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Abstract

We examine whether the Colombian government, when instituting and expanding social programs in the early nineties, inadvertently created incentives for people to become informal. We use data from repeated cross-sections of the Colombian Household Survey for periods before and after implementation of the reforms. As robustness, we also construct a panel of individuals interviewed for the first and second Census of the Poor. Using the variation in the onset of interviews across municipalities we find robust and consistent estimates of an increase in informal employment between 2 and 4 percentage points. From a policy perspective this implies that the broad expansion of government provided health insurance in Colombia contributed to increasing informal employment.

JEL No. I11, I18, O17.

Keywords: Incentives, Informal Sector, Health Insurance, Social Protection, Colombia.

Efectos del Sistema de Protección Social Colombiano en las Decisiones entre Trabajo Formal e Informal[*]

Adriana Camacho   Emily Conover   Alejandro Hoyos

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Resumen

Este artículo examina si el gobierno colombiano, cuando implementó y expandió una serie de programas sociales a comienzos de la noventas, de manera no intencionada creó incentivos para la informalidad. El estudio utiliza como fuente de datos las encuestas de hogares para Colombia, para periodos antes y después de la implementación de las reformas. Como un ejercicio de robustez también se construyó un panel de individuos a partir de las bases de la primera y segunda versión del Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales (SISBEN). Utilizando la variación en las fechas de iniciación de encuestas del SISBEN para los diferentes municipios se encuentra un incremento de entre 2 y 4 puntos porcentuales en el empleo informal. Desde la perspectiva de políticas públicas esto implica que esta expansión de la cobertura de salud por parte del gobierno colombiano contribuyó a incrementar el empleo informal.

JEL No. I11, I18, O17.

Palabras Claves: Incentivos, Informalidad, Protección Social, Colombia.

1   Introduction

Informal sector employment is often characterized as undesirable, because it is perceived to encompass constrained and low productivity firms in unorganized and unregulated activities. Other people believe that informality status may be preferred by some workers, given that it grants them greater independence and work schedule freedom (Maloney, 2004). Informality may also be preferred if taxes or social security contributions exceed the workers valuation of the services they provide. This situation can be exacerbated if the government provides informal workers with comparable free services (Levy, 2008; Pagés and Madrigal, 2008).

In a recent study, the World Bank reports an upward trend in informality since the 1990s, this trend is more noticeable for the Latin American countries (Perry et al., 2007). During this period different Latin American countries also instituted and expanded social program provisions.[1] There are many factors that are likely to affect informal employment,[2] one of these factors is "increased availability of non-contributory social protection schemes for informal workers" as noted by Perry et al. (2007, p.13). In this paper we examine whether the Colombian government, when instituting and expanding social programs in the early nineties, inadvertently contributed to an increase in informal employment. While there is plenty of anecdotal evidence regarding potential disincentives for formal employment generated by the social protection system in Colombia, no systematic empirical evidence has been presented to confirm or reject this hypothesis.[3]

According to Cárdenas (2007, p.388) between 1992 and 2005, the period that we study,

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[1] See Grosh (1994) for a review of 30 social programs in 11 Latin American countries.

[2] See Loayza (1996) and de Soto's (1989) for characterizations of the informal labor market and its determinants.

[3] For example, in a news article reported by *Presidencia de la República* (Feb. 2006), the Minister of Social Protection indicated that people's valuation of the public health insurance program (the Subsidized Regime (SR)) was so high as to be creating incentives to discourage formal employment. A study by Santamaria et al. (2008) reports that 49% of SR recipients indicated that they are not willing to lose their (SR) benefits by switching to a formal job.

Colombia's informal sector accounted for approximately 57% of its labor force. The definition of informality that Cárdenas uses follows the International Labor Office convention, which takes into account the occupational category and educational level of workers, regardless of enrollment into a health insurance program.[4] The share of informal employment, using this job-category based definition, increased steadily from 1996 until reaching a peak of 61.3% in 2002.

During this period, there were several legislative changes and economic reforms that likely affected the Colombian labor market. In particular, in 1990 Colombia opened its economy to imports and foreign investment, the government passed laws to increase flexibility in the Colombian labor market, and several social programs were also introduced.[5] Among them one stands out in magnitude and scope: the health sector reform of December 1993. This reform aimed to achieve universal health insurance coverage by the creation of two regimes: a Contributive (CR) and a Subsidized Regime (SR). Eligibility for the SR was determined with a poverty index score, calculated from answers to a Census of the Poor interview.[6]

To determine whether the provision of health insurance to the poor through the Subsidized Regime was an incentive for leaving formal employment and taking up informal employment we use a *benefit based* informality definition, which encompasses workers without social security,[7] and the variation in the onset of the Census of the Poor across municipalities.

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[4]The definition of informality used by Cárdenas includes non-professionals who are self-employed, domestic employees and household workers without payment regardless of education level. An additional definition of informality considered by DANE (Colombia's National Statistical Agency) is based on firm size. According to this definition, informal workers are those working in a firm with less than 10 employees regardless of their education level, occupational status and enrollment into a health insurance program.

[5]One of the labor market regulation changes included reduced severance payments for workers hired after 1990. See Kugler (1999), Kugler and Kugler (2005), Santamaria et al. (2009), and Sánchez et al. (2009) for more details and analysis on the labor market reforms. See Cárdenas and Bernal (2003) for a summary of recent labor legislation changes in Colombia. See Lora (1997) for a summary of the reform process of the 1990s across Latin American countries.

[6]The Census of the Poor is known as the SISBEN in Colombia.

[7]Specifically, formal workers are all individuals in the Labor force that receive health insurance through their

This variation serves as a measure of the population's awareness to the potential benefits of the Subsidized Regime.

Our main dataset comes from repeated cross-sections of the Colombian Household Survey for periods before and after implementation of Census of the Poor interviews. Using individual level data, and controlling for municipality and year effects, we estimate whether or not there was an increase in informal employment after the municipality started conducting interviews. Given that we are evaluating the effects of government provision of health insurance, we use the definition of informality that accounts for employees between 12 and 65 years who do not contribute to health insurance through employment. We find robust and consistent effects of an increase in informal employment from 3.4 to 4.2 percentage points. Alternative specifications using the variation in fraction of interviews conducted within a municipality and across time, yield an increase in informal employment from 1.9 to 3.2 percentage points. We corroborate our findings using an alternative dataset that we constructed with a panel of individuals interviewed in the first and second Census of the Poor. Using information about their eligibility status, as determined by the poverty index score from the first Census of the Poor, we find consistent results of an increase of 1.8 to 1.9 percentage points in informal employment.

The paper is organized as follows: in section 2 we review articles that looked at the effects of other reforms that took place in Colombia during the period we study. We also discuss specific reasons why Colombia's social protection system may be generating differential incentives for workers to become or remain informal. In Section 3 we describe the datasets used in the analysis. In Section 4 we present the empirical results. We conclude in Section 5.

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employer and informal are those who do not.

2 Literature and Background

Between 1990 and 2005 the Colombian labor market underwent several legislative changes and economic reforms. Other studies have looked at different aspects of the reforms. Using a panel of manufacturing plants Kugler and Kugler (2005) estimate that a 10% increase in payroll taxes reduces formal employment between 4-5%. They also estimate a reduction in formal wages between 1.4-2.3%. They mention that the smaller shifting of the tax increase to the workers through lower wages could be due to "the relatively high minimum wage and weaker link between contributions and benefits" in Colombia (p.21). Kugler (1999) has also studied the incidence of job security regulations implemented in the early nineties on exit rates into and out of unemployment. She finds that these regulations increased labor market flexibility and pro-cyclical relationship between employment and business cycles. Mondragon et al. (2009) find that an increase in non-wage costs and in the minimum wage has a significant and positive effect on informal employment, and a negative effect on informal wages.

A study by Cárdenas and Bernal (2003) documents a sharp increase in unemployment rates since 1995. They highlight the increase in labor costs due to the changes in legislation as a main factor affecting labor demand. Gaviria and Henao (2001) report that a strategy used by households faced with loss of employment is to participate in informal sector activities. Using data from the National Statistical Agency (DANE), they report an upward trend in informal employment between 1996 and 2000 for both men and women (p.28).

The studies described above analyze the impact of a change in labor taxes, but they don't specifically address the effect of public health insurance provision on informal employment. We focus our analysis on the effects of the Subsidized Regime on informal employment,

as defined as a worker who does not receive social security contributions through employment. The structure of the health sector has raised questions of whether the creation of the Subsidized Regime unintentionally generated incentives for informality, since for those willing and able to engage in informal employment it reduced health insurance costs to both the employer and employee. The Contributive Regime, required enrollment of all workers through their employer. Employees pay 1/4 of the cost, while employers are responsible for 3/4. Independent workers can also enroll in the Contributive Regime by paying the full cost.[8] In exchange for these contributions, employees and their direct dependents (spouse and children, or one parent) have access to a range of health services and medications known as the *Plan Obligatorio de Salud* (POS).[9]

The Subsidized Regime was designed to reach people who did not have access to the Contributive Regime, specifically the poor and the unemployed. The Subsidized Regime is financed with a 1% transfer from the Contributive Regime, and with local and central government funds. Households eligible for the Subsidized Regime have free access to a package of services and medications known as the *Plan Obligatorio de Salud Subsidiado* (POSS).[10] This package is less comprehensive than the one offered by the Contributive Regime, but unlike the Contributive Regime, it covers every member in an eligible household regardless of their relationship to the household head.

Family composition may affect the incentives for workers to become or remain informal. The Contributive Regime allows enrollment only for a restricted group of family members: (1) if married/cohabiting for more than 2 years, children and a spouse/partner who is not directly enrolled in the Contributive Regime; (2) if single or without children, a parent who

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[8]From 1995 to 2007 the cost was 12% of a person's income.
[9]In English POS stands for "Obligatory Health Plan."
[10]In English POSS stands for "Subsidized Obligatory Health Plan."

is a dependent. Coverage for any additional family member, in the Contributive Regime, has an additional cost. This per capita cost is set by the government and is known as *Unidad de Pago por Capitación* (UPC). The Subsidized Regime, on the other hand, allows enrollment of any member of the family unit, regardless of family links. The less costly and less restrictive enrollment rules for family members or dependents in the Subsidized Regime might encourage some people to seek this type of health care coverage. Specifically, the Subsidized Regime is likely to be attractive to households with large extended families rather than smaller nuclear families. In section 4.2 we explore whether there are stronger effects in households with large extended families.

There could be heterogeneity in how the different packages of services offered by the Contributive Regime and Subsidized Regime affected workers. It is possible that people who are eligible for both regimes seek different systems depending on their anticipated health needs. Households with vulnerable members like newborns, children and elderly could be likely to prefer a more comprehensive plan like the one offered by the Contributive Regime. On the other hand, healthy young people who do not foresee a high need for health services would prefer the Subsidized Regime. For them, the differential cost of the Contributive Regime would be higher than the loss in terms of the quality and comprehensiveness of its health package. In section 4.2 we look at whether the effects are attenuated in households with a higher proportion of vulnerable members such as young children and elderly.

3 Data

3.1 Household Survey Data

We use repeated cross-sections of the Colombian Household Survey, for periods before and after implementation of the health care reform.[11] These cross-sections are representative samples of the population living in the following ten cities: Bogotá, Cali, Medellín, Barranquilla, Bucaramanga, Pereira, Manizales, Villavicencio, Pasto and Cúcuta. For the analysis we use the informality modules included in the second trimester every two years from 1990 to 2000, and once every year between 2001 and 2005. We define informality as employees between 12 and 65 years who do not contribute to health insurance through employment.[12] For the context of our study, which evaluates the effect of a health insurance expansion, we consider this to be the relevant definition of informality.

Table 1 shows descriptive statistics for total, formal and informal workers in columns 1, 2 and 3 respectively. There is a higher proportion of men in the labor force (57.54%). Men are also more likely than women to have an informal employment. The average age of workers in Colombia is approximately 35 years. The highest proportion of workers is in the 25 to 34 age category. There are higher proportions of informal workers in younger cohorts (12 to 24 years). 29% of informal workers have had some secondary schooling, while 31% of formal workers have completed secondary school. 40% of formal workers are married, while 26% of informal workers are married. Cohabitating is more common among informal workers. Informality rates are higher among households with more members. Other relatives and non-relatives within a household account for 13% of the household members.

We defined five groups of vulnerable people within the household: proportion of children

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[11] In Spanish: *Encuesta Nacional de Hogares* (ENH) 1986-2000, and *Encuesta Continua de Hogares* (ECH) 2001-2005.

[12] Alternative definitions of informality are based on firm size, or education level of workers.

below 1, 2 and 5 years and proportion of elderly in the household. An informal worker has on average a higher proportion of kids in the household but a lower proportion of elderly.

Table 2 describes the sample corresponding to each municipality in column 1, and the rate of informality and formality in column 2 and 3 respectively. We also report information for the labor controls that are included in the regressions.

Table 3 reports informality rates by economic sector, organized by informality level on the eve of the onset of the Census of the Poor, 1992. Personal and household services is the economic activity with the highest rate of informality (79%), while Public administration and defense has the lowest rate of informality (1%). Column 1 shows the relative size of the economic sector. Column 2 shows the rate of informality in 1992. Columns (3) and (4) show the informality rate for the pre and post interview periods respectively.

3.2 The Onset of the Census of the Poor Interviews

To determine whether the Subsidized Regime increased informal employment, we use variation across municipalities and compare the levels of informal employment before and after the onset of Census of the Poor interviews. In all of the specifications we include year and municipality controls to ensure that economy wide and time invariant municipal characteristics are not influencing our results. We also have specifications with individual and household level controls. Identification comes from assuming that the variable of interest is capturing variation due solely to the onset of the Census of the Poor interviews, and that the characteristics of the municipalities which implemented the Census of the Poor interviews later do not differ from municipalities that implemented earlier.

We explore the relationship between early and late adopters of the Census of the Poor interviews, in Table 4. The Table shows summary statistics using 1992 data, prior to the

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onset of the Census of the Poor interviews, and grouping the municipalities in earlier and later adopters. We find that although the largest cities started conducting Census of the Poor Interviews early, the proportion of informal workers on the eve of the first Census of the Poor interviews is almost the same across the groups. The order of the distribution across sectors is the same across the groups. And although there are differences in the education distribution across the groups, we report results controlling for these demographic characteristics.

3.3 Panel using Census of the Poor Data

As a robustness check for our results we use a panel dataset at the individual level that we constructed from the first and second Census of the Poor. These Census, administered by the local government, collect household and individual level data used to calculate a poverty index score. The poverty index score is used to select beneficiaries for government social programs including health subsidies. The first Census of the Poor was conducted between 1994 and 2003, and the second between 2003 and 2005. The algorithm used to construct the poverty index score changed between the first and second Census. We used information on eligibility based on the poverty index score obtained from the first Census, and determine whether informality rates observed in the second Census of the Poor are higher for individuals who are barely eligible for the Subsidized Regime, relative to individuals who are barely not eligible.

4 Empirical Analysis

4.1 Effect of the Subsidized Regime on Informal Employment

Assuming that the reform was effectively in place when the municipality started doing Census of the Poor interviews, we can estimate the effect of the reform on informal employment. We capture this by constructing an indicator variable *post* which aligns the starting date of Census of the Poor interviews for each city, and is equal to 1 on and after the year when the municipality started conducting interviews. Specifically, we estimate probit models with the following specification:

$$inf_{ihjt} = \alpha + \theta post_{jt} + \gamma_j + \sigma_t + X'_{jt}\beta_1 + Z'_{ihjt}\beta_2 + T'_{hjt}\beta_3 + S'_{ihj}\beta_4 + \epsilon_{ihjt} \qquad (1)$$

Where the sub-indices correspond to: i for individual, h for household, j for municipality, t for year. inf corresponds to an indicator variable for being informal, defined as a worker who does not contribute to health insurance through employment. γ represents municipality effects, while σ represents year effects. X is a vector of controls that vary across municipality and over time such as population, working age population, economically active population, employment and state level GDP. These controls serve to capture variation due to business cycles. Z corresponds to a vector of individual controls, such as age group, schooling, marital status, relation to the household head and whether or not working in activities which are likely to be seasonal.[13] T corresponds to a vector of household controls such as proportion of children in the household, proportion of elderly, proportion of potential beneficiaries to the Subsidized Regime, proportion employed, average education, and average age. S captures controls for employment sector as defined in Table 3. ϵ correspond to the idiosyncratic error term, assumed to be mean zero and with a constant variance.

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[13]Specifically for this variable we generated an indicator which took a value of 1 for: independent, self-employed and domestic workers; and a value of 0 for: employers, government workers, or family worker without remuneration.

We are interested in the value of θ, the parameter for the indicator variable *post*. If $\theta > 0$ then there is an increase in informal employment after the onset of the Census of the Poor interviews. We report estimates in Table 5, where we show specifications including different sets of controls in each column. Estimates show a positive and significant effect of *post*, with an average increase in informality of 3.8 percentage points. All specifications are clustered at the municipality level. The corresponding figure for the regressions in Table 5 columns (2) and (4) are depicted in Figure 1. The Figure aligns the onset of the Census of the Poor Interviews across municipalities, and shows an increase in informal employment at the onset. The effect is strongest in the first 3 years after the initiation of interviews in the municipality, but it seems to decline over time. This decline is sharpest, when additional controls are included.

Our identification comes from assuming that the variable *post* is capturing only the variation due to the onset of the Census of the Poor interviews. Year and municipality controls ensure that economy wide and time invariant municipal characteristics are not influencing our results. For some municipalities however, implementation dates of the Subsidized Regime coincided with an increase in labor taxes, thus we can not attribute all of the increase in informal employment to the Subsidized Regime. To the extent that the increase in informal employment is a consequence of both the increase in labor taxes in the formal sector and the decrease in costs of being informal, the effect that we estimate could be an upper-bound of the Subsidized Regime on informality.

To more precisely estimate the effect of the Subsidized Regime on informality we use the variation in the proportion of interviews conducted within a municipality and over time, as recorded in the first Census of the Poor database. With the idea that as more people had

access to the Subsidized Regime, they could more easily choose to opt-out of the Contributory Regime which is provided through formal employment. To do this, we specify a regression where the variable of interest is $prop\_inter$. This variable captures the cumulative proportion of Census of the Poor interviews that have been conducted, allowing us to use the variation within a municipality and over time. It takes a 0 value in periods prior to the onset of Census of the Poor interviews, values between 0 and 1 in years when interviews were conducted but not completed, and a value of 1 in years when all the Census of the Poor interviews were completed. We estimate probit models with the following specification:

$$inf_{ihjt} = \alpha + \kappa prop\_inter_{jt} + \gamma_j + \sigma_t + X'_{jt}\beta_1 + Z'_{ihjt}\beta_2 + T'_{hjt}\beta_3 + S'_{ihj}\beta_4 + \epsilon_{ihjt} \quad (2)$$

Where all other variables are defined as in equation 1. The coefficient of interest is κ, the parameter for the proportion of Census of the Poor interviews conducted. If $\kappa > 0$ then a higher proportion of Census of the Poor interviews conducted in a municipality is associated with an increase in informal employment. We report results from this regression in Table 6. The table report an average increase in informality of 2 percentage points. All specifications are clustered at the municipality level.

4.2 Informal Employment by Household Composition

In this section we explore the relative effects of offering the Subsidized Regime by household composition groups. We use household characteristics as a proxy for health insurance valuation. In particular we want to see whether we find attenuated effects for households with vulnerable members since, as described in Section 2, the Contributive Regime provides a more complete package of services and medicines than the Subsidized Regime. We expect that households with a higher proportion of vulnerable members are likely to value the Contributive Regime more relative to households without vulnerable members. To test this

hypothesis, we define a variable *vulnerable* which calculates the proportion of children under 1 year of age and the proportion of elderly members.

We estimate equations 1 and 2 after dividing the data in three groups: the first group does not have vulnerable members in the household; the second group has vulnerable members and the proportion of vulnerable members is less than or equal to the median observed in the data; the third group has vulnerable members and the proportion of vulnerable members is higher than the median. We report the coefficient estimates for the *post* variable. Results are reported in Tables 7 and 8. Results show that the effects of the Subsidized Regime are strongest in households with no vulnerable members and attenuated in households with vulnerable members for both specifications, with an average effect of 4.5 percentage points.[14]

During the period we study, the Subsidize Regime, but not the Contributive Regime, covers every member in an eligible household regardless of their relationship to the household head. Thus we expect attenuated effects on households where the proportion of potential beneficiaries for the Subsidized Regime is lowest, and stronger effects where the proportion of potential beneficiaries is relatively high. We define potential beneficiaries as household members not in the nuclear family including married children and their spouses, grandchildren, grandparents and their spouses, siblings of the household head and other relatives. These household members would be eligible for the Subsidized Regime but not the Contributive Regime. Again, we divide the sample into three groups: first a group without potential beneficiaries; second a group with potential beneficiaries but with a proportion less than or equal to the median; and finally a group with potential beneficiaries but with a proportion higher than the median. Results are reported in Tables 9 and 10. The Tables show that the effects

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[14]These results are consistent with those we get when we divide the sample by the proportion of children less than one year of age, and the proportion of elderly independently.

are attenuated in the sample without potential beneficiaries, and disappear once we include controls for socio-economic strata. The increase in informality is largest for the groups above the median number of potential beneficiaries, with an average effect of 5 percentage points.

4.3   Robustness

4.3.1   Estimation accounting for Eligibility

Using the Household Survey dataset, in this section we construct a proxy for the Poverty Index Score to assess whether the positive increase in informal employment is concentrated among the people who are eligible for the Subsidized Regime.

The poverty index score calculated from information in the Census of the Poor is made of four components: demographic, education, utilities and housing. The poverty index score is not available in the household survey data, but we construct a proxy the following way: the information required for the demographic and education components is available in the household surveys, thus we calculate these components using the algorithm for the poverty index score. The information for the other two components is not complete. So, using the Census of the Poor we add the housing and utility component score and regress the sum on variables that are available in the household surveys and the Census of the Poor. These variables have a reasonable predictive power of these two components.[15] We then use the coefficients obtained from this regression on the household survey data to generate a value for the missing poverty index score components for the strata levels 1-3 (those targeted with household interviews in the Census of the Poor): utilities and housing. Finally, we use this value together with the demographic and education score to generate a proxy for the poverty

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[15]Specifically, the variables are: neighborhood strata level, municipality, head of household education, head of household activity, size of firm where head of household works, household mean education level, proportion of children in the household and proportion of workers in the household.

index score. The specification that we use is:

$$inf_{ihjt} = \alpha + \theta post_{jt} + \eta elig_{ihjt} + \delta post_{jt} * elig_{ihjt} \tag{3}$$

$$+ \gamma_j + \sigma_t + X'_{jt}\beta_1 + Z'_{ihjt}\beta_2 + T'_{hjt}\beta_3 + S'_{ihj}\beta_4 + \epsilon_{ihjt}$$

Where we follow the same definitions used in equation 1, and $elig$ is an indicator variable that takes a value of one for individuals who according to the proxy for the poverty index score are eligible for the Subsidized Regime. The variable of interest is δ. A positive δ will report the relative increase in informality, after the onset of the Census of the Poor interviews, among the eligible people for the Subsidized Regime relative to the ineligible. Results, using the indicator for *post* and *prop_inter* for the proportion of interviews, are reported in Tables 11 and 12. The tables show an increase in informality of approximately 5.7-9.3 percentage points. These findings are consistent with the increase reported in the previous section.

4.3.2 Alternative Estimation Using a Panel Dataset of Individuals

Using a panel dataset that we construct by matching individuals observed in the first and second Census of the Poor, we estimate the effect of the Subsidized Regime on the probability of being informally employed accounting for eligibility. We observe each individual twice. We assume that it takes people time to learn about the program and whether or not they are eligible for the Subsidized Regime. For the eligible population relative to the non-eligible, we estimate the probability of being informally employed in the second Census of the Poor, controlling for the informality rates observed in the first Census of the Poor. Specifically we estimate:

$$inf_{it} = \alpha + \gamma_i + \sigma_t + \rho post_t + \theta eligible\_post_{it} + \epsilon_{it} \tag{4}$$

Where γ_i captures the individual effects including the eligibility indicator equal to 1

for people with Poverty Index Scores below the threshold; σ_t are year indicators; *post* is an indicator for whether the survey is the first or the second; θ is the coefficient of interest which if positive implies that the probability of being informal increased for the eligible people. Because of concerns of manipulation of the Poverty Index Scores, and thus eligibility status, we split the sample in two periods: before 1998 where there is no evidence of manipulation and after 1998 where there is evidence of manipulation (see Camacho and Conover, 2009). In the pre 1998 period the rates of informal employment around the threshold are smooth functions using information for the old and new Census of the Poor, as seen in Figure 2. This is not the case for the period after 1998. In the post 1998 we see that the informality rates exhibits a small discontinuity using information from the second Census of the Poor, as seen in Figure 3. The corresponding regression results are reported in Table 13. They show that for the post 1998 period graph show that informality among the eligible population increased by 1.9 percentage points. The direction of the results is consistent with those estimated using the variation in implementation dates across municipalities.

5   Conclusion

In this paper we explore whether an expansion on non-contributory health insurance for the poor had unintended consequences on increasing informal employment. Using the onset of the Census of the Poor interviews in each municipality, we estimate that informal employment increased on average 3.8 percentage points.

Although we can not attribute all of this 3.8 percentage points increase in informal employment to the Subsidized Regime because for some municipalities implementation dates of the Subsidized Regime coincided with an increase in labor taxes; we can more precisely estimate the effect of the Subsidized Regime on informality by using the variation in the

proportion of interviews conducted within a municipality and over time. We use this variation because as more people had access to the Subsidized Regime, the relative value of the Contributory Regime declined, and thus we see more people opting for informal employment. We find that, with an average increase in the proportion of interviews conducted, informal employment increased between 1.9 and 3.2 percentage points. The sign of the coefficient suggests that some marginal individuals seem to have been optimizing when deciding whether or not to participate in the formal sector.

We corroborate these results by using alternative methodologies and data. We construct a panel dataset of individuals interviewed for the first and second Census of the Poor. Using this dataset, which account for variation in informality rates over time and among the eligible and non-eligible workers, we find that informality rates for the individuals interviewed after 1998 increased on average 1.9 percentage points. The results presented here imply that the broad expansion of public health insurance in Colombia contributed to increasing informal employment.

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Table 1: Summary Statistics for Demographic Variables, % unless noted

	Total (1)	Informal (2)	Formal (3)
Male	57.54	58.31	56.76
Age			
12 to 17	3.31	6.04	0.52
18 to 24	16.93	19.57	14.25
25 to 34	30.35	27.17	33.60
35 to 44	25.85	23.85	27.90
45 plus	23.55	23.37	23.74
Mean (years)	35.66	34.88	36.46
Education			
None	2.41	4.09	0.70
Some primary	11.35	17.54	5.04
Completed primary	17.08	23.05	10.99
Some secondary	23.74	28.88	18.50
Completed secondary	24.65	18.64	30.80
Some university	8.16	4.15	12.26
Completed university	12.59	3.67	21.71
Marital status			
Cohabitation	20.78	24.67	16.80
Married	32.91	25.71	40.26
Divorced / widow(er)	13.08	14.43	11.70
Single	33.24	35.19	31.25
Household size			
Mean (number of people)	4.80	5.05	4.55
Less or equal to 3	27.95	25.33	30.62
4 to 5	42.09	39.83	44.41
6 to 10	27.84	31.90	23.68
More than 10	2.12	2.94	1.29
Relation			
Household head	45.25	42.37	48.19
Spouse	15.54	15.28	15.80
Child	25.85	26.78	24.89
Other relative	9.09	10.27	7.90
Non-relative	4.27	5.30	3.22
Household composition			
Prop. kids < 5 in HH	9.47	10.19	8.73
Prop. kids < 2 in HH	4.51	4.87	4.14
Prop. kids < 1 in HH	2.93	3.13	2.72
Prop. elderly in HH	4.50	4.41	4.59
Observations (unweighted)	289,340	146,186	143,154
Observations (weighted)	56,854,686	25,751,162	31,103,524

Note: ENH-ECH Household Survey 1992-2004. Authors' calculations. See Section 3 for details.

Table 2: Summary Statistics for Labor Variables and Municipalities, %

	Total (1)	Informal (2)	Formal (3)
Municipality			
Medellín	12.43	9.58	15.33
Barranquilla	11.40	13.45	9.31
Bogotá	17.61	15.10	20.18
Manizales	7.78	6.79	8.79
Villavicencio	7.70	7.90	7.50
Pasto	9.23	11.53	6.88
Cúcuta	7.75	10.74	4.70
Pereira	6.85	6.23	7.47
Bucaramanga	6.59	6.69	6.48
Cali	12.67	12.00	13.36
Observations (unweighted)	289,340	146,186	143,154
Observations (weighted)	56,854,686	25,751,162	31,103,524
	mean		
Population 12-65 years	70.57		
Economically active population	64.61		
Employment	84.90		
Unemployment	15.10		
Observations (unweighted)	289,340		
Observations (weighted)	56,854,686		

Note: ENH-ECH Household Survey 1992-2004. Authors' calculations. Results are in % unless otherwise noted. See Section 3 for details.

Table 3: Average Informality Rate by Economic Sector

	Total sample (1)	Informal 1992 (2)	Informal pre (3)	Informal post (4)
Group 1- Informality rate 79-66				
Personal and household services	13.00	79.05	78.04	70.30
Other mining	0.06	71.85	75.62	58.43
Construction	5.58	69.47	69.54	68.85
Manuf. of wood products, furniture	1.21	66.50	68.91	64.60
Restaurants and hotels	4.44	66.27	65.13	64.79
Group 2- Informality rate 60-47				
Wholesale and retail trade	21.99	59.99	59.29	55.21
Transport and storage	6.13	57.56	56.09	45.41
Textile, apparel and leather industries	6.96	52.11	50.43	46.66
Recreational and cultural services	2.11	50.19	51.43	51.17
Metal ore mining	0.01	48.11	62.31	55.23
Agriculture and hunting	1.17	46.91	53.67	39.17
Group 3- Informality rate 43-35				
Manuf. of non-metallic mineral products	0.75	42.94	39.52	39.04
International and extra-territorial bodies	0.07	42.07	31.30	10.90
Manuf. of food, beverages and tobacco	3.53	40.00	39.99	38.49
Manuf. of metal, machinery and equipment	3.75	39.84	39.50	39.75
Real estate and business services	6.41	35.09	33.30	30.09
Basic metal industries	0.30	34.80	29.99	35.80
Group 4- Informality rate 33-16				
Manuf. of paper, printing and publishing	1.45	32.96	30.92	25.48
Fishing	0.03	30.84	28.36	58.05
Coal mining	0.07	29.34	22.10	17.35
Activities not adequately defined	0.07	26.10	32.26	22.60
Manuf. of chemicals, oil, coal and plastic	2.23	21.94	20.19	14.58
Forestry and logging	0.02	19.02	8.66	46.26
Social and related community services	10.29	18.38	19.31	14.76
Sanitary and similar services	0.19	16.20	20.20	21.66
Group 5- Informality rate 13-1				
Electricity, gas and steam	0.42	12.55	11.37	5.79
Insurance	0.69	9.11	11.98	7.95
Communication	1.13	6.86	11.28	22.95
Crude oil and natural gas production	0.18	6.57	12.75	5.10
Financial institutions	2.02	4.86	7.38	5.82
Water works and supply	0.16	2.86	10.86	8.55
Public administration and defense	3.57	1.08	5.10	3.74
Observations (unweighted)	289,340	26,590	62,875	226,465
Observations (weighted)	56,854,686	4,746,616	10,695,120	46,159,566

Note: ENH-ECH Household Survey 1992-2004. Authors' calculations.

Table 4: Characteristics on the Eve of Census of the Poor Interviews

Adopters:	Earlier	Later
Population	4,183,059	1,448,700
Labor variables		
Informal	50.63	50.26
Working age population	70.61	70.86
Active population	64.36	64.26
Employed	90.54	86.70
Group 1 (66-79 informality)	25.80	30.27
Group 2 (47-60 informality)	38.73	40.01
Group 3 (35-43 informality)	13.34	11.86
Group 4 (16-33 informality)	13.70	12.06
Group 5 (1-13 informality)	8.44	5.79
Demographic variables		
Proportion male	58.46	58.67
No education	2.02	2.17
Some primary	10.14	13.97
Completed primary	18.01	19.31
Some secondary	27.36	27.99
Completed secondary	21.65	19.50
Some college	8.35	7.39
Completed College	12.47	9.67
Age	33.84	34.18

Note: ENH-ECH Household Survey 1992. Authors' calculations. Using data from 1992, prior to the onset of the Census of the Poor interviews.

Table 5: Changes in Informality after the Onset of Census of the Poor Interviews

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
Post	0.040*	0.042**	0.039*	0.037*	0.034*
	[0.020]	[0.020]	[0.021]	[0.020]	[0.020]
Observations	289,340	289,340	287,818	287,818	287,818
Pseudo R-squared	0.025	0.025	0.173	0.180	0.238
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
Sector controls					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion of children in the household, proportion of elderly, proportion of potential beneficiaries to the Subsidized Regime, proportion employed, average education, and average age. Employment sector controls correspond to the economic sectors as defined in Table 3.

Table 6: Changes in Informality Using the Proportion of Census of the Poor Interviews

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
Prop. Interviews	0.020	0.032	0.032**	0.028*	0.019
	[0.015]	[0.020]	[0.015]	[0.015]	[0.017]
Observations	289,340	289,340	287,818	287,818	287,818
Pseudo R-squared	0.025	0.025	0.173	0.180	0.238
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
Sector control(s)					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion of children in the household, proportion of elderly, proportion of potential beneficiaries to the Subsidized Regime, proportion employed, average education, and average age. Employment sector controls correspond to the economic sectors as defined in Table 3.

Table 7: Informality After the Onset of Interviews by Proportion of Vulnerable Members in the Household

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
No vulnerable members	0.037	0.044**	0.045*	0.044*	0.049*
	[0.023]	[0.022]	[0.023]	[0.022]	[0.026]
Observations	203,059	203,059	202,050	202,050	185,658
Pseudo R-squared	0.025	0.025	0.172	0.177	0.245
≤ median vulnerable	0.046*	0.042**	0.028	0.025	0.035
	[0.024]	[0.019]	[0.025]	[0.023]	[0.024]
Observations	46,138	46,138	45,859	45,859	42,016
Pseudo R-squared	0.024	0.024	0.167	0.178	0.244
> median vulnerable	0.049	0.041	0.021	0.014	0.005
	[0.031]	[0.031]	[0.033]	[0.033]	[0.028]
Observations	40,143	40,143	39,909	39,909	37,281
Pseudo R-squared	0.027	0.027	0.183	0.190	0.251
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
SES controls					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion employed, average education and average age. SES controls include controls for geographic socio-economics status.

Table 8: Informality Using Proportion of Interviews by Proportion of Vulnerable Members in the Household

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
No vulnerable members	0.028*	0.037*	0.042***	0.039***	0.033**
	[0.017]	[0.021]	[0.015]	[0.014]	[0.014]
Observations	203,059	203,059	202,050	202,050	185,658
Pseudo R-squared	0.024	0.025	0.172	0.177	0.245
≤ median vulnerable	0.014	0.042	0.035	0.029	0.007
	[0.034]	[0.037]	[0.028]	[0.027]	[0.024]
Observations	46,138	46,138	45,859	45,859	42,016
Pseudo R-squared	0.024	0.024	0.167	0.178	0.244
> median vulnerable	-0.008	0.011	-0.013	-0.018	-0.013
	[0.007]	[0.013]	[0.015]	[0.016]	[0.014]
Observations	40,143	40,143	39,909	39,909	37,281
Pseudo R-squared	0.027	0.027	0.183	0.190	0.251
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
SES controls					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion employed, average education and average age. SES controls include controls for geographic socio-economics status.

Table 9: Informality After the Onset of Interviews by Proportion of Potential Beneficiaries in the Household

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
No potential beneficiaries	0.029	0.038**	0.036*	0.034*	0.034
	[0.020]	[0.017]	[0.020]	[0.019]	[0.023]
Observations	174,727	174,727	174,009	174,009	159,884
Pseudo R-squared	0.027	0.027	0.179	0.185	0.251
≤ median potential beneficiaries	0.050*	0.053*	0.047	0.045	0.053*
	[0.028]	[0.029]	[0.032]	[0.031]	[0.031]
Observations	57,628	57,628	57,227	57,227	53,221
Pseudo R-squared	0.024	0.024	0.168	0.177	0.244
> median potential beneficiaries	0.057***	0.052**	0.044*	0.043**	0.054**
	[0.020]	[0.023]	[0.023]	[0.022]	[0.023]
Observations	56,985	56,985	56,582	56,582	51,850
Pseudo R-squared	0.023	0.023	0.157	0.163	0.232
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
SES controls					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion employed, average education and average age. SES controls include controls for geographic socio-economics status.

Table 10: Informality Using Proportion of Interviews by Proportion of Potential Beneficiaries in the Household

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
No potential beneficiaries	0.025	0.023	0.027**	0.024*	0.015
	[0.017]	[0.019]	[0.014]	[0.014]	[0.014]
Observations	174,727	174,727	174,009	174,009	159,884
Pseudo R-squared	0.027	0.027	0.179	0.185	0.251
≤ median potential beneficiaries	0.026**	0.042***	0.051***	0.050***	0.049***
	[0.011]	[0.013]	[0.009]	[0.007]	[0.011]
Observations	57,628	57,628	57,227	57,227	53,221
Pseudo R-squared	0.024	0.024	0.168	0.177	0.244
> median potential beneficiaries	0.016	0.049	0.029	0.022	0.018
	[0.030]	[0.040]	[0.032]	[0.031]	[0.027]
Observations	56,985	56,985	56,582	56,582	51,850
Pseudo R-squared	0.023	0.023	0.157	0.163	0.231
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
SES controls					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion employed, average education and average age. SES controls include controls for geographic socio-economics status.

Table 11: Informality After the Onset of Interviews by Eligibility

Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
Post	0.067**	0.019	0.027	0.025	0.024
	[0.027]	[0.019]	[0.020]	[0.021]	[0.022]
Eligible	0.436+	0.447+	0.386+	0.393+	0.375+
	[0.005]	[0.007]	[0.011]	[0.015]	[0.014]
Post*Eligible	0.072+	0.062+	0.046**	0.049**	0.053**
	[0.016]	[0.021]	[0.020]	[0.020]	[0.022]
Observations	177,935	177,935	176,800	176,800	176,800
Pseudo R-squared	0.165	0.166	0.218	0.222	0.281
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
Sector control(s)					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Results only use information for strata levels less than 4, to make it comparable to the interviews targeted by the Census of the Poor. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion of children in the household, proportion of elderly, proportion of potential beneficiaries to the Subsidized Regime, proportion employed, average education, and average age. Employment sector controls correspond to the economic sectors as defined in Table 3.

Table 12: Informality Using Proportion of Interviews by Eligibility

| Dependent variable:	Informal employment				
	(1)	(2)	(3)	(4)	(5)
Proportion of interviews	0.005	0.052**	0.047**	0.047**	0.034*
	[0.019]	[0.021]	[0.020]	[0.020]	[0.020]
Eligible	0.443+	0.454+	0.394+	0.402+	0.383+
	[0.010]	[0.008]	[0.008]	[0.011]	[0.010]
Proportion of interviews*Eligible	0.093+	0.077+	0.054+	0.057+	0.065+
	[0.016]	[0.018]	[0.020]	[0.019]	[0.021]
Observations	177,935	177,935	176,800	176,800	176,800
Pseudo R-squared	0.165	0.166	0.219	0.222	0.282
Municipality effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Labor controls		Yes	Yes	Yes	Yes
Individual controls			Yes	Yes	Yes
Household controls				Yes	Yes
Sector control(s)					Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the municipal level. Results only use information for strata levels less than 4, to make it comparable to the interviews targeted by the Census of the Poor. Labor controls include: population, working age population, economically active population, employment and state level GDP. Individual controls include: age group, schooling, marital status, sex, relation to the household head and whether or not working in activities which are likely to be seasonal. Household controls include: proportion of children in the household, proportion of elderly, proportion of potential beneficiaries to the Subsidized Regime, proportion employed, average education, and average age. Employment sector controls correspond to the economic sectors as defined in Table 3.

Table 13: Informality Using a Panel Dataset of Individuals Interviewed after 1998

| Dependent variable:	Informal Employment		
	(1)	(2)	(3)
Eligible x post	0.018***	0.019***	0.019***
	[0.003]	[0.002]	[0.003]
Observations	909,720	761,770	599,628
R-squared	0.03	0.03	0.03
Distance to the threshold	5	4	3
Individual effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; + significant at 1%. Results are clustered at the score level.

Figure 1: Informality before and after the Implementation of the Census of the Poor
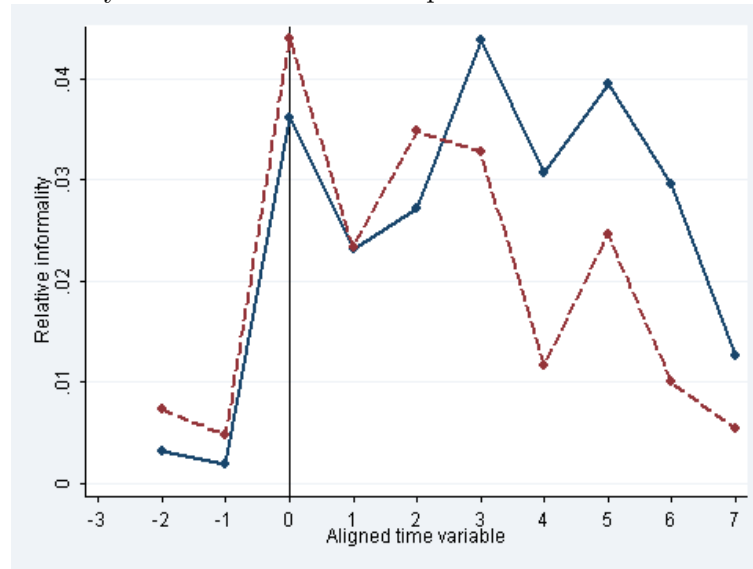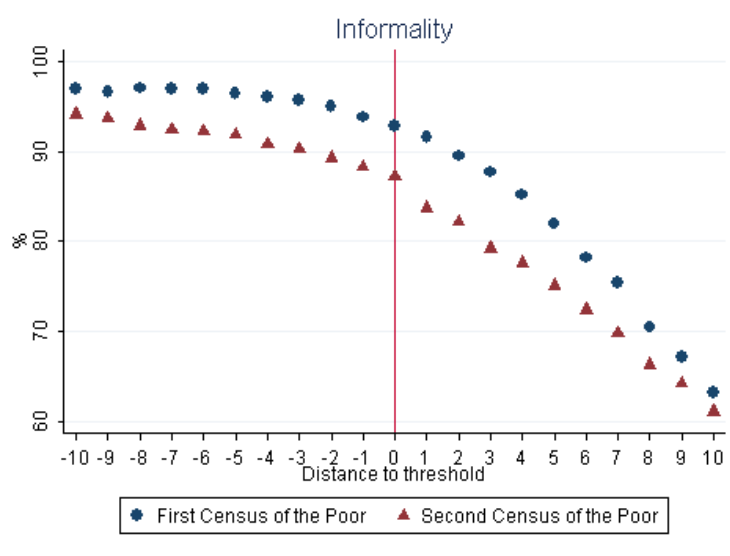

Note: Solid blue line results from a regression which includes year controls. Dash red line results from a regression which includes year, municipality, individual and household controls.

Figure 2: Informality Using a Panel Dataset of Individuals Interviewed before 1998
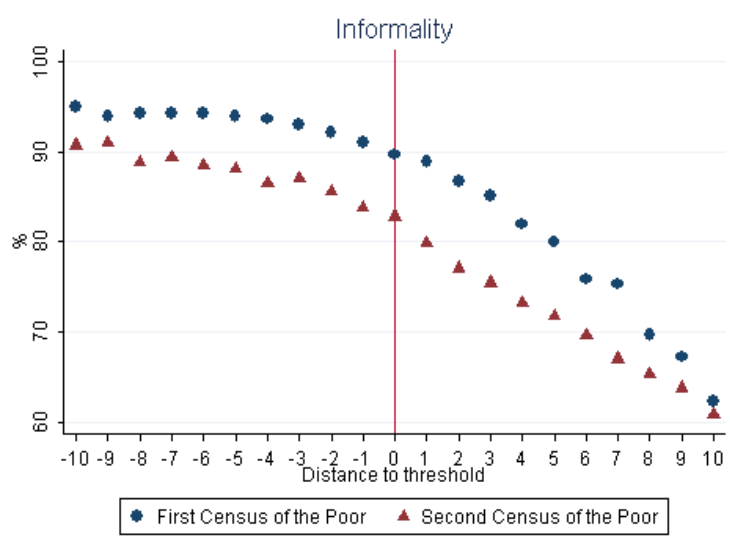
Note: Blue dots indicate informality rates using information from the first Census of the Poor. Red triangles indicate informality rates using information from the second Census of the Poor.

Figure 3: Informality Using a Panel Dataset of Individuals Interviewed after 1998

Note: Blue dots indicate informality rates using information from the first Census of the Poor. Red triangles indicate informality rates using information from the second Census of the Poor.