Minimum Eligibility Age for Social Pensions and Household Poverty: Evidence from Mexico*

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May 22, 2023

Abstract

This paper examines the impact of social pensions on old-age poverty. To achieve causal identification, we leverage the reduction in the minimum eligibility age of Mexico's flagship non-means-tested social pension program. We find that the program's expansion significantly reduced extreme poverty, mainly among indigenous seniors and in rural areas. However, it had negligible effects on labor force participation, suggesting that social pensions were not effective in ensuring minimum economic well-being and simultaneously inducing retirement among seniors at early stages of old age. The program's small cash transfer and mistargeting are among the main explanations.

Keywords: Non-contributory pensions, poverty, elderly
JEL Classification: H55, I38, J14

*We thank two anonymous referees for their detailed comments that greatly improved this article. We also thank Aimee Chin, Margaret Grosh, Carolina Romero, Chinhui Juhn, Concha Steta, Francesca Lamanna, Gonzalo Reyes, Ignacio Apella, Pablo Gottret, Rafael Rofman, William Wiseman, and León Fernández for their insightful comments. We benefited from presenting at the World Bank, Banco de México, University of Houston, Universidad Autónoma Chapingo, and Southern Economic Association 91st Annual Meeting. The findings, interpretations, and conclusions expressed in this paper do not necessarily reflect the views of the World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work. Part of this paper was previously circulated under the title "What are the effects of expanding a social pension program on extreme poverty and labor supply? Evidence from Mexico's pension program for the elderly."

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Introduction

In 2019, unprecedented, anti-government, mass protests erupted in Latin America. Although each mobilization was sparked by different factors, all shared a common thread: long-standing inequality and socioeconomic immobility. From Chile and Ecuador to Colombia, young protesters had specific demands, but one stood out across countries: an overhaul of the pension system and better social protection for the elderly (Reid, 2019; Gonzalez and Morán, 2020; Shifter, 2020). The demand for better pensions by people far from retirement age confirms the ineffectiveness of the region's contributory pension systems, which have increasingly left seniors in precarious living conditions. These demonstrations motivated debates about what policies could achieve a more socially just region. Among the main suggested instruments was the expansion of social (non-contributory) pension programs.

The accelerated pace of population aging, rising life expectancy, and high poverty rates among the elderly also support the view of expanding social pensions, especially in countries with limited social security coverage (Barrientos, 2006). The conventional view is that non-contributory pension schemes can influence retirement and reduce labor supply among the elderly, with effects varying by gender (Juarez and Pfutze, 2015; Posel, Fairburn and Lund, 2006).[1] Previous literature shows that such schemes can also have a positive impact on consumption (Case and Deaton, 1998), food security (Aguila, Kapteyn and Perez-Arce, 2017; Juarez and Pfutze, 2020), health (Bando, Galiani and Gertler, 2016; Huang and Zhang, 2021), and subjective well-being (Bando, Galiani and Gertler, 2020). In addition, several studies find that social pensions may affect human capital investments, health outcomes, and labor supply patterns of other household members, including prime-age adults (Ardington, Case and Hosegood, 2009; Bertrand, Mullainathan and Miller, 2003), adolescents (Edmonds, 2006; Juarez and Pfutze, 2015), and children (Duflo, 2003). This evidence, however, pertains to social pension programs implemented for the first time and mostly targeting elderly over 70 years old.[2] Therefore, we know little about the effectiveness of expanding existing programs to previously uncovered age cohorts.[3]

In this paper, we examine the expansion of Mexico's non-contributory pension program: *Programa de Adultos Mayores* (PAM). This program is one of the main social protection instruments in the country,

[1] Reductions in labor supply usually refer to paid work (formal employment). Bando, Galiani and Gertler (2016) find that beneficiaries reduced their participation in paid work in favor of unpaid work within the household or family businesses.
[2] See Leisering (2009) and Dethier, Pestieau and Ali (2010) for surveys on non-contributory pension programs in developing countries and in Latin America, respectively.
[3] To our knowledge, De Carvalho Filho (2008) and Pak (2021) are the only studies examining the expansion of social pensions in Brazil and South Korea, respectively.

with a budget of 104 billion pesos, about 0.56% of Mexico's GDP, and 9.7 million beneficiaries in 2021 (CONEVAL, 2022). From the beginning of the program in 2007 until 2012, the minimum eligibility age was 70 years and beneficiaries received a monthly cash transfer of 500 Mexican pesos (40 US dollars) aiming to improve the living conditions of the elderly, prevent old-age poverty, and close the coverage gap of the pension system (SEDESOL, 2011).[4] In 2013, the program's minimum eligibility age was reduced to 65 years (SEDESOL, 2013*a*). We exploit this change in the eligibility rules to estimate the impact of expanding social pensions on a set of outcomes capturing the well-being of the elderly: (extreme) poverty, labor force participation, and labor supply. A priori, the effects of the expansion are unclear for two main reasons. First, in contrast to means-tested social pension programs that have an immediate impact on poverty (see, for example, Case and Deaton, 1998; Pal and Palacios, 2011; Bando, Galiani and Gertler, 2021), PAM does not use any mechanisms to target the poor. Hence, the program's cash transfer may have not been enough to lift the elderly out of poverty and/or the program may have benefited individuals who were already above the poverty threshold (Aguila, Kapteyn and Tassot, 2017; Acosta, Leite and Rigolini, 2014; Pal and Palacios, 2011). Second, retirement behavior is primarily influenced by earning ability and illness risk, which vary throughout old age (Diamond and Mirrlees, 1978; Dwyer and Mitchell, 1999; Mitchell and Fields, 1984). This implies that the retirement response to income shocks is likely to differ between seniors at early stages of old age and those in advanced stages (Kolsrud et al., 2021).

To identify the effect of the program's expansion, we use the 2008-2014 rounds of Mexico's National Household Income and Expenditure Survey (ENIGH) and implement a difference-in-differences (DD) strategy. Our treatment group consists of individuals aged 66-69, who became eligible for the program and did not receive a contributory pension. Individuals aged 61-64, who were not affected by the policy change, are our comparison group. We find that the expansion of PAM reduced the probability of living in *extreme* poverty by 5 percentage points but had no effect on poverty. Our analysis provides suggestive evidence that the impact on poverty reduction would have been negligible even with a 100% take-up. This is particularly worrisome as the poverty line that we use captures the cost of basic goods (personal hygiene and clothing) and services (transportation) that besides the basic food basket, captured by the extreme poverty line, are necessary for the well-being of the elderly population (Hernandez Licona, 2016). We also find that the program had no effect on labor force participation or labor supply among new eligible seniors, which contrasts with previous research studying individuals aged 70 years and older in Mexico (Bando, Galiani and Gertler, 2016; Juarez and Pfutze, 2015). Together these findings suggest

[4]We use the average monthly exchange rate in 2013: 12.5 MXN per 1 USD.

that the expansion was unable to guarantee a good life quality and simultaneously induce retirement. Our results are robust to using control and treatment groups closer to the minimum eligibility age and to using an alternative control group. We also provide suggestive evidence on the absence of preexisting differences between treatment and control groups in the trend of outcome variables; and we do not find evidence of anticipation effects associated with the program's expansion when examining the labor supply of non-eligible seniors aged 63-64 years.

The effects of the expansion varied substantially across population groups (men, women, and indigenous people) and contexts (rural and urban). The results show that the effect on extreme poverty was substantially larger for indigenous than for non-indigenous: 20 v. 3 percentage points reduction, respectively. This is a reassuring finding, as in Mexico the percentage of indigenous people living in poverty nearly doubles that of non-indigenous. The effect of the expansion also varied across contexts. It reduced extreme poverty in rural areas but had no impact in cities or suburbs. In these urban contexts, the poor population tends to live in informal settlements (slums) or marginal lands (steep hillsides): areas that are hard to reach for promoting enrollment in social programs (Marx, Stoker and Suri, 2013). We provide evidence that the program's take-up was particularly low in both cities and suburbs, suggesting that the expansion may have been mistargeted due to imperfect information (Daponte, Sanders and Taylor, 1999; Heckman and Smith, 2004; Kleven and Kopczuk, 2011; Lain and Julia, 2022). Although we do not find an effect on labor force participation and hours worked, our analysis shows that the expansion induced the substitution of subordinate work for self-employment. This effect, however, was not accompanied by a reduction in the number of hours worked, implying that the expansion of PAM only affected the composition of labor supply, with eligible-for-treatment women and indigenous moving to less stressful and less demanding jobs.[5] Similar results have been previously documented for rural Mexico (Bando, Galiani and Gertler, 2016) and Peru (Bando, Galiani and Gertler, 2020).

An interesting feature of our data source is that we can observe PAM beneficiaries, which allows us estimate the average treatment effect on the treated. However, the program was not randomly assigned, as the Mexican government selected localities with high poverty rates to promote enrollment in the program. We overcome this selection problem by implementing an instrumental variables (IV) strategy, where we instrument the endogenous variable—be a PAM beneficiary—with the exogenous variation in eligibility age produced by the intervention. The results are in line with our DD estimates. Among

[5] Self-employment among the elderly usually takes place in family businesses or family farms that may demand the participation of the beneficiary particularly during early stages of old age.

treated individuals, the expansion of PAM was only successful in reducing the probability of living in *extreme* poverty. This effect was larger for the most vulnerable, with indigenous people and individuals living in rural communities experiencing a 39 and 19 percentage point reduction, respectively.

This paper extends our understanding on social pensions in two main aspects. First, we provide causal evidence on the effect of social pensions on old-age poverty when no mechanisms are used to target the poor. Our findings show that social pensions reduced the share of seniors with income below the value of the basic food basket, but had no effect when the value of other necessary non-food goods and services is considered. This is mainly explained by the program's small cash transfer and mistargeting, elements that usually characterize social pension programs in developing countries, as governments face significant budgetary constraints. Second, our study focuses on seniors aged 65 to 69 years, whose retirement responses to income shocks are likely to differ from that of seniors aged 70 and over—the population group that has been primarily studied by previous literature. Our results show no significant effects on retirement or labor supply, suggesting that social pensions may not be effective in inducing retirement among seniors with relatively high earning ability and low illness risk. However, social pensions may influence the substitution of subordinate work for self-employment even if the cash transfer is small.

This research also contributes to the literature addressing the impact of social pensions in Mexico, which to the best of our knowledge focuses mainly on rural areas (see, for example, Aguila, Kapteyn and Perez-Arce, 2017; Amuedo-Dorantes, Juarez and Alonso, 2019; Bando, Galiani and Gertler, 2016; Juarez, 2010; Juarez and Pfutze, 2015, 2020). We present evidence on the effects of social pensions in urban contexts, where the dynamics of poverty and labor supply are likely to differ from those in rural areas (Amato and Zuo, 1992; Ravallion, 2002). Finally, our study builds on the recent work of Aguila and Smith (2020), Aguila, Park and Vega (2020), and Juarez and Rodriguez Piña (2021) by analyzing a nationally representative sample of indigenous seniors, who are arguably among the most vulnerable population in Mexico and whose decisions on labor supply and retirement may be influenced by cultural and social norms (Blanco et al., 2017; Lopez-Calva and Patrinos, 2015).

1. Background

In the last century, pension systems worldwide were mainly contributory plans with a minimum eligibility requirement of hours or weeks worked. In many countries, these pension schemes left out people that did not work or did not work "enough" in formal jobs. The financial sustainability of such systems also

became questionable in the 1980s and 1990s due to demographic changes: accelerated population aging and rising life expectancy (Holzmann, 2013). While governments undertook wide-ranging reforms to improve contributory pension schemes, issues such as pension coverage were often left out of discussion (Aguila, 2011; Rofman, Apella and Vezza, 2015). In Mexico, for example, only 35% of the economically active population contributed to a pension scheme and about 37% of the population older than 65 years received a contributory pension in 2010 (Villagómez and Ramírez, 2015).[6] Another issue of contributory schemes is that their coverage tends to be biased toward the high-income population, accentuating poverty among the elderly.[7] To deal with these limitations, policymakers promoted the implementation of non-contributory (social) pension schemes.[8] In addition to reducing the coverage gap, social pensions became a popular instrument to tackle poverty in old-age; provide social protection to a population group facing higher vulnerability to sickness and disability; and guarantee retirement with an adequate pension (Holzmann and Robalino, 2009).

1.1 The Program

In 2007, Mexico's Ministry of Social Development introduced a non-contributory pension program called *Programa de Adultos Mayores* (PAM) targeting adults of 70 years of age or older who lived in rural villages—localities with less than 2,500 inhabitants.[9] PAM provided a cash transfer of 1,000 Mexican pesos (80 US dollars) every two months, aiming to close the coverage gap of the pension system, improve the living conditions of the elderly, and prevent old-age poverty (SEDESOL, 2007*b*). The program executed 6 billion pesos—about 0.05% of GDP—in its first year of operation and had 1.03 million beneficiaries. Since then, PAM has been growing in terms of budget and number of beneficiaries, becoming the flagship program of Mexico's social protection policy. In 2008, changes were made to indicate that while priority was still given to rural villages, the program could extend its coverage to other villages of up to 10,000 inhabitants and, if budget allowed, the program could expand to villages of up to 20,000 inhabitants prioritizing poor villages (SEDESOL, 2007*a*). In 2009, the program expanded its coverage to villages of up to 30,000 inhabitants, and in 2012 the roll-out of the program expanded to all villages (see Amuedo-Dorantes, Juarez and Alonso, 2019, Table A2). From 2007 to 2012, the benefit

[6] The coverage of the Mexican contributory pension system is lower than in countries such as Argentina, Brazil, and Chile.
[7] Since contributory schemes are based on formal work history, they tend to exclude the poor who usually work in informal jobs during their lifetime.
[8] While social pensions have existed for decades, it was not until the beginning of the twenty-first century that they gained momentum.
[9] The program was also known as *70 y Más.*

level of PAM was maintained at 500 Mexican pesos per month: about 50% of beneficiaries' monthly per capita income (see Table A.1).[10]

1.2 The Expansion of PAM

On December 1, 2012, Enrique Peña Nieto took office as President of Mexico and announced that he would expand PAM. Three months later, in February 2013, the minimum eligibility age for PAM was reduced to 65 years, and the program's cash transfer was increased to 580 Mexican pesos per month (SEDESOL, 2013*a*). Two factors facilitated the relatively rapid expansion of the program. First, the new eligibility criteria was relatively easy to verify. Second, the existing operating capacity of PAM covered all 32 states of Mexico. According to the program's beneficiary records there were more than 1.5 million PAM beneficiaries aged 65 to 69 years by the end of 2014 (see Figure A.1). The rapid implementation of the expansion is relevant to our analysis, as it allows us to assume that systemic drivers affecting the economic well-being and labor supply of the elderly population did not change during the expansion. The short period of time between the announcement and the formalization of the expansion also minimizes the likelihood of capturing potential income or labor supply adjustments in anticipation of the program's expansion.[11] However, as part of our analysis, we will provide evidence supporting the absence of anticipation effects.

2. Data

The data for our empirical analysis come from the Socioeconomic Conditions Module (MCS) of Mexico's National Household Income and Expenditure Survey (ENIGH). In particular, we use the 2008, 2010, 2012, and 2014 rounds to construct a pooled cross-section data set. The survey collects rich socioeconomic data for a sample of households representative at the national, state, and urban-rural level. It reports detailed information on income sources for each household member, including contributory pensions or retirement payments, and cash transfers from PAM and other non-contributory pension programs. This allows us to identify the elderly who received any kind of contributory pensions and exclude them from

[10] In 2010, the program added a lump-sum payment of 1,000 Mexican pesos to be paid to a representative of the beneficiary in the case of death (SEDESOL, 2009).

[11] We acknowledge that the expansion of PAM was part of Peña Nieto's presidential campaign and thus some seniors could have anticipated the expansion of the program. However, the campaign proposal did not mention any specifics about when the expansion would take place or which would be the eligibility criteria.

the analysis.[12] We also exclude individuals who did not receive a contributory pension but had direct access to social security, which would entail receiving a pension in the near future.[13]

2.1 Outcome Variables

Our analysis focuses on four outcomes that capture the quality of life of the elderly: incidence of (extreme) poverty, labor force participation, and labor supply. We use per capita household income and Mexico's official monetary poverty lines to identify the elderly living in (extreme) poverty (CONEVAL, 2014*b*). Per capita household income—hereinafter referred to as income—is the total monetary (wages, income from independent work, and nonworking income such as dividends, rents, or money transfers) and non-monetary (the value of gifts, payments, and transfers in kind) monthly income of the household divided by the number of adult-equivalent household members. The extreme poverty line is the monetary value of the basic food basket, which represents the minimum recommended nutritional intake for the average Mexican. The poverty line is the sum of the monetary value of the basic food and non-food baskets. The non-food basket comprises basic necessary goods and services such as personal hygiene items, clothing, and transportation. Note that the value of each basket is estimated for urban and rural areas to consider differences in social contexts (Hernandez Licona, 2016).[14] We use these thresholds to construct the variables poverty (1 = the individual has an income below the poverty line, 0 = otherwise) and extreme poverty (1 = the individual has an income below the extreme poverty line, 0 = otherwise).

Regarding the labor market outcomes, we use an indicator for labor force participation equal to one if the individual is employed or unemployed but actively seeking for a job, and zero otherwise. We construct this variable based on answers to the questions, "Did you work last month?" (1 = yes, 0 = no) and "Did you search for a job last month?" (1 = yes, 0 = no). We measure labor supply as the number of hours worked by the individual in the week prior to the interview. This variable takes the value of zero for unemployed or retired individuals. As part of the analysis, we also examine the labor supply composition: subordinate work (1 = the individual is employed and has a boss or supervisor, 0 = otherwise) or self-employment (1 = the individual is self-employed, 0 = otherwise).[15] We construct these variables based on answers

[12] Note that in 2014 seniors aged 65 and over who received a contributory pension of less than 1,092 pesos became eligible for PAM (SEDESOL, 2013*b*). Hence, excluding all seniors receiving a contributory pension from the analysis allows us to identify the effects of the 2013 expansion.

[13] We identify individuals with direct access to social security as those with access to a public or private pension fund through their employment. We identify these individuals based on answers to the question, "Do you have access to a SAR (Retirement Savings System), AFORE (Retirement Funds Management Agency) or other pension fund?"

[14] Table A.2 presents the value of the poverty lines from 2008 to 2014.

[15] The subordinate work and self-employment categories are mutually exclusive.

to the questions, "Did you have a boss or supervisor in your work?" and "Did you work in your own business or venture?"

2.2 Control Variables

To improve the precision of our estimates, we use a set of control variables, including sex, years of formal education, indigenous status (1 = the individual speaks an indigenous language, 0 = otherwise), and cohabitation status (1 = the individual lives in a household with one or more PAM beneficiaries, 0 = otherwise). This set also includes indicators for locality size of residence (up to 2,499 inhabitants; 2,500 to 14,999 inhabitants; 15,000 to 99,999 inhabitants; and over 100,000 inhabitants) and state of residence. The former controls for unobserved labor market characteristics specific to each locality size, while the latter accounts for unobserved state-specific factors that may influence the well-being of the elderly such as differences in the access to state-level non-contributory pension programs. See Amuedo-Dorantes, Juarez and Alonso (2019, Table A1) and Aguila et al. (2011, Table A1) for a review on the existing social pension programs implemented by state governments.

2.3 Descriptive Statistics

In Figure 1 we plot the pensions coverage gap in Mexico. It is clear that PAM helped to close the pension coverage gap from 2008 to 2014, but did it most notably in the lower income deciles. Despite the significant progress, the coverage gap at the bottom of the income distribution was still substantial in 2014. Even in top-income deciles the coverage remained under 70%. Although some state governments have implemented their own social pension programs to secure the well-being of their elderly population, many of these programs are very limited in terms of the number of beneficiaries and size of cash transfer. Perhaps the only exceptions are the programs in Mexico City and the state of Chiapas (Aguila et al., 2011; Amuedo-Dorantes, Juarez and Alonso, 2019).

In Table 1 we compare the socioeconomic profile of the control and treatment groups before and after the expansion of PAM. The treatment group consists of individuals aged 66-69 years, who became eligible for the program as a result of the expansion. The comparison group consists of non-eligible individuals aged 61-64 years, whose observed pre-intervention characteristics are very similar to those of the treatment group. Note that we exclude individuals aged 65 years from the analysis, as they represent a potential source of bias. This age group may not have had enough exposure to eligibility for treatment for two reasons. First, since the ENIGH is collected from August to November, individuals turning 65

just before or during this period may not have had enough time to enroll in the program or for their application to be processed. Second, PAM's cash transfer is paid every two months, implying that some of these individuals could have received the benefit after being surveyed.

Panel A shows that per capita income of both groups increased from 2012 to 2014, but it increased more for eligible-for-treatment individuals. The difference-in-differences estimate shows that despite having a lower per capita income in 2012, the treatment group had an income 10 percent higher than that of the control group after the intervention. The treatment group also had a smaller proportion of individuals living in extreme poverty after the intervention: four percentage points less than the control group. However, we find no statistically significant differences in any other outcome variable. These preliminary results suggest that becoming eligible for PAM represented a significant income shock but its impact was limited to the poorest population.

In Panel B we present difference-in-differences estimates for our control variables, which could have influenced changes in the well-being of the elderly. We find no statistically significant differences across groups in terms of years of education, proportion of indigenous people, or proportion of households with PAM beneficiaries (cohabitation).[16] We find, however, a five percentage points increase in the proportion of females and a four percentage points increase in the proportion of individuals living in mid-size urban areas (15,000 to 99,999 inhabitants). Overall, the descriptive statistics suggest that both groups are comparable, as they present very similar observable characteristics.

3. Identification Strategy

Our identification strategy consists of difference-in-differences (DD) and instrumental variables (IV) designs that estimate, respectively, the intention-to-treat (ITT) and local-average-treatment (LATE) effects associated with the program's expansion.

3.1 Difference-in-Differences

To evaluate the effect of becoming eligible for the program, we use a DD design that exploits the reduction in PAM's minimum eligibility age. This policy change allows us to estimate differences in outcomes between the treatment and control groups. Note that the treatment group includes individuals who were not necessarily beneficiaries and thus this approach estimates the ITT effect of the program's expansion.

[16] Table A.3 shows that the socioeconomic profile of the control and treatment groups are very similar if households with other PAM beneficiaries (cohabitation) are excluded from the analysis.

Our DD estimating equation is as follows:

$$y_{iat} = \alpha + \beta\,(treatment_a \times after_t) + \delta\, after_t + \gamma_a + \boldsymbol{X_{iat}}\boldsymbol{\lambda} + \varepsilon_{iat}. \tag{1}$$

Where y_{iat} is the outcome for individual i; $treatment_a$ is a dummy variable indicating whether the individual belongs to the treatment group; $after_t$ is a dummy variable indicating whether the individual is observed after the intervention; γ_a is a full set of age fixed effects that control for any time-invariant, age-specific characteristics; and $\boldsymbol{X_{iat}}$ is a vector of control variables defined previously (sex, education, indigenous status, cohabitation status, locality size of residence, and state of residence). The coefficient of interest, β, is the difference-in-differences estimator that captures the effect of the intervention for individuals in the eligible-for-treatment group.

Following Abadie et al. (2022), we cluster standard errors at the municipality level in all specifications. The authors provide recommendations on when and a what level standard errors should be clustered, with the correct level of clustering depending on the treatment assignment mechanism and the sampling process only. When clusters of units are assigned to treatment in a random sample, standard errors should be clustered at the level of the assignment (Abadie et al., 2022, p. 33). However, when the data used were sampled from a population following a clustered sampling process, standard errors should be clustered at the level at which the sample was first selected. Our study lies in the latter case, as the ENIGH is characterized by a multi-stage cluster sampling, where a set of primary sampling units (PSUs) are first randomly selected, and then a number of households are randomly selected from each PSU. According to Mexico's National Institute of Statistics and Geography (INEGI), the PSUs can be best described as municipalities, particularly in rural areas. Abadie et al. (2022, p. 32) also show that in settings where the cluster sampling probability is small, as in the ENIGH, the clustered variance estimator of the least-squares estimator is asymptotically correct regardless of whether the treatment assignment is clustered or not.

The identifying assumption in our specification is that in the absence of the program's expansion, differences in outcomes between the comparison and treatment groups should be constant over time. We provide suggestive evidence on the validity of this assumption by estimating the following (event study) equation:

$$y_{iat} = \alpha + \sum_t \beta_t I_{(treatment_{at}=t)} + \gamma_a + \tau_t + \boldsymbol{X_{iat}}\boldsymbol{\lambda} + \varepsilon_{iat}. \tag{2}$$

Where $I_{(treatment_{at}=t)}$ is an indicator function with $t = \{2008, 2010, 2014\}$, and τ_t is a full set of time fixed effects. The coefficient β_t can be interpreted as the difference in outcomes between the treatment and comparison group relative to the difference in outcomes in the omitted year, 2012. In this sense, non-statistically significant β_t coefficients for the pre-intervention period, $t = \{2008, 2010\}$, would provide evidence supporting the parallel trend assumption.

3.2 Instrumental Variables Strategy

One feature of our data source is that it identifies the program's beneficiaries, allowing us to gauge the effect of receiving a social pension. We could estimate the effect of PAM on the treated population as follows:

$$y_{iat} = \phi_0 + \phi_1 PAM_{iat} + \phi_2 after_t + \gamma_a + \boldsymbol{X_{iat}}\boldsymbol{\psi} + v_{iat}. \tag{3}$$

Where PAM_{iat} is a dummy variable indicating whether the individual is a beneficiary of PAM. However, as part of the program's expansion, the Mexican government promoted and prioritized enrollment in localities with high poverty and high social rights deprivation rates (SEDESOL, 2013*a*). This indirect targeting strategy raises concerns about the potential endogeneity of the program's enrollment. To account for this issue, we use the interaction between the individual's eligibility status and the timing of the policy intervention $(treatment_a \times after_t)$ as an instrument for the condition of being beneficiary of the program (PAM_{iat}). Although the exclusion restriction cannot be tested empirically, we argue that the instrument does not directly affect poverty other than through PAM because the individuals' eligibility to the program is not directly related to their well-being outcomes. The first-stage (Equation 4) and second-stage (Equation 5) regression equations of our IV strategy are the following:

$$PAM_{iat} = \pi_0 + \pi_1 (treatment_a \times after_t) + \pi_2 after_t + \gamma_a + \boldsymbol{X_{iat}}\boldsymbol{\omega} + u_{iat} \tag{4}$$

$$y_{iat} = \psi_0 + \psi_1 \widehat{PAM}_{iat} + \psi_2 after_t + \gamma_a + \boldsymbol{X_{iat}}\boldsymbol{\theta} + \epsilon_{iat}. \tag{5}$$

As part of the results, we will present the first-stage F-statistics, which exceed the rule of thumb cutoff, confirming that the instrument relevance condition is satisfied (Bound, Jaeger and Baker, 1995). Note that the IV estimator (ψ_1) captures the treatment effect for compliers near the eligibility threshold: individuals 66-69 years old who were beneficiaries of PAM. Therefore, the estimates of our IV strategy capture the local-average-treatment effect (LATE) associated with the program.

4. Results

4.1 Intention-to-Treat Effect

In Figure 2 we provide suggestive evidence on the validity of the parallel trend assumption underlying our difference-in-differences design. Panels A to D show that β_t estimates for both 2008 and 2010 are mostly not statistically different from zero, indicating that differences in outcomes between the control and treatment groups were constant over time before the intervention. In Panel A of Table 2 we present the main results of our study. Column 1 shows that about 48% of the new eligible seniors enrolled in PAM. One feature of the program may explain the relatively low take-up rate: eligible individuals have to present a document proving their age at registration centers.[17] Although most official documents are free and easy to get in Mexico, transportation to the registration centers may involve significant out-of-pocket costs, particularly for the poorest seniors.

Column 2 shows that PAM increased per capita income of the eligible-for-treatment group by 12.5 percent. An increase in income, however, does not necessary imply that the intervention reduced (extreme) poverty among the new eligible population. If the cash transfer was not enough to lift the elderly out of poverty or the program benefited individuals who were already above the poverty threshold (inclusion errors), the expansion could have had limited effects on poverty reduction (Acosta, Leite and Rigolini, 2014; Pal and Palacios, 2011). Column 3 shows that PAM's expansion did not affect the probability of living in poverty. Although the effect is negative, the point estimate is relatively small and statistically insignificant. Column 4, on the contrary, shows that PAM's expansion reduced the probability of living in extreme poverty by 5 percentage points for the average senior in the new eligible group.[18] As the extreme poverty threshold captures the cost of the basic food basket, this finding aligns with recent research showing that, before the program's expansion in 2013, PAM reduced the share of seniors that had only one meal a day due to lack of economic resources (Juarez and Pfutze, 2020).

Reaching the extreme poor only can be considered an important limitation of the expansion, as the poverty line that we use captures the cost of basic goods (personal hygiene and clothing) and services (transportation) that besides the basic food basket, captured by the extreme poverty line, are necessary for the well-being of the elderly population. The ineffectiveness of PAM's expansion to reduce poverty is

[17] PROSPERA, the largest cash transfer program in Mexico, can be considered the most comparable program to PAM. The take-up rate of PROSPERA was 63.2% in 2016 (CONEVAL, 2017).

[18] We obtain very similar results if households with other PAM beneficiaries (cohabitation) are excluded from the analysis (see Table A.4).

explained by the small size of the cash transfer and the considerably low per capita income of the elderly population in Mexico. In Figure 3 we show that per capita income of most new eligible individuals remained below the poverty line with or without the cash transfer from PAM in both rural and urban contexts. We also plot the per capita income distribution assuming all eligible-for-treatment individuals in the sample received the cash transfer. Our exercise provides suggestive evidence that the impact on poverty reduction would have been negligible even with a 100% take-up, which highlights that the universalization of social pensions may not be an effective instrument against poverty when the cash transfer is relatively small.

The small value of the program's cash transfer also questions whether the expansion could have affected retirement and/or labor supply patterns and simultaneously induce the observed effect on extreme poverty. Column 5 shows that the expansion of PAM had a small and statistically insignificant effect on labor force participation. This finding contrasts with previous literature arguing that PAM significantly increased retirement among seniors of 70 years old and over (Bando, Galiani and Gertler, 2016; Juarez and Pfutze, 2015). We also find a small, positive but statistically insignificant effects on labor market outcomes, suggesting that seniors at early stages of old age may use social pensions as a mechanism to remain in the labor force and/or increase their labor supply (see column 6). Pfutze and Rodríguez-Castelán (2019) show that this was the case among Colombian old-age adults under 70 years old, who tend to use social pensions for expenditures on public transportation and the attire required for work.[19]

4.1.1 Robustness tests

During old age health can deteriorate rapidly, increasing the individual's vulnerability to poverty (Dwyer and Mitchell, 1999; Lloyd-Sherlock, 2000; Smith and Kington, 1997). One potential caveat to our results is that the treatment and control groups may not be strictly comparable, as the youngest individuals in our control group are about 7 to 8 years younger than the oldest individuals in the eligible-for-treatment group. In Panel B of Table 2 we present results using comparison (63-64 years old) and treatment (66-67 years old) groups closer to the minimum eligibility age. The effects on (extreme) poverty and labor outcomes are similar to our baseline estimates in terms of direction, magnitude, and significance.

[19] In Figure A.2 we also provide evidence suggesting that the expansion of the program had no effect on the likelihood of experiencing sickness or visiting a health center.

Another potential caveat is that individuals in the control group may be too young for retirement. That is, their labor-leisure preferences may not be comparable to those of individuals at age of retirement.[20] To address this concern, we use as control group individuals aged 71 to 74 years, whose retirement preferences should be more similar to that of the eligible-for-treatment individuals. Note that this group consists of potential beneficiaries, as these age cohorts were eligible for the program before the intervention. In Panel C of Table 2 we present results using this alternative control group. The income effect is small and statistically insignificant, suggesting that the program's expansion increased per capita income of the treatment group to a level similar to that of potentially pre-treated individuals. The estimated effects on (extreme) poverty and labor outcomes are very similar to our baseline results. In Panel D, we present estimates including eligible-for-treatment individuals of 65 years of age. The coefficient on extreme poverty continues to be statistically significant, but its magnitude decreases relative to our baseline estimate. As argued previously, this age group may not have had enough exposure to eligibility for treatment, which is captured by the lower take-up (see column 1). Overall, these robustness checks suggest that our estimates are robust to variation in the composition of age cohorts within groups.

4.1.2 Heterogeneous effects

The previous results are average estimates for eligible-for-treatment individuals. These effects, however, may vary between population groups due to a number of factors, including inequalities based on gender and ethnicity. Gender gaps in borrowing capacity, earnings, education, and labor force participation make women more vulnerable to poverty in old age than men (Adair et al., 2002; Alesina, Lotti and Mistrulli, 2013; Buvinic, Das Gupta and Casabonne, 2009; Filmer, 2005). Gender differences in life expectancy, access to social networks, and cultural norms can also exacerbate and perpetuate poverty among elderly women (Knodel and Ofstedal, 2003). Similarly, previous literature has documented that poverty rates are considerably higher among ethnic minorities and indigenous people, as these population groups usually face labor market discrimination and limited access to education and health services (Berman, 2018; Eversole, McNeish and Cimadamore, 2008; Hall and Patrinos, 2006, 2012). In 2012, just before the expansion of PAM, the shares of women and indigenous people in Mexico with income below the poverty line were 1.6 and 28.5 percentage points higher than that of their male and non-indigenous counterparts, respectively (CONEVAL, 2012). Hence, everything else equal, women and indigenous people should benefit the most from social pensions.

[20] According to Mexico's National Survey of Occupation and Employment, the mean retirement age among individuals 60 to 70 years old was 64.8 in 2012 and 64.9 in 2014.

In Panel A of Table 3 we present estimates of the program's expansion effect for four population groups: men, women, indigenous (individuals who speak an indigenous language), and non-indigenous. We find that the expansion of PAM increased per capita income of men and women by an amount similar to our baseline estimates. For indigenous people, however, the effect on per capita income is about three times greater than for non-indigenous (see column 2). As before, we only find significant effects on extreme poverty. Although the intervention reduced the likelihood of living in extreme poverty for all groups, there are two results to highlight. First, the effect for men and women is similar—about a five percentage points reduction—which suggests that the gender gap in the vulnerability to poverty was unlikely to be affected by the intervention. Second, the effect for indigenous people is considerably larger than that for non-indigenous: 20 v. 3 percentage points reduction. This finding is consistent with recent literature showing that indigenous people may disproportionately benefit from social pensions (Juarez and Rodriguez Piña, 2021). These heterogeneous effects uncover existing differences in the vulnerability to extreme poverty within the elderly population, suggesting that the expansion of PAM was effective in reducing extreme poverty among the most vulnerable.

Results in column 5 show that the expansion also increased the probability of participating in the labor force for women and indigenous people by 4.5 and 11.5 percentage points, respectively. This finding suggests that among the most vulnerable, social pensions may not induce retirement but working life during early stages of old age. Although we do not find statistically significant effects on labor supply, the point estimates also suggest that the expansion may have increased labor supply among women (see column 6). These results, however, should be interpreted with caution. Table 1 shows that the proportion of women in the treatment group increased after the expansion of PAM relative to the control group, suggesting that the above-mentioned effects may have been partially influenced by compositional changes in the treatment group.

In Panel B of Table 3 we present estimates of the expansion's effects by locality size: up to 2,499 inhabitants (rural areas); 2,500 to 14,999 inhabitants (suburban areas, usually surrounding cities); 15,000 to 99,999 inhabitants (mid-size urban areas or towns); and over 100,000 inhabitants (big cities). The program's take-up among eligible-for-treatment individuals varies across categories, with cities and suburban areas having a relatively low take-up (see column 1). In these urban contexts, the poor population tends to live in informal settlements (slums) or marginal lands (steep hillsides): hard-to-reach areas to promote enrollment in social programs (Marx, Stoker and Suri, 2013). In Figure A.3 we provide evidence showing that the take-up rate decreases with altitude in all contexts, but this negative

relationship is more pronounced in big cities. The population living in informal settlements is also often underestimated, which affects the targeting of social programs (Lucci, Bhatkal and Khan, 2018). Results in column 2 support this argument, as PAM substantially increased income but only in rural and middle-size urban areas, suggesting that the expansion may have not reached the poorest individuals living in suburban areas or cities. In column 4 we present evidence that this was the case, as the effects on extreme poverty were close to zero and statistically insignificant in these areas. In contrast, the expansion of PAM significantly reduced extreme poverty by 11 and 9 percentage points in rural and mid-size urban areas, respectively.

Note that the expansion was very successful in mid-size urban areas, as it also reduced poverty by about 21 percentage points. In our view, this effect was induced by the large take-up, accurate targeting, and statistically insignificant effects on both labor force participation and labor supply. Table 1 also shows that the proportion of eligible-for-treatment individuals increased by four percentage points in mid-size urban areas after the expansion of the program, suggesting that compositional changes may have partially influenced the large poverty reduction effect in these areas. In contrast, we find an increase in poverty (significant at the 10% percent level) in big cities, which suggests that reaching the elderly population living in poverty in densely populated areas could be particularly challenging due to the aforementioned factors. In terms of labor market outcomes, we find a statistically significant positive effect on labor force participation in rural areas only. This result is consistent with our finding on the increase in labor force participation among indigenous people, as this population group is more likely to live in rural areas.

4.1.3 Substitution, spillover, and anticipation effects

We have provided evidence that the intervention increased the participation in the labor force of new eligible seniors, particularly among indigenous people and women. Previous literature argues that social pensions represent a reliable source of income that allows beneficiaries to reduce their labor supply in formal jobs and engage in informal economic activities (Bando, Galiani and Gertler, 2020). We examine whether the expansion of PAM induced the substitution of subordinate work for self-employment among new eligible individuals. The point estimates in Panel A of Table 4 suggest that PAM's expansion increased the substitution of subordinate work by 5 and 15 percentage points among women and indigenous people, respectively, whereas the estimates for men are small and statistically insignificant.

Another question of interest is whether the expansion of PAM had any effects on individuals co-residing with new eligible seniors. Previous literature shows that the effect of non-labor income shocks on

the labor supply of other household members may vary depending on the beneficiary's gender (Bertrand, Mullainathan and Miller, 2003; Duflo, 2003; Lundberg, Pollak and Wales, 1997) and bargaining power in the household (Becker, 1991; Chiappori, 1992). In Panel A and B of Figure A.4 we show that the intervention did not affect the labor force participation or labor supply of boys (11-17 years old) or prime-age men (18-54 years old). However, we find that girls (11-17 years old) increased their labor supply by 2.5 hours per week. One explanation to this result is that the aforementioned substitution of subordinate work in favor of self-employment, usually considered as an indication of investment in small family businesses, demanded the participation of girls in activities associated to these ventures.[21] Since this substitution occurred among women only, it is possible that the persistence of gender norms about the intrahousehold division of work mediated the labor supply increase among girls (Giménez-Nadal, Mangiavacchi and Piccoli, 2019). Juarez (2010) finds similar gendered effects for Mexico City's social pension program: non-eligible women who live with a potential beneficiary increased their housework hours, whereas their male counterparts reduced their work time. However, our result is at odds with previous literature showing that South African girls aged 13-17, who usually work more hours in domestic chores than boys, experienced larger declines in working hours when a household member became eligible for a social pension (Edmonds, 2006).

As described previously, the expansion of PAM was announced and implemented very rapidly. Yet a concern is that our findings may be downward biased due to anticipation effects affecting the comparability of our control group. To identify the presence of anticipation effects, we examine the retirement behavior of individuals aged 63-64 years, who may have started retiring in anticipation of receiving the cash transfer. For this analysis, we use as control group individuals aged 61-62 years, who are far from being eligible for PAM and therefore unlikely to change their retirement behavior. All point estimates in Panel B of Table 4 are close to zero and statistically insignificant, suggesting the lack of anticipation effects.

4.2 Local-Average-Treatment Effect

In Table 5 we present estimates of the local-average-treatment effect of the program's expansion. We only report effects on (extreme) poverty, as our reduced form estimates for labor force participation and labor supply are not statistically different from zero (see Table 2). We start by reporting in column 1 the structural-OLS estimates, which suggest that the effect on poverty was small and statistically insignificant (see Panel A). In contrast, PAM significantly reduced the probability of living in extreme poverty among

[21] According to the ENIGH, in 2014 about 86% of the individuals aged 12-17 years, who reported to be in the labor force and lived in a household with an eligible-for-treatment senior, worked in family businesses.

the treated elderly by 10 percentage points (see Panel B). These estimates, however, are likely to suffer from sample selection bias, as the implementation of the expansion was prioritized in poor localities. To correct for endogeneity, we use the exogenous variation around the eligibility age as instrument. Results in column 2 provide suggestive evidence that our instrument is relevant, and the reported F statistics show that our results are unlikely to suffer from weak instrument bias (Bound, Jaeger and Baker, 1995). The estimated coefficients in column 4 show that, among treated individuals, the program was successful in reducing extreme poverty only: PAM's expansion reduced the probability of living in extreme poverty by about 11 percentage points.

However, these findings mask substantial variation between treated individuals. Consistent with our DD results, the IV estimates show that the expansion of PAM was successful in reaching the most vulnerable among the treated population, with indigenous people and individuals living in rural areas experiencing the largest reductions in extreme poverty: 39 and 20 percentage points, respectively.[22] These large heterogeneous effects by population groups and contexts (rural/urban) are depicted in Figure A.5, where we compare the cumulative per capita income distribution of the treated population with and without PAM. Overall, our results suggest that the expansion of social pensions reduced extreme poverty and benefited the most vulnerable in Mexico. This is particularly relevant, as indigenous people and women in Mexico have historically experienced structural barriers to economic progress that are accentuated in rural areas due to climate shocks, limited income sources, and constrained markets (see, for example, Arceo-Gomez and Campos-Vazquez, 2014; Mckinley and Alarcón, 1995; Pagán and Sánchez, 2000; Villarreal, 2010).

5. Conclusion

In Mexico, as in many other countries of Latin America and the developing world, most of the elderly do not qualify for a contributory pension (Rofman, Apella and Vezza, 2015). This leaves the elderly population at risk of old-age poverty with extremely limited options (if any) but to keep working and/or depend on aid from informal safety nets such as family members (Fan, 2010; Heemskerk, Norton and De Dehn, 2004). The impact of social pensions on (extreme) poverty has been overlooked by previous literature, as social pension programs usually use means tests to identify the poor population. Hence, it is commonly assumed that the effect of social pensions on poverty reduction is self-evident. Many

[22] IV estimates are available upon request. Note that the point estimates can be easily computed from Table 2 by dividing the coefficient of interest over the corresponding first stage estimated coefficient, which equals the estimated take-up reported in Table 2.

governments, however, do not use means tests or similar mechanisms to target social pensions, but instead had opted for demogrant designs. This is the case of Mexico, a country with high poverty rates and one of the world's largest social pension programs.

With the objective of preventing old-age poverty and improving the well-being of the elderly, in 2013, the minimum eligibility age for Mexico's social pension program (PAM) was reduced from 70 to 65 years. Soon after the announcement of PAM's expansion in 2013, Aguila et al. (2013) examined the financial sustainability of the intervention. They predicted large increases in the cost of the program in the short, medium, and long terms that would affect the impact of the program. In this paper, we evaluate the effectiveness of such intervention in reducing (extreme) poverty. Although previous research has addressed the relationship between poverty and social pensions (see, for example, Aguila, Kapteyn and Tassot, 2017; Barrientos, 2006, 2008; Cruz-Martínez, 2019), to our knowledge, we are the first to provide a systematic analysis of the impact of social pensions on (extreme) poverty. The program's expansion also allows us to examine labor market outcomes for individuals at early stages of old age, whose retirement responses to income shocks are likely to differ from that of seniors aged 70 and over—the population group that has been primarily studied by previous literature.

Our findings suggest that the intervention was effective in reducing extreme poverty among the most vulnerable population: indigenous people and individuals living in rural contexts. However, we also find a zero-effect in terms of poverty reduction for all population groups, which is mainly explained by the relatively small size of the program's cash transfer and the potential mistargeting of the program in urban areas. These poverty effects were accompanied by a substantial increase in the labor force participation of indigenous people and individuals living in rural areas. In Mexico, indigenous people and women face barriers to economic progress that are accentuated in rural areas due to climate shocks, limited income sources, and constrained markets. Hence, for the most vulnerable seniors, social pensions may represent an effective instrument for engaging in small ventures and/or getting access to labor markets other than the local economy. Overall, our study suggests that, when the cash transfer is relatively small or mistargeted, social pensions may not be able to reduce poverty and simultaneously induce retirement among seniors at early stages of old age. Despite these limitations, PAM has proven to be effective in reducing extreme poverty among the most vulnerable population in Mexico.

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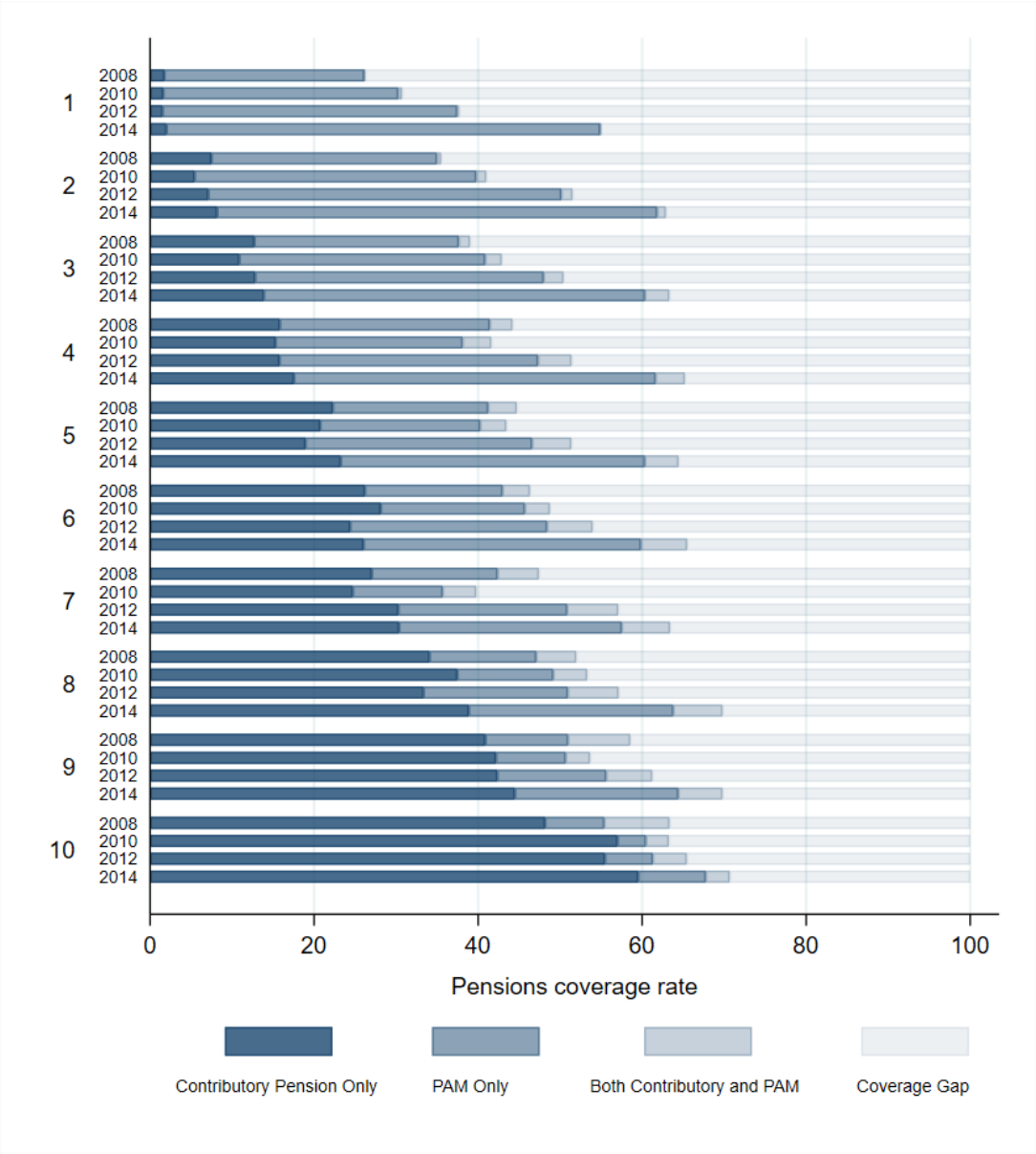
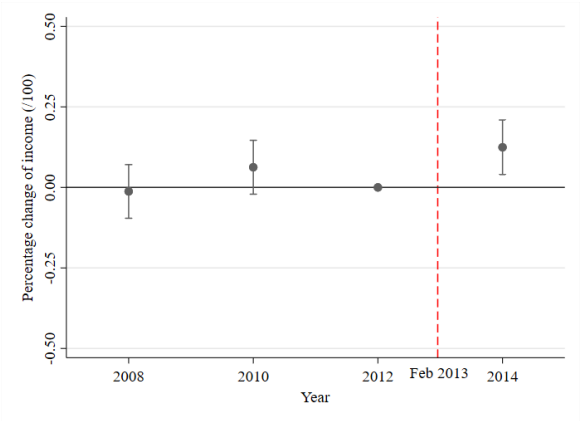
Figures and Tables

Figure 1: Pensions coverage by income decile, Mexico (2008-2014)

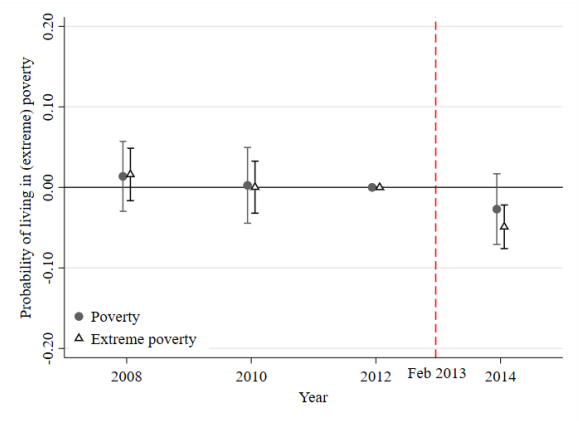


Note: Contributory pension schemes are based on formal work history. Since formal jobs usually pay higher wages than informal jobs, the share of the elderly getting benefits from contributory pensions is greater in higher deciles of income. Data are from the 2008, 2010, 2012, and 2014 Household Income and Expenditure National Survey (ENIGH).

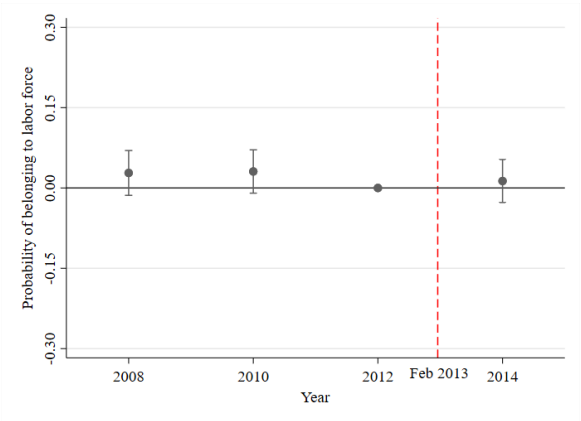
Figure 2: Parallel trend assumption



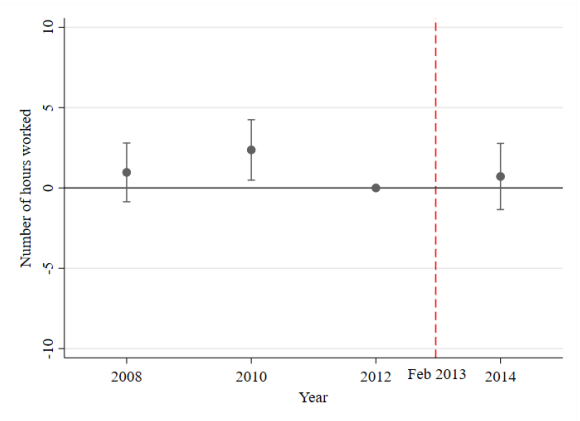
Panel A. ln(Income)



Panel B. Poverty and Extreme poverty



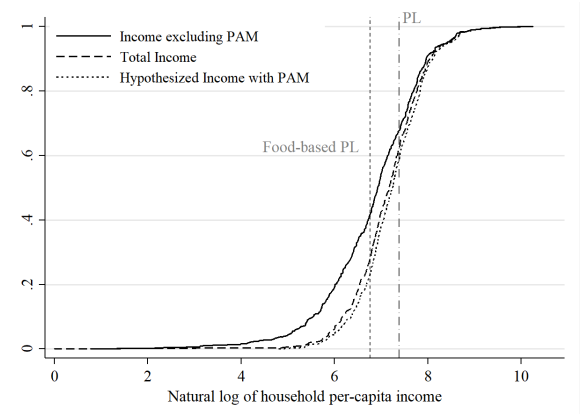
Panel C. Labor force participation



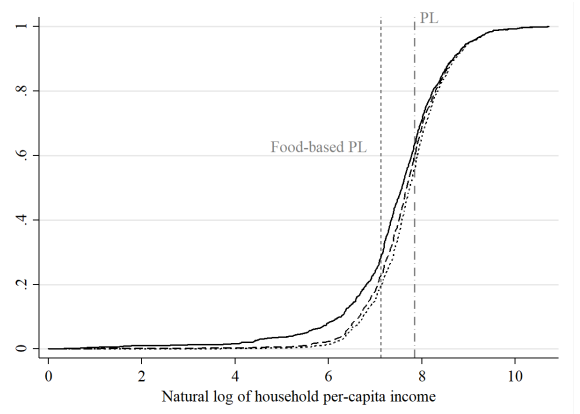
Panel D. Labor supply

Note: Graph points show differences in outcomes between treatment and control groups relative to 2012 levels. Whiskers show 95% confidence intervals. The vertical line depicts the date when the policy intervention was enacted (February 2013). This figure provides suggestive evidence on the parallel trend assumption underlying our difference-in-differences identification strategy. Data are from the 2008, 2010, 2012, and 2014 Household Income and Expenditure National Survey (ENIGH).

Figure 3: Simulated income distribution with and without PAM (eligible sample)



A. Rural



B. Urban

Note: We show cumulative income distributions in 2014. We plot observed income, income without PAM's cash transfer, and income if PAM's cash transfer had been given to all eligible individuals. Vertical lines represent the poverty (PL) and extreme poverty (EPL) lines in rural and urban regions. The figure suggests that the program was particularly effective in reducing extreme poverty in rural areas. However, even with a 100% take-up, the effect on poverty would have been negligible. Data are from the 2014 Household Income and Expenditure National Survey (ENIGH).

Table 1: Summary statistics

	2012		2014		
	Control Group	Treatment Group	Control Group	Treatment Group	DD
Panel A: Outcome variables					
Per capita Household Income (log)	7.48	7.32	7.57	7.50	0.10**
	(0.04)	(0.04)	(0.03)	(0.03)	(0.06)
Poverty (%)	0.50	0.55	0.50	0.53	−0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Extreme Poverty (%)	0.16	0.17	0.13	0.10	−0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Labor Force Participation (%)	0.55	0.45	0.57	0.51	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
Labor Supply (hours)	20.58	16.93	20.79	16.78	−0.36
	(0.52)	(0.50)	(0.57)	(0.54)	(1.32)
Panel B: Control variables					
Female (%)	0.61	0.59	0.57	0.61	0.05*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
Education (years)	4.95	4.13	5.28	4.28	−0.19
	(0.19)	(0.19)	(0.16)	(0.14)	(0.30)
Indigenous (%)	0.12	0.11	0.10	0.11	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Cohabitation (%)	0.24	0.35	0.12	0.26	−0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.10)
Locality Size (s_l)					
$s_l < 2{,}500$	0.30	0.32	0.27	0.30	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
$2{,}500 \leq s_l < 15{,}000$	0.15	0.16	0.15	0.15	0.00
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
$15{,}000 \leq s_l < 100{,}000$	0.14	0.11	0.14	0.14	0.04**
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
$s_l \geq 100{,}000$	0.42	0.41	0.43	0.40	−0.03
	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Observations	3,981	2,978	3,971	2,884	13,814

Note: In 2013, Mexico's Social Pension Program for the Elderly (PAM) was expanded. The table reports characteristics of the control and treatment group observed before (2012) and after (2014) the intervention. The treatment group are individuals who became eligible (aged 66-69) for the program as a result of the expansion. The control group are non-eligible individuals (aged 61-64). The table reports weighted mean values and weighted proportions. Clustered standard errors at municipality level in parentheses. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. The last column reports difference-in-differences (DD) estimates. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).

Table 2: The impact of expanding social pensions (DD estimation)

	1	2	3	4	5	6
	PAM Take-Up	Income	Poverty	Extreme Poverty	Labor Force Participation	Labor Supply
Panel A. Baseline						
After×Treat	0.478***	0.125***	−0.027	−0.051***	0.009	0.641
	(0.016)	(0.043)	(0.022)	(0.014)	(0.020)	(1.048)
Observations	13,814	13,814	13,814	13,814	13,814	13,814
Adjusted R^2	0.434	0.199	0.199	0.147	0.316	0.240
Panel B. Narrowed age groups (63-64 v. 66-67)						
After×Treat	0.464***	0.193***	−0.047	−0.065***	0.019	1.202
	(0.019)	(0.062)	(0.030)	(0.019)	(0.025)	(1.275)
Observations	7,302	7,302	7,302	7,302	7,302	7,302
Adjusted R^2	0.418	0.188	0.196	0.139	0.311	0.239
Panel C. Alternative control group (71-74)						
After×Treat	0.460***	0.042	−0.020	−0.079***	−0.004	1.173
	(0.028)	(0.049)	(0.023)	(0.017)	(0.022)	(1.031)
Observations	10,403	10,403	10,403	10,403	10,403	10,403
Adjusted R^2	0.276	0.195	0.198	0.127	0.301	0.230
Panel D. Baseline including individuals 65 years old						
After×Treat	0.405***	0.110***	−0.028	−0.028**	0.011	0.532
	(0.013)	(0.039)	(0.021)	(0.012)	(0.018)	(0.891)
Observations	15,952	15,952	15,952	15,952	15,952	15,952
Adjusted R^2	0.368	0.203	0.202	0.147	0.309	0.234

Note: The treatment group are individuals aged 66-69, who became eligible to receive a social pension in 2014. Individuals aged 61-64, who were not affected by the policy change, are the control group. All models include control variables and state fixed effects. Panel A shows the main result: the expansion of PAM reduced the probability of living in extreme poverty by five percentage points. This effect was induced by two factors: a 12.5% increase in income and a zero effect on labor force participation and labor supply. Panels B, C, and D present estimates for three robustness checks, suggesting that our main results are robust to variation in unobservables across age cohorts. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Standard errors clustered at the municipality level in parentheses. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).

Table 3: Heterogeneous effects of expanding social pensions (DD estimation)

	1	2	3	4	5	6
	PAM Take-Up	Income	Poverty	Extreme Poverty	Labor Force Participation	Labor Supply
Panel A. Population group						
Men						
After×Treat	0.467***	0.129*	−0.007	−0.048**	−0.043	−0.598
	(0.023)	(0.076)	(0.034)	(0.024)	(0.030)	(2.022)
Observations	5,730	5,730	5,730	5,730	5,730	5,730
Adjusted R^2	0.430	0.191	0.161	0.142	0.053	0.027
Women						
After×Treat	0.485***	0.122**	−0.038	−0.053***	0.045*	1.530
	(0.017)	(0.049)	(0.027)	(0.017)	(0.027)	(1.183)
Observations	8,084	8,084	8,084	8,084	8,084	8,084
Adjusted R^2	0.436	0.202	0.222	0.146	0.050	0.029
Indigenous						
After×Treat	0.524***	0.277**	−0.015	−0.204***	0.115**	−0.415
	(0.038)	(0.108)	(0.044)	(0.062)	(0.053)	(2.502)
Observations	1,710	1,710	1,710	1,710	1,710	1,710
Adjusted R^2	0.479	0.163	0.150	0.135	0.307	0.315
Non-Indigenous						
After×Treat	0.473***	0.108**	−0.028	−0.032**	−0.004	0.736
	(0.017)	(0.046)	(0.024)	(0.013)	(0.022)	(1.138)
Observations	12,104	12,104	12,104	12,104	12,104	12,104
Adjusted R^2	0.430	0.172	0.176	0.094	0.312	0.232
Panel B. Locality size (s_l)						
Rural: $s_l < 2{,}500$						
After×Treat	0.562***	0.153**	−0.053	−0.106***	0.058**	1.798
	(0.023)	(0.067)	(0.038)	(0.029)	(0.029)	(1.558)
Observations	4,677	4,677	4,677	4,677	4,677	4,677
Adjusted R^2	0.505	0.097	0.117	0.129	0.362	0.304
Urban: $2{,}500 \leq s_l < 15{,}000$						
After×Treat	0.482***	0.152	−0.072	−0.019	−0.004	−0.961
	(0.034)	(0.110)	(0.053)	(0.046)	(0.047)	(2.515)
Observations	2,553	2,553	2,553	2,553	2,553	2,553
Adjusted R^2	0.445	0.088	0.133	0.115	0.278	0.193
Urban: $15{,}000 \leq s_l < 100{,}000$						
After×Treat	0.501***	0.292**	−0.207***	−0.093***	0.038	3.217
	(0.035)	(0.114)	(0.062)	(0.036)	(0.053)	(2.779)
Observations	1,980	1,980	1,980	1,980	1,980	1,980
Adjusted R^2	0.456	0.119	0.195	0.066	0.290	0.229
Urban: $s_l \geq 100{,}000$						
After×Treat	0.409***	0.043	0.064*	−0.010	−0.023	−0.172
	(0.027)	(0.079)	(0.034)	(0.015)	(0.034)	(1.686)
Observations	4,604	4,604	4,604	4,604	4,604	4,604
Adjusted R^2	0.373	0.124	0.173	0.039	0.285	0.227

Note: The treatment group are individuals aged 66-69, who became eligible to receive a social pension in 2014. Individuals aged 61-64, who were not affected by the policy change, are the control group. All models include control variables and state fixed effects. Panel A shows heterogeneous effects for different population groups. We only find significant effects on extreme poverty, with the intervention reducing the likelihood of living in extreme poverty for all groups. The program's expansion also increased the probability of participating in the labor force for women and indigenous people. Panel B shows heterogeneous effects for different locality sizes. The effects on extreme poverty were close to zero and statistically insignificant in suburban areas (2,500 to 14,999 inhabitants) and cities (over 100,000 inhabitants). * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Standard errors clustered at the municipality level in parentheses. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).

Table 4: Substitution and anticipation effects of expanding social pensions (DD estimation)

	1	2	3	4
	Full sample	Men	Women	Indigenous
Panel A. Substitution of subordinate work for self-employment				
Dependent variable: self-employment				
After×Treat	0.036*	0.011	0.053**	0.153***
	(0.018)	(0.032)	(0.021)	(0.052)
Observations	13,814	5,730	8,084	1,710
Mean (dependent variable)	0.295	0.459	0.180	0.474
Adjusted R^2	0.149	0.097	0.045	0.183
Panel B. Anticipation effects (61-62 v. 63-64)				
Dependent variable: labor force participation				
After×Treat	0.010	−0.012	0.021	−0.037
	(0.026)	(0.034)	(0.037)	(0.058)
Observations	7,952	3,340	4,612	990
Mean (dependent variable)	0.513	0.730	0.316	0.645
Adjusted R^2	0.302	0.027	0.035	0.305

Note: Panel A shows that that the expansion of social pensions increased the substitution of subordinate work in favor of self-employment by 5 and 15 percentage points among women and indigenous people, respectively. Panel B provides evidence about the absence of anticipation effects among individuals who are close to become eligible for the program. All models include control variables and state fixed effects. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Standard errors clustered at the municipality level in parentheses. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).

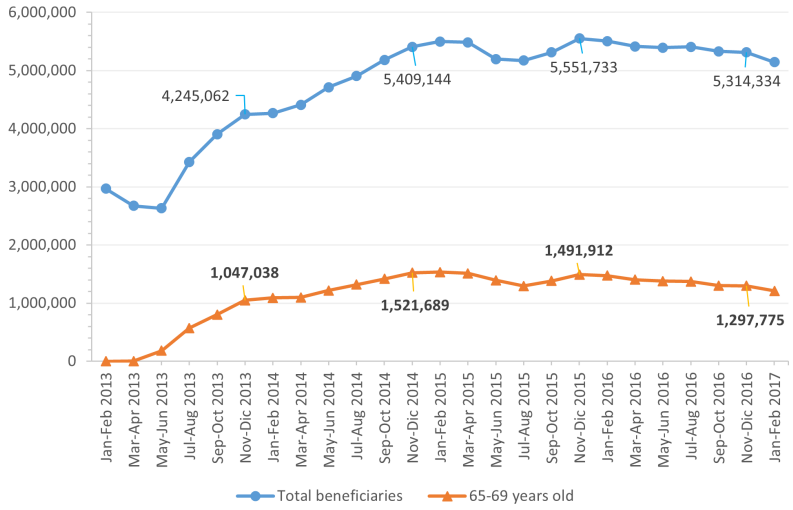
Table 5: The impact of expanding social pensions
(IV estimation)

	1	2	3	4
	Structural-OLS	First Stage	Reduced Form	Structural-IV
Panel A. Poverty				
PAM	−0.024			−0.057
	(0.023)			(0.046)
After×Treat		0.478***	−0.027	
		(0.016)	(0.022)	
Observations	13,814	13,814	13,814	13,814
Adjusted R^2	0.199	0.434	0.199	
F statistic	81.66	77.91	81.76	
Kleibergen-Paap				1,522.83
Panel B. Extreme Poverty				
PAM	−0.100***			−0.106***
	(0.012)			(0.029)
After×Treat		0.478***	−0.051***	
		(0.016)	(0.014)	
Observations	13,814	13,814	13,814	13,814
Adjusted R^2	0.151	0.434	0.147	
F statistic	22.58	77.90	20.66	
Kleibergen-Paap				1,522.83

Note: We present estimates of the local-average-treatment effect of the program's expansion. Among treated individuals, the program was successful in reducing extreme poverty only: PAM's expansion reduced the probability of living in extreme poverty by about 11 percentage points. In column 2 we provide evidence on the relevance condition, with an F statistic value greater than the standard rule of thumb. All models include control variables and state fixed effects. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Standard errors clustered at the municipality level in parentheses. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).

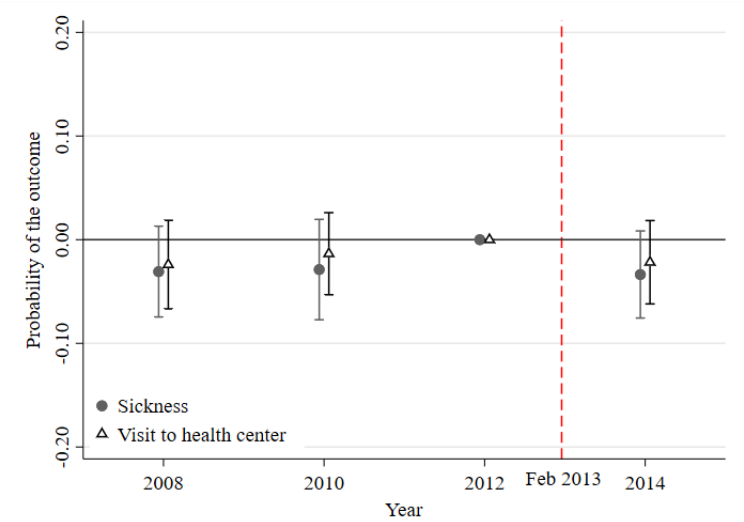
Online Appendix

Figure A.1: PAM beneficiaries, 2013-2016



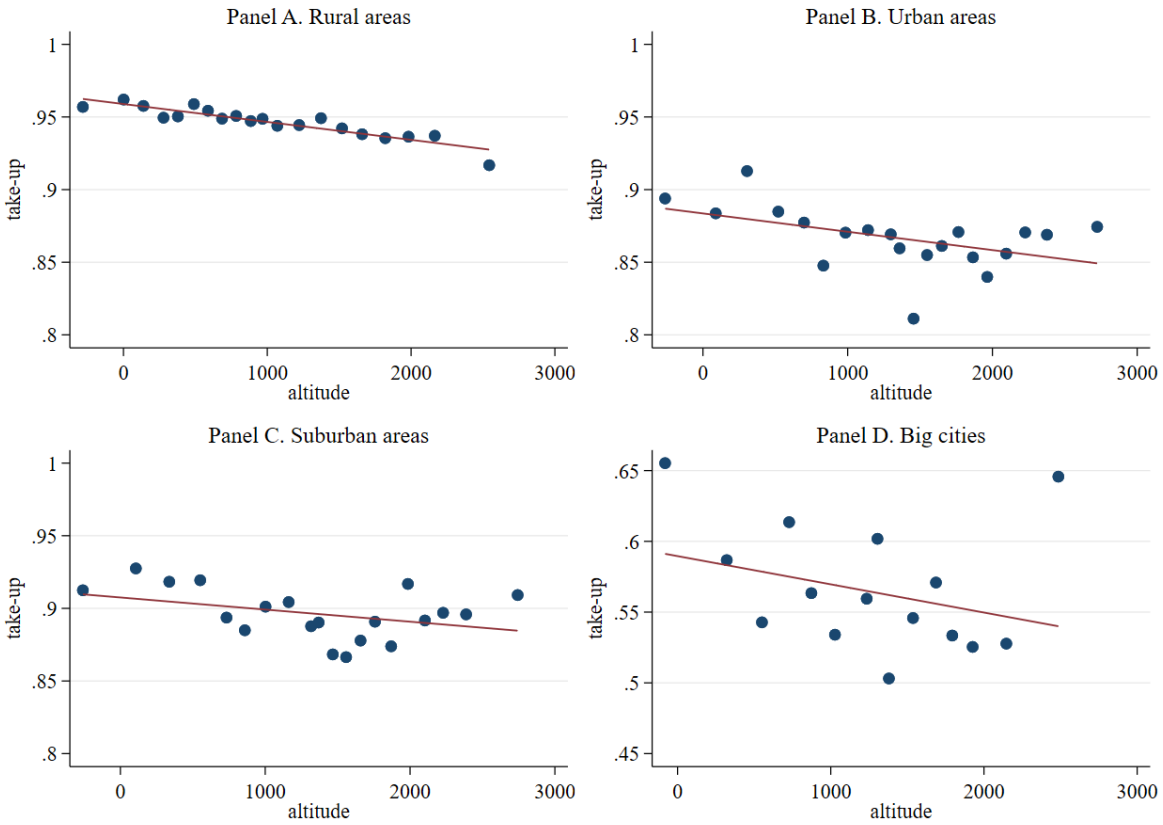
Note: According to the program's enrollment records, no one under 70 years old received PAM at the beginning of 2013. Four months after the new eligibility rules were announced, there were over half a million beneficiaries between 65 and 69 years of age. Before the end of 2014, there were more than 1.5 million beneficiaries belonging to this age cohort, representing one-third of Mexico's population between 65 and 69 years of age. Data are from the enrollment records of the *Programa de Adultos Mayores*.

Figure A.2: Outcomes related to health



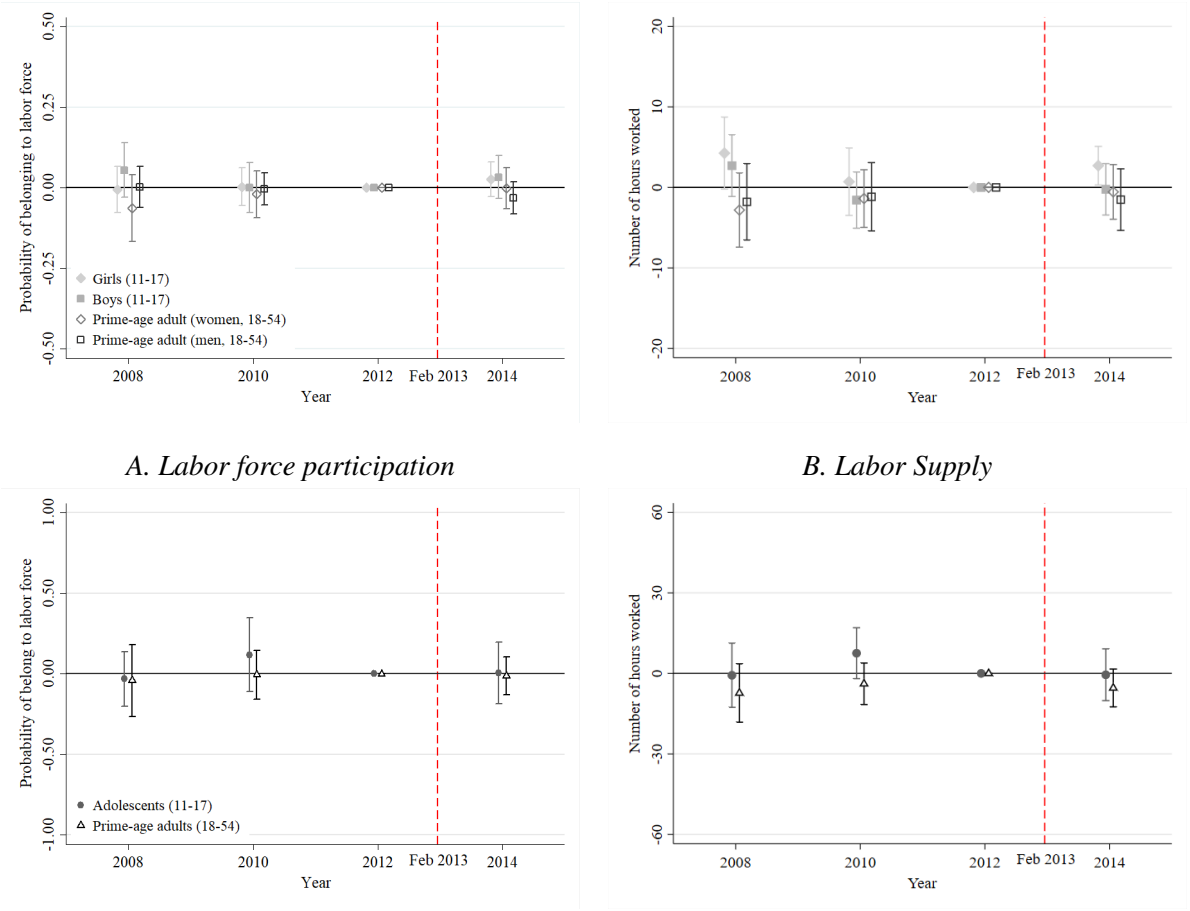
Note: Graph points show differences in outcomes between treatment and control groups relative to 2012 levels. Whiskers show 95% confidence intervals. The vertical line depicts the date of the policy intervention (February 2013). This figure suggests that the expansion of the program had no effect on two health-related outcomes. The variable *sickness* is constructed based on the answer to the question "In the last 12 months, have you been sick or suffered from any pain, discomfort or accident that has prevented you from doing your daily activities?" There are two things to note. First, sickness is self-reported, which contrasts with previous literature examining the impact of social pensions on health outcomes (Aguila and Casanova, 2020). Second, we do not observe what kind of sickness the individual experienced, and thus the variable may capture a broad spectrum of sicknesses that may not accurately reflect the individual's health, i.e., from a flu to a broken bone or a degenerative disease. The variable *visit to health center* is constructed based on the answer to the question "In the last 12 months, has any doctor or nurse measured your weight or height?" Again, we do not observe the reason why the individual went to doctor. This variable may capture programmed check-ups or visits due to severe illness. This result is in line with Bando, Galiani and Gertler (2020), who argue that social pensions in Peru did not affect physical health outcomes or the use of health services. However, Aguila, Kapteyn and Smith (2015); Aguila, Kapteyn and Perez-Arce (2017); Aguila and Smith (2020) show that this effect can be mediated by the frequency of the program's cash transfer. Data are from the 2008, 2010, 2012, and 2014 Household Income and Expenditure National Survey (ENIGH).

Figure A.3: Take-up rate and altitude by locality size



Note: We show the relationship between the program's take-up and altitude by locality size: up to 2,499 inhabitants (rural areas); 2,500 to 14,999 inhabitants (suburban areas, usually surrounding cities); 15,000 to 99,999 inhabitants (mid-size urban areas or towns); and over 100,000 inhabitants (big cities). We use PAM's 2014 enrollment records at the locality level and 2010 census data to approximate the take-up among seniors aged 65 years and over. The underlying estimating equations of the binned scatter plots control for latitude, longitude, and municipality fixed effects. There is a clear negative relationship between the program's take-up and altitude in all contexts, but the negative correlation appears to be more pronounced in cities. In these urban contexts, the poor population tends to live in informal settlements (slums) or marginal lands (steep hillsides): hard-to-reach areas to promote enrollment in social programs (Marx, Stoker and Suri, 2013).

Figure A.4: PAM effect on other household members



A. Labor force participation

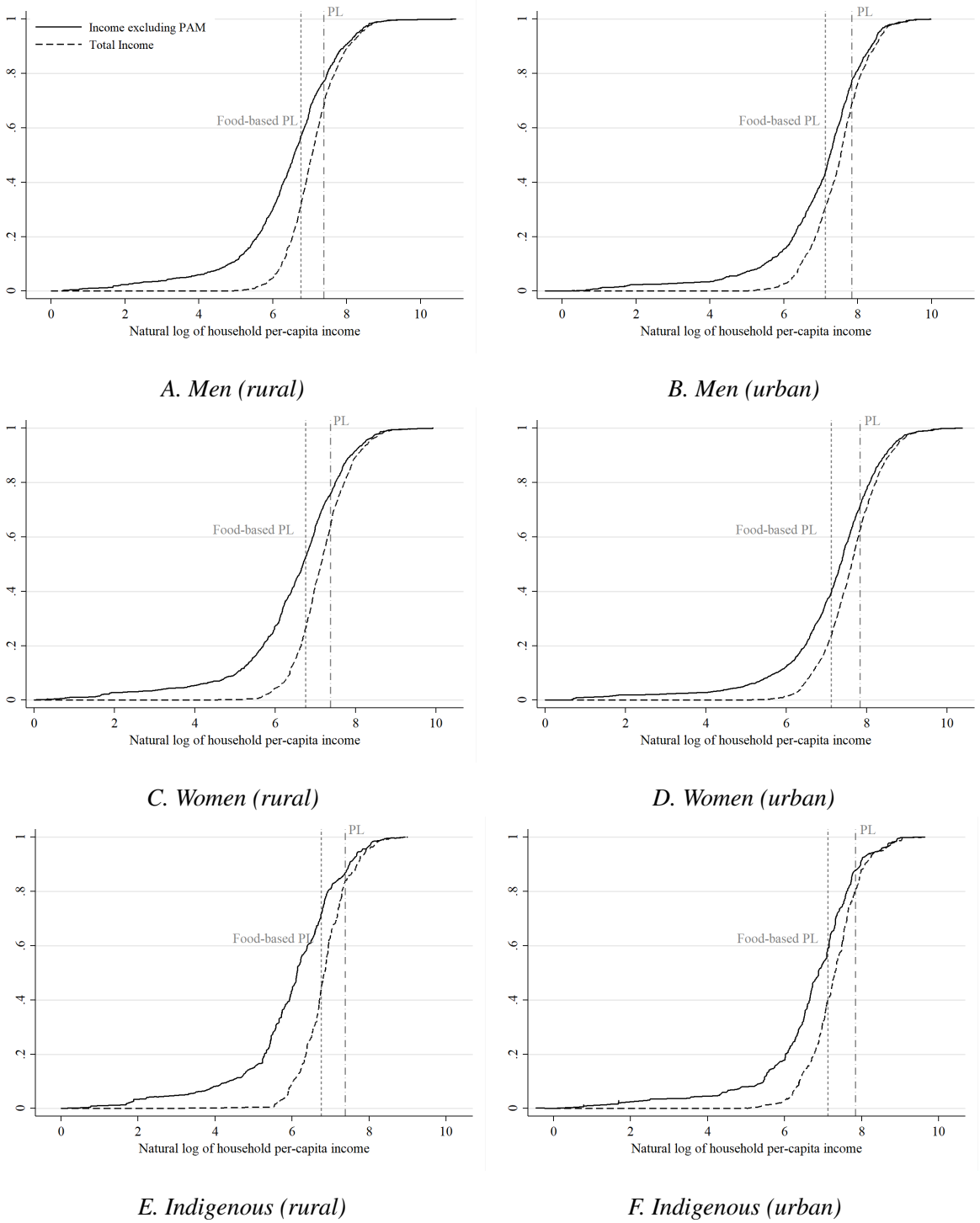
B. Labor Supply

C. Labor force participation (indigenous)

D. Labor Supply (indigenous)

Note: Graph points are coefficients capturing changes in outcome variables for the eligible-for-treatment group relative to 2012 levels. Whiskers show 95% confidence interval. The dotted vertical line depicts the date of the policy intervention (February 2013). We do not observe effects on the labor force participation of younger individuals living in the same beneficiary's household. Data are from the 2008, 2010, 2012, and 2014 Household Income and Expenditure National Survey (ENIGH).

Figure A.5: Income distribution with and without PAM (treated sample)



Note: We show cumulative income distributions in 2014. We plot observed income and income without PAM's cash transfer for treated individuals. Vertical lines represent the poverty (PL) and extreme poverty (EPL) lines in rural and urban regions. Data are from the 2014 Household Income and Expenditure National Survey (ENIGH).

Table A.1: Proportion of beneficiaries and income from PAM

	Proportion of PAM beneficiaries				Self-reported cash transfer from PAM			
Locality size (s_l)	2008	2010	2012	2014	2008	2010	2012	2014
Panel A: Full sample								
$s_l < 2{,}500$	58.35	57.05	45.63	42.28	509.73	494.37	490.75	549.23
$2{,}500 \leq s_l < 15{,}000$	21.30	26.09	25.23	21.60	474.80	509.15	495.11	550.85
$15{,}000 \leq s_l < 100{,}000$	4.93	10.34	13.64	12.71	469.85	492.18	470.44	527.43
$100{,}000 \leq s_l$	15.42	6.52	15.50	23.41	968.21	591.24	540.55	591.07
Panel B: Sample excluding Mexico City								
$s_l < 2{,}500$	65.63	57.84	46.47	43.11	509.50	494.42	490.75	549.23
$2{,}500 \leq s_l < 15{,}000$	23.91	26.46	25.63	21.94	470.34	509.15	491.70	549.04
$15{,}00 \leq s_l < 100{,}000$	5.42	10.39	13.90	12.95	436.47	492.33	470.44	527.26
$100{,}000 \leq s_l$	5.04	5.32	14.01	22.00	445.67	502.77	460.85	550.65

Notes: Locality size indicates the number of inhabitants. The proportion of PAM beneficiaries should be read by columns. Panel A shows that most beneficiaries concentrated in localities with up to 2,500 inhabitants (rural areas) during the period of analysis. From 2008 to 2012, the programs cash transfer was 500 Mexican pesos per month. In 2013, the cash transfer was increased to 580 pesos. The self-reported figures on the program's cash transfer reflect this change. Panel B shows the same figures excluding Mexico City, where there was a major social pension program before 2008. Data are from the 2008, 2010, 2012, and 2014 Household Income and Expenditure National Survey (ENIGH).

Table A.2: Value of poverty lines

	2008		2010		2012		2014	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Average Income	1321	3279	1397	3375	1685	3645	1798	3961
Poverty lines								
Extreme poverty	614	875	684	978	800	1,125	868	1,243
Percentage of income (%)	(46.5)	(26.7)	(49.0)	(29.0)	(47.5)	(30.9)	(48.3)	(31.4)
Poverty	1203	1922	1329	2114	1489	2328	1615	2542
Percentage of income (%)	(91.1)	(58.6)	(95.1)	(62.6)	(88.4)	(63.9)	(89.8)	(64.2)

Notes: Income is the total monetary (wages, income from independent work, and nonworking income such as dividends, rents, or money transfers) and non-monetary (the value of gifts, payments, and transfers in kind) monthly income of the household divided by the number of adult-equivalent household members (household size). The extreme poverty line is the monetary value of the basic food basket, which represents the minimum recommended nutritional intake for the average Mexican. The poverty line is the sum of the monetary value of the food and non-food baskets. The latter comprises basic necessary goods and services such as personal hygiene, clothing, transportation, among others. All values are reported in current Mexican pesos. During the period of analysis, the value of the poverty line represented about 91% of the average income in rural areas and 62% of the average income in urban areas. From 2007 to 2012, the benefit level of PAM was maintained at 500 Mexican pesos per month, i.e., less than the value of the extreme poverty line. Data are from CONEVAL (2008, 2010, 2012, 2014*a*).

Table A.3: Summary statistics by cohabitation status

	Without cohabitation			With cohabitation		
	Control Group	Treatment Group	Diff.	Control Group	Treatment Group	Diff
Panel A: Outcome variables						
Per capita Income (log)	7.58	7.48	-0.10^{***}	7.57	7.50	-0.06^{**}
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Poverty (%)	0.49	0.54	0.05^{**}	0.50	0.53	0.03^{*}
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Extreme Poverty (%)	0.12	0.10	-0.02^{**}	0.13	0.10	-0.03^{***}
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Labor Force Participation (%)	0.57	0.51	-0.06^{***}	0.55	0.45	-0.10^{***}
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Labor Supply (hours)	21.53	19.26	-2.27^{**}	20.79	16.78	-4.02^{***}
	(0.57)	(0.54)	(0.92)	(0.57)	(0.54)	(0.76)
Panel B: Control variables						
Female (%)	0.55	0.53	-0.02	0.57	0.61	0.04^{**}
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Education (years)	5.36	4.24	-1.12^{***}	5.28	4.28	-1.00^{***}
	(0.16)	(0.16)	(0.18)	(0.16)	(0.14)	(0.15)
Indigenous (%)	0.10	0.11	0.01	0.10	0.11	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Observations	3,441	2,128	5,569	3,971	2,884	6,855

Note: We compare the socioeconomic profile of the control and treatment groups by cohabitation status (1 = lives in a household with one or more PAM beneficiaries, 0 = otherwise) in 2014. The treatment group are individuals aged 66-69, who became eligible to receive a social pension in 2014. Individuals aged 61-64, who were not affected by the policy change, are the control group. We report weighted mean values and weighted proportions. Clustered standard errors at the municipality level in parentheses. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Data are from the 2014 Household Income and Expenditure National Survey (ENIGH).

Table A.4: The impact of expanding social pensions
(DD estimation excluding households with cohabitation)

	1	2	3	4	5	6
	PAM Take-Up	Income	Poverty	Extreme Poverty	Labor Force Participation	Labor Supply
Panel A. Baseline results						
After×Treat	0.482***	0.153***	−0.027	−0.062***	0.008	0.726
	(0.017)	(0.054)	(0.029)	(0.016)	(0.025)	(1.275)
Observations	10,435	10,435	10,435	10,435	10,435	10,435
Adjusted R^2	0.439	0.186	0.197	0.147	0.307	0.228
Panel B. Narrowed age groups (63-64 v. 66-67)						
After×Treat	0.483***	0.209***	−0.033	−0.068***	0.036	1.869
	(0.021)	(0.076)	(0.036)	(0.022)	(0.031)	(1.519)
Observations	5,574	5,574	5,574	5,574	5,574	5,574
Adjusted R^2	0.434	0.172	0.195	0.127	0.299	0.225
Panel C. Alternative control group (71-74)						
After×Treat	0.478***	0.201***	−0.019	−0.082***	−0.018	−0.077
	(0.019)	(0.047)	(0.022)	(0.015)	(0.021)	(1.039)
Observations	4,000	4,000	4,000	4,000	4,000	4,000
Adjusted R^2	0.331	0.150	0.176	0.131	0.300	0.217
Panel D. Baseline results including individuals 65 year old						
After×Treat	0.399***	0.135***	−0.024	−0.036**	0.015	0.683
	(0.014)	(0.048)	(0.026)	(0.014)	(0.022)	(1.070)
Observations	12,051	12,051	12,051	12,051	12,051	12,051
Adjusted R^2	0.368	0.189	0.199	0.147	0.299	0.222

Notes: The treatment group are individuals aged 66-69, who became eligible to receive a social pension in 2014. Individuals aged 61-64, who were not affected by the policy change, are the control group. All models include control variables and state fixed effects. We present estimates excluding households with other PAM beneficiaries (cohabitation). Panel A–D show that our main results are very similar to those in Table 2. * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level. Standard errors clustered at the county level in parentheses. Data are from the 2012 and 2014 Household Income and Expenditure National Survey (ENIGH).