. However, Social Security and severance payment benefits are bundled<sup>12</sup>, and therefore only a small fraction of workers in the covered sector have a temporary labor contract. In addition, it is difficult to distinguish whether a worker with a temporary contract is on a trial period or if he agreed not to have severance payment coverage<sup>13</sup>. Restricting the control group to temporary workers will implicitly restrict the control group to workers with low tenure. I included all workers employed in the covered sector in the control group to avoid comparison among groups of workers with systematic differences in tenure levels. Table 2 shows workers in the covered sector with severance payment and workers without severance payment coverage have similar skill and demographic characteristics. Furthermore, they have similar occupational structure and skill distribution.

The most significant difference between workers in the complying and non-complying sector is the distribution of workers across firm sizes. About 83% of workers in the uncovered sector work in a firm that has fewer than 16 employees, compared to only 22% of the workers in the covered sector work in a firm of with fewer than 16 employees. One explanation is that firms deciding not to comply must restrict their size in order to avoid detection by the regulatory agencies. The evidence suggests that firms that comply are not randomly distributed across sectors and the regulation imposes a tax on goods that exhibit economies of scale in production.

Workers employed in the covered are not less likely to have outside coverage than workers employed in the uncovered sector. The variable outside coverage is a dummy equal to one if the individual

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<sup>12</sup> Once a firm registers a worker in the Social Security Administration, it is difficult not to comply with the severance payment regulation as well.

<sup>13</sup> Trial period contracts are prohibited but extensively used by complying firms.



lives in a household where there is somebody else that is covered by a health plan and he is eligible to receive medical treatment from this plan<sup>14</sup>.

Differences in education are more evident when we compare the distribution of years of schooling. The fraction of workers in the uncovered sector with 6 or fewer years of education is almost twice the fraction than in the SS+SP sector. Only 8 percent of the uncovered sector workers have more than 12 years of education compared to 20 percent of SS+SP workers. The fact that the complying sector is more skill intensive does not preclude us to compare wages unless workers sort according to skill. Table 3, shows the distribution according to skill and age groups. Workers with higher schooling attainment are more likely to work in the covered sector. However, schooling does not determine which sector a worker is going to be employed. More than one third of workers with fewer than 6 years of schooling are employed in the covered sector. At the same time, more than one third of workers with college education are employed in the uncovered sector.

The evidence shows that Social Security regulation does not impact all economic sectors equally, but there is an important variation on coverage across economic sectors. Table 4 shows social security coverage by economic sector. The sample includes only male workers with 6 to 9 years of education in order to control for differences in the composition of workers across economic sectors. The incidence of non-compliance is twice as high in the service sector than in the manufacturing sector, this is related to the fact that the scope of economies of scale is higher manufacturing sector.

Social security coverage is particularly low in sectors with seasonal demand fluctuations such as hotels, restaurants and construction. Surprisingly, the share of temporary workers in the sector composed of hotels and restaurants is lower than the average. A possible explanation could be that the two different forms of non-compliance, Social Security and severance payments, complement each other. For example, it is easier to avoid the severance payment regulation if workers are not registered in the Social Security, and at the same time is easier to avoid the Social Security tax if the employees are replaced constantly.

To conclude, workers in the covered sector are comparable to workers in the uncovered sector but firms are not. Firms in the covered sector are skill intensive, are larger and are more likely to be producing goods in the manufacturing sector than in the service sector. The decision to choose a job with benefits is linked to the decision on which economic sector to be employed. Therefore, individual supply decision is better represented in a two sector Generalized Roy model.

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<sup>14</sup> The criteria for coverage within the household include public sector workers. Public sector workers receive similar medical benefits than Social Security and are also extended to the immediate family of the worker.

## 5 Model

The point of departure is Harberger's two-sector general equilibrium model. In this model labor taxes apply to only one sector, the covered sector. Because a large fraction of workers are employed at firms that do not comply with the regulation, the Social Security regulation is analyzed in an economy with two competing sectors, the taxed and the untaxed sector.

I extend Harberger's model to analyze the Social Security tax when only the covered employees receive the benefits of the programs financed with this tax and therefore, complying firms can pay lower wages in exchange for social security benefits. Because coverage is not uniform across economic sectors, I build the model allowing covered and uncovered sectors to demand different types of skills. Evidence shows that social security coverage varies widely among economic sectors and skill groups. Firms in the covered sector are skill intensive, are larger and are more likely to be producing goods in the manufacturing sector than in the service sector. In this section I extend the previous model to derive the implications when the covered and uncovered sector demand different types of skills and workers select into the taxed sector based on preference for coverage but also based on their comparative advantage.

In this case, workers select into the covered sector based on their preferences for coverage, but also based on their comparative advantage. Some workers would have to give up their comparative advantage in order to be in an economic sector typically covered with social security.

The analysis of the two-sector model shows that the Social Security tax is an implicit tax to firms that have higher cost of avoiding the regulation, and therefore it is an implicit tax to goods produced by these firms. I find that even if wages adjust completely between the complying and the non-complying sector for differences in benefits, there are still several important equilibrium effects that must be considered. Social Security regulation distorts the optimal allocation of factor between sectors when the firms that have the highest cost of compliance differ in their production technology to the rest of the economy.

The economy is divided in two sectors Sector 1 is the taxed sector and Sector 0 is the untaxed (non-complying sector).  $X_1$ , and  $X_0$  are respectively the output produced in the taxed sector and the untaxed sectors.

Total labor input in Sector  $j$  is the sum of the sector specific units of all workers employed in Sector  $j$ :

$$L_j = \sum_{i \in j} q_{ij}$$

Where

$q_{ij}$  is the amount of efficiency units that individual  $i$  supplies to sector  $j$ .

Output produced in each sector is:

$$X_j = F(L_j, K_j)$$

Let  $\pi_j$  be the price for sector specific skill in sector  $j$ . Assuming constant returns to scale in  $L_j$  and  $K_j$ , 4.1 and 4.2 represent the cost functions in each sector:

$$C^1(r, \pi_1, X_1) = c^1(r, \pi_1(1+t))X_1 \quad 4.1$$

$$C(r, \pi_0, X_1) = c^1(r, \pi_0)X_0 \quad 4.2$$

Competition forces prices equal to marginal cost

$$p_1 = c^1(r, \pi_1(1+t)) \quad 4.3$$

$$p_0 = c^1(r, \pi_0) \quad 4.4$$

Demand for goods produced in each sector are given by:

$$X_0 = X_0(p_1, p_2, \pi_1 L_1 + \pi_0 L_0 + rK) \quad 4.5$$

$$X_0 = X_0(p_1, p_2, \pi_1 L_1 + \pi_0 L_0 + rK) \quad 4.6$$

Factors demands are:

$$L_1^d = c_2^1(r, \pi_1(1+t)) \quad 4.7$$

$$L_0^d = c_2^1(r, \pi_0) \quad 4.8$$

$$K_1^d = c_1^1(r, \pi_1(1+t)) \quad 4.9$$

$$K_0^d = c_0^1(r, \pi_0) \quad 4.10$$

$c_i^j$  Corresponds to the derivative of the  $i$  argument of the unitary cost function in sector  $j$

The total tax rate is divided in two parts, so that the tax paid by the firm is given by:

$$t = t_1 + t_2$$

$t_1$  is the portion of the payroll tax that is allocated to programs whose benefits are perceived as public, i.e. both covered and uncovered workers have access to them.  $t_2$  corresponds to the portion of the Social Security tax that goes into programs that are exclusive to covered workers. Although the partition is irrelevant for the firm, since labor costs are determined by the total tax, I made this partition explicit because only  $t_2$  determines the relative labor supply between the covered and the uncovered sector.

Let  $b(t_2)$  represents the monetary equivalent of the benefits received in the covered sector.  $b(t_2)$  is a function of the tax paid by the firm since the revenues are used to finance programs favoring workers employed in the covered sector. Because benefits that are exclusive to covered workers are related to their earning while working in the covered sector, let  $b(t_2) = \pi a t_2$ . In this function,  $a$  represents what fraction of the tax goes finances programs that are proportional to earnings. For example, individual retirement accounts.

### 5.3 Labor Supply

Each agent is endowed with a pair of sector specific efficiency units of labor  $q_{1i}$  and  $q_{0i}$ . That is, an agent  $i$  supplies  $q_{1i}$  efficiency units of labor if he works in the compliance sector or  $q_{0i}$  efficiency units of labor if he works in the non-compliance sector. It is assumed that the distribution of sector specific efficiency units is given.

The agent with endowment  $(q_{0i}, q_{1i})$  selects into the sector that yields him the higher benefits, but he can only work at one sector at a time. Benefits in sector 1 include, in addition to earnings, benefits covered by social security,  $b(t_2)$ . An agent with endowment  $(q_{0i}, q_{1i})$  will work in the covered sector if benefits in Sector 1 are higher than benefits in Sector 0. That is:

$$\pi_1 q_{1i} (1 + a t_2) \geq \pi_0 q_{0i}$$

Number of workers employed at each sector is given by:

$$N_1 = \int_{-\infty}^{\infty} \int_{-\infty}^{\frac{\pi_1 q_1 (1+at_2)}{\pi_0}} N f(q_0, q_1) dq_0 dq_1$$

$$N_0 = \int_{-\infty}^{\frac{\pi_1 q_1 (1+at_2)}{\pi_0}} \int_{-\infty}^{\infty} N f(q_0, q_1) dq_0 dq_1$$

Where:

$f(q_1, q_0)$  is the joint density of sector specific skills and,  
N is number of agents in the economy.

Labor supply measured in efficiency units in each sector is given by:

$$L_1 = \int_{-\infty}^{\infty} \int_{-\infty}^{\frac{\pi_1 q_1 (1+at_2)}{\pi_0}} N q_1 f(q_0, q_1) dq_0 dq_1 \quad 4.11$$

$$L_0 = \int_{-\infty}^{\frac{\pi_1 q_1 (1+at_2)}{\pi_0}} \int_{-\infty}^{\infty} N q_0 f(q_0, q_1) dq_0 dq_1 \quad 4.12$$

Equation 4.13' and 4.14' represent the differentials of the labor supply evaluated at  $t_2=0$ :

$$dL_1 = \left( \hat{\pi}_1 + a dt_2 - \hat{\pi}_0 \right) \left( \frac{\pi_1}{\pi_0} \right) N \int_{-\infty}^{\infty} q_1^2 f(A, q_1) dq_1 \quad 4.13$$

$$dL_0 = - \left( \hat{\pi}_1 + a dt_2 - \hat{\pi}_0 \right) \left( \frac{\pi_1}{\pi_0} \right) N \int_{-\infty}^{\infty} q_1 q_0 f(A, q_1) dq_1 \quad 4.14$$

Where

$$A = \frac{\pi_1 q_1 (1+at_2)}{\pi_0}$$

Note that  $f(A, q_1)N$  is the number of workers with specific capital  $q_1$  that are indifferent between sectors because total benefits are equal in both sectors. Labor supply is not completely elastic because workers that have a significant comparative advantage in one sector will not respond to small changes in the relative price of sector specific skills. Labor supply elasticity is higher the larger is the correlation between sector specific skills.

It is not longer true that  $dL_1 = -dL_0$  as it is the case when workers are homogenous in skills. Equation 4.15' shows that the rate at which labor in Sector 1 transforms into labor in Sector 0 is equal to the conversion rate for individuals who are at the margin.

$$\frac{dL_0}{dL_1} = - \frac{\int_{-\infty}^{\infty} q_1 q_0 f(A, q_1) dq_1}{\int_{-\infty}^{\infty} q_1^2 f(A, q_1) dq_1} * \frac{P(q_0 \leq A)}{P(q_0 \leq A)} \equiv \beta(\pi_1, \pi_0) \quad 4.15$$

It will be useful to define the labor supply elasticity between the covered and the uncovered sector:

$$\ln\left(\frac{L_1}{L_0}\right) = \gamma \ln(\pi_1 / \pi_0) \quad 4.16$$

According to Equations 4.13 and 4.14, the labor supply elasticity is given by:

$$\gamma(\pi_1, \pi_0) = \left(\frac{\pi_1}{\pi_0}\right) \int_{-\infty}^{\infty} \left(\frac{q_1^2}{Eq_1} + \frac{q_1 q_0}{Eq_0}\right) f(A, q_1)$$

The equilibrium wage differential depends on the relative size of each sector since units of labor required by the expanding sector will not necessarily equalize units of labor displaced by the other sector.

Equations 4.1-4.16, evaluated at  $t=0$ , generate the following system of equations in differences (See Appendix A for derivation):

$$\hat{p}_1 - \hat{p}_{10} - \hat{\theta}_{11}(\pi_1 - r) + \hat{\theta}_{10}(\pi_0 - r) = \hat{\theta}_{11} dt$$

$$\lambda(\varepsilon_{11} - \varepsilon_{00})(\hat{p}_1 - \hat{p}_{10}) - (\sigma_1 A_1 - g(\pi))(\hat{\pi}_1 - \hat{r}) + (\sigma_0 A_0 + g(\pi))(\hat{\pi}_0 - \hat{r}) = \sigma_1 A_1 dt$$

$$(\varepsilon_{11} - \varepsilon_{00})(\hat{p}_1 - \hat{p}_{10}) - (\gamma(\pi) + \sigma_1 \theta_{k1})(\hat{\pi}_1 - \hat{r}) + (\gamma(\pi) + \sigma_0 \theta_{k0})(\hat{\pi}_0 - \hat{r}) = \sigma_1 \theta_{k1} dt + adt_2 \gamma(\pi)$$

Where:

$$\hat{x} \equiv \frac{dx}{x}$$

$$\theta_{lj} = \frac{w_j L_j}{C^j} \text{ is the labor share on the costs in sector } j$$

$$\sigma_j \equiv - \frac{d \log \left( \frac{K_j}{L_j} \right)}{d \log \left( \frac{r}{w_j} \right)} \text{ is the elasticity of substitution between capital and labor}$$

$$A_j \equiv \frac{L_j}{L} \theta_{kj} - \frac{K_1}{K} \theta_{lj}$$

$\eta_{ll}^j = -(1 - \theta_{lj}) \sigma_j$  is the constant-output price elasticity of the demand of labor in sector  $j$  with respect to the price of labor in sector  $j$

$$\lambda \equiv \frac{L_1}{L} - \frac{K_1}{K} \equiv l_1 - k_1$$

$\epsilon_{jk}$  is the price elasticity of good  $j$  with respect to price  $k$

$$\sigma_m = (\epsilon_{11} - \epsilon_{00})$$

$$g(\pi_1, \pi_0) = \frac{dL}{d \ln \left( \frac{\pi_1}{\pi_0} \right)} \text{ is the change in total efficiency units of labor supply, and}$$

$$\gamma(\pi_1, \pi_0) = \frac{d \ln \left( \frac{L_1}{L_0} \right)}{d \ln \left( \frac{\pi_1}{\pi_0} \right)} \text{ is the relative labor supply elasticity}$$

According to labor supply,  $g(\pi_1, \pi_0)$  and  $\gamma(\pi_1, \pi_0)$  are given by:

$$g(\pi_1, \pi_0) = \int_{-\infty}^{\infty} q_1 (q_{i1} - q_{i0}) f(A, q_1) dq_1 \left( \frac{\pi_1}{\pi_0} \right)$$

Equation 4.17' shows the wage differential response to changes in the tax rate and changes in benefits.

$$d \ln \frac{\pi_1}{\pi_0} = \frac{1}{D} [-\eta_1 + (k_1 - g(\pi))(\eta_1 - \eta_0)] dt - [\lambda\gamma(\eta_1 - \eta_0) - \gamma] adt_2 \quad 4.18$$

Where

$\eta_j = -\sigma_j(1 - \theta_{lj}) - (\varepsilon_{jj} - \varepsilon_{kk})\theta_{lj}$  is the labor elasticity in sector j

$$D = \eta_1 - (k_1 - g(\pi) - \lambda\gamma(\pi))(\eta_1 - \eta_0) - \gamma(\pi)$$

#### 5.4 Shifting Tax vs Shifting Benefits

The regulation will be inefficient as long as the regulation distorts the supply price differential between sectors that would prevail in absence of social security taxes. This requires that the shifting of taxes to wages be equal to changes in benefits  $adt_2$ . In this case, the regulation does not change the composition of workers across sectors. If the degree of shifting is greater than benefits, then some workers will find that their supply comparative advantage has changed. We can decompose the Equation 4.18 in two parts:

$$d \ln \frac{\pi_1}{\pi_0} = (1 - a) \frac{[-\eta_1 + (k_1 - g(\pi))(\eta_1 - \eta_0)]}{D} dt_2 - adt_2$$

The first term is the shifting of the cost of the regulation that is above benefits. Workers whose comparative advantage lies in a sector typically covered by social security have to pay  $(1 - a) \frac{[-\eta_1 + (k_1 - g(\pi))(\eta_1 - \eta_0)]}{D} dt_2$  in order to finance programs that are available for both covered and uncovered workers.

But not only covered workers pay for this programs, workers whose comparative advantage at the new equilibrium prices is not longer in the covered sectors are worse off with the regulation.



## 6 EMPIRICAL ESTIMATES

### 6.1 Prices of sector specific skills

The amount of efficiency units of individual  $i$  in sector  $j$  is determined by observed individual characteristics  $X_i$  and a sector specific random component  $U_{ij}$ . Assuming that the function that maps skills into sector specific efficiency units is log linear in  $X_i$  and  $U_{ij}$ , Equation 6.1 represents workers  $i$  potential supply of efficiency units to sector  $j$ .

$$\ln q_{ij} = \beta_j X_i + U_{ij} \quad 6.1$$

Equation 6.2 represents earnings in sector  $j$  at time  $t$ .

$$\begin{aligned} W_{ijt} &= \pi_{jt} q_{ij} \\ \ln W_{ijt} &= \ln \pi_{jt} + \ln q_{ij} \end{aligned} \quad 6.2$$

Where

$\pi_{jt}$  is the equilibrium price of efficiency units of labor in sector  $j$

The log wage of individual  $i$  on sector  $j$  at time  $t$  is given by:

$$\ln W_{ijt} = \ln \pi_{jt} + \beta_j X_i + u_{ij} \quad 6.3$$

In addition to earnings, workers employed in covered sector receive mandated social security benefits. The ratio benefits to contributions varies across individuals according to function  $a(Z_i)$ .

Where:

$Z_i = [R, X]$  is a vector of observed random variables

$R$  is a vector of observed random variables that determines participation in the Social Security sector, but does not determine earnings.  $R$  includes compliance rate in the city where individuals lives, family size and years upon retirement.

An agent with endowment  $(q_{0i}, q_{1i})$  will work in the covered sector if:

$$\pi_1 q_{i1} (1 + a(z)t_2) \geq \pi_0 q_0$$

Define

$$D_i^* = \ln q_{i1} - \ln q_{i0} + \ln \pi_{1t} + \ln(1 + a(z)t_2) - \ln \pi_{0t} \quad 6.4$$

Where:

$U_d$  is a random component on the preference for coverage.

Note that  $D^*$  can be decomposed into two components:

$$D_i^* = G(Z_i) - U_{id} \quad 6.5$$

Where:

$$U_{id} = U_{i0} - U_{i1}$$

$$D_i = 1 \quad \text{if} \quad D_i^* > 0 \quad 6.6$$

Assume that:

- (i)  $U_1, U_0$  are unobserved random variables with mean zero.
- (ii)  $U_1, U_0$  are independent of  $(R, X)$
- (iii)  $G(Z)$  is a non-degenerate random variable conditional on  $X$

A useful transformation proposed by Heckman and Vytlacil (1999) is to assume that  $U_d \sim Unif[0,1]$ , there is no loss of generality if  $F_{Ud}$  is strictly monotonic. In this case  $G(z) = Pr[D=1|Z=z]$ , since  $Pr[D=1|Z=z] = F_{Ud}(G(Z))$ . Given this transformation, Equation 6.7 represents the conditional expectations of  $U_0$  and  $U_1$ <sup>15</sup>:

$$\begin{aligned} E[U_1 | P(Z), X, D = 1] &= E[U_1 | U_d < P(Z)] \\ E[U_0 | P(Z), X, D = 1] &= E[U_0 | U_d < P(Z)] \\ E[U_1 | P(Z), X, D = 0] &= E[U_1 | U_d \geq P(Z)] \\ E[U_0 | P(Z), X, D = 0] &= E[U_0 | U_d \geq P(Z)] \end{aligned} \quad 6.7$$

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<sup>15</sup> See Heckman and Robb (1986) for derivation of this representation, also Heckman, Ichimura and Todd (1998).

Earnings in Sector  $j$  are composed by the sum of two functions: a known linear function of individual characteristics  $X_i$ , and by an unknown function of  $P(Z_i)$ .

$$\begin{aligned} E(W_{1t} | X, P(Z), D = 1) &= X_{it}' \beta_1 + K_{11t}(P(Z)) \\ E(W_{0t} | X, P(Z), D = 0) &= X_{it}' \beta_0 + K_{00t}(P(Z)) \end{aligned} \quad 6.8$$

Where:

$K_{ijt}$  is the conditional expectation of  $U_i$  given that a worker belongs to sector  $j$ .

$$K_{ijt} \equiv E(U_i | Z, D = j) = K_{ijt}(P(Z))$$

I follow Heckman, Ichimura and Todd (1998) to estimate the partial linear regression model in Equation 6.8<sup>16</sup>. The estimation has two stages. In the first stage  $\ln W_{it}$  and each element of  $X_{it}$  are regressed against the estimated probability  $\hat{P}(Z_i)$ .  $P(Z_i)$  is estimated by logit regression. The variables used in the logit regression are skill and skill specific time trends, experience and its square, city and industry dummies. It also includes years upon retirement, a dummy for married, the rate of regional employment growth and the city compliance rate<sup>17</sup>.

I estimate by local linear regression  $E(W_1 | P(Z), D = 1)$  and  $E(X | P(Z), D = 1)$  using the sample of workers employed in the covered sector<sup>18</sup>. In the same way, I estimate  $E(W_1 | P(Z), D = 0)$  and  $E(X | P(Z), D = 0)$  using the sample of workers employed in the uncovered sector.

On the second stage, I use the residuals  $\ln W_{ijt} - E[\ln W_{ij} | P(Z_{it}), D = j]$  and  $X_{it} - E[X_{it} | P(Z_{it}), D = j]$  to construct the OLS model represented in Equation 6.9 to obtain unbiased estimates of  $\beta_j$ .

$$W_{ijt} - E(W_{ijt} | P_i, D_i) = [X_{it} - E[X_{it} | P_{it}, D_{it}]]' \beta_j + v_{it} \quad 6.9$$

Where:

$$E(v_{it} | P_{it}, D_{it}) = 0$$

<sup>16</sup> See Robinson (1988) for a detailed description of the partially linear model as well as the asymptotic properties of the estimators.

<sup>17</sup> See Appendix B for details on the estimation of  $P(Z)$ .

<sup>18</sup> See Heckman, Ichimura and Todd (1998) for details and Fan(1993) for the distribution theory of the local linear regression estimator.

Residuals from the second stage form a function of the constant term and the conditional expectation of the error term  $U_j$ . The later is a function of  $P(Z)$ .

$$W_{ijt} - X_{it} \hat{\beta}_j = \ln \pi_{jt} + \beta_{oj} + K_{jj}(P(Z_{it})) \quad 6.10$$

To identify  $\ln \pi_{jt} + \beta_{0j}$  from  $K_{jjt}(P(Z_{it}))$ , we need to evaluate the function  $\beta_{0j} + K_{jj}(P(Z_{it}))$  at values of  $P(Z_{it})$  where  $K_{jjt}(P(Z_{it}))=0$ . Note that:

$$E(U_1 | X, P(Z) = 1, D = 1) = E(U_1 | U_d < 1) = E(U_1) = 0$$

Alternatively,

$$E(U_0 | X, P(Z) = 0, D = 0) = E(U_1 | U_d > 0) = E(U_1) = 0$$

The estimates of  $\beta_{oj} + \ln \pi_{jt}$  correspond to the value of  $E[\ln W_{ijt} - X_{it} \hat{\beta}_j | P(Z), D = 1]$ .

To identify  $\beta_{o0} + \ln \pi_{0t}$ , I evaluated the estimated function  $\hat{K}_{oo}(P(Z_{it}))$  at  $P(Z_{it})=0.05$ . Ideally, I would like to evaluate the conditional expectation at  $P(Z_{it})=0$ , but there are few observations of workers in the non-complying sector where  $P(Z)<0.025$ <sup>19</sup>. To identify  $\beta_{o1} + \ln \pi_{1t}$ , I evaluated the estimated function  $\hat{K}_{11t}(P(Z_{it}))$  at  $P(Z_{it})=0.975$ .

## 6.2 Labor Supply Elasticity

Because regulation is not neutral across economic sectors, employment opportunities in the uncovered sector vary according workers' skills. The individual selection model shows that an increase in the relative wage in the covered sector will attract first workers that are indifferent between sectors at the previous equilibrium prices. A feature of selection models is that labor shifting between sectors depends on the response of marginal workers to changes in skill prices. Labor supply elasticity from Sector 0 to Sector 1 is determined by the distribution parameters corresponding to marginal workers

According to the individual selection model, the labor supply elasticity is given by:

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<sup>19</sup>Although there is enough observations in the cells were  $P(Z)$  approaches to one, there is few observations in the intervals where  $P(Z)$  approaches to zero even for the sample that includes only workers at the non-complying sector.

To estimate  $\gamma(\pi)$  we only need to recover the joint distribution of  $q_{0i}$  and  $q_{1i}$  at the points where  $q_0 = \pi q_1(1 + at_2)$ , or  $\pi_0 q_0 = \pi_1 q_1(1 + at_2)$ . Following Heckman and Honore (1990) identification theorem when panel data on aggregate earnings is available and the distribution of skills does not change with time<sup>20</sup>, I estimated the joint distribution of  $q_{0i}$  and  $q_{1i}$  at this point. Note that if  $\pi(1 + at_2)q_{1i} \leq q_{0i} \leq \pi'(1 + at_2)q_{1i}$  then:

$$F(q_1, q_0) = \Pr(q_{i1} < q_1, q_{i2} < q_2) =$$

$$\Pr\left(q_{i1} < q_1, q_{i0} \left(\frac{1}{\pi'(1 + at_2)}\right) < q_1, q_{i0} < q_0, \pi(1 + at_2)q_{1i} < q_0\right)$$

$$F(q_1, q_0) = \Pr\left(\max\left\{q_{1i}, \frac{q_{0i}}{\pi'(1 + at_2)}\right\} \leq q_1, \max\left\{q_{1i}, \frac{q_{0i}}{\pi(1 + at_2)}\right\} \leq \frac{q_0}{\pi}\right)$$

The density  $\hat{f}(\pi q_1, q_1)$  can be approximated by  $\hat{F}(\pi' q_1, q_1) - \hat{F}(\pi q_1, q_1)$  when  $\pi$  is close to  $\pi'$ .

Using estimates of  $\ln \hat{\pi}_{jt}$ , I computed  $\ln q_{i1}$  by subtracting  $\ln \hat{\pi}_{1t}$  to  $\ln W_{it}$  to workers employed in the covered sector. I estimated  $\ln q_{i0}$  by subtracting  $\ln \hat{\pi}_{1t}$  to  $\ln W_{it}$  to workers employed in the covered sector.

The reference period used is 1997:1 and 1997:2 to obtain the elasticity corresponding to the date at which the reform took place. In the reference period  $d\pi/\pi = 0.04$  and  $t_2$  is equal to zero. The distribution of  $Z = \max\{q_{1i}, q_{0i}/\pi\}$  and  $Z' = \max\{q_{1i}, q_{0i}/\pi'\}$ <sup>21</sup> is estimated using the Epanechnikov kernel. The bandwidth was chosen following Silverman (1986) optimal bandwidth rule<sup>22</sup>.

Table 5 shows the estimates of the functions  $\gamma(\pi)$  using  $\hat{f}(\pi q_1, q_1)$ . When the equilibrium price ratio is greater than 1, higher benefits in the covered sector increase the fraction of workers at the margin, and therefore, supply is more elastic.

<sup>20</sup> Heckman and Honore (1990) *Theorem 11*

<sup>21</sup> Where  $Z=q_1$  if the individual selects into the covered sector and  $Z = q_0/\pi$  if the individual works in the uncovered sector.

<sup>22</sup>  $h=A(K)n^{-1/6}$ . Where  $A(K)=2.40$  for a multivariate Epanechnikov kernel of dimension 2.

### 6.3 Labor Demand Elasticities

Assuming labor demand for sector specific efficiency units is log linear in real prices, Equation 6.11 represents the demand of sector specific efficiency units in Sector  $j$ :

$$\ln L_{jt} = \eta_o^j + \eta_{ll}^j \ln \left( \frac{\pi_{jt}}{P_{jt}} \right) + \sum_k \eta_k^j \ln P_{kt} \quad 6.11$$

Where:

$P_{kt}$  is the price for intermediate input  $k$ . Includes index price for energy, intermediate inputs in the sector, user cost of capital.

To estimate Equation 6.11 I follow Heckman and Sedlacek (1985). They estimate demand functions for unmeasured tasks that are sector specific using sectoral wage bills in the manufacturing and services sectors. They observe that total wages paid in each Sector  $j$  are equal  $L_{jt}$  times  $\ln \Pi_{jt}$ . Substituting total waged paid in equation 6.11 gives:

$$\ln \left( \frac{\text{Wages Paid in Sector } j}{P_{jt}} \right) = \eta_o^j - \beta_{oj} (\eta_{ll}^j + 1) + (\eta_{ll}^j + 1) \left( \frac{\ln \hat{\pi}_{jt}}{\ln P_{jt}} \right) + \sum_k \eta_k^j \ln P_{kt} \quad 6.12$$

Table 6 shows the estimates of demand elasticities. Wage bills and prices are not aggregated in covered and uncovered sectors, instead these variables are aggregated by industries. I selected industries that are representative of the covered and uncovered sectors respectively to estimate. For example, data for the covered sector comes from the Encuesta Industrial Mensual. The Encuesta Industrial Mensual is a firm based survey that covers the largest firms in the manufacturing sector, where compliance is the highest. Data on wages paid in the uncovered sector comes from INEGI calculations based on the Encuesta Comercial Mensual. The Encuesta Comercial Mensual is an establishment-based survey that covers small retailers and restaurants. These industries have high non-compliance incidence. Prices of other factors include: energy price index, investment index, intermediate good price index and the net rate of return of commercial bonds at 28 days<sup>23</sup>.

<sup>23</sup> Data on prices and interest rates comes from Cuadernos de Informacion Economica, Banco de Mexico, various issues.

#### 6.4 What Fraction of the Cost is Shifted to Wages?

The degree of shifting depend on the following parameters: the relative demand elasticities between covered and uncovered sector, as well the joint distribution of  $q_{0i}$  and  $q_{1i}$  corresponding to marginal workers, and the correlation of benefits to taxes.

Equation 4.18 separates the effect the regulation reform into two components: changes in the cost of providing Social Security and changes in the benefits received by workers employed in the covered sector. The first term is the shifting of the cost of providing Social Security ( $dt$ ) on wages.. The second term determines how this differential is affected by changes in benefits.

Table 7 shows the estimates of Equation 4.18 substituting the estimates previously defined for the whole sample and for males between 20 and 40 years old. The estimates show that increasing the tax to finance Social Security programs while leaving benefits unchanged will reduce wages in the covered sector by 43% of the tax increase. If the tax is not changed but benefits are tied to contributions at a one to one relationship, wages paid in the covered sector will decrease by 57% of the value of benefits. For the young male sample, the estimates are 43% and 57% respectively.

Full shifting of the cost cannot be achieved unless labor supply is inelastic. The higher the elasticity of supply into the covered sector the lower is the shifting of the tax in form of lower wages. On the contrary, higher elasticity of supply results in larger shifting of benefits to wages.

## 7 Conclusions

Two contributions are presented in this paper. First, it defines the framework to evaluate Social Security taxation when there is a sector that does not comply with the regulation and workers self-select into the covered sector. Second, it presents estimates of the incidence of Social Security for different types of payroll financed social programs.

A general equilibrium analysis is required to identify the effect of any labor regulation when there is a sector that does not comply for two reasons: coverage varies widely across economic sectors and because the composition of the treatment group depends on how benefits are specified. There are two important lessons derived from the analysis. First, Social Security regulation distorts the optimal allocation of labor and capital between production sectors. Second, evaluating the response on wages paid complying firms to changes in the nominal tax by differences in differences estimators does not provide any evidence on what fraction of the cost can be shifted to wages.

The model shows that regulation is inefficient when benefits are not exclusive to covered workers, because factors are misallocated between sectors. In the case of labor, there is a misallocation

when regulation affects the effective comparative advantage among sectors. In order to reduce this distortion is it required that benefits in the covered sectors to be proportional to earnings.

The analysis presents a clear cut between social security programs whose benefits are exclusive to covered workers and programs available for both covered and uncovered workers. However, finding the empirical distinction present two challenges. First, uncovered workers may have access to programs perceived as public at a higher cost than covered workers. Second, covered and uncovered workers may be related to each other.

The analysis presented in this paper assumes a given distribution of firms across sectors, future work will benefit from explicitly deriving firms' decisions to comply. Findings presented in this paper will hold if the new composition of firms across sectors did not switch workers' comparative advantage between covered and uncovered sectors. The evidence shows that this is the case, coverage increased in all economic sectors employment, but differences in incidence among production sectors remained constant.



Table 1  
Average Social Security Tax Rates for the Median Worker<sup>1/</sup>

Program	Before 1997		After 1997	
	Employer	Employee	Employer	Employee
Medical Insurance	8.75	3.125	5.38	0.25
Disability, Death and Retirement Insurance	5.95	2.125		
Disability and Death Insurance			1.75	0.625
Health Plan for Retired Workers	0.00	0.00	1.05	0.375
Individual Retirement Accounts	2		6.5	
INFONAVIT <sup>2/</sup>	5		5	
Total Tax Rate	14.7	5.25	8.18	1.25
Total Tax deposited on the IRA	2		11.5 <sup>3/</sup>	

*Notes:*

1/The median worker earns three times the minimum wage.

2/ INFONAVIT is a government institution that provides low cost financing for housing. Before the reform, INFONAVIT's funding was limited and restricted to those workers that purchase a house built by the Institute. Because the loan was tied to the property, INFONAVIT rationed credit by building a limited number of houses. The new legislation, substituted INFONAVIT tax for an individual INFONAVIT account, and funding is no longer tied to the property. The legislation states that the balances in the INFONAVIT account will be transferred to the IRA at the retirement date.

3/ This is the payroll contribution to the IRA. In addition, the government deposits about 6% of monthly earnings of the minimum wage worker to each worker registered in the SS.

Table 2  
Summary Statistics by Contract Type

	Benefits		
	Social Security and Severance Payment	Social Security only	None
Years of Schooling			
Fewer or equal than 6	0.28	0.27	0.46
Fewer or equal than 9	0.57	0.61	0.76
Fewer or equal than 12	0.80	0.84	0.91
Experience			
Fewer or equal than 5	0.14	0.22	0.19
Fewer or equal than 10	0.35	0.42	0.40
Fewer or equal than 15	0.53	0.65	0.54
Male	0.66 (0.47)	0.66 (0.47)	0.65 (0.47)
Age	31.85 (10.50)	28.47 (9.56)	30.11 (11.68)
Professional	0.03 (0.18)	0.02 (0.15)	0.01 (0.10)
Technician	0.04 (0.21)	0.03 (0.10)	0.02 (0.14)
Manager	0.04 (0.20)	0.01 (0.10)	0.00 (0.07)
Production Worker	0.17 (0.39)	0.18 (0.38)	0.19 (0.40)
Clerk	0.18 (0.33)	0.15 (0.35)	0.06 (0.24)
Crafts	0.13 (0.32)	0.11 (0.31)	0.16 (0.36)
Sales	0.12 (0.32)	0.17 (0.38)	0.26 (0.43)
Services	0.26 (0.43)	0.31 (0.46)	0.28 (0.45)
Married	0.63 (0.48)	0.52 (0.49)	0.50 (0.50)
Share Working on a Firm size <20	0.22 (0.41)	0.12 (0.34)	0.83 (0.37)
Share with Social Security Coverage from other household member	0.33 (0.47)	0.32 (0.46)	0.26 (0.43)
Number of Observations	29782	4451	22401

*Notes:*

Standard Errors in Parenthesis.

The variable outside coverage is a dummy equal to one if the individual lives in a household where there is somebody else that is covered by a health plan and he is eligible to receive medical treatment from this plan. The criteria for coverage within the household include public sector workers. Public sector workers receive similar medical benefits than SS and are also extended to the immediate family of the worker.

To determine eligibility I followed the criteria of the legislation. Only immediate family member are eligible and descendants aged 21 or less if they are studying or 16 or less if they are not.

Table 3  
Incidence Variation According to Schooling and Age

	Social Security and Severance Payment	Social Security only	Uncovered
Schooling years<6	36.69	5.59	57.62
6<= schooling years<9	46.79	6.87	46.34
9<= schooling years<12	55.82	9.13	35.05
Schooling years =12	59.73	8.82	31.46
Schooling years >12, technical	74.09	8.29	17.63
Schooling years>12, College	56.71	9.04	34.26
Age <20	33.06	8.56	59.38
Age 20-30	53.75	9.8	36.44
Age 30-40	58.98	7.11	33.91
Age 40-50	57.21	5.05	37.74
Age >50	53.29	4.61	42.1
Average	54.65	7.77	37.5

*Source:* ENEU, 1996. Non-agricultural private sector employees that work at least 30 hours a week.

Table 4  
Compliance Incidence by Economic Sector

Industry	Benefits		
	Social Security and Severance Payment	Social Security only	None
Textile, except apparel	0.82	0.08	0.10
Apparel	0.65	0.10	0.25
Leather and footwear	0.73	0.16	0.10
Wood and Paper	0.68	0.11	0.21
Chemicals	0.53	0.08	0.39
Plastics and Glass	0.67	0.14	0.18
Basic Metals	0.84	0.14	0.02
Machinery and Equipment	0.82	0.09	0.08
Construction	0.27	0.12	0.61
Retailing	0.54	0.07	0.39
Retailing (Bulk)	0.49	0.11	0.40
Hotels and Restaurants	0.41	0.05	0.54
Transportation	0.78	0.07	0.15
Communication	0.63	0.08	0.29
Real state and financial services	0.61	0.13	0.26
Professional services	0.58	0.09	0.34
Repairing services	0.27	0.06	0.67
Other Services	0.47	0.10	0.43
Std. Deviation	0.16	0.03	0.18

*Source:* ENEU96 non-agricultural, private sector employees that work at least 30 hours a week. The sample is restricted to males with 9 years of schooling.

Table 5  
Relative Labor Supply Elasticity

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	$\gamma(\pi) = \frac{d \ln \left( \frac{L_t}{L_0} \right)}{d \ln \left( \frac{\pi_t}{\pi_0} \right)}$
$\pi_1/\pi_0 = 2.33, \quad b(t)/\pi_1 = 0$	3.14
$\pi_1/\pi_0 = 2.33, \quad b(t)/\pi_1 = 0.115$	3.20

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*Notes.*

The sample includes non-agricultural private sector employees who worked at least 30 hours during the week previous to the interview. The sample period is from the second quarter of 1996 to the second quarter of 1997.

Benefits in the third row, are set equal to the amount that firms deposits in Individual Retirement Accounts.

Table 6  
Labor Demand for Sector Specific Skills

Sector	OLS		Instrumental Variables	
	Coefficient t	Standard Error	Coefficient	Standard Error
<b>Covered Sector</b>				
Ln $\pi_1$	-1.3636	0.3339	-1.5464	0.4507
Ln Energy Price Index	0.4790	1.0882	0.6013	1.0349
Ln Investment Deflator	2.8275	1.7807	3.1528	1.7144
Ln Intermediate Inputs Price Index	-0.5146	0.3983	-0.3923	0.3970
Ln Commercial Bond Interest Rate	0.0080	0.0060	0.0086	0.0057
Constant	8.3780	2.4885	7.3308	2.5849
R square	0.71		0.68	
<b>Uncovered Sector</b>				
Ln $\pi_0$	-0.8575	0.3462	-0.7018	0.5355
Ln Energy Price Index	4.3923	0.9347	4.4444	0.9361
Ln Investment Deflator	-3.6437	1.6105	-3.9338	1.7679
Ln Intermediate Inputs Price Index	-0.8559	0.2764	-0.8874	0.2863
Ln Commercial Bond Interest Rate	0.0244	0.0070	0.0234	0.0074
Constant	9.5099	2.2641	10.5183	3.4821
R square	0.85		0.89	

*Notes:*

All prices are divided by the producer's price index of the corresponding sector.

Covered sector's labor demand is estimated using data from largest firm in the manufacturing sector.

Uncovered sector's labor demand is estimated using data from small establishments in retail and restaurants.

Instruments are: index price for energy, investment and intermediate inputs, 28 days commercial bond interest rate, unemployment rate and mandated minimum wage.

Table 7  
Estimates of the Shifting of Taxes to Wages

	Shifting
$\frac{d \ln\left(\frac{\pi_1}{\pi_0}\right)}{dt_1}$	-0.43
$\frac{d \ln\left(\frac{\pi_1}{\pi_0}\right)}{dt_2} \Bigg _{t=t_1+t_2}$	-0.57

*Notes:*

Estimates are computed according to Equation 4.17'.

$$\hat{\pi}_1 - \hat{\pi}_0 = \frac{1}{D} [-\eta_1 + (k_1 + g(\pi))(\eta_1 - \eta_0)] dt - [(\lambda\gamma(\eta_1 - \eta_0) - \gamma)] dt_2$$

Where

$\eta_j = -\sigma_j(1 - \theta_{lj}) - (\varepsilon_{jj} - \varepsilon_{kk})\theta_{lj}$  is the labor elasticity in sector j

$$D = \eta_1 - (k_1 - g(\pi) - \lambda\gamma(\pi))(\eta_1 - \eta_0) - \gamma(\pi)$$

Demand elasticities correspond to the OLS estimates presented in Table 12.

$$k_1 = \frac{K_1}{K} = 0.85$$

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