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Labor informality and the incentive effects of social security Evidence from a health reform in Uruguay

This version: December 2010
Preliminary draft – comments welcome

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Abstract: This document studies the incentive effects of social security benefits on labor market informality exploiting a policy reform in Uruguay. This reform extended health benefits to private sector salaried workers' dependants, mainly children and spouses, and thus changed the incentive structure of holding formal jobs within the household. The characteristics of the policy change provide an identification strategy which relies on the comparison between workers affected with those unaffected by the reform. The estimations employ repeated cross sections of household survey data to construct difference in differences estimates. Preliminary findings indicate that after the health reform the informality rates among workers in the treatment group fell significantly by about 1.5 percentage points (a 5.5 percent change) with respect to those in the control group. This sizeable effects provide evidence of relevant and substantial incentive effects of social security benefits on the type of employment.

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This paper was financed as a part of the Regional Dialogue on Social Security organized by the Labor Markets Unit of the Inter-American Development Bank (IDB). It also received partial funding from CEDLAS' IDRC-sponsored project *Labour markets for inclusive growth in Latin America* (www.Labor-AL.org). The authors wish to thank María Laura Alzúa, David Kaplan and Carmen Pagés for comments on preliminary versions of this project – the usual disclaimer applies. The views expressed here are those of the authors and do not necessarily reflect those of their institutions or those of the funding agencies.

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1 Introduction

Uruguay has one of the oldest and most developed contributive social security systems in Latin America, with the highest coverage among the cluster of countries in the region with relatively low levels of labor informality (Gasparini and Tornarolli, 2009). The system is based on employer and employee's contributions from formal jobs, and provides the covered workforce a series of benefits, including health coverage, pensions and others. Its high coverage rate and a number of recent reforms make the Uruguayan system an interesting case to study the incentive effects of social security benefits and their impact on behavior and labor market outcomes.

There is a longstanding literature on social security and its incidence, its welfare impact and its labor market effects in developed countries (see Summers, 1989, Gruber and Poterba, 1996, and Moffitt, 2002, among many others). A growing body of work discusses this type of effects in developing countries, where the presence of substantial uncovered segments and the co-existence of partial contributory systems with universal and means-tested benefits generates a complex incentive structure. These discussions usually concentrate on the source of the incentive effects (Fields, 2005, 2009; Galiani and Weinschelbaum, 2007) and on their policy implications (Perry et al., 2007; Levy, 2008). The causes of informality and worker non-registration, the degree of employee choice and bargaining power in this decision, and how binding are social security system incentives are salient issues in the recent literature on formality in developing countries.

This document belongs to a strand of research which aims to assess their presence and their quantitative magnitude (for instance, the effects of México's *Seguro Popular* reform have been studied by Juárez, 2009, and Bosch and Campos-Vázquez, 2010). The main contribution of this research is to provide evidence on the incentives of non-pecuniary benefits for formal employment. Changes in benefit packages linked to formal jobs provide a plausible identification strategy to account for the effects of these incentives. Studies of this type will provide evidence on the structure of labor markets in developing countries, and should inform future social security reforms, especially in terms of the interaction between contributory and non-contributory benefits and labor market decisions.

The analysis presented here focuses on the recent extension of health coverage to private sector salaried workers' dependants (mainly spouses and children), which

provides a policy experiment setting to study the presence and quantitative relevance of social security incentives in the labor market. More specifically, this study's outcome of interest is the decision to operate formally or informally – that is, to work in a covered or uncovered job. The decision to contribute to social security depends (at least in part) on the employer and the worker's response to policy incentives, and thus the reform might have affected the incentives of both primary and secondary workers to operate formally.

The context of labor market institutions in Uruguay substantiates this document's approach. Labor legislation compels employers in the private sector¹ to register their employees with the Institute of Social Security (*Banco de Previsión Social*, BPS). The social security system relies on a joint contribution mechanism, where both employers and employees pay contributions to the BPS, which are typically deducted from wages. In return, the employee receives a mandated social benefits package which includes health insurance, unemployment insurance and pension rights, among others. However, a substantial proportion of private sector workers are not covered by the social security system because they are not registered in the BPS by their employers. For instance, in 2007 approximately 21 percent of eligible salaried workers did not have access to this benefits package. Since 2005, the Uruguayan government has implemented several policies to extend the coverage of the social security system, including an extension of health care benefits to workers' dependants. The government created the National Health Insurance (NHS) system to manage this reform.

However, fiscal restrictions implied that this extension was applied in stages. The first stage began in January 2008, when the NHS incorporated the children of dependant. The second stage, which will include spouses, will be implemented in 2010. The only requirement to be incorporated into the system is that eligible children must be younger than 18 years old. Upon fulfilling this requirement, coverage for qualifying children is universal and irrespective of previous health coverage arrangements. According to estimations from the Ministry of Public Health, roughly 137.000 previously uncovered children enrolled in the NHS during the first semester of 2008, which implied an increase of 21 percentage points in coverage for children in

¹ In addition, public employees are also covered by the social security system, but unlike their private sector counterparts, the bundle of benefits that they receive is broader and more heterogeneous.

the relevant age group. Workers and their dependants lose their NHS mandated benefits if the worker becomes “unregistered” (informal).

The extension of healthcare benefits to dependants increases the incentive to become a formal worker and contribute to the BPS, and may also generate changes in intrahousehold labor arrangements regarding secondary workers. Moreover, depending on the incidence of contributions, this reform might have additional impact on other labor market outcomes – including wage levels and participation decisions. The analysis presented in this paper deals mainly with the effect of this health insurance reform (HR) on labor informality. In particular, this study seeks to establish the impacts of shifts in the benefits package linked to formal jobs (due to the reform) on the incentives of salaried workers in the private sector to contribute to the social security system. The identification strategy exploits the exogeneity of the extension of healthcare coverage for workers’ dependants due to the HR.

This policy experiment setup exploits household survey data from repeated cross sections of Uruguay’s *Encuesta Continua de Hogares* (ECH) from 2001 to 2009. The estimation relies on a difference in differences approach to identify and estimate the reform’s causal effect. The treatment group consists of private sector salaried workers with at least one child younger than 18, while adult workers without children in the same sector constitute the control group. The years 2001-2007 are used as the pre-reform period, and 2009 as the reform period – 2008 is considered as a period of behavioral adjustment. In order to account for the potential heterogeneity of the reform’s effects, the estimations are computed by worker characteristics such as gender, age, and educational level.

The preliminary results indicate that the health reform induced workers in the treatment group to increase their formality levels by about 1.4 percentage points. In terms of the pre-period average, this effect represents a 5.5 percent decrease in the probability that a private sector salaried worker holds a job with no associated contributions to the social security system. These results are compatible with theoretical predictions, since extending benefits should increase worker incentives to contribute to the Social Security System. Moreover, informality levels drop significantly for females, for workers aged 26 to 50 years, and for those who have medium levels of education. These findings are supported by a series of robustness checks.

The rest of the document is organized as follows. The next section describes the Uruguayan Social Security System and the subsequent health care Reform of 2008. Section 3 presents the theoretical framework and the proposed empirical strategy to obtain the preliminary estimates in Section 4.

2 Uruguay's Social Security System and the 2008 Health reform

2.1 The Social Security System in Uruguay

Uruguay has one of the oldest and most developed contributory social security systems in Latin America². The system is divided into six governing institutions (known as *cajas*), which oversee a particular aspect of the system. In particular, the one which is responsible for social security benefits for the workforce is the *Banco de Previsión Social* (BPS), which administers services for registered salaried workers employed in the private sector³.

The law in Uruguay compels employers in the private sector to register their employees with BPS. Both employers and employees are required to pay contributions to the BPS amounting to about 32 percent of gross salaries⁴. In return, the employee receives a package of mandated social benefits which includes health insurance, unemployment insurance, retirement savings and pensions, and family allowances, among others. Although the total amount of contributions is the sum of different components (mainly health insurance contributions and retirement savings), the social benefits package is indivisible and is usually likened to an overall payroll tax with some benefits (Summer, 1989). Thus, affiliation to BPS grants the worker access to all benefits in the bundle.

In this context, formal workers are defined as individuals working in firms who are registered in the BPS, or self-employed workers who receive the mandated social benefits package. Conversely, informal workers are salaried workers in firms that

² For details about the Uruguayan social security system, see Bucheli (2004) and Ferreira-Coimbra and Forteza (2004).

³ The other institutions give coverage to other groups of workers. In particular, two social security institutions cover to the police and armed forces, respectively. The other three institutions administer services for professionals and for workers in the financial sector. Each of these institutions provide different bundles of benefits, usually broader than those provided to BPS beneficiaries.

⁴ In fact, the contribution of salaried employees is calculated using actual nominal salaries, while a notional amount is imputed in the cases of entrepreneurs and self-employed workers.

have not been registered in the BPS by their employers, and thus are not covered by the contributive system.

2.2 The Uruguayan Health System

Historically, the health care system in Uruguay has been characterized by a complex and fragmented structure. The main public provider of health is the Ministry of Public Health (*Ministerio de Salud Pública*, MSP), which provides health care in the form of free medical services and medicines to the low income population⁵. The main private health provider is a conglomerate known as the Collective Health Care Institutions (*Instituciones de Asistencia Médica Colectiva* - IAMC), which includes a network of private hospitals as well as clinics ruled under the “mutual” principle⁶. Individuals affiliated to the IAMC pay a fixed amount in exchange of a wide range of health services.

As mentioned, the BPS historically granted a health care package to registered private employees only. Under this contributive scheme, employers and workers paid 5 and 3 percent of salaries, respectively, for a total contribution of 8 percent. A contributing worker is eligible to select an institution from the IAMC network as his/her provider of health care services, paid for by the BPS. Non-covered individuals may choose to pay for their own private health care package, use the public health system (subject to a means test), or remain uncovered.

2.3 The 2008 Health Care Reform

After a long debate, Uruguay’s Parliament approved a bill (number 18.211) to reform the health care component of the social security system. This bill created an integrated National Health System (NHS) with the objective to provide comprehensive care to all residents and guarantee equitable and universal coverage, coordinating the complementarity between the public and private health care sectors. This health reform also intended to unify several fragmented institutions, providers

⁵ The public sector is also composed for the Hospital of the Public University (Hospital de Clínicas), the Army and Police Health Services (Hospital Militar y Policial, respectively), and other similar institutions.

⁶ The private sector also encompasses private insurers and providers of highly specialized medical services, among others.

and sources of financing into a common integrated system. In implementing this health care reform (henceforth referred to as the HR) the government sought to strengthen three areas: health care coverage (focusing on the primary care level), health management and health financing.

The pivotal component of the reform was the extension of health care coverage to the worker's dependants, mainly their children and spouse/partner. However, because of fiscal restrictions, this extension was applied in stages. The first stage began in January 2008, when the NHS incorporated workers' children. Qualifying children must be younger than 18 years old, and their inclusion is universal and irrespective of previous health coverage arrangements. The second stage, which will include spouses, will be implemented in 2010.

The reform also modified substantially the financing of health care services. The new scheme is financed through a public fund called the National Health Fund (*Fondo Nacional de Salud*, FONASA; Law no. 18.131) and managed by the BPS. FONASA receives funds from the mandatory contributions of private and public sector workers, employers in private and public firms, retirees, and funds from the central government. A notable feature of the reform is that all contributions were increased. For instance, employee contributions grew from 3 to 6 percent of taxable earnings for individuals with children, while for those with no children in charge contributions increased from 3 to 4.5 percent. Employer contributions remained unchanged at 5 percent under the new scheme. With these funds, the BPS pays the IAMC or public health providers (depending on the user's decision) for health care services.

The expansion of health care coverage to worker's dependants due to the HR affects both public employees and private sector workers registered in the social security system. However, in several cases public workers were already entitled to this extended coverage by the State. The introduction of coverage was thus most relevant for registered private sector workers, who had to pay for their children's health care prior the HR. The new fund, FONASA, assumes this cost under the new legislation. Even children of formal low-income workers, who previously used public health services, were eligible for private care since FONASA entitles them to choose an IAMC in the private health sector.

3 Analytical Framework and Empirical Strategy

3.1 *Predicted incentive effects*

From a choice based perspective, the Uruguayan HR has a series of potential effects on worker incentives and subsequent labor market outcomes. The most direct behavioral change should apply to the decision to operate formally or informally – that is, as a registered or non-registered worker.⁷ This is especially relevant if there are workers in the margin (Maloney, 1999, 2004; Heckman and Pagés, 2004). Moreover, if workers' value mandated benefits (especially those immediately available, such as health insurance), as suggested by Levy (2009) and discussed by Summers (1989), then their behavioral labor supply responses must internalize that these are only obtainable through formal employment contributions.

Because health insurance is a substantial component in the mandated benefits package in Uruguay, the changes in the HR may modify incentives for some workers (most probably for those at the margin between formality and informality) to move into formal jobs, or negotiate different employment conditions with their employers. In particular, that change should be relevant for individuals working in the private sector, because public sector workers already had this type of benefits. Finally, self-employees' coverage status is also relevant, because their formality choice does not depend on an employer's decision.

From an ex-ante point of view, however, it should be noted that the impact of HR on formality is ambiguous for two reasons. On the one hand, the expansion of coverage to the workers' dependants has some value, but this is partially offset by the increase in the contribution from 3 to 6 percent of taxable labor earnings. On the other hand, the ambiguity also stems from the relevant decision unit – i.e., the individual or the household. In any case, in a choice-theoretic setting, the decision should be guided by a cost-benefit analysis in which individuals compare the net gains of contributing to the BPS and receiving the expanded health care coverage and other related social security benefits.

From an individual worker's perspective, the incentive to become formal stems from the benefit of no longer needing to pay directly for their children's health care

⁷ Whether workers have the power to make that decision or if it all comes down to an employer's cost-benefit analysis is a contentious issue in the literature. Instead of opting for one of the two extremes, the discussion in this document assumes that there some degree of influence the worker might have in this decision, and the empirical estimates contribute to assessing this degree.

and having it covered by the social security contribution. These incentives are significant: for a worker with an average salary, the individual cost of children's affiliation with an IAMC is comparable to the corresponding overall payroll tax for a registered worker⁸, which gives him/her access to the whole bundle of social security benefits, including retirement savings and unemployment insurance. The effect of the HR from an individual perspective suggests that the reform would potentially increase the incentives of private sector workers to become formal, and this incentive should be increasing in the number of children.

If the decision to operate formally or informally is taken at the household level, predicting the impact of the HR is less straightforward. In this case, the direction of the effect likely depends on the existing intrahousehold allocation of employment relations before the policy change. Galiani and Weinschelbaum (2007) analyze this point from a theoretical perspective, and show empirical results for Latin America whereby secondary workers are more prone to be informal workers if primary workers are formal. In the HR reform, if more than one member of the household was formal before the policy change there might be duplicity in contributions, since the law stipulates that payroll taxes are computed at the individual and not at the household level. In that case, the HR may induce some of the household's workers to move towards the informal sector, since with only one formal worker in the household the children would receive coverage. In the case where all workers in a household are informal, the HR may induce some of them to operate formally in order to obtain health coverage for their children and spouse. Finally, in households who have members in both sectors, the policy might not alter their formality status.

However, since not all households have young children, workers in these households may not have incentives to change their status since there are no additional benefits. In this situation, informal workers would not change their decision because they are not potential beneficiaries of the policy (since they do not have children). Additionally, there may even be incentives to leave the formal sector, in response to the increase in the payroll tax linked to the health insurance for those

⁸ In 2008, the average monthly wage for salaried workers with children in the sample described below is around 630 USD (at 2005 PPP), of which about 130 USD would have corresponded to social security contributions for formal workers. In the same period the average amount that workers would have paid to enroll their children in an IAMC would be 60 USD. Since salaried workers have on average 2 young children, the total amount paid for private health care would amount to 120 USD.

workers (from 3 percent to 4.5 percent). Nevertheless, this effect will likely be negligible because of the marginal increase of the payroll tax.

In sum, these theoretical considerations provide ambiguous predictions with respect to the net effect of a policy such as the HR on labor informality. The direction ultimately depends on the weight attached to the benefits and costs for employees and employers, and whether the formality decision is taken at the individual or household level.

3.2 Identification Strategy

The aim of the estimates presented below is to identify the causal effect of the HR on formality, and thus provide some evidence on the direction and magnitude of the net incentive effects discussed in the previous pages. The empirical strategy exploits the exogenous extension of health care coverage for workers' children due to the HR in 2008, using adult private sector salaried workers with at least one child as a treatment group in order to isolate the impact of this policy on individual formality choices⁹. Since health insurance is a substantial component of mandated benefits package, the expansion of this component, while theoretically ambiguous, might be expected to increase the incentives of private sector salaried workers to become registered/formal (under the individual decision framework). This policy-experiment setup focuses on workers with children because they are the group directly affected by the health care expansion. The variation caused by the HR can be considered exogenous from the worker's perspective.

The econometric approach is based on the difference-in-differences (DD) methodology (Card, 1990; Angrist and Krueger, 1999; Bertrand, Duflo and Mullainathan, 2004), and exploits the time dimension and the conditions established by the reform which determine the worker's exposure to the health care expansion. This framework compares the results of a treatment group which is exposed to the policy change with another similar group which feasibly represents the unobserved counterfactual evolution for the treated group. In this particular setting, the group of workers affected by the HR is composed of individuals who have at least one child younger than 18 after the law was implemented in

⁹ Gruber and Madrian (1995), Gruber and Hanratty (1995), Gruber (1996) and Yelowitz (1995) among others, use a similar approach to analyze the effect of health coverage expansions on different outcomes in the US labor market.

January 2008 (treatment group). The comparison group consists of private sector salaried workers with no children. The estimation strategy compares the formality levels among workers with children younger than 18 years and workers with no children before and after the policy change. The time period used to obtain the estimates is 2001-2009, with 2001-2007 defined as the pre-policy period and the second semester 2009 as the post-policy period – the year 2008 is used as a period to capture workers' behavioral adjustments.

3.3 *Econometric modeling and identification assumptions*

The following basic DD specification with controls is used in order to obtain the estimates:

$$Y_{it} = \alpha + \delta children_{it} + \beta children_{it} * post + X_{it}' \gamma + \delta_t + \varphi_r + \varepsilon_{it} \quad (1)$$

where i index workers and t time. Y_{it} is an indicator variable representing the informality status of the worker, i.e. an indicator function equal to one if the worker is *not registered* in social security and zero otherwise. $children_{it}$ is a binary variable taking the value of one if the worker has at least one child less than 18 years old and zero otherwise; $post$ is a dummy equal to one in the post-policy period and zero otherwise; and $children_{it} * post$ is an interaction term between those variables. The X_{it} matrix contains individual and household covariates including age, gender, whether the individual is the household head, marital status, education, firm size and industry dummies. Both δ_t and φ_r are a full set of year and department fixed effects which account for any aggregate systematic shock to the individual's informality choice correlated with, but not caused by, the HR¹⁰. Finally, ε_{it} is an error term. In this DD setup the parameter β captures the causal impact of the HR.

Estimates of equation (1) are obtained by a linear model (OLS) for binary dependant variables. Angrist and Pischke (2009) highlight that linear probability model estimates do not differ substantially from those obtained by probit and logit, and have the advantage that the DD estimate of β has a straightforward causal interpretation. Therefore, the estimate of the impact of the HR may be interpreted as the average treatment effect on the treated (ATET), since the effect of the policy could be heterogeneous. To assess

¹⁰ Uruguay is divided in nineteen departments which represent the second administrative level of government. The main department is Montevideo (capital of Uruguay) which concentrates most of the economic activity and population.

heterogeneity, the empirical application also explores different effects on labor informality by groups defined by gender, age and level of education.

The above DD model requires certain assumptions which must be satisfied in order to obtain a causal interpretation of the estimates. First, there are necessary identification assumptions: (1) aside from the expansion of health care coverage due to the HR there are no other contemporaneous shocks that affect the informality choice of workers for both groups differently after the policy; and (2) in the absence of the policy change the underlying trends in informality levels (conditional on X) for both groups would be similar.

The first assumption seems plausible, since government welfare policies which may have affected the labor market decisions of both treatment and control groups are identifiable in the data (described below). Hence, it is possible to control for any spurious correlations in the estimates. The second assumption can be verified by comparing pre-treatment trends, and by performing “false experiments”. For instance, equation (1) can be estimated after re-defining the pre-policy period (2001-2007). The estimations and robustness tests are presented below.

4 Main results and robustness tests

4.1 Data

The empirical analysis in this document is based on repeated cross sections of household survey microdata from the *Encuesta Continua de Hogares* (ECH) for the years 2001 through 2009. This survey is a nationwide cross-sectional household survey which is carried out by the Uruguayan National Institute of Statistics (*Instituto Nacional de Estadística*, INE). The ECH constitutes the main source for information on income, employment and socio-economic characteristics of households and individuals. Additionally, this data is also employed by the government to calculate its official socioeconomic statistics.

Since 2001, the ECH includes a standardized question which asks respondents whether their current job entitles them to a pension or retirement savings. This question allows quantifying the proportion of workers who are registered in the social

security system¹¹. Therefore, this question is generally used as a proxy to identify a worker's formality status according to the legal definition (see Gasparini and Tornarolli, 2009, for a discussion of alternative definitions in Latin America). In what follows, this constitutes the main dependant variable in used for the econometric estimates.

Due to survey changes and the causal effect of interest, a subset of the total sample is used for the estimates. On the one hand, the ECH began including rural areas starting in 2006. Therefore, in order to maintain comparability, the sample used for the estimates is limited to individuals residing in urban areas containing more than 5000 inhabitants¹². On the other hand, the sample is also restricted to private sector salaried workers, since they are the ones primarily affected by the policy change. Public sector workers and the self employed are not included in the analysis, as discussed above. Finally, the sample consists only of adult individuals, defined here as workers between the ages of 19 and 60¹³. The final sample is a multi-year pool of ECH microdata including the following years: 2001-2007 and 2009 (2008 is omitted and is defined as an adjustment period).

Due to the nature of the policy change, the treatment group consists of all adult private sector salaried workers who reside in a household with at least one child younger than 19 years old. The control group consists of adult salaried workers in the private sector with no children.

Table 1 presents summary statistics for treatment and control groups in the pre-policy and post-policy period. This unconditional mean analysis reveals that both groups seem to show similar trends in all variables during the entire period. However, some differences arise. For instance, salaried workers in the control group are older, more educated and are less likely to be married in comparison to salaried workers with children (treatment group). These pre-existing differences indicate that even while both samples seem to be well-balanced, controlling for these individual characteristics may be necessary for unbiased estimation.

¹¹ In addition, starting in 2008 after the implementation of the HR, the ECH inquires whether individuals are entitled to health insurance by the NHS.

¹² Although this restriction results in some loss of information, more than 80 percent of the population in Uruguay lives in urban areas.

¹³ In Uruguay, the legal retirement age for private sector workers is 65 years. However, even while it is common for individuals to continue to work past this age, they are not eligible for the HR benefits. Younger salaried workers are also excluded since their health coverage might stem from their parent's formality status.

Figure 1 depicts group trends of average informality for the period under analysis. In general, formality seems to be lower for the treatment group and higher for the control group. Despite this difference in levels, both groups exhibit similar trends during the period under analysis, although there is to be a small but significant reduction in the gap between the two groups after the policy change. This graphical analysis is a first indication that the HR may have had an effect on labor informality by increasing incentives to become a registered worker – i.e., motivating formal employment. The following section presents econometric estimates of this effect of the HR on informality levels.

4.2 The effect of the health reform on informality

Table 2 reports the primary results of implementing the empirical strategy in Section 3. The coefficients and statistics in the table correspond to the estimation of equation (1) by OLS on the sample of adult salaried workers in the private sector. The first row presents the estimates of the coefficient of interest (β), which captures the impact of the HR on informality. Each column corresponds to different specifications of the model in equation (1): Column (1) is an unrestricted model with no covariates; Column (2) includes a matrix of covariates including the worker's age, gender, whether the individual is the household head, marital status, education, firm size and industry indicators; the remaining columns correspond to the robustness assessment discussed below.

The results of the specification in column (1) indicate a negative but not significant unconditional effect of the HR on the average informality rate when comparing the treatment and control groups. The results in column (2) are similar in size, but significant at the 5 percent level, indicating the need to control for individual worker characteristics to control for the pre-existing differences between the two groups, detailed in the descriptive analysis in the previous section. In general, the estimated coefficients on the covariates exhibit the expected magnitude and sign¹⁴. This result suggests that the HR significantly induced private sector salaried workers in the treatment group to switch to formal employment by about 1.4 percentage

¹⁴ The full regression results are available from the authors upon request.

points. In terms of the pre-intervention average, this effect represents a 5 percent decrease in the probability to operate informally.

The regressions provide some additional relevant results. For instance, the coefficient on *children* remains statistically significant across all specifications. This suggests different levels of labor informality between workers who have at least one child and those who do not have children, even when controlling for observed demographic characteristics. The following sections deal with differential (heterogeneous) effects across different types of workers and with some robustness checks.

4.3 Evaluating heterogeneous effects of the HR

As has been documented in the literature (Gasparini and Tornarolli, 2007), the degree of informality varies for different socio-economic groups, and thus the HR may have affected the incentives of those groups differently. In order to capture these heterogeneous effects, the above estimates are conducted for subgroups defined by worker characteristics such as gender, age and educational level. Table 3 summarizes these additional results.

In terms of gender, the effect for men is not significant and very close to zero (less than 0.3 percentage point). Most of the effect arise from the impact of the HR on salaried women – the effect is around 3 percentage points, and significant at the 1 percent level. This represents a decrease of 12 percent from the pre-policy average for women.

Effects by age group are provided in columns (3)-(5) in Table 3. The effect of the HR on the youngest (19-25) and oldest groups (51-60) is not significant at the usual levels. However, a negative and significant effect is found for salaried workers aged 26-50 years for whom the likelihood of working without contributing to social security decreases in 1.8 percentage points, which is close to the average total effect.

Finally, the last columns in Table 3 present estimates by educational levels. The results indicate a negative and statistically significant effect (at the 5 percent level) for workers with a middle levels of education, and no significant or substantial effects on workers in the low and high education groups. For those who are affected, labor informality decreases by 2 percentage points after the HR, which means a decrease of 8 percent relative to the pre-policy period average.

4.4 Robustness checks

This section carries out some tests to assess the validity of the results presented above. These exercises are based on estimates of equation (1) with full controls for individual characteristics and year-department fixed effects.

The first test addresses the concern that systematic differences between both groups might vary over time. To control for this source of bias, the regression is estimated including interaction terms between the *children* indicator (treatment status) and the entire set of demographic covariates. These results are presented in column (3) of Table 2. The findings indicate that the estimated coefficient of interest remains unchanged, suggesting that there are no time-variant trends which affect the main results.

A second concern with the standard specification in column (2) is that there may be spatial correlation patterns in labor informality, reflecting local labor market dynamics which might be unaccounted for in the first specification and may affect the variance estimates (see Bertrand *et al.*, 2004; Donald and Lang, 2007; Angrist and Pischke, 2009). To correct for this potential source of bias, standard errors are clustered by department-year groupings. The estimates in column (4) of Table 2 show that the main results remain unaltered by this change in specification.

The final robustness test explores the existence of pre-policy trends that differentially affect salaried workers with and without children, in order to assert that there are no unobservable differences between the groups which may bias the estimates. For example, if labor informality was diminishing for the treatment group before the HR, the above estimates may be capturing a spurious correlation. To address this issue, a “false experiment” was conducted using the sample that corresponds to the pre-policy period (2001-2007). In particular, the basic regression is re-estimated setting the years 2003 to 2006 successively as the year that the policy was implemented. Thus, the *post* indicator is activated for those years in each estimate. Table 4 presents the estimates for each pre-post policy simulation in columns (1) to (4), respectively for each year. The results show that the causal parameter (*post*children*) is statically insignificant at standard levels. The failure of these placebo estimates supports the assumption that the treatment and control groups exhibited similar trends (conditional on the X variables) before and after the policy change.

The empirical results thus support the expected theoretical prediction that improving the benefits from a mandated social package provides additional incentives to become a formal worker. Furthermore, these results seem to be robust to different specifications and controlling for additional dimensions. Therefore, the main finding in these preliminary results suggests that labor informality decreased in Uruguay due to the HR expansion of health care coverage, and that some workers were able to react to the new incentive structure.

5 Discussion and conclusions

The results presented in this document indicate that social security systems imply sizeable incentive effects for worker's labor market outcomes in developing countries. Specifically, Uruguayan private sector workers seem to have seized the opportunity of an expansion in social security health benefits. Further research should study the specific mechanisms by which this change happens – do workers switch jobs to take advantage of the reform, or do they re-negotiate employment conditions? The answer to this type of questions would illustrate the working of labor markets in developing countries and inform future policy changes.

References

- Angrist, J. and J. Pischke (2008), *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press.
- Bertrand, M., E. Duflo, and S. Mullainathan, (2004), "How Much Should We Trust Differences- in-Differences Estimates?", *Quarterly Journal of Economics*, 119(1): 249-275
- Bosch, M. and Campos-Vázquez, R. (2010), "The trade-offs of social assistance programs in the labor market: The case of the "Seguro Popular" program in Mexico," Centro de Estudios Económicos Working Paper 12, Colegio de México.
- Bucheli M. (2004) "Uruguay: La cobertura de la seguridad social en el empleo, 1991-2002". En Fabio Bertranou (editor) *Protección social y mercado laboral. Santiago de Chile*, Oficina Internacional del Trabajo.
- Currie, J. and B. Madrian (1999), "Health, Health Insurance and the Labor Market," Chapter 50 en Orley Ashenfelter and David Card, eds. *Handbook of Labor Economics*, Amsterdam: North Holland, pp. 3309-3407.
- Eissa, N. and Liebman, J. (1996), "Labor Supply Response to the Earned Income Tax Credit," *Quarterly Journal of Economics*, vol. 111(2), pages 605-37.
- Ferreira-Coimbra, N.; Forteza, A. 2004 *Protección social en Uruguay: Financiamiento, cobertura y desempeño, 1990-2002* (Santiago, Oficina Internacional del Trabajo).
- Fields, G. (2005), "A Guide to Multisector Labor Market Models", World Bank Social Protection Unit Discussion Paper No. 50.
- Fields, G. (2009), "Segmented labor market models in developing countries". Retrieved on December 2010 from Cornell University, ILR School site: <http://digitalcommons.ilr.cornell.edu/articles/162/>
- Galiani, S. and F. Weichelbaum, (2007), "Modelling Informality Formally: Households and Firms", CEDLAS Working Paper 47, Universidad Nacional de La Plata.
- Gasparini, L. and L. Tornarolli (2009), "Labor Informality in Latin American and the Caribbean: Patterns and Trends from Household Surveys Microdata", *Revista Desarrollo y Sociedad*, Universidad de Los Andes-CEDE, Colombia. Available as CEDLAS Working Paper 46, Universidad Nacional de La Plata.
- Gasparini, L., Haimovich, F. and Olivieri, S. (2007), "Labor Informality Effects of a Poverty-Alleviation Program," CEDLAS Working Papers 53, Universidad Nacional de La Plata.
- Gruber, J. (1996), "Disability insurance benefits and labor supply", NBER Working Papers 5866, National Bureau of Economic Research.
- Gruber, J. and B.C. Madrian (1995), "Health insurance availability and the retirement decision", *American Economic Review* 85: 938-948.

- Gruber, J. and M. Hanratty (1995), “The labor market effects of introducing national health insurance: evidence from Canada”, *Journal of Business and Economics Statistics* 13: 163-174.
- Gruber, J. and Poterba, J. (1994), “Tax Incentives and the Decision to Purchase Health Insurance: Evidence from the Self-Employed,” *Quarterly Journal of Economics*, MIT Press, vol. 109(3), pages 701-33.
- Heckman, J., and C. Pages (2004), “Law and Employment: Lessons from Latin America and the Caribbean”, the University of Chicago Press for the National Bureau of Economic Research.
- Juárez, L. (2009), “Are Informal Workers Compensated for the Lack of Fringe Benefits? Free Health Care as an Instrument for Formality”, mimeo, ITAM, México.
- Levy, S. (2008), *Good Intentions, Bad Outcomes: Social Policy, Informality and Economic Growth in Mexico*. Washington, D.C., The Brookings Institute.
- Maloney, W. (1999), “Does Informality Imply Segmentation in Urban Labor Markets? Evidence from Sectoral Transitions in Mexico”, *World Bank Economic Review*, 13: 275-302.
- Perry G., W. Maloney, O. Arias, P. Fajnzylber, A. Mason, J. Saavedra-Chanduvi (2007), *Informality: exit and exclusion*, World Bank Latin American and Caribbean Studies, The World Bank.
- Summers, L. (1989), “Some Simple Economics of Mandated Benefits,” *American Economic Review*, vol. 79(2), pages 177-83.
- Yelowitz, A. (1995), “The Medicaid Notch, Labor Supply and Welfare Participation: Evidence from Eligibility Expansions”. *The Quarterly Journal of Economics*, 110, 909-939.

Tables

Table 1
Summary Statics

	Control: salaried worker without children less than 18				Treat: salaried worker at least 1 child less than 18			
	Pre (2001 - 2007)		Post (2009)		Pre (2001 - 2007)		Post (2009)	
	(N = 19607)		(N = 5380)		(N = 47977)		(N = 11250)	
	mean	sd	mean	sd	mean	sd	mean	sd
Informal	0.23	0.42	0.17	0.37	0.26	0.44	0.19	0.39
Age	39.62	12.30	39.24	12.29	38.52	8.39	38.32	8.36
Man	0.52	0.50	0.52	0.50	0.53	0.50	0.52	0.50
Married	0.63	0.48	0.61	0.49	0.89	0.32	0.86	0.34
Head	0.69	0.46	0.68	0.46	0.63	0.48	0.63	0.48
Years Education	10.32	3.99	10.53	3.82	9.61	3.64	9.64	3.52
Region								
Montevideo	0.74	0.44	0.70	0.46	0.62	0.48	0.62	0.48
North	0.05	0.22	0.06	0.24	0.08	0.28	0.09	0.29
Centre - North	0.06	0.25	0.06	0.24	0.09	0.29	0.09	0.28
Centre - South	0.05	0.22	0.06	0.24	0.07	0.26	0.07	0.26
South	0.10	0.30	0.12	0.32	0.13	0.33	0.13	0.33
Firm size: 1-4 employ.	0.30	0.46	0.25	0.43	0.32	0.47	0.26	0.44
Firm size: 5-49 employ.	0.36	0.48	0.35	0.48	0.35	0.48	0.36	0.48
Firm size: + 49 employ.	0.34	0.47	0.40	0.49	0.33	0.47	0.38	0.49
Category of Industry								
Agriculture	0.04	0.19	0.04	0.20	0.05	0.22	0.06	0.24
Industry	0.09	0.28	0.09	0.29	0.10	0.30	0.11	0.31
Manufacturing	0.06	0.24	0.08	0.27	0.06	0.25	0.07	0.26
Construction	0.05	0.21	0.06	0.24	0.06	0.24	0.08	0.28
Trade	0.20	0.40	0.23	0.42	0.18	0.38	0.23	0.42
Transport/commun	0.07	0.25	0.08	0.28	0.07	0.25	0.08	0.27
Finance/professional	0.10	0.30	0.11	0.32	0.07	0.25	0.07	0.26
Education/health	0.17	0.37	0.17	0.38	0.15	0.36	0.16	0.37
Personal	0.12	0.33	0.12	0.33	0.15	0.35	0.14	0.35
Others	0.11	0.31	0.00	0.00	0.10	0.30	0.00	0.00
Weekly hours worked	41.57	14.42	41.64	13.66	41.54	15.85	41.70	14.66
Hourly wage (usd PPP 05)	3.18	5.28	3.54	5.64	3.10	4.20	3.43	4.14

Note: Data are from survey years 2001-2007 and 2009 of the Encuesta de Hogares Continua (ECH). Sample includes salaried workers in the private sector of activity in urban areas ages 19-60 and employed at least one hour in the last week. Informal equals one if the worker is entitled for retirement savings. Means are weighted with ECH supplement weights.

Table 2
Effect of health reform on informality

	sample: salaried workers in private sector			
	(1)	(2)	(3)	(4)
children*post	-0.0116 [0.0078]	-0.0142** [0.0068]	-0.0148** [0.0068]	-0.0142** [0.0067]
post	-0.0508*** [0.0083]	-0.0202*** [0.0073]	-0.0201*** [0.0073]	-0.0202*** [0.0068]
children	0.0167*** [0.0041]	0.0353*** [0.0038]	-0.0414 [0.0836]	0.0353*** [0.0040]
Socio-economic Covariates	No	Yes	Yes	Yes
Dummies Time and State	Yes	Yes	Yes	Yes
Interactions demographic covariates-children	No	No	Yes	No
Cluster Stand. Err. (department*time)	No	No	No	Yes
Observations	84214	84214	84214	84214
R ²	0.04	0.29	0.29	0.29

Note: Data are from survey years 2001-2007 and 2009 of the Encuesta de Hogares Continua (ECH). The dependant variable is informal status which is equals one if the worker is entitled for retirement savings. Controls include age dummies, gender, household head status, marital status, and a full set of set of education, industry, departments, and time dummies and a constant. Columns (1) to (4) present robust standard errors in brackets. In column (5) robust standard errors are clustered on department and year. Regressions are weighted with ECH supplement weights.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3
Effect of Health Reform on informality by group status

	By gender Status		By group of age			By educational status		
	Male (1)	Female (2)	[19-25] (3)	[26-50] (4)	[51-60] (5)	primary (6)	secondary (7)	tertiary (8)
children*post	-0.0028 [0.0090]	-0.0305*** [0.0100]	0.0084 [0.0233]	-0.0177** [0.0078]	-0.0229 [0.0187]	-0.0055 [0.0179]	-0.0205** [0.0101]	-0.0074 [0.0103]
post	-0.0211** [0.0098]	-0.0172 [0.0107]	-0.0056 [0.0244]	-0.0200** [0.0084]	-0.0172 [0.0178]	-0.0359** [0.0183]	-0.0188* [0.0112]	0.0009 [0.0108]
children	0.0185*** [0.0054]	0.0519*** [0.0055]	0.0506*** [0.0143]	0.0297*** [0.0044]	0.0373*** [0.0094]	0.0439*** [0.0093]	0.0381*** [0.0058]	-0.0033 [0.0055]
Socio-economic Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummies Time and State	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44231	39983	6885	65911	11418	20605	39106	15886
R ²	0.23	0.34	0.31	0.29	0.28	0.27	0.26	0.13

Note: Data are from survey years 2001-2007 and 2009 of the Encuesta de Hogares Continua (ECH). The dependant variable is informal status which is equals one if the worker is entitled for retirement savings. Controls include age dummies, gender, household head status, marital status, and a full set of set of education, industry, departments, and time dummies and a constant. Robust standard errors are presented in brackets. Estimations in columns (6) to (8) restricts the sample to salaried workers aged 25-60. Regressions are weighted with ECH supplement weights.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Informality before the Health Reform

	sample: salaried workers in private sector			
	Post dummy activated in 2003 (1)	Post dummy activated in 2004 (2)	Post dummy activated in 2005 (3)	Post dummy activated in 2006 (4)
children*post	-0.0136 [0.0087]	-0.0084 [0.0076]	0.0026 [0.0070]	-0.0045 [0.0065]
post	-0.0047 [0.0084]	-0.0085 [0.0078]	-0.0164** [0.0075]	-0.0114 [0.0072]
children	0.0451*** [0.0079]	0.0403*** [0.0066]	0.0337*** [0.0058]	0.0366*** [0.0052]
Socio-economic Covariates	Yes	Yes	Yes	Yes
Dummies Time and State	Yes	Yes	Yes	Yes
Observations	67584	67584	67584	67584
R ²	0.29	0.29	0.29	0.29

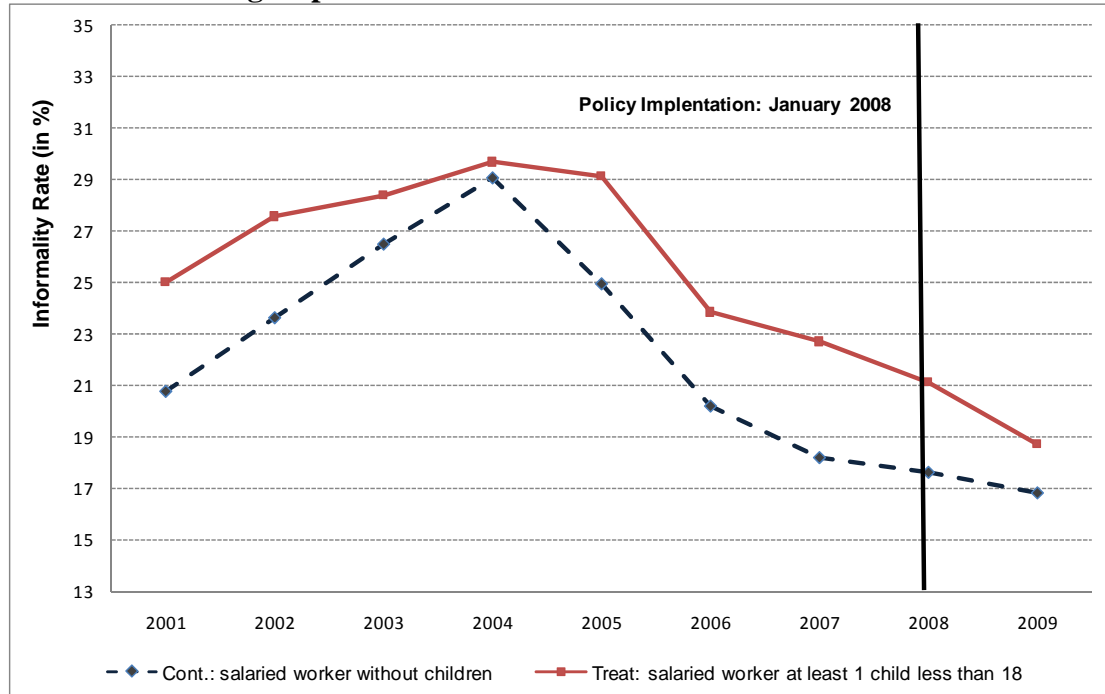
Note: Data are from survey years 2001-2007 and 2009 of the Encuesta de Hogares Continua (ECH). The dependant variable is informal status which is equals one if the worker is entitled for retirement savings. Controls include age dummies, gender, household head status, marital status, and a full set of set of education, industry, departments, and time dummies and a constant. Robust standard errors are presented in brackets. Regressions are weighted with ECH supplement weights.

* significant at 10%; ** significant at 5%; *** significant at 1%

Figures

Figure 1

Private sector salaried worker's informality in 2001-2009 by control and treatment group



Note: Data are from survey years 2001- 2009 of the Encuesta de Hogares Continua (ECH). Sample includes salaried workers in the private sector of activity in urban areas ages 19-60 and employed at least one hour in the last week. Informal equals one if the worker is entitled for retirement savings. Informality rate is computed relative to occupied workers in the same universe. Means are weighted with ECH supplement weights.