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ABSTRACT

Social Security Coverage and the Labor Market in Developing Countries*

This paper examines the reasons behind the low rates of participation in old age pension programs in developing countries. Using a large set of harmonized household surveys from Latin America we assess how much of the low participation can be explained by involuntary rationing out of jobs with benefits versus how much can be instead explained by workers' low willingness/ability to contribute towards such programs. We compare contribution patterns among wage employees, for whom participation is compulsory, with contribution patterns among self-employed workers, for whom participation is often voluntary. For both types of workers the probability of contributing to old age pension programs is similarly correlated with education, earnings, size of the employer, household characteristics and age. Our results indicate that on average at least 20-30 percent of the explained within-country variance in participation patterns can be accounted for by individuals' low willingness to participate in old-age pension programs. Nonetheless, we also find evidence suggesting that some workers are rationed out of social security against their will.

JEL Classification: J32, J81

Keywords: informality, old-age pension, social security, self-employment, Latin America

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I. Introduction

The low coverage of social security programs in developing countries is often attributed to the dual nature of their labor markets. Implicit in this view is that workers are rationed out of social security against their will because they are unable to find formal jobs with benefits. In this paper we examine how much of the low participation can be accounted by involuntary rationing and how much can be instead explained by a low willingness or ability to contribute for old-age pension by part of workers.

Throughout the world, social security programs have been introduced to insure consumption in old age. For salaried workers, participation in these programs is linked to employment; employers are required by law to register workers and transfer a certain share of workers' wages to pension administrators. In practice, however many employers have not enrolled their workers in these plans.

Table 1 presents affiliation rates during the 1990s and the beginning of the twenty-first century for different samples of workers in the seven countries of Latin America included in our study. These rates are computed from individual household surveys (see Section IV for a description of the data). On average, only four out of ten workers 15 to 64 years old are contributing towards future pensions.[2] While some workers might have contributed in former jobs and thus accrued some pension rights, participation rates are very low, suggesting that a large share of the labor force in Latin America will not receive a pension or will retire with meager benefits. Nonetheless, there are large differences across countries: Costa Rica, Chile and Brazil show contribution rates above 50 percent, while in Nicaragua and Peru, less than 25 percent of workers 15-64 years old participate in such programs. Participation rates are somewhat higher among salaried workers, and very low among the self-employed, a group, for whom, with the exception of Brazil, participation in social security is voluntary. In many countries less than one in ten self-employed workers are contributing.

Most studies attribute the high rates of non-participation (also commonly referred as informal employment) to the characteristics and regulations prevailing in the labor market or to the characteristics of firms (Jackle and Li, 2006). Some studies emphasize

[2] While workers might be affiliated but not actively contributing to social security, in this paper we use the terms *participation*, *affiliation* and *contribution* as synonyms and referring to a worker that makes active contributions to a public old age pension program (see section IV).

the importance of wage rigidities caused by labor regulations, unions or efficiency wages, which lead to rationing of formal sector jobs with benefits (Harris and Todaro, 1970; Esfahani, Hadi and Salehi-Isfahani, 1989; Agénor, 2005) Other studies, explain informality as the result of the decisions of firms (Levenson and Maloney, 1998). In this view, firms decide whether to engage in formal institutions by assessing the benefits and costs of doing so, with the outcome of this calculation depending on the cost structure and characteristics of firms (for example, its size). In all these studies, participation in social security is treated as exogenous to workers' decisions. In this paper, we examine how much of the low rates of participation can be instead accounted by the alternative hypothesis that workers with weak preferences for participating in social insurance programs sort into jobs in which social security is easier to evade. The possibility that workers preferences are likely to underlie participation in social insurance programs has been long recognized in the health insurance literature in developed countries (Monheit and Vistnes, 2006). Yet this hypothesis has been hardly explored in the development literature on informality.

To examine how worker preferences can account for the observed patterns of participation in old-age pension programs, we first develop a very simple model assessing individuals' decisions to participate in old-age pension plans. The model is based on the premise that while participation is in principle mandatory, enforcement is weak. This model builds a bridge between the savings/insurance and the labor demand literature and shows that (i) some individuals may be more willing than others to participate in an old age program, (ii) some firms are more likely than others to evade social security contributions, (iii) firms for which evasion is costly are more likely to hire workers with stronger preferences for social security insurance and (iv) workers with weaker preferences for social security are likely to be employed in jobs not registered with social security.

We then explore the patterns of participation for salaried and self-employed workers in seven countries of Latin America (Brazil, Chile, Colombia, Costa Rica, El Salvador, Nicaragua and Peru) and find important commonalities across countries despite fundamental differences in pension programs (pay-as-you-go versus individual capitalization accounts). In all countries studied, old age pension participation strongly increases with the education and the age of a worker. Women tend to contribute more than males, while being married and head of the household increases an individual's probability of contributing, particularly for males. Individuals in households with a higher share of non-earners are more likely to contribute, while the size of the household is negatively correlated with the probability of contribution. Individuals working in urban areas at firms with more than five employees, employed full time, in the public sector and in manufacturing are more likely to contribute than other workers. Workers in households where other members are already contributing and workers with higher earnings are also more likely to contribute. Our results indicate that factors related to the demand for insurance (captured with individual and household variables) may account for at least 20-30 percent of the explained variance.

The coefficients of a selection-corrected Probit model of social security participation might be biased due to omitted variables. In particular, the danger is that we might be attributing undue importance to demand factors because coefficients on demand–related variables capture the correlation between worker and household characteristics and some omitted job characteristics. To disentangle these effects, we compare contribution patterns among wage employees, for whom participation is compulsory, with contribution patterns among self-employed workers, for whom participation is often voluntary. Since the latter are free to reveal their preferences for social protection, a comparison between the two groups can shed light on the causes behind low participation rates. Despite the lower contribution rates for self-employed workers, we find strong commonalities in the contribution patterns of wage employees and self-employed workers. These patterns suggest that, to a large extent, the low contribution rates observed in Latin America are driven by a combination of certain types of workers' low willingness to participate in social security programs and the State's inability to enforce firms' contributions for workers not willing to participate. Yet, quite importantly, our evidence also suggest that some groups of workers, such as workers earning wages below the minimum wage, or part-time employees, might be rationed out of social security against their will.

The rest of the paper is organized as follows. Section II provides a brief description of old-age pension systems in Latin America, and Section III presents a simple model of the determinants of contributions to old-age pensions programs. Section IV discusses the data used in this paper, and Section V presents the results of studying contribution patterns for wage employees and self-employed workers in a large number of countries. Finally, Section VI concludes and provides some implications for social protection policies.

II. Pension Programs in Latin America

Latin American countries present a variety of old-age pension programs. Here we focus on the seven countries included in our empirical analysis (Brazil, Chile, Colombia, Costa Rica, El Salvador, Nicaragua and Peru). Up to the 1970s, all of them relied on publicly administered pay-as-you-go systems in which contributions from the active population afforded the benefits of inactive pensioners; pensions were defined by governments according to a formula based on previous salaries and contributions. Chile was the first country to introduce mandatory private individual capitalization accounts in 1981, and it has been the model for many other reforms of social security systems around the world (Acuña and Iglesias, 2001). The origin of the privatization movement was mainly driven by financial problems; the public social security systems were highly indebted and facing an aging population, which jeopardized sustainability.

El Salvador (1998) adopted a system of individual capitalization accounts based on the Chilean model. Individual accounts are privately managed and supervised by a governmental agency. Pensions depend upon the balance accumulated in the personal account and the type of payout chosen after retirement (schedule withdraw, permanent life annuity or temporary income with deferred life annuity). In Chile and El Salvador, the government guarantees a minimum subsidized pension. Moreover, in El Salvador at the time of reform, some people affiliated with the old system were forced to remain in the pay-as-you-go scheme (older than 55/50 for men/women) while others were free to choose (middle age). New entrants are only allowed to participate in the new private system.

Peru (1993) and Colombia (1994) introduced a parallel private capitalization accounts system that competes with the pay-as-you-go system. Workers are free to choose between the two modalities. In Colombia, for example, they are able to switch every three years.

Alternatively, Costa Rica (2000) introduced reforms to combine the main characteristics of both systems. The public system is kept as a basic pillar, but it is complemented by individual capitalization accounts.

Finally, Nicaragua and Brazil maintain the public pay-as-you-go system. It should be noted, however, that in Brazil some parametric reforms have been carried out in order to homogenize different pensions systems among the different governmental levels.

In most cases, the reforms have increased the years of contributions necessary to retire and the contribution rates. The goal has been to increase the link between the contributions and the benefits obtained from the system and therefore strengthen its financial sustainability

In all the countries studied, social security contributions are compulsory for wage employees and are voluntary for the self-employed (except in Brazil where contributions are also compulsory for the self-employed). Table A.1 in Appendix A presents a description of the Social Security Systems in the seven Latin American countries under study.

III. A Simple Model of Participation in Old Age Pension Programs

In this section, we adapt the De la Rica and Lemieux (1993) model of health insurance to model the decision to participate in pension programs in Latin America. This simple model is useful in that it helps to clearly state some predictions regarding which workers are more likely to contribute to social security programs. We first consider the case when participation is voluntary and then develop the case when participation in the program is compulsory but enforcement is weak.

A. Voluntary Participation

Assume a two-period economy where individuals (workers) have the possibility to participate in a voluntary pension program to insure consumption in the old age. In the first period, individuals work, consume, save for the second period, and decide whether to contribute a fraction t of their labor income W_i towards future pensions; in the second period, they retire and consume their first-period savings and the pension B_i, where i indexes individuals. Workers can only participate in the plan through their employers, who in turn collect the contributions and transfer the funds to the pension program administrator. Workers decide whether to participate based on whether they are better off receiving the pension and paying tW_i than otherwise. Assume that worker i's preferences can be represented by:

$$U(C_{1i}, C_{2i}) = u(C_{1i}) + \frac{1}{1+\rho_i}\, u(C_{2i})$$

where C_{ji} denotes consumption in period j by individual i and ρ_i is the individual i discount rate. Assume further that $u'(C_{ji})>0$ and $u''(C_{ji})<0$. Given t and B_i, workers will choose consumption levels that maximize their utility function subject to their inter-temporal budgetary constraint given by

$$(1\text{-}t)\, W_i = C_{1i} + \frac{1}{(1+r_i)}\,(C_{2i} - B_i) \qquad (1)$$

$$\text{and } C_{ji} > \overline{C}$$

where r_i denotes the interest rate available to the worker, and $\overline{C}$ is a minimum subsistence consumption level. The interior solution of this maximization problem yields $u'(C^*_{1i})/u'(C^*_{2i}) = \dfrac{(1+r_i)}{1+\rho_i}$. That is, consumption in the first period will be higher (lower) than consumption in the second period if the interest rate available to the worker is lower (higher) than her discount rate. If $r_i = \rho_i$ then $C^*_{1i} = C^*_{2i}$.

Worker i will prefer to participate in the pension benefit program if

$$U(C^*_{1i}(t,B_i), C^*_{2i}(t,B_i); t, B_i) \geq U(C^*_{1i}(0,0), C^*_{2i}(0,0); 0,0) \qquad (2)$$

and condition (2) holds if and only if

$$tW_i \leq \frac{1}{1+r_i}\, B_i \qquad (3)$$

that is, if the present value of the pension is no less than the cost of the contribution. In a pay-as-you-go system, pension benefits are given by $B_i = \alpha W_i$ where α is the replacement rate determined by the pension plan. The higher the interest rate available on savings and the higher the tax relative to the replacement rate, the less likely it is that a worker will voluntarily participate in the pension plan. Instead, in an individual capitalization system, the benefit is given by $B_i = (1+\tilde{r}_i)tW_i$, where $\tilde{r}_i$ is the interest rate available to the individuals investing in an individual capitalization account. Individuals who can get returns on their savings above the returns yielded by individual capitalization pension accounts will not voluntarily participate in a individual capitalization pension plan.

For individuals for which $W_i \leq \dfrac{\overline{C}}{1-t}$, the optimal consumption in the first period involves a corner solution of the form $C_{1i}^* = \overline{C}$, as well as no savings or participation in pension programs. [3] Therefore the lower the income of the individuals, the lower the probability that such workers participate in old-age pension programs.

Let us now look at the supply side. In order to participate in the program, workers need to get jobs. Let a_i denote the marginal product of labor of worker i, and let Wr_i be the wage of such worker if she becomes self-employed. We refer to this wage as the reservation wage in salaried jobs. In addition, let s_i denote the difference between the marginal product and the reservation wage for worker i, $s_i = a_i - Wr_i$. Positive surpluses may arise because specific skills make a worker more productive in a given firm than in other jobs—including self-employment-- or due to rents generated by imperfect competition in the labor market. The division of the surplus between employers and employees will depend on their relative bargaining power. Let β denote the share of the surplus that accrues to workers after bargaining and W_i the wage paid to a worker.

In this environment, workers will accept salaried jobs as long as $W_i \geq Wr_i$, and firms will hire workers as long as $a_i \geq W_i$, while the wage that a worker will receive would be $(Wr_i + s_i\beta)(1-t)$ for a worker who chooses to participate, and $Wr_i + s_i\beta$ for a

[3] This formulation postulates that individuals with very low income will use their resources for consumption of goods rather than for purchasing pension funds. It also assumes that earnings are at least high enough to buy the subsistence bundle.

worker who chooses not to. This implies that when workers are free to choose whether to contribute or not, firms simply collect contributions from workers who have given them instructions to do so. The pension program will not affect firms' labor costs and therefore the existence of such program will not change employment decisions by firms.[4]

B. Binding Minimum Wages

In the former scenario, all workers who wish to participate in the pension program can do so through their employers and therefore, participation is entirely determined by the decisions of workers rather than the decisions of employers. This scenario is feasible only when there are no restrictions on wage adjustment. Consider for example the case when there is a binding minimum wage, $\overline{W}$, such that $\overline{W} \geq Wr_i + s_i \beta$.[5] Firms hire a worker *i* as long as $a_i \geq \overline{W}$. If $a_i \geq \overline{W}(1+t)$, the firm can hire the worker at the minimum wage, pay the cost of social security and still make a profit. However, per-worker profit is higher if no social security contributions are paid. Instead, if $\overline{W}(1+t) \geq a_i \geq \overline{W}$ worker *i* is offered a job only under the condition of no social security contributions. Therefore, a binding minimum wage may result in inefficiently low pension coverage, since a subset of workers may be denied contributions, even when they are willing to pay for them.

Inefficiently low coverage may also occur if workers' participation in a pension program brings additional costs for firms that cannot easily be transferred to workers (for instance, because affiliating workers increases the probability of a tax inspection, or it requires registering a firm). When minimum wages or other cost externalities are important, participation is determined by the decisions of employers and not by workers' willingness to pay.

C. Compulsory Contributions

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[4] In the more general case where the supply of labor of individuals enters in the utility function, the presence of a voluntary benefit program may lead to higher labor supply, lower wages for salaried workers, and more employment in this sector than when such program is not available.

[5] It may be argued that if enforcement is imperfect minimum wages will not necessarily bind. Yet, recent evidence for Brazil and Colombia suggest that despite high levels of non-compliance with social security regulations, minimum wages are binding both in the formal and informal sectors. See Maloney and Nuñez (2004) for Colombia, and Lemos (2004) for Brazil.

Assume now that participation is compulsory, wages can freely adjust to compensate for contributions, and enforcement is weak. As in the voluntary participation case, firms hire workers willing to contribute to the pension program as long as $a_i \geq (Wr_i + s_i \beta)$. Instead, compulsory participation increases the cost of hiring workers not willing to contribute if the cost of non-compliance is larger than zero. Assume that, with probability $\lambda < 1$, an evading firm is discovered and forced to pay the social security contribution plus a fine $(t+f)\ (Wr_i + s_i \beta)$ firms will choose to abide by the law and affiliate a worker for whom $a_i \geq (Wr_i + s_i \beta)(1+t)$ if:

$$a_i - (Wr_i + s_i \beta)(1+t) \geq a_i - (Wr_i + s_i \beta)(1+\lambda(t+f)) \tag{4}$$

which holds if $f \geq t(1-\lambda)/\lambda$.[6] Thus, the higher is the probability of being caught and the higher are the fines, the more likely are firms to comply. To the extent that λ or f increase with the size of the firm, larger firms will be more likely to comply with mandatory programs than smaller ones. Recent evidence presented by Aterido et al (2007) based on firm-level data for over 70,000 firms in 107 countries indicates that enforcement –as measured by labor and tax inspections—strongly increases with the size of the firm. Therefore, affiliation rates are expected to be higher among workers employed in larger firms.

Assuming that expression (4) holds, salaried employment of workers who are not willing to participate may decline. This is the case for workers whose marginal product cannot compensate for the tax, that is $a_i < (Wr_i + s_i \beta)(1+t)$.[7] In this case contribution rates increase, but at the potential cost of lower salaried employment. Notice that salaried employment may decline even in the case where condition (4) does not hold and firms choose non-compliance. This is because firms still incur the potential costs associated with being charged a fine. Thus, the employment condition in this case is:

$$a_i \geq (Wr_i + s_i \beta)(1+\lambda(t+f))$$

D. Self-Employment

[6] Chong and Saavedra (1999) also make the case that entering the informal sector is a decision that both firms and employees make on the basis of cost benefit evaluations that are continuously revised and may vary depending on changes in institutions, regulations, preferences and changes in economic activity.

Workers may become self-employed, either by choice, or because they do not find jobs as salaried workers. Workers engaged in self-employment contribute to old age pension programs if,

$$tWr_i \leq \frac{1}{1+r_i} B_i \qquad (3)'$$

where Wr_i is the return to self-employment. Enforcement of compulsory contributions in the wage employment sector reduces wage employment among workers unwilling to contribute if $a_i < (Wr_i + s_i \beta)(1+t)$. Therefore, enforcement results in a higher proportion of contributors among wage employees and a lower share of contributions among the self-employed as workers unwilling to contribute shift to self-employment.

E. Summary

The simple model presented above suggests that in economies where enforcement is imperfect participation patterns will, to a large extent, reflect individuals' taste or ability to pay for social protection. Our model also shows that better enforcement will result in higher contribution rates among workers with low willingness or ability to participate, but at the possible cost of lower wage employment and higher self-employment for these workers.

In this model we have assumed perfectly rational individuals, whilst mandatory pension plans are often justified on the grounds of sub-optimal old age savings. The introduction of time inconsistency or incomplete information about the benefits of planning for old age in this simple model would reinforce the main conclusion of the model, as it would create further incentives for workers not to participate. In this case, mandatory enforcement could, under some hypothesis, increase workers' welfare, but still at the potential cost of lower formal employment rates.

[7] If $a_i<(Wr_i + s_i\beta)(1+t)$ but $a_i > Wr_i (1+t)$ firms could pass on the cost of the contribution to workers without necessarily reducing employment, as long as β declines.

IV. Data

This study draws from a large set of household surveys from seven countries during the 1990s[8]. Since our methodology involves comparing results within and across countries, our goal has been to create a set of consistent variables across countries and over time but there are some limitations. Thus, while our main variable of interest is whether workers are actively contributing to old-age pension programs, in Brazil, Costa Rica, El Salvador, and Nicaragua survey information refers to contribution to social security, which includes pensions plus other social security programs.[9] A related challenge is that in Colombia, Peru and El Salvador the question posed in the household surveys refers to the worker's affiliation rather than contribution status. Workers could be affiliated to social security – for example, by opening an individual capitalization account—but not being actively contributing at the moment. Reassuringly, data from Chilean 1994 CASEN Survey indicates that 93 percent of affiliated salaried workers were also contributing at the time of the survey. Moreover, in all countries the questions refer to the current job, which increases the probability that the worker interprets the question as current contributions. In what follows, we assume that in the three countries mentioned the answers refer to contribution status.

The data cover the period 1990-2002 but the information is not balanced across countries. For Costa Rica, the data provide coverage of the entire period. For Brazil, the data cover the period 1992–1999. For Colombia and Chile, the data cover the period 1996-1999 and 1994-2000, respectively. For El Salvador and Nicaragua, the information is only available for the later half of the period. Lastly, for Peru the available years are 1994, 1997 and 2000. The average number of observations per survey and year ranges from 19,000 (Peru) to 340,000 (Brazil). The geographic coverage of the study is nationwide. Table A.2 provides further information on the countries, years, geographic coverage and average number of observations contained in the data.

[8] The working paper version considers eleven countries. In this version we excluded four countries because either the household surveys did not provide information about social security participation for the self-employed (Argentina, Mexico and Venezuela) or because the number of observations was very small to provide reliable estimates (Paraguay).

[9] See Table B.1 in Appendix B for a more detailed description on the construction of the social security variable.

We restrict the sample to men and women 15-64 years old who work more than 5 hours per week and consider two categories of workers: salaried and self-employed. Salaried workers are individuals who work for a public or private employer in exchange for remuneration, either wages or salary. The self-employed operate their own economic enterprise or engage independently in a profession or trade, and hire no employees. We exclude employers and non-remunerated workers from the analysis. Contribution rates for self-employed in Nicaragua, Peru, and El Salvador are too low to yield reliable estimates. Therefore, our analysis concerning the self-employed is restricted to three countries: Chile, Colombia and Costa Rica.[10]

To assess a worker's wage relative to the minimum wage, we gather minimum wage (*MW*) levels from individual country statistical reports and Ministries of Labor. Since wages reported in household surveys are net of social security contributions, we use information on total workers' contributions to social security programs (maternity and sickness, pension programs, workplace injuries, unemployment insurance and family allowances) obtained from various issues of the *Social Security throughout the World* published by the U.S. Social Security Administration, to compute gross wages. We also gather information on firms' contributions to such programs to assess whether gross wages fall in the MW-$MW*(1+t)$ interval, where t are total contributions to social security paid by firms.

Tables 2, 3 and 4 summarize the means of the variables included in our analysis of the full, salaried workers, and self-employed workers samples, respectively. On average, 27 percent of workers in our sample are self-employed, ranging from 16 percent in Chile to 37 percent in Colombia. In the sample of salaried workers, participation rates range from 32 percent in Nicaragua to 78 percent in Chile. On average, 57 percent of salaried workers are contributing to mandatory old-age pension programs. The share of contributors among self-employed workers, on the other hand, ranges from below 2.5 percent in Nicaragua and Peru to 40 percent in Costa Rica. Women make up 30 percent of the salaried workers and 39 percent of the self-employed.

[10] While there are enough self-employed workers contributing in Brazil, we do not focus on this country because contributions for the self-employed in Brazil are compulsory.

On average, three out of five salaried workers are in the prime-age group (25-49 years old) and have either primary or secondary education. About 44 percent are heads of households, and the share of wage-earners earners in a household averages 47 percent. In contrast, workers in self-employment tend to be older, less educated and more likely to be heads of the household than wage employees.

The variable firm size distinguishes firms with fewer than five workers from larger firms. On average, about 27 percent of employees work for small firms. Moreover, about 22 percent of the salaried workers are in the public sector. Sectors of activity are identified at the 1-digit, ISIC-Rev. 2 classification. Due to the reduced number of observations for some countries in Agriculture, Hunting, Forestry and Fishing, this sector is merged with Mining and Quarrying. Between 13 to 23 percent of the salaried employees are in Manufacturing and another 15-21 percent in Wholesale, Retail and Hospitality. Among the self-employed, between 23 and 58 percent are concentrated in Wholesale and Retail and Hospitality.

For salaried workers, non-compliance with minimum wages varies from 9 percent in Brazil to 32 percent in Colombia. Among the self-employed, the incidence of wages below the minimum wage tends to be higher than among salaried workers. The incidence of part-time work ranges from 6 to 15 percent among salaried workers and is higher among the self-employed.

We further identify if the worker lives in an urban area. An average of 78 percent of the salaried workers and 69 percent of the self-employed reside in urban areas.

VI. Empirical Methodology and Results

A. Methodology

We estimate the determinants of the probability of contributing to an old age pension program using individual-level data, accounting for possible selection bias in employment. For each country, we assume that the probability of contributing for worker *i* in sector of activity *j* (ISIC 1 digit) in period *t* is explained by the following model:

$$Y^{*}_{ijt} = \alpha + Z_i\delta_1 + H_i\,\delta_2 + F_i\delta_3 + S_j\delta_4 + T_t\,\delta_5 + u_{1i}$$

$$\text{where } y_{ijt} = \begin{cases} 1 & if\ \ Y_{ijt}* > 0 \\ 0 & otherwise \end{cases}$$

$$\Pr ob(y_{ijt} = 1) = \Phi(\alpha + Z_i\delta_1 + H_i\,\delta_2 + F_i\delta_3 + S_j\delta_4 + T_t\,\delta_5) \qquad (5)$$

while the selection equation is

$$K_i\theta + u_{2i} > 0 \qquad (6)$$

and u_{1i}, u_{2i} are Normally distributed *N(0,1)* with *corr* $(u_{1i}, u_{2i}) = p$.

Z_i is a vector of individual characteristics, H_i is a vector of household characteristics, F_i are a set of variables related to the job, S_j and T_t are a set of sector and time dummies, and $\Phi(\cdot)$ represents the c.d.f. of a standard normal variable. Among the personal characteristics, we include age, gender, marital status, level of education and geographic area. In our simple model, decision-making occurs at the individual level; however, social security decisions are likely to depend on household characteristics. Consequently, we include controls to account for the following factors: whether the individual is the head of the household, if there are other members contributing to social security, the total number of household members and the share of inactive members by age group (less than 15, 15-64, more than 64). In terms of job characteristics, we control for part-time work (that is, if a person works less than 30 hours per week), firm size (up to five 5 employees or more than five), whether the worker is self-employed, and whether the worker is in the public sector. We also control for wage level including a variable that assesses the worker's wage in relation to the minimum wage dividing the wage distribution in brackets, distinguishing whether a worker earns a gross wage below the gross minimum wage (*MW*), between *MW* and $MW(1+t)$, between $MW(1+t)$ and $MW(1+t)^2$, between $MW(1+t)^2$ and $MW(1+t)^3$, and above the latter value. The groups of interest are workers who earn wages below the minimum wage and workers who earn wages immediately above the minimum wage. In the first group, contribution rates are expected to be lower because firms cannot register workers at a wage below the statutory minimum. Also, in the second-lowest wage group, firms' contribution to social security cannot be passed on to workers in the form of lower wages and therefore the incidence of social security may decline. Taking the bracket $MW(1+t)$- $MW(1+t)^2$ as the reference group, a negative and statistically significant coefficient for the income group MW - $MW(1+t)$, accompanied by a non-statistically significant coefficient for the income group $MW(1+t)^2$- $MW(1+t)^3$, would identify a negative effect of wage rigidities on social security contributions.

We further include a set of time dummies to control for cyclical changes in the interest rate and personal income, and a set of industry variables (1 digit ISIC) to account for differences in market power, importance of specific skills or probability of enforcement that may differ systematically across industries.

In the selection equation (6) we include the set of individual and household characteristics (Z_i, H_i), a variable that identifies if a worker lives in a urban or a rural area, plus a variable that indicates the number of children ages 4-10. We also include the interaction of this variable with gender. We exclude children ages 0 to 4 because they might be endogenous to the employment participation decision. Instead, it is considered that for children ages 4 onwards the fertility decision is sufficiently pre-determined relative to the decision of participating in the labor market.

Estimating this model provides valuable information about the correlates of the decision to contribute to old age pensions. Yet, the coefficients of demand or job characteristics may not correctly identify whether the observed contribution patterns are driven by workers' decisions or firms' choices. This is because statistically significant coefficients for firm and job characteristics may reflect sorting decisions by workers rather than rationing decisions by firms – i.e. workers not willing to participate seek jobs with better possibilities of evasion. Similarly, statistically significant coefficients for demand variables (individual and household characteristics) may reflect correlation with unobserved employment characteristics rather than the effect of individuals or household choices. We address this issue in two alternative ways. We first compute a lower bound of how much can be accounted by demand factors by assessing the change in the explained variance between a model that includes only employment characteristics, and a model that includes individual, household and employment characteristics. This approach takes into account the high correlation between groups of variables, but is liable to omitted variable bias.

Our second approach is to compare the coefficients estimated for salaried workers, for whom participation is compulsory, with the coefficients estimated for self-employed workers, whose participation is voluntary and which therefore can freely disclose their preferences for social protection. To the extent that the coefficients on the demand factors look similar across both groups of workers, it is possible to argue that the coefficients in the demand variables reflect preferences for social protection. This identification strategy relies on the assumption that preferences for social protection are comparable in both groups of workers. Recent evidence suggests that self-employed and salaried workers are not greatly different. Barr and Packard (2002, 2003) perform field experiments in Chile and Peru, asking individuals hypothetical questions to measure agents' risk and time preferences through decisions about contributing to a pension program. They find that the self-employed are indistinguishable from salaried workers with respect to these parameters.

B. Results

Individual Characteristics

Table 5 shows the Probit estimates for all workers. Across all countries, the probability of contributing to social security is strongly correlated with education. In general, there is a large increase in the probability of contributing if a worker increases his level of education from primary complete to secondary complete. After this level, even when generally the probability grows, the differences across education groups are much smaller, with the exception of Peru, where the probability of participation almost doubles for workers graduated from college relative to those that graduated from secondary.

The probability of contributing to social security also differs substantially across age groups. In all countries, contribution probabilities are higher for prime-age (25-49) and older workers (50-65) than for workers younger than 25. In Brazil, prime-age workers are more likely to be contributing than older workers, while in the rest of the countries the opposite is true. In Nicaragua and Peru, the two countries with the lowest contribution rates, the difference between the contribution rates for men 50-64 year-old and prime-age men is very large. This suggests that one of the reasons for the low contribution rates is that people only start contributing a few years before the retirement age. This behavior is likely to be driven by the retirement conditions, which are extremely generous in both countries. In Paraguay it is possible to retire only after approximately 15 years of contributions, and the wage base for the pension is calculated as the average of the 3, 4 or 5 last years of work. In Peru (in the pay-as-you-go system), workers can retire after 20 years of contributions and with a base wage computed as the average of wages during the last five years (See Table A.1).

For most countries, the probability of contributing is higher for single women than for single men; however, the order is reversed for married women. To the extent that married women are entitled to a survival pension (if they survive the spouse) or can access their husbands' account balances, which are in many cases higher than the pension they can get through their own contributions, they have a smaller incentive to contribute relative to that of married men or single women.

Lastly, contribution rates vary with the area of residence. In most countries, urban residents have a higher probability of contributing than rural residents. Such differences could be explained by (i) differences in enforcement between rural and urban areas; (ii) higher earning opportunities during old-age in rural areas; or (iii) higher life expectation in urban areas.

Interestingly, De la Rica and Lemieux (1993) examine the incidence of health insurance coverage in the United States and Spain and find patterns that are similar to the ones reported here. In both countries, coverage increases with education and experience. Coverage also increases for married individuals, particularly men. Such similarities suggest that the patterns of coverage of social security protection are similar across countries at different levels of development.

Household Characteristics

The structure of the household strongly affects the probability of participation in ways that are strikingly common across countries (Table 5). Except in Nicaragua, male household heads are more likely to be contributing than other members of the household.

In addition, in five out of seven countries, female household heads are less likely to contribute than male heads. Across countries, individuals in households with a higher share of inactive members (relative to the total number of members in the household) have a higher probability of contributing. This probability increases with the age of the inactive individuals. In contrast, individuals in larger households are less likely to contribute. In addition, our findings strongly contradict the notion that individuals "free-ride" on other household members that are contributing to social security. We find that, in all countries, and therefore regardless of the pension model, the probability of participation increases between 5 and 12 percentage points for workers who have at least one additional household member contributing. This variable may be capturing unobserved household characteristics that are correlated with the probability of contributing.

Job and Sector Characteristics

Job characteristics are also important in determining contribution probabilities. Part-time workers are much less likely to be contributing to social security than workers employed full-time. Similar results were also found by De la Rica and Lemieux (1993) for Spain and the United States. Workers in low-paid jobs are also less likely to be contributing than workers who earn higher wages. This is especially the case for workers who earn wages below the minimum wage.

On the other hand, only in Nicaragua is there evidence that workers in the bracket immediately above the MW are less likely to be contributing than workers in the control group (above $MW*(1+t)$ and below $MW*(1+t)^2$), while the probability of those in the following wage bracket does not significantly differ from that of the control group. For the rest of the countries, the effects of the minimum wage on workers immediately above the minimum, if present, cannot be disentangled from a strong income effect, which indicates that workers in higher wage brackets are much more likely to contribute that workers with wages around or below the minimum wage.[11]

[11] We attempted to disentangle these effects estimating two alternative specifications: The first one substitutes the set of minimum-wage related variables included in Table 5 for an alternative set of variables that contains the log of wages (to capture the income effect) and two dummy variables identifying the position of the wage relative to $MW*(1+t)$. The first dummy, *below*, takes a value of one if a worker's

Our results also suggest that workers in larger firms are more likely to contribute than workers in small firms. Differences in enforcement among small and large firms, in the development of specific skills, or in the existence of rents could explain this effect, whose magnitude is very large. Being employed in a firm of with five employees or less reduces the probability of contribution relative to salaried employees in large firms in 14 percentage points in Peru or 26 percentage points in El Salvador. Instead, being self-employed reduces considerably the probability of contribution, most notably in Brazil and Colombia. Lastly, workers in public sectors jobs are much more likely to be contributing.

Finally, contribution probabilities vary by sector and the patterns are again common across countries. In all, workers in the primary sector (Agriculture and Mining) have a lower probability of contributing than workers in the excluded sector (Manufacturing). This difference ranges from 2 percentage points lower in Costa Rica to 28 points in El Salvador. Construction workers are also much less likely to be contributing than manufacturing workers (with a difference in participation of between 6 and 19 percentage points). Workers in Transport, Storage and Communication and in Community, Social and Personal Services, are also less likely to be contributing than workers in Manufacturing. In contrast, contribution patterns are less clear for workers in Utilities and in Financing, Insurance, and Business Services. In some countries those workers exhibit higher contribution rates than in Manufacturing, while in other countries the opposite is true. Sector differences may arise from differences in technology and market structure that in turn lead to differences in rents across sectors. They may also reflect differences in enforcement rates across sectors. Packard, Shinkai and Fuentes (2000) also find lower levels of coverage among workers in small firms and those employed in the agriculture, transportation and construction industries.

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wage is between $0.95 * MW*(1+t)$ *and* $MW*(1+t)$ while the other, *above*, takes the value of 1 if a worker's wage is between $MW*(1+t)$ *and* $1.05 * MW*(1+t)$. The expected signs are negative for *below*, and not statistically significant for *above*. In the second specification, we include the two described dummies but substitute log of wages by a polynomial function of wages. In the two cases, we find that the only country for which the signs and statistical significance conform to the predicted ones is Nicaragua. Therefore, with the exception of this country, we do not find evidence indicating that minimum wages are exerting adverse effect on the contribution rates of low-wage workers.

To analyze the degree of commonality across countries in our study, we compute the cross-country correlations between marginal effects for all the variables of our model. Table A.3 reports the results. The correlation coefficients are extremely high (above 0.65 in all cases) and statistically significant at the 1 percent level in all cases. This underscores the fact that the patterns of social security coverage are very similar countries of Latin America regardless of the pension system.

While it is expected that demand (individual and household characteristics) and supply (job, firm and sector characteristics) factors are highly correlated, it is useful to compute the upper and lower bounds of the fraction of the explained variance accounted for by demand factors. To compute these bounds, we first estimate selection corrected Probit models for each country including only supply correlates. We compute the *lower* bound by comparing the resulting *pseudo R-square* with the ones resulting from the full model (as presented in Table 5) according to the formula (*Pseudo R^2 full-Pseudo R^2 Supply)/Pseudo R^2 Full*. Similarly, we compute the *upper* bound by first estimating a Probit including only demand correlates and comparing this model's pseudo R^2 with the one obtained from the full model according to the formula *1-((Pseudo R^2 full-Pseudo R^2 demand)/Pseudo R^2 Full*). The results of these computations are presented in Table 6. We also perform the same computations with the *R^2* obtained from estimating a selection corrected Linear Probability Model (LPM) instead of the selection corrected Probit. While the coefficients resulting from the LPM are very similar to the marginal effects in the Probit, the LPM has the advantage that the *R^2* is directly related to the variance of the dependent variable, while the *Pseudo R^2* is not.

The results indicate that in average, demand factors account for between 20 and 55 percent of the total explained variance, if the LPM is used, and between 30 and 52 percent if the calculation is performed with the Probit. Such figures suggest that, in addition to supply factors, demand variables play an important role in determining the probability of contributing to social security programs. Demand factors seem to be less important in Brazil, Chile and El Salvador, where supply variables seem to be the main factor in accounting for the explained variance in social security contribution status.

Country Characteristics

How much of the variance in social security contributions can be explained by individual and firm characteristics and how much can be explained by country policies or institutions, such as differences in enforcement or better management of social security schemes? To answer this question we pool the data for all countries and estimate the empirical model reported in Table 5 with and without country dummies allowing for clustering of the errors at the country level. We then compare these results with the results of estimating a pooled model with only country dummies as explanatory variables. The first column of Table 7 reports the results of the model only with country dummies, the second column reports the results of estimating the specification reported in Table 5 with the pooled data without country dummies, while the third column reports the results of adding all the controls. The coefficients in the country dummies reported in the first column indicate that Chile (the omitted country) has the highest contribution rate of the sample of countries studied.

The marginal effects of the country dummies suggest that there are significant differences in contribution rates across countries even after accounting for individual, household and firm effects. Similar effects are obtained when individual observations are weighted so that all countries have equal weight in the estimation. Differences in enforcement or in the overall attractiveness of social security systems may explain differences in country means.

In contrast, country variables have a seemingly small effect on the explained variance. In addition to the *pseudo* R^2, a measure not directly related to the variance of the dependent variable and biased to be less than one, we include other measures of goodness of fit, such as the count of correctly classified observations, or the R^2 of a Linear Probability model.[12] Neither the *pseudo* R^2, the R^2 nor the predictions of the model improve much when country dummies are taken into account. Thus, the percentage of cases correctly predicted by the model goes from 69 to 71 in both models with and without special weights, a fairly marginal improvement. Similarly, the R^2 increases from 0.43 (0.38) to 0.46 (0.45) when country effects are added to the model without weights

[12] All models account for selection into employment.

(with weights). In sum, country factors such as institutional enforcement or the attractiveness of the social security program explain differences in mean contribution rates across countries, but explain little of the individual variance in contribution rates.

The analysis above indicates that the patterns of contribution to social security exhibit prominent regularities across countries, individuals, households, firms and sectors. An analysis of variance suggests that at least in four out of seven countries, in addition to supply factors, demand factors account for a substantial share of the explained variance. In the next section, we compare the patterns of contributions between salaried and self-employment workers. Similar patterns across the two groups would provide an additional indication that to an important extent the patterns of contributions among salaried workers respond to the voluntary choices of workers rather than, or in addition to, the evasion decisions of firms.

C. Results for salaried versus self-employed workers

Table 8 summarizes the results of an extended model in which we add interactions of the variables presented in table 5 with self-employment, focusing on the three countries for which enough self-employed workers are contributing to social security. The results suggest that there are few differences between the patterns of contributions of salaried and self-employed workers even if, as shown in Table 5, self-employed contribute less on average than salaried workers. When different, the patterns for self-employment tend to magnify the differences across individuals found for salaried workers, which would go in the direction of confirming that the patterns for self-employed workers show the unrestricted preferences of workers who are similar in their preferences for social protection to salaried workers.

For example, in Chile and Colombia, gender patterns of participation (for single or married workers) do not vary across salaried and self-employed workers. In Costa Rica, women are less likely to contribute among self-employed than among salaried workers.

There are also some small differences in the age patterns of affiliation between salaried and self-employed workers that go in the direction of indicating a stronger relationship between age and probability of contribution for self-employed workers.

Similarly, there are very few differences in the education patterns of contribution across the two groups, with a steeper effect of graduating from college among the self-employed in Chile, and a slightly lower effect of graduating from secondary completed among self-employed workers in Colombia. There is also a slightly larger probability of contribution among workers with primary education among the self-employed in Costa Rica.

Similarly, only a few of the interactions between household characteristics and self-employment are statistically significant. The only pattern that emerges is that the effect of having other members of the household affiliated with social security has a smaller effect on the contribution rates of self-employed workers than among salaried ones. We do not have a good explanation for this effect.

Instead, and quite interestingly, systematic differences across the two groups arise in many of the job characteristics suggesting that supply factors are also an important determinant of contributions. Thus, in Costa Rica and Colombia, earning wages below the minimum wage reduces the probability of contributions for both types of workers but the effect is more prominent in the wage employment sector, suggesting that firms that pay wages below the minimum wage are also likely to evade social security contributions (or force workers to register as self-employed). Similarly, part-time workers have a lower probability of contributing to social security relative to full time workers in the wage employment than in the self-employment sector. This suggests that, at least for some workers, part-time salaried work might be the result of a deliberate strategy by firms to evade social security. Lastly, it is also worth noting that the distribution of contributions across sectors tends to be skewed towards manufacturing among the salaried and against manufacturing among the self-employed. This pattern can emerge from a stricter enforcement of social security laws in the manufacturing sector relative to other sectors of activity among salaried workers.[13]

[13] Notice that stricter enforcement in manufacturing explains both the higher coefficient in manufacturing wage employment and the lower coefficient in manufacturing self-employment. This is because higher enforcement in the manufacturing wage employment may push some manufacturing workers towards the

D. Discussion

Similar patterns of contributions of salaried and self-employed workers across individual and household characteristics suggest that demand factors are important in explaining contribution decisions. Therefore, low contribution rates are partly explained by the inability of enforcement authorities to undo the outcomes of voluntary choices. The results would suggest that in many countries, at least 20 to 30 percent of the explained variance can be attributed to demand factors. Yet, there is also evidence that some workers may be rationed out of social security. This is the case for workers employed in part-time jobs or earning wages below the statutory minimum. It could also be the case for workers employed in small firms.

The fact that workers may choose to be informal is at odds with traditional theories of labor market segmentation emphasizing rationing out of good jobs with benefits. In fact, recent evidence for Latin America strongly suggests that the dual labor market model may not be an accurate representation of reality. Maloney (1999) and Bosh and Maloney (2005) study mobility patterns across sectors using detailed panel data for Mexico, Argentina and Brazil and find only limited evidence in favor of the dualistic model. Navarro-Lozano and Schrimpf (2004) estimate counterfactual wages for formal workers in the informal sector in Mexico and also conclude that there is no evidence of segmentation in the labor market. Gong, van Soest and Villagomez (2004) and Gong and van Soest (2002) estimate dynamic multinomial Logit models to assess mobility patterns in Mexico and they conclude "many of our findings suggest that, for the less educated workers, the dualistic view of the labor markets is not a good description." Yet, these authors also conclude that the market for higher educated workers seems to behave more according to the dual hypothesis. The work presented in our study suggest that informal sector jobs may be desirable to lower educated workers because they allow them to evade contributions on programs they don't want. Instead, since protection is more valuable for higher educated workers, formal jobs might be more desirable for those workers.

Our results are also in line with a number of recent studies indicating that workers bear a part of the cost of social security contributions in the form of lower wages.

self-employment sector, which in turn reduces the contribution rate among manufacturing self-employed workers. This is so, because enforcement displaces workers with lower willingness to contribute.

Edwards and Cox-Edwards (2002) find that in Chile, after controlling for selection, wages of individuals contributing to social security are 8.5 percent lower than those of non-contributors. Since contributions to social security (health, life insurance and pensions) amount to about 20 percent, more than 40 percent of the contributions are passed on to workers. Gruber (1997), MacIsaac and Rama (1997), Marrufo (2001), Mondino and Montoya (2004), and Heckman and Pagés (2004) also find evidence of sizeable pass-through in Chile, Ecuador, Mexico, Argentina, and in a sample of Latin American countries, respectively. Workers not willing or able to accept a wage cut prefer not to contribute; weak enforcement allows them that option.

Finally, our findings are also consistent with recent studies conducted in the US emphasizing the role of workers preferences for health insurance coverage. Monheit and Vistnes (1999) use the 1987 National Medical Expenditure Survey and show that weak preferences for health insurance are an important element in salaried workers' decision to sort into jobs without insurance. Their analysis also shows that approximately 30 percent of such workers failed to obtain jobs consistent with their taste for coverage, suggesting the presence of 'imperfect sorting'. Monheit and Vistnes (2006), use the 2001 Medical Expenditure Panel Survey and find that single and married workers with weak or uncertain preferences for health coverage are less likely to obtain jobs with health insurance and to take up offered coverage than those with strong preferences.

VI. Conclusions

This paper explores the reasons behind the low contribution to mandatory old age pension programs in seven countries of Latin America. Our results indicate that the low rates of contribution are partly explained by demand factors (such as individual preferences). Weak enforcement has enabled many workers to opt out of social security programs they do not find beneficial, either because of low taste for insurance, lack of information on the benefits of planning for retirement, affordability issues, or because social security systems are not well targeted to these workers' needs. Across countries, the pattern is strikingly similar: the unskilled, the young, married women, workers living in large households with many active members, workers without other members of the household contributing to social security, workers with low wages and workers in rural areas find social security programs less attractive than the average worker. Yet, not all participation outcomes are the result of workers' choices. The evidence presented in this paper also suggests that some workers may be rationed out of social security. This seems to be the case for workers in part-time jobs and earnings below the minimum wage. It may also be the case for at least some workers employed in small firms.

Our findings raise some key implications for public policy. The first one is that toughening enforcement can increase the percentage of contributors to social security but reduce salaried employment for workers unwilling to contribute.[14] The second implication is that minimum wage policies may lead to sub-optimal participation, although evidence of this effect was also found for Nicaragua. A related implication is that part-time work may be a form of evasion; regulations pertaining to this form of work should be reviewed to minimize such incentives. Our results also suggest that policies that seek to de-link contributions from labor market participation will not necessarily solve the contribution deficit. Instead, if the problem lies in the low willingness or ability to participate of a large number of less-advantaged workers, policies intended to increase the coverage of social security programs should alter the current equation of benefits and contributions. This may imply subsidizing workers with low willingness or ability to contribute, improving information about the benefits of planning for old age, or better targeting the package of benefits to the needs and risks of people with low willingness to contribute.

[14] It may also reduce welfare, unless workers are time-inconsistent or rationally bounded in their inter-temporal consumption choices.

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Table 1
Social security contributions
(In percentages)

Country	**All workers**				**Salaried Workers**				**Salaried Workers Private Sector**				**Self-employed Workers**			
	Early 90's (1)	Middle 90's (2)	Late 90's and early 00's (3)	Average all period	Early 90's (1)	Middle 90's (2)	Late 90's and early 00's (3)	Average all period	Early 90's (1)	Middle 90's (2)	Late 90's and early 00's (3)	Average all period	Early 90's (1)	Middle 90's (2)	Late 90's and early 00's (3)	Average all period
Brazil	57.14	56.29	53.65	55.69	69.53	69.83	73.28	70.88	75.46	73.63	72.89	74.00	17.39	15.90	16.90	16.73
Chile (4)	64.33	66.73	65.12	65.39	76.75	79.33	77.36	77.81	77.21	79.71	77.41	78.11	23.48	22.43	19.50	21.80
Colombia		36.26	35.63	35.94		52.27	54.49	53.38		45.33	47.30	46.32		8.55	7.45	8.00
Costa Rica	71.03	68.22	65.68	68.31	78.21	75.22	73.85	75.76	72.17	69.31	67.97	69.82	46.00	43.29	37.13	42.14
El Salvador			38.92	38.92			53.91	53.91			46.39	46.39			3.36	3.36
Nicaragua (4)			20.45	20.45			31.70	31.70			25.09	25.09			1.09	1.09
Peru		21.02	16.18	18.60		37.62	28.70	33.16		27.15	19.25	23.20		2.78	1.47	2.13

Notes: National sample: Males and females 15 to 64 years old working more than 5 hours a week. (1) Early 90's: reports average of data available for each country in period 1990-1993. (2) Middle 90's: reports average of data available for each country in period 1994-1997. (3) Late 90's and early 00's: reports average of data available for each country in period 1998-2002. (4) Workers in the sector 9 (ISIC Rev.2) are considered employed in the public sector.
Source: Own calculations from Countries' Household Surveys. See Table A.2 for a description of the data.

Table 2
Mean of the variables for the sample of salaried and self-employed workers

Variable	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Contributing to social security	0.5737	0.6904	0.3674	0.6775	0.4016	0.2146	0.2420
Female	0.3091	0.3436	0.3993	0.3243	0.4200	0.3666	0.3763
Married	0.3218	0.6423	0.5802	0.5699	0.5258	0.6004	0.5852
Age							
15-24	0.2373	0.1568	0.1857	0.2468	0.2339	0.2609	0.2190
25-49	0.6346	0.6805	0.6800	0.6316	0.6206	0.6015	0.6457
50-64	0.1280	0.1627	0.1343	0.1216	0.1455	0.1377	0.1353
Education							
Less than primary complete	0.2753	0.1205	0.1436	0.1806	0.3489	0.4807	0.1139
Primary complete	0.1577	0.0735	0.1629	0.3353	0.1181	0.1419	0.1307
Secondary incomplete	0.2914	0.2962	0.2425	0.1769	0.2209	0.1805	0.1559
Secondary complete	0.1645	0.2686	0.2579	0.1219	0.1681	0.0872	0.2993
College incomplete	0.0352	0.1549	0.0770	0.1237	0.0736	0.0690	0.1743
College complete	0.0759	0.0863	0.1161	0.0715	0.0705	0.0407	0.1259
Household composition							
Head of the household	0.5300	0.5044	0.4668	0.4969	0.4616	0.4546	0.3939
Other members contributing to social security	0.5673	0.6666	0.3952	0.7054	0.4060	0.2500	0.2858
Share of household members with positive income	0.5073	0.4749	0.4869	0.4344	0.4308	0.3919	0.4524
Share of household members less than 15 out of the labor force	0.2445	0.1865	0.2513	0.2617	0.2830	0.3325	0.2740
Share of household members 15 to 64 out of the labor force	0.2141	0.1906	0.2305	0.2718	0.2473	0.2376	0.2252
Share of household members older than 64 out of the labor force	0.0228	0.0254	0.0292	0.0280	0.0303	0.0219	0.0323
Total number of members in the household	4.5246	4.5028	4.7876	4.7307	4.9822	6.1457	5.8075
Geographic area							
Urban	0.8109	0.8658	0.8655	0.5054	0.7032	0.6299	0.8043
Income Intervals in relation to Minimum Wage							
Wage < Minimum Wage	0.1448	0.1618	0.3930	0.3372	0.3634	0.1994	0.3686
Min. Wage < Wage < Min. Wage (1+t)	0.0539	0.0011	0.1210	0.1234	0.0883	0.0324	0.0349
Min. Wage (1+t) < Wage < Min. Wage $(1+t)^2$	0.0625	0.0015	0.0927	0.1185	0.0716	0.0443	0.0362
Min. Wage $(1+t)^2$ < Wage < Min. Wage $(1+t)^3$	0.0742	0.0032	0.0847	0.1013	0.0664	0.0431	0.0330
Min. Wage $(1+t)^3$ < Wage	0.6646	0.8324	0.3086	0.3196	0.4104	0.6809	0.5274
Firm							
Part time worker	0.0987	0.0853	0.1240	0.1224	0.1532	0.1563	0.2079
Small firm (<=5 workers)	0.1009	0.3441	na	0.4113	0.3283	0.5959	0.5432
Public sector	0.2165	na	0.1175	0.1726	0.1253	na	0.1689
Self- employed	0.2468	0.1641	0.3662	0.2041	0.2704	0.3386	0.3087
Sector							
Agriculture, Hunting, Forestry, Fishing, Mining and Quarrying	0.1849	0.1613	0.0536	0.1800	0.1179	0.2733	0.1319
Manufacturing	0.1952	0.1505	0.1711	0.1686	0.2193	0.1217	0.1469
Electricity, Gas and Water	0.0151	0.0088	0.0086	0.0132	0.0057	0.0088	0.0055
Construction	0.1033	0.0870	0.0629	0.0655	0.0701	0.0567	0.0573
Wholesale and Retail Trade and Restaurants and Hotels	0.1836	0.1745	0.2721	0.1858	0.2864	0.2286	0.2558
Transport, Storage and Communication	0.0629	0.0758	0.0759	0.0583	0.0553	0.0409	0.0887
Financing, Insurance, Real Estate and Business Services	0.0258	0.0687	0.0719	0.0532	0.0523	0.0074	0.0530
Community, Social and Personal Services	0.2293	0.2734	0.2840	0.2754	0.1930	0.2626	0.2609
Number of observations	493,888	207,965	139,501	73,613	80,112	11,223	12,793

Notes: Education categories are mutually exclusive. *na* denotes not-available. The data refers to salaried and self-employed workers working more than 5 hours a week. The coverage of the sample is national. *t* denotes social security contribution rate.
Source: Own calculations from Countries' Household Surveys.

Table 3
Mean of the variables for the sample of salaried workers

Variable	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Contributing to social security	0.7198	0.7832	0.5339	0.7491	0.5389	0.3190	0.3397
Female	0.5306	0.3552	0.4118	0.3351	0.3246	0.3409	0.3272
Married	0.2952	0.6276	0.5429	0.5367	0.5070	0.5449	0.5477
Age							
15-24	0.2839	0.1715	0.2291	0.2849	0.2887	0.3360	0.2574
25-49	0.6311	0.6876	0.6789	0.6204	0.6078	0.5748	0.6389
50-64	0.0850	0.1409	0.0919	0.0947	0.1035	0.0892	0.1037
Education							
Less than primary complete	0.2632	0.1058	0.0950	0.1612	0.2839	0.4127	0.0857
Primary complete	0.1520	0.0646	0.1342	0.3221	0.1054	0.1395	0.1001
Secondary incomplete	0.3297	0.2878	0.2292	0.1769	0.2305	0.2008	0.1454
Secondary complete	0.1995	0.2793	0.2972	0.1290	0.1981	0.1060	0.3112
College incomplete	0.0448	0.1671	0.0987	0.1382	0.0937	0.0853	0.1995
College complete	0.0962	0.0954	0.1456	0.0814	0.0884	0.0557	0.1581
Household composition							
Head of the household	0.4679	0.4869	0.4264	0.4626	0.4524	0.3857	0.3806
Other members contributing to social security	0.6592	0.6969	0.4609	0.7439	0.4421	0.2919	0.3241
Share of household members with positive income	0.5677	0.4738	0.4950	0.4396	0.4290	0.4151	0.4522
Share of household members less than 15 out of the labor force	0.2584	0.1779	0.2434	0.2601	0.2786	0.3277	0.2632
Share of household members 15 to 64 out of the labor force	0.2225	0.1784	0.2306	0.2691	0.2551	0.2256	0.2348
Share of household members older than 64 out of the labor force	0.0268	0.0237	0.0294	0.0279	0.0308	0.0229	0.0332
Total number of members in the household	4.2345	4.5161	4.7434	4.7776	5.0252	6.2216	5.9258
Geographic area							
Urban	0.9883	0.8773	0.8826	0.5189	0.7032	0.6657	0.8138
Income Intervals in relation to Minimum Wage							
Wage < Minimum Wage	0.0916	0.1622	0.3219	0.3115	0.3086	0.1709	0.3206
Min. Wage < Wage < Min. Wage (1+t)	0.0549	0.0011	0.1352	0.1333	0.0996	0.0321	0.0334
Min. Wage (1+t) < Wage < Min. Wage $(1+t)^2$	0.0556	0.0016	0.0961	0.1262	0.0795	0.0466	0.0429
Min. Wage $(1+t)^2$ < Wage < Min. Wage $(1+t)^3$	0.0783	0.0023	0.0967	0.1057	0.0690	0.0504	0.0313
Min. Wage $(1+t)^3$ < Wage	0.7195	0.8328	0.3501	0.3233	0.4433	0.6999	0.5717
Firm							
Part time worker	0.0834	0.0653	0.0849	0.0878	0.1048	0.1150	0.1509
Small firm (<=5 workers)	0.1106	0.2171	na	0.2586	0.2835	0.4002	0.3392
Public sector	0.2994	na	0.1854	0.2169	0.1720	na	0.2443
Sector							
Agriculture, Hunting, Forestry, Fishing, Mining and Quarrying	0.1265	0.1565	0.0542	0.1657	0.1540	0.2374	0.1449
Manufacturing	0.2357	0.1582	0.1977	0.1747	0.2260	0.1384	0.1574
Electricity, Gas and Water	0.0191	0.0103	0.0119	0.0165	0.0078	0.0133	0.0078
Construction	0.0737	0.0837	0.0515	0.0589	0.0860	0.0702	0.0684
Wholesale and Retail Trade and Restaurants and Hotels	0.1512	0.1481	0.2142	0.1739	0.1760	0.1426	0.1509
Transport, Storage and Communication	0.0610	0.0720	0.0728	0.0526	0.0617	0.0417	0.0745
Financing, Insurance, Real Estate and Business Services	0.0331	0.0750	0.0868	0.0560	0.0649	0.0099	0.0585
Community, Social and Personal Services	0.2998	0.2962	0.3109	0.3016	0.2236	0.3465	0.3377
Number of observations	365,410	172,034	87,267	57,890	57,207	7,081	8,806

Notes: Education categories are mutually exclusive. *na* denotes not-available. The data refers to salaried workers in the private and public sectors working more than 5 hours a week. The coverage of the sample is national. *t* denotes social security contribution rate.
Source: Own calculations from Countries' Household Surveys.

Table 4
Mean of the variables for the sample of self-employed workers

Variable	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Contributing to social security	0.1647	0.2177	0.0792	0.3980	0.0313	0.0106	0.0231
Female	0.2185	0.2845	0.3776	0.2821	0.6774	0.4167	0.4861
Married	0.3930	0.7170	0.6449	0.6996	0.5765	0.7087	0.6693
Age							
15-24	0.1214	0.0820	0.1106	0.0984	0.0862	0.1140	0.1331
25-49	0.6476	0.6443	0.6818	0.6752	0.6548	0.6536	0.6610
50-64	0.2310	0.2737	0.2076	0.2264	0.2590	0.2324	0.2059
Education							
Less than primary complete	0.4404	0.1957	0.2277	0.2566	0.5242	0.6135	0.1769
Primary complete	0.2058	0.1186	0.2125	0.3870	0.1522	0.1466	0.1993
Secondary incomplete	0.2310	0.3390	0.2656	0.1768	0.1949	0.1407	0.1795
Secondary complete	0.0846	0.2142	0.1898	0.0940	0.0872	0.0507	0.2727
College incomplete	0.0116	0.0925	0.0394	0.0669	0.0193	0.0370	0.1178
College complete	0.0266	0.0399	0.0650	0.0331	0.0222	0.0116	0.0539
Household composition							
Head of the household	0.6850	0.5934	0.5368	0.6305	0.4866	0.5890	0.4236
Other members contributing to social security	0.3485	0.5121	0.2814	0.5550	0.3086	0.1681	0.2001
Share of household members with positive income	0.4506	0.4807	0.4730	0.4142	0.4355	0.3466	0.4527
Share of household members less than 15 out of the labor force	0.2578	0.2301	0.2649	0.2681	0.2950	0.3418	0.2981
Share of household members 15 to 64 out of the labor force	0.2452	0.2526	0.2304	0.2826	0.2261	0.2613	0.2038
Share of household members older than 64 out of the labor force	0.0206	0.0341	0.0290	0.0287	0.0289	0.0198	0.0303
Total number of members in the household	4.6104	4.4353	4.8643	4.5481	4.8664	5.9974	5.5428
Geographic area							
Urban	0.6718	0.8071	0.8359	0.4530	0.7033	0.5602	0.7833
Income Intervals in relation to Minimum Wage							
Wage < Minimum Wage	0.2400	0.1597	0.5154	0.4408	0.5005	0.2621	0.4772
Min. Wage < Wage < Min. Wage (1+t)	0.0522	0.0006	0.0965	0.0838	0.0602	0.0329	0.0382
Min. Wage (1+t) < Wage < Min. Wage $(1+t)^2$	0.0634	0.0014	0.0869	0.0874	0.0516	0.0390	0.0209
Min. Wage $(1+t)^2$ < Wage < Min. Wage $(1+t)^3$	0.0769	0.0082	0.0640	0.0837	0.0598	0.0269	0.0368
Min. Wage $(1+t)^3$ < Wage	0.5676	0.8301	0.2372	0.3044	0.3279	0.6390	0.4269
Firm							
Part time worker	0.1447	0.1875	0.1917	0.2572	0.2839	0.2368	0.3357
Sector							
Agriculture, Hunting, Forestry, Fishing, Mining and Quarrying	0.3453	0.1858	0.0526	0.2358	0.0207	0.3434	0.1030
Manufacturing	0.0731	0.1108	0.1251	0.1447	0.2011	0.0892	0.1234
Electricity, Gas and Water	0.0002	0.0012	0.0027	0.0002	0.0000	0.0000	0.0006
Construction	0.1761	0.1039	0.0828	0.0912	0.0271	0.0303	0.0324
Wholesale and Retail Trade and Restaurants and Hotels	0.2927	0.3092	0.3723	0.2322	0.5842	0.3965	0.4906
Transport, Storage and Communication	0.0715	0.0954	0.0812	0.0803	0.0379	0.0392	0.1204
Financing, Insurance, Real Estate and Business Services	0.0079	0.0365	0.0461	0.0425	0.0183	0.0026	0.0407
Community, Social and Personal Services	0.0332	0.1571	0.2374	0.1731	0.1106	0.0988	0.0890
Number of observations	119,079	35,931	52,234	15,723	22,905	4,142	3,987

Notes: Education categories are mutually exclusive. The data refers to self-employed working more than 5 hours a week. The coverage of the sample is national. *t* denotes social security contribution rate.
Source: Own calculations from Countries' Household Surveys.

Table 5

Selection corrected probit estimates of the probability of contributing to social security. (Marginal effects)

Variable	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Female	0.0527	0.0076	0.0421	0.0890	0.0683	0.0262	-0.0348
	(0.0033)***	(0.0074)	(0.0068)***	(0.0067)***	(0.0097)***	(0.0207)	(0.0165)**
Married	0.0433	0.0462	0.0284	0.0778	0.0340	0.0040	0.0379
	(0.0027)***	(0.0063)***	(0.0057)***	(0.0071)***	(0.0078)***	(0.0141)	(0.0116)***
Married * Female	-0.0084	-0.0631	0.0005	-0.1833	-0.0371	0.0379	0.0001
	(0.0042)**	(0.0111)***	(0.0078)	(0.0128)***	(0.0116)***	(0.0224)*	(0.0174)
Age							
25-49	0.0706	0.0591	0.0810	0.0579	0.0381	0.0490	0.0847
	(0.0024)***	(0.0066)***	(0.0054)***	(0.0055)***	(0.0063)***	(0.0128)***	(0.0128)***
50-64	0.0526	0.0729	0.1074	0.0589	0.0561	0.1079	0.1351
	(0.0037)***	(0.0068)***	(0.0077)***	(0.0074)***	(0.0092)***	(0.0226)***	(0.0184)***
25-49 * Female	0.0005	0.0414	0.0016	0.0099	0.0177	-0.0190	0.0516
	(0.0040)	(0.0081)***	(0.0077)	(0.0089)	(0.0100)*	(0.0205)	(0.0205)**
50-64 * Female	0.0009	0.0606	-0.0151	-0.0139	0.0114	-0.0653	0.0042
	(0.0073)	(0.0106)***	(0.0120)	(0.0143)	(0.0193)	(0.0265)**	(0.0281)
Education							
Primary complete	0.0464	0.0251	0.0495	0.0533	0.0615	0.0149	0.0137
	(0.0023)***	(0.0052)***	(0.0058)***	(0.0042)***	(0.0062)***	(0.0120)	(0.0150)
Secondary incomplete	0.0488	0.0396	0.0680	0.0638	0.0780	0.0530	0.0275
	(0.0021)***	(0.0042)***	(0.0054)***	(0.0050)***	(0.0052)***	(0.0111)***	(0.0149)*
Secondary complete	0.0918	0.0944	0.1376	0.0960	0.1288	0.0727	0.0544
	(0.0025)***	(0.0051)***	(0.0057)***	(0.0060)***	(0.0065)***	(0.0145)***	(0.0138)***
College incomplete	0.0808	0.1093	0.1683	0.0845	0.1394	0.1276	0.0836
	(0.0042)***	(0.0061)***	(0.0074)***	(0.0070)***	(0.0092)***	(0.0184)***	(0.0156)***
College complete	0.1136	0.1347	0.1985	0.0664	0.1364	0.1228	0.1078
	(0.0035)***	(0.0080)***	(0.0075)***	(0.0099)***	(0.0117)***	(0.0219)***	(0.0173)***
Household composition							
Head of the household	0.0503	0.0563	0.0531	0.0718	0.0311	0.0176	0.0459
	(0.0028)***	(0.0054)***	(0.0057)***	(0.0071)***	(0.0068)***	(0.0130)	(0.0115)***
Head of the household * Female	-0.0148	-0.0521	0.0013	-0.0706	-0.0237	0.0276	-0.0040
	(0.0052)***	(0.0095)***	(0.0080)	(0.0113)***	(0.0115)**	(0.0213)	(0.0193)
Other members contributing to social security	0.0704	0.0909	0.1286	0.0472	0.0575	0.0618	0.0739
	(0.0012)***	(0.0023)***	(0.0023)***	(0.0024)***	(0.0036)***	(0.0062)***	(0.0048)***
Share of household members less than 15 out of the labor force	0.0824	0.1080	0.1198	0.0812	0.0389	0.0818	0.0775
	(0.0050)***	(0.0107)***	(0.0094)***	(0.0112)***	(0.0134)***	(0.0236)***	(0.0204)***
Share of household members 15 to 64 out of the labor force	0.1274	0.1932	0.1471	0.2295	0.0195	0.1022	0.1211
	(0.0078)***	(0.0163)***	(0.0128)***	(0.0168)***	(0.0259)	(0.0439)**	(0.0286)***
Share of household members older than 64 out of the labor force	0.1804	0.2327	0.2098	0.2716	0.0759	0.1231	0.1593
	(0.0099)***	(0.0181)***	(0.0168)***	(0.0203)***	(0.0267)***	(0.0525)**	(0.0343)***
Total number of members in the household	-0.0172	-0.0207	-0.0204	-0.0140	-0.0069	-0.0062	-0.0082
	(0.0005)***	(0.0010)***	(0.0009)***	(0.0011)***	(0.0011)***	(0.0015)***	(0.0016)***
Geographic area							
Urban	0.0239	0.0084	0.0626	-0.0172	0.0065	0.0061	0.0295
	(0.0027)***	(0.0034)**	(0.0056)***	(0.0036)***	(0.0043)	(0.0088)	(0.0089)***

Table 5 (Cont.)
Selection corrected probit estimates of the probability of contributing to social security. (Marginal effects)

Variable	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Income Intervals in relation to Minimum Wage							
Wage < Minimum Wage	-0.1246	-0.0810	-0.0556	-0.1092	-0.0783	-0.0433	-0.0365
	(0.0037)***	(0.0266)***	(0.0047)***	(0.0053)***	(0.0072)***	(0.0194)**	(0.0171)**
Min. Wage < Wage < Min. Wage (1+t)	-0.0441	0.0208	-0.0075	-0.0146	-0.0035	-0.0568	0.0016
	(0.0042)***	(0.0443)	(0.0053)	(0.0063)**	(0.0081)	(0.0272)**	(0.0224)
Min. Wage $(1+t)^2$ < Wage < Min. Wage $(1+t)^3$	0.0326	-0.0119	0.0237	0.0124	-0.0109	-0.0178	0.0058
	(0.0037)***	(0.0332)	(0.0059)***	(0.0071)*	(0.0095)	(0.0226)	(0.0229)
Min. Wage $(1+t)^3$ < Wage	0.1133	0.0462	0.0419	0.0152	0.0606	0.0501	0.0812
	(0.0030)***	(0.0266)*	(0.0050)***	(0.0061)**	(0.0076)***	(0.0168)***	(0.0162)***
Firm							
Part time worker	-0.1916	-0.1934	-0.1577	-0.1896	-0.1530	-0.0613	-0.0790
	(0.0029)***	(0.0054)***	(0.0055)***	(0.0050)***	(0.0073)***	(0.0110)***	(0.0086)***
Small firm (<=5 workers)	-0.2438	-0.1967		-0.2134	-0.2601	-0.1849	-0.1455
	(0.0023)***	(0.0041)***		(0.0038)***	(0.0049)***	(0.0089)***	(0.0076)***
Self-employed	-0.3177	-0.2764	-0.3053	-0.0667	-0.1847	-0.1519	-0.1346
	(0.0028)***	(0.0045)***	(0.0032)***	(0.0045)***	(0.0146)***	(0.0165)***	(0.0118)***
Public sector	0.0524		0.1741	0.2175	0.1325		0.0982
	(0.0034)***		(0.0059)***	(0.0081)***	(0.0080)***		(0.0099)***
Sector							
Agriculture, Hunting, Forestry, Fishing, Mining and Quarrying	-0.1816	-0.0739	-0.0669	-0.0195	-0.2808	-0.1155	-0.0597
	(0.0054)***	(0.0053)***	(0.0071)***	(0.0055)***	(0.0073)***	(0.0097)***	(0.0110)***
Electricity, Gas and Water	0.0700	-0.0102	0.0059	-0.0329	0.0078	0.1168	-0.0107
	(0.0064)***	(0.0172)	(0.0153)	(0.0285)	(0.0175)	(0.0335)***	(0.0325)
Construction	-0.1456	-0.0615	-0.1234	-0.1940	-0.1215	-0.0948	-0.0884
	(0.0029)***	(0.0064)***	(0.0058)***	(0.0079)***	(0.0070)***	(0.0143)***	(0.0114)***
Wholesale and Retail Trade and Restaurants and Hotels	-0.0242	-0.0058	-0.0514	-0.0286	-0.0560	-0.0364	-0.0227
	(0.0022)***	(0.0053)	(0.0037)***	(0.0054)***	(0.0056)***	(0.0115)***	(0.0096)**
Transport, Storage and Communication	-0.0059	-0.0587	-0.0544	-0.0608	-0.1482	-0.0486	-0.0593
	(0.0031)*	(0.0068)***	(0.0052)***	(0.0086)***	(0.0082)***	(0.0178)***	(0.0110)***
Financing, Insurance, Real Estate and Business Services	-0.0090	0.0202	0.0431	-0.0473	0.0227	0.0863	-0.0121
	(0.0052)*	(0.0082)**	(0.0058)***	(0.0099)***	(0.0100)**	(0.0363)**	(0.0127)
Community, Social and Personal Services	-0.0174	-0.0108	-0.0384	-0.0831	-0.0843	0.0037	-0.0127
	(0.0030)***	(0.0055)**	(0.0041)***	(0.0062)***	(0.0083)***	(0.0107)	(0.0100)
Number of observations	755,065	414,638	288,717	125,952	142,521	26,847	25,931
Number of censored observations	457,022	221,613	152,952	60,620	96,348	16,284	13,275
Log likelihood	-174,000,000	-20,638,653	-41,858,677	-5,903,971	-6,131,799	-2,650,744	-18,182,753
Pseudo R2	0.4494	0.2213	0.2119	0.2927	0.5294	0.2091	0.1857

Notes: The sample is national and covers salaried and self-employed workers working more than 5 hours a week. Robust standard errors in parentheses. The specification includes year dummies in all countries. *Min. Wage* and t denote minimum wage and social security contributions, respectively The omitted categories are the workers 15 to 24 years old, less than primary complete, manufacturing, the share of household members with positive income and the group where the Min. Wage (1+t) < Wage < Min. Wage $(1+t)^2$. *significant at 10%, **significant at 5%, ***significant at 1%.

Table 6
Fraction of explained variance accounted by demand factors.

	Selection corrected Probit Model		Selection corrected Linear Probability Model	
	Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**
Brazil	0.10	0.31	0.21	0.69
Chile	0.17	0.50	0.17	0.36
Colombia	0.45	0.62	0.26	0.59
Costa Rica	0.54	0.69	0.22	0.47
El Salvador	0.16	0.36	0.14	0.55
Nicaragua	0.30	0.57	0.18	0.55
Peru	0.32	0.61	0.22	0.62
Average	0.29	0.52	0.20	0.55

Notes: The data refers to salaried and self-employed workers working more than 5 hours a week. The coverage of the sample is national. See text for a definiton of upper and lower bounds.

Table 7
Probability of contributing to social security. Country effects.

Country dummies	**Selection corrected Probit - Marginal effects**					**Selection corrected Linear probability model**			
	No country weights			**All countries equal weight**		**No country weights**		**All countries equal weight**	
	Only with country dummies and no other variables	No country dummies	With country dummies	No country dummies	With country dummies	No country dummies	With country dummies	No country dummies	With country dummies
Brazil	-0.109		-0.089		-0.090		-0.066		-0.090
	(0.004)***		(0.022)***		(0.023)***		(0.0063)***		(0.0186)***
Colombia	-0.299		-0.261		-0.267		-0.194		-0.244
	(0.005)***		(0.014)***		(0.026)***		(0.0162)***		(0.0292)***
Costa Rica	-0.011		0.079		0.049		0.031		-0.010
	(0.006)*		(0.008)***		(0.034)		(0.0104)***		(0.0286)
El Salvador	-0.257		-0.249		-0.255		-0.198		-0.233
	(0.006)***		(0.008)***		(0.025)***		(0.0125)***		(0.0263)***
Nicaragua	-0.397		-0.397		-0.399		-0.345		-0.369
	(0.011)***		(0.006)***		(0.031)***		(0.0117)***		(0.0320)***
Peru	-0.424		-0.438		-0.441		-0.340		-0.395
	(0.011)***		(0.013)***		(0.033)***		(0.0171)***		(0.0333)***
Number of observations	478,165	451,094	451,094	451,094	451,094	451,094	451,094	451,094	451,094
Number of censored observations	239,905	239,905	239,905	239,905	239,905	239,905	239,905	239,905	239,905
Log likelihood	-9.4E+07	-8.0E+07	-7.4E+07	-5.5E+07	-4.9E+07	-9.4E+04	-8.9E+04	-1.0E+05	-8.9E+04
Pseudo R2	0.024	0.175	0.232	0.431	0.497	0.431	0.456	0.379	0.447
Count R2 (Correctly Classified)	0.595	0.696	0.712	0.690	0.714				

Notes: Pooled sample of salaried and self-employed workers for 7 countries. The estimation corresponds to the year 2000, in those cases where there was no data available for that year, we consider the closest year available. The ommited country is Chile. In addition to reported variables, all specifications include the explanatory variables shown in Table 5. Robust standard errors in parentheses. *significant at 10%, **significant at 5%, ***significant at 1%.

Table 8
Selection-corrected Probit estimates of the probability of contributing to social security. Interactions with self-employment dummy.

Variable	Chile		Colombia		Costa Rica	
	Var	Var*Self	Var	Var*Self	Var	Var*Self
Self Employed	-0.302		-0.3356		-0.216	
	(0.0636)***		(0.0275)***		(0.0249)***	
Female	0.0095	-0.0419	0.0411	-0.0264	0.0793	-0.0653
	(0.0077)	(0.0357)	(0.0071)***	(0.0241)	(0.0070)***	(0.0301)**
Married	0.0468	-0.0113	0.0271	0.0099	0.0733	0.0359
	(0.0070)***	(0.0135)	(0.0065)***	(0.0127)	(0.0080)***	(0.0149)**
Married * Female	-0.0599	-0.0083	0.0036	-0.0135	-0.1598	-0.1468
	(0.0123)***	(0.0216)	(0.0088)	(0.0176)	(0.0138)***	(0.0268)***
Age						
25-49	0.0607	-0.0294	0.0841	-0.0308	0.0596	0.0053
	(0.0071)***	(0.0176)*	(0.0058)***	(0.0167)*	(0.0059)***	(0.0150)
50-64	0.0645	0.0067	0.0964	0.0056	0.0352	0.046
	(0.0076)***	(0.0202)	(0.0091)***	(0.0193)	(0.0093)***	(0.0186)**
25-49 * Female	0.0363	0.0594	-0.0033	0.0476	0.0213	0.0323
	(0.0084)***	(0.0379)	(0.0081)	(0.0252)*	(0.0098)**	(0.0346)
50-64 * Female	0.0495	0.0857	-0.0126	0.0238	0.03	-0.0176
	(0.0115)***	(0.0415)**	(0.0141)	(0.0303)	(0.0171)*	(0.0408)
Education						
Primary complete	0.0282	-0.0162	0.0449	0.0168	0.0505	0.0175
	(0.0058)***	(0.0128)	(0.0065)***	(0.0120)	(0.0048)***	(0.0093)*
Secondary incomplete	0.0403	-0.0104	0.0682	-0.0019	0.0635	-0.0029
	(0.0046)***	(0.0106)	(0.0061)***	(0.0115)	(0.0059)***	(0.0121)
Secondary complete	0.0918	-0.0012	0.144	-0.0311	0.0987	-0.0071
	(0.0057)***	(0.0120)	(0.0066)***	(0.0120)***	(0.0071)***	(0.0152)
College incomplete	0.1084	-0.0096	0.175	-0.0217	0.0882	-0.0142
	(0.0070)***	(0.0150)	(0.0086)***	(0.0167)	(0.0082)***	(0.0177)
College complete	0.1259	0.0414	0.1994	0.0252	0.0707	-0.0118
	(0.0091)***	(0.0210)**	(0.0088)***	(0.0156)	(0.0117)***	(0.0255)
Household composition						
Head of the household	0.059	-0.0168	0.0549	-0.0067	0.0744	-0.023
	(0.0059)***	(0.0141)	(0.0065)***	(0.0132)	(0.0082)***	(0.0162)
Head of the household * Female	-0.0503	-0.0166	0.0031	-0.0067	-0.0641	0.006
	(0.0103)***	(0.0241)	(0.0091)	(0.0186)	(0.0131)***	(0.0273)
Other members contributing to social security	0.0893	0.0054	0.132	-0.0183	0.0538	-0.0313
	(0.0025)***	(0.0060)	(0.0026)***	(0.0054)***	(0.0027)***	(0.0060)***
Share of household members less than 15 out of the labor force	0.1108	0.0128	0.1262	-0.0371	0.0721	0.0187
	(0.0121)***	(0.0264)	(0.0105)***	(0.0220)*	(0.0131)***	(0.0260)
Share of household members 15 to 64 out of the labor force	0.1963	0.0223	0.1466	-0.0254	0.1798	0.0499
	(0.0189)***	(0.0242)	(0.0140)***	(0.0201)	(0.0177)***	(0.0242)**
Share of household members older than 64 out of the labor force	0.1889	0.1405	0.1951	0.0386	0.2634	-0.0275
	(0.0197)***	(0.0392)***	(0.0188)***	(0.0367)	(0.0239)***	(0.0447)
Total number of members in the household	-0.0198	-0.0048	-0.0191	-0.0053	-0.0138	0.0003
	(0.0010)***	(0.0028)*	(0.0009)***	(0.0022)**	(0.0012)***	(0.0025)
Geographic area						
Urban	0.0057	0.0201	0.0663	-0.0231	-0.0123	-0.02
	(0.0037)	(0.0098)**	(0.0062)***	(0.0122)*	(0.0043)***	(0.0084)**

Table 8 (Cont.)
Selection-corrected Probit estimates of the probability of contributing to social security. Interactions with self-employment dummy.

Variable	Chile Var	Chile Var*Self	Colombia Var	Colombia Var*Self	Costa Rica Var	Costa Rica Var*Self
Income Intervals in relation to Minimum Wage						
Wage < Minimum Wage	-0.0794	0.0363	-0.0641	0.038	-0.13	0.0977
	(0.0288)***	(0.0596)	(0.0053)***	(0.0113)***	(0.0060)***	(0.0129)***
Min. Wage < Wage < Min. Wage (1+t)	0.0234	0.019	-0.0084	-0.0061	-0.0218	0.0258
	(0.0474)	(0.1172)	(0.0059)	(0.0140)	(0.0071)***	(0.0163)
Min. Wage $(1+t)^2$ < Wage < Min. Wage $(1+t)^3$	0.0067	-0.0613	0.0203	0.0113	0.0091	0.0292
	(0.0375)	(0.0733)	(0.0065)***	(0.0147)	(0.0083)	(0.0170)*
Min. Wage $(1+t)^3$ < Wage	0.0546	-0.0197	0.0436	-0.0002	0.0177	0.0142
	(0.0287)*	(0.0591)	(0.0058)***	(0.0120)	(0.0074)**	(0.0141)
Firm						
Part time worker	-0.2341	0.1597	-0.195	0.1246	-0.2362	0.1674
	(0.0060)***	(0.0109)***	(0.0060)***	(0.0106)***	(0.0063)***	(0.0105)***
Small firm (<=5 workers)	-0.1923				-0.1998	
	(0.0041)***				(0.0039)***	
Public sector			0.1853		0.2027	
			(0.0063)***		(0.0084)***	
Sector						
Agriculture, Hunting, Forestry, Fishing, Mining and Quarrying	-0.0791	0.0492	-0.0761	0.1074	-0.0501	0.1082
	(0.0058)***	(0.0145)***	(0.0077)***	(0.0194)***	(0.0064)***	(0.0130)***
Electricity, Gas and Water	-0.0142		-0.0095		-0.0404	
	(0.0174)		(0.0157)		(0.0289)	
Construction	-0.0806	0.1052	-0.142	0.1545	-0.2287	0.1357
	(0.0071)***	(0.0150)***	(0.0062)***	(0.0161)***	(0.0092)***	(0.0160)***
Wholesale and Retail Trade and Restaurants and Hotels	-0.0016	0.0229	-0.0583	0.0855	-0.0322	0.0255
	(0.0061)	(0.0124)*	(0.0042)***	(0.0108)***	(0.0066)***	(0.0128)**
Transport, Storage and Communication	-0.0735	0.0961	-0.0811	0.17	-0.1085	0.1466
	(0.0077)***	(0.0150)***	(0.0057)***	(0.0134)***	(0.0106)***	(0.0172)***
Financing, Insurance, Real Estate and Business Services	0.0103	0.0813	0.0416	0.0337	-0.0602	0.0626
	(0.0089)	(0.0229)***	(0.0066)***	(0.0163)**	(0.0117)***	(0.0230)***
Community, Social and Personal Services	-0.0084	0.0291	-0.0622	0.1387	-0.1036	0.069
	(0.0062)	(0.0138)**	(0.0046)***	(0.0112)***	(0.0075)***	(0.0139)***
Number of observations	414,638		288,717		125,952	
Number of censored observations	221,613		152,952		60,620	
Log likelihood	-2.06E+07		-4.17E+07		-5.86E+06	
Pseudo R2	0.223		0.217		0.298	

Notes: Marginal effects. For each country the specification includes the variables presented in Table 5, plus a set of interactions of these variables with a dummy *self-employed*. The national sample covers salaried and self-employed workers working more than 5 hours a week. Robust standard errors in parentheses. *Min. Wage* and *t* denote minimum wage and social security contributions, respectively. The omitted categories are workers 15 to 24 years old, less than primary complete, manufacturing, the share of household members actively participating in the labor market and the group where the Min. Wage (1+t) < Wage < Min. Wage $(1+t)^2$. *significant at 10%, **significant at 5%, ***significant at 1%.

Appendix A
Table A.1
Social security systems in Latin America

Country	Brazil	Chile	Colombia	Costa Rica	El Salvador	Nicaragua	Peru
Social Security System (Pensions)	Pay-as-you-go	Individual Capitalizacion Accounts	Parallel	Dual	Individual Capitalizacion Accounts	Pay-as-you-go	Parallel
Year of Social Security Reform	-	1980	1993	1999	1996	-	1992
Actual implementation	-	May 1981	April 1994	February 2000	April 1998	-	January 1993
Is the new system Voluntary ?	-	Yes, for self-employed	Yes	No	Yes, for workers between 36 and 55/50 years old	-	Yes
Is the new system Mandatory?	-	Yes, for new entrants after 1982	No	Yes	Yes, for new entrants after 1998	-	No
Retirement age: men	65 and 35 years of contributions for urban, 60/30 rural	65 and 20 years of contributions	60 (rise to 62 in 2009) 1000 weeks of contrib.	61 and 11 months with 466 monthly contrib. (reduced to 240 if age 65)	60 with 25 years of contrib. or just 30 years contrib.	60 and 750 weeks of contributions	65 (and 20 years of contributions in pay-as-you-go)
Retirement age: women	60 and 30 years of contributions for urban, 55/25 rural	60 and 20 years of contributions	55 (rise to 58 in 2009) 1000 weeks of contrib	59 and 11 months with 466 monthly contrib. (reduced to 240 if age 65)	55 with 25 years of contrib. or just 30 years contrib.	60 and 750 weeks of contributions	65 (and 20 years of contributions in pay-as-you-go)
Early Retirement for ICA (1)		Allowed if pension equals at least 50% of average wage over last 10 years and is at least equal to 110% of minimum old-age pension	Allowed if ICA is sufficient to purchase an annuity equal to 110% of minimum wage.	-	Alowed if pension equals at least 60% of basic earnings or 160% of current minimum pension		Allowed if the ICA is at least 50% of average indexed earnings in last 10 years
Pension Contribution Rate (1999)	28.125	13	13.5	7.25	10.5	5.25	11
Total Social Security Contribution Rate (1999) (2)	29.125	21	29.8	27	21	15	21
Self-employed contribution to Social Security	Mandatory	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary
Are pension and other benefits bundled?	Yes	No	No	No	No	No	No
Replacement Rate (1)	70%, plus 6% after 30 years of contributions	ICA	65% plus 2% for each 50 weeks of contrib. between 1,000-1,200 weeks, max. of 73%. Plus 3% for each 50 weeks 1,200-1,400, max. of 85%.	60% plus 0.0835% for each month of contribution above 240.	ICA or 30% of base salary plus 1.5% for each additional year.	40% plus 1.365% for each 50 weeks of contrib. Or 45% + 1.591% if less than twice minimum wage	ICA or 50% plus 4% for each additional year of contributions beyond 20
Base salary	Avg. last 36 months	-	Avg. last 10 years	Average of the highest 48 monthly wage during last 5 years of coverage.	Avg last 120 months of earnings	Avg earnings during last 5, 4, or 3 years (based on contrib. of 15, 20, or 25 years)	Avg earnings in the last 5 years

Notes: (1) ICA stands for Individual Capitalization Account. MOPRE stands for "Modulo Previsional" in Spanish and it is an average pension retribution assigned by the government. PBU Spanish acronym for Basic Universal Pension (pay-as-you-go guaranteed basic pension). PAP Spanish acronym for Additional Public Pension for workers remaining in the public system. (2) Social Security Contributions include pension for old-age, disability and death, work injury, sickness and maternity, family allowances, and unemployment insurance.
Source: Country Laws and Social Security Administration (1999).

Appendix A
Table A.2. Household survey description.

Country	Years included	Month of the survey	Name of the survey	Coverage	Average Number of Observations
Brazil	1992, 1993, 1995, 1996 -1999	September	Pesquisa Nacional por Amostra de Domicilios	National	336,073
Chile	1994, 1996, 1998, 2000	November	Encuesta de Caracterización Socioeconómica Nacional	National	161,529
Colombia	1996, 1997, 1998, 1999	September	Encuesta Nacional de Hogares	National	142,852
Costa Rica	1993, 1995, 1997, 1998, 2000, 2001	July	Encuesta de Hogares de Propósitos Múltiples	National	40,981
El Salvador	1997-2002	January to December	Encuesta de Hogares de Propósitos Múltiples	National	61,032
Nicaragua	1998, 2001	April to August 98; April to September 99	Encuesta Nacional de Hogares de Medición de Calidad de Vida	National	57,920
Peru	1994, 1997, 2000	May to August 94; September to November 97; May to June 00	Encuesta Nacional de Hogares sobre Mediciones de Niveles de Vida	National	19,398

Appendix A
Table A.3
Correlation coefficients between estimated marginal effects across countries

Country	**Brazil**	**Chile**	**Colombia**	**Costa Rica**	**El Salvador**	**Mexico**	**Nicaragua**	**Peru**
Brazil	1.0000							
Chile	0.9155* 0.0000	1.0000						
Colombia	0.9078* 0.0000	0.9329* 0.0000	1.0000					
Costa Rica	0.7458* 0.0000	0.8386* 0.0000	0.7686* 0.0000	1.0000				
El Salvador	0.8606* 0.0000	0.8021* 0.0000	0.8396* 0.0000	0.7073* 0.0000	1.0000			
Nicaragua	0.8765* 0.0000	0.7948* 0.0000	0.8719* 0.0000	0.6559* 0.0000	0.8407* 0.0000	0.7450* 0.0000	1.0000	
Peru	0.8772* 0.0000	0.9164* 0.0000	0.9106* 0.0000	0.8064* 0.0000	0.8166* 0.0000	0.7164* 0.0000	0.8411* 0.0000	1.0000

Notes: Sample of salaried and self-employed workers working more than 5 hours a week; The coefficients are computed correlating the vectors of estimated marginal effects presented in Table 5. Second line is the p-value. * Significant at 1%

Appendix B
Table B.1
Construction of the social security variable from the household surveys' questionnaires

Country	Survey question	Coverage	Social security variable
Brazil	Do you contribute in this job to the *Instituto de Previdencia* ? Answer: Yes/No.	All workers	Takes value of 1 if the answer is Yes
Chile	Are you contributing to a pension system? Answer: 1) SSS; 2) CANAEMPU; 3) EMPART; 4) INP; 5) AFP; 6) CAPEDRENA or DIPRECA; 7) Other; 8) Not contributing.	All workers	Takes value of 1 if the answer is SSS, CANAEMPU, EMPART, INP, AFP, CAPEDRENA or DIPRECA or other
Colombia	In your job, are you contributing (1) to any social pension institute? Answer: Yes/No.	All workers	Takes value of 1 if the answer is Yes
Costa Rica	What type of Social Insurance do you have? **Directly Insured:** 1) Salaried; 2) By agreement (associations, union, cooperatives, etc.); 3) Own account (voluntary); 4) By the State or family subsidy; 5) Relative of direct insured. **Pensioner:** 6) 7) 8) 9); 10) Not insured.	All individuals from the survey	Takes value of 1 if the answer is salaried, by agreement or own account
El Salvador	Are you contributing (1) by any public or private social security system ? Answer: 1)Yes, affiliated; 2) Yes, beneficiary; 3) No.	All workers except the domestic employees.	Takes value of 1 if the answer is Yes, affiliated
Nicaragua	Do you contribute through this job to the Social Insurance (INSS)? Answer: Yes/No.	All workers	Takes value of 1 if the answer is Yes
Peru	Are you contributing (1) to any pension system? Answer: 1)ONP; 2) AFP; 3) Police; 4) Other; 5) No.	All workers	Takes value of 1 if the answer is ONP,AFP, Police or other

Note: (1) In some of the surveys the original word in Spanish was *"afiliado"* , however we assume that the person considers herself *"afiliado"* when she is contributing to the system.