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HOW DO BASIC INCOME FOR ELDERLY AFFECT HEALTH OF SELF-EMPLOYED?

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2024s-04
WORKING PAPER

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ISSN 2292-0838 (online version)

How Do Basic Income for Elderly Affect Health of Self-employed?

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Abstract/Résumé

This study explores how basic income for elderly (non-contributory pension program) affects the health of self-employed and salaried workers differently, which is particularly interesting given the greater social protection and lower income volatility of the latter. The study uses a cluster-randomized controlled trial that provides supplemental incomes to adults aged 70 or older in two towns in Yucatan, Mexico, and compares the effects of supplemental income over two waves for Valladolid (where eligible individuals received a monthly income supplement throughout the analysis period) and Motul (a demographically matched control town). The results indicate that self-employed workers experience a decrease in anemia, an improvement in peak expiratory flow, and better health care use and well-being. In contrast, salaried workers' health outcomes show no significant effect from the program. The program improves food availability for both self-employed and salaried workers, but its impact on food availability is stronger for self-employed workers.

Cette étude examine comment le revenu de base pour les personnes âgées (programme de pension non contributif) affecte différemment la santé des travailleurs indépendants et des travailleurs salariés, ce qui est particulièrement intéressant compte tenu de la plus grande protection sociale et de la plus faible volatilité des revenus de ces derniers. L'étude utilise un essai contrôlé randomisé en grappes qui fournit des revenus supplémentaires aux adultes âgés de 70 ans ou plus dans deux villes du Yucatan, au Mexique, et compare les effets du revenu supplémentaire sur deux vagues pour Valladolid (où les personnes éligibles ont reçu un supplément de revenu mensuel tout au long de la période d'analyse) et Motul (une ville de contrôle appariée sur le plan démographique). Les résultats indiquent que les travailleurs indépendants connaissent une diminution de l'anémie, une amélioration du débit expiratoire maximal, ainsi qu'une meilleure utilisation des soins de santé et un meilleur bien-être. En revanche, le programme n'a pas eu d'effet significatif sur la santé des travailleurs salariés. Le programme améliore la disponibilité alimentaire tant pour les travailleurs indépendants que pour les salariés, mais son impact sur la disponibilité alimentaire est plus important pour les travailleurs indépendants.

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Keywords/Mots-clés: Supplemental income, Elderly, Mexico, Health, Lifetime occupation / Revenu complémentaire, Personnes âgées, Mexique, Santé, Occupation à vie

JEL Codes/Codes JEL: I32, I14, J14, 015

Pour citer ce document / To quote this document
Aguila, E., & Fonseca, R. (2024). How Do Basic Income for Elderly Affect Health of Self-employed? (2024s-04, Working Papers, CIRANO.) https://doi.org/10.54932/ZKRN4888

Introduction

Mexico has one of the highest proportions of the self-employed workers among OECD countries, with 32% in 2019. One significant reason for the high prevalence of self-employment in Mexico is relatively low-income levels (Gollin, 2002). Self-employed workers are more affected by the income loss due to business cycle during different recession periods (Hipple, 2010). During their working life, the self-employed experience more income variation than salaried workers (EFILWC, 2017; Andersen et al., 2015; Aspen Institute, 2016). They are more likely to encounter fluctuating workloads and income flows due to higher exposure to unanticipated demand shocks, which can translate into more adverse health outcomes compared to salaried workers.

At the same time, salaried workers generally have better social protection than the self-employed. For instance, salaried workers usually have a better access to health insurance though employer plans, whereas the self-employed often struggle to afford quality health care without jeopardizing their finances. Salaried workers also have a better access to social security benefits in retirement (Aguila et al, 2011). This paper aims to examine how a supplemental income or non-contributory pension program affects individuals with different states of health and different employment life trajectories.

Depending on the health outcomes, the relationship can even be going in the opposite direction. On one hand, self-employment may attract healthier individuals due to their ability to focus on business opportunities. Income when self-employed is often dependent on one's ability to work, and self-employed individuals may have limited access to sickness benefits. On the other hand, health problems could be a barrier to finding wage employment, and may lead to self-employment among less healthy individuals, as suggested by Zissimopoulos and Karoly (2007).

Therefore, the relationship between health and self-employment is complex and may depend on various factors, such as the nature of the work, access to health care, and personal circumstances.

In richer countries, self-employed workers do not necessarily report better health outcomes than salaried workers (Perry and Rosen, 2004). Studies by Voskeritsian and Marx (2016) and Gonçalves and Martins (2021) found a reduction in healthcare use among the self-employed in Portugal, indicating higher probabilities of hospitalization, especially for men, older individuals, and those with lower education levels. These findings suggest that self-employment is associated with specific health risks that need targeted policy interventions. Similar findings are found Berkowitz et al. (2021) for the U.S. and Khan et al. (2023) for Canada.

In countries with larger informal labor markets and less developed welfare state, such as Mexico, this relationship is more complex. Aguila, et al. (2015), using data from the Mexican Health and Aging Study, found that self-employed workers report worse health on average than salaried workers. Vega et al. (2014) highlighted that income inequality, even after controlling for socioeconomic factors, is associated with worse health outcomes, emphasizing the role of social protection programs, such as Seguro Popular, in mitigating these disparities. They found these programs have a positive impact on reducing income-related health disparities. Overall, the study highlights the need for policies that address income inequality and improve access to healthcare, particularly for vulnerable populations like the self-employed who may lack traditional employment benefits.

The link between health and work was first examined in the Leibenstein (1957) study, which established a connection between nutrition and productivity. Subsequent studies have corroborated the relationship between health and income, showing the correlations between individuals' height, their physical strengths, their mental and physical abilities and their

productivity and earnings. A link between health and income is now well corroborated by several studies. Subsequent studies have corroborated the relationship between health and income, showing that serious health events negatively impact employment and earnings (Smith, 1999, 2004). Strully (2009) and Michaud et al. (2016) examine the impact of job loss on health in the US labor market, finding significant negative effects on health outcomes. Adeline et al. (2019) conclude that income volatility, particularly the permanent component, is associated with worse health and well-being outcomes for Canada. These findings suggest significant policy implications, emphasizing the need for social insurance and policies targeting income stability to improve public health.

The importance of health care coverage and retirement incentives as an explanation for self-employment at older ages have been previously documented for the United States (Parker and Rougier, 2007; Zissimopoulos and Karoly, 2007; Fairlie et al., 2011). Other studies have analyzed the occupational choices and characteristics of return migrants in Mexico (Papail, 2002, 2003). Aguila, et al. (2015) found that the self-employed are less likely to have health insurance and more likely to retire at older ages than salaried workers.

However, few studies examine the role of health insurance to explain health disparities between self-employed and salaried workers. One of the first studies is by Perry and Rosen (2001). Using comparative statistics for the United States for the year 1996, they analyze the differences between self-employed workers and employees on various health variables. Their study examines the health status of these two categories of workers, whether they hold health insurance and compares their use of the health system. Their results show that even though the self-employed do not generally have health insurance, this does not seem to have any impact on their health or that of their children. Strauss and Thomas (1998) believe that there is a real interest and scope for

research in the link between health insurance and the labor market, especially in developing countries. Berkowitz et al. (2021) underscore the impact of losing employer-sponsored health insurance on the uninsured rate among self-employed workers in the U.S., while Khan et al. (2023) reveal the gaps in social protection for self-employed workers in Canada, emphasizing the need for policy reforms to bridge these gaps. Both studies highlight some health disparities between self-employed and salaried workers due to differences in access to health insurance and social protection.

Although clear differences in health outcomes were not found in the health economics literature when looking at different health insurance systems in richer countries, the differences between having or not having social insurance can affect health outcomes in countries where the welfare system is not generous or remains to be built. Furthermore, the introduction of a non-contributory pension for the elderly can influence health outcomes and more particularly on the self-employed who suffer the most income uncertainty during their employment life cycle (Adeline et al., 2019). Even though several studies have been conducted to explain the link between the labor market and social insurance, and health, it would be important to study more deeply the interactions between these two sectors, particularly in emerging economies.

In Mexico, self-employed workers do not have mandatory social security and health care service contributions, often working in the informal sector and missing out on higher quality health insurance and social security benefits. While formal sector workers are entitled to social security benefits and health care insurance provided mainly by the Mexican Social Security Institute (Instituto Mexicano del Seguro Social, or IMSS), in the private sector, and by the Social Security Institute for Government Workers (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, or ISSSTE), in the public sector, workers operating in the informal sector who do not

pay into these systems are only entitled to noncontributory pensions and health care services such as “70 y más ” and “Seguro Popular” (Aguila et al., 2011; Lee et al., 2023). This is significant, given that 58% of the labor force is in the informal sector (Perry et al., 2007).

Previous studies found that supplemental income programs or basic income programs can reduce poverty and improve health care utilization and food availability (Barrientos et al. 2003 in Brazil or Pestieau et al. 2010, in 18 Latin American countries, Case, 2004, and Schatz et al., 2012 in South Africa, and Riumallo-Herl and Aguila, 2019 in Mexico). Cash transfer programs in developing countries can have significant long-term impacts on the health and well-being of recipients (Gertler et al. 2012 and Feeney 2017 for Mexico) as well as an increase in food availability, and household consumption (for instance see Schwarzer and Querino, 2002 and Lloyd-Sherlock and Agrawal, 2014 for Brazil or Aguila, et al. 2015 for Mexico). However, none have distinguished the effects by occupational choice. The role of basic income, and formal insurance in explaining health disparities between self-employed and salaried workers in less developed countries remains under-explored. Both factors -increased income volatility for the self-employed during their working life and worse health insurance coverage or formal insurance compared to salaried workers- could imply these two groups have different levels of health before receiving the non-contributory pension.

Therefore, our research question is the following: In what ways does a non-contributory pension program (*basic income for elderly*) affect the health of the self-employed and salaried workers differently? To answer our question, we evaluate the impact of the implementation of a non-contributory program in the city of Valladolid, in Mexico’s Yucatan state, and we analyze the health effect of this policy implementation for both the self-employed and salaried workers. We

compare the results with those obtained for the city of Motul – otherwise very similar to Valladolid – which will be the control group in our analysis.

Our main results indicate that the supplemental income affects both occupational choices, but more so for the self-employed, and the mechanisms that affect health differ between the two groups. Our primary health outcome results for the self-employed include a decline in anemia and an improvement in peak expiratory flow. Secondary outcomes were health care use and well-being variables. We found a positive effect of the health care use, with a higher proportion of self-employed workers visiting the doctor, as well as improved well-being for the self-employed, while there was no effect on these variables for the salaried workers. Finally, we found improvements in food availability for both self-employed and salaried workers after the introduction of the supplemental income program, but the effects were stronger for food availability outcomes among the self-employed.

3. Methods: Survey and Data

3.1 Study Design and Participants

In 2008, the Government of Yucatan rolled out the first stage of an income supplement program (*Reconocer Urbano*) targeted to individuals aged 70 and older living in urban areas with more than 20,000 inhabitants within the State. The program provided a non-contributory, flat-rate pension of 550 Mexican pesos per month (US$58.7 per month at 2014 purchasing power parity, or PPP). A detailed description of the study design, sampling frame, and follow-up procedures has been previously published (Aguila et al., 2014).

To evaluate of the impact of the non-contributory program, it was rolled out in stages, using an experimental design. We employed a cluster randomized control trial design among 11 eligible towns in the State of Yucatan, matched in pairs with similar demographic and economic

characteristics according to the available 2005 Census data. We randomly selected a pair of towns—Valladolid (45,868 inhabitants) and Motul (21,508 inhabitants), both located in the northeastern part of the state. One town, Valladolid, was randomly chosen as the treatment group, and the other town, Motul, as the control or comparison group. We screened all households to create a listing of adults 70 years or older eligible for the program in the treatment and control towns. The Mexican National Institute of Statistics and Geography (INEGI) assisted in training our interviewers to conduct the listing, providing cartography of the towns, and assessing the quality of the fieldwork. The take-up rate of the program was 94%. Motul was chosen as a control group because it was deemed the most similar to Valladolid among cities in the State fulfilling the program's criteria. The study was double blinded, with the interviewers unaware of which town would receive the noncontributory pension during the baseline interview.

Baseline surveys (W1) were conducted in Valladolid and Motul between August and November 2008 among all households with persons aged 70 or older, prior to the December 2008 introduction of the state pension program in Valladolid. Follow-up surveys (W2) were conducted simultaneously in both towns between July and September 2009. Response rates---computed using American Association for Public Opinion Research guidelines (The American Association for Public Opinion Research, 2011)--- were 91.5 percent in Valladolid and 95.3 percent in Motul at W1, and 87.9 percent in Valladolid and 81.9 percent in Motul at W2. The Internal Review Board at RAND Corporation reviewed and approved the research project protocol (approval number 2008-0513-CR07).

The survey questionnaires were comparable to those for the Mexican Health and Aging Study (MHAS) and the U.S. Health and Retirement Study (HRS), including a comprehensive assessment of health, disability, and socioeconomic characteristics. The surveys also collected

anthropometric measurements (height, weight, waist circumference) and performance measures (lung capacity, walking speed, grip strength) for age-eligible respondents. We conducted the survey using Computer Assisted Personal Interviewing (CAPI). Our survey was translated into Spanish and Mayan (the main local indigenous language), and we hired and trained bilingual interviewers. Interviewers received over 250 hours of training covering interviewing techniques, question specifications, handling refusals, obtaining informed consent, using proxy respondents and secondary informants, managing common problems, ensuring data confidentiality and safeguarding, field safety, issues in surveying identified respondents, and protocols for managing case assignments. We trained and certified interviewers in the collection of anthropometric measurements and biomarkers, following the standardized protocols and equipment of HRS.

3.1 Labor Market, Social Security and Health Insurance

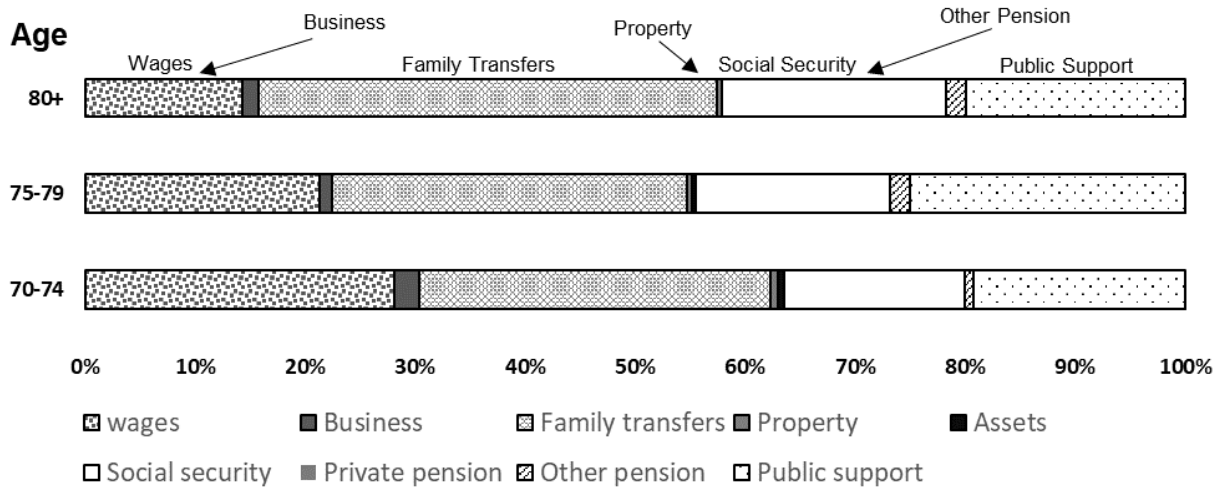
We are interested in how individuals labor market experience has been important for health and well-being outcomes after the implementation of the program. Many developing countries face the problem of having a high proportion of the labor force in the informal sector. As we mentioned previously, an unstable source of income can be different from self-employment and salary workers as well as across different social protection programs. We define self-employment and workers using the answer to the question: "What was your main occupation or what type of work did you do most of your life?" This helps to identify workers who are more exposed to the formal and informal sectors. There are nine categories: 1. Boss at a business or company 2. Self-employed 3. Worked by the piece or on commission 4. Salaried employees in the private sector 5. Salaried employees in the public sector 6. Domestic employee 7. Work at a family business without pay 8 Worked at a private business without pay and 9. Other.

We define self-employed workers as those individuals who report being self-employed[1], individuals who have worked by the piece or on commission, and domestic employees. We keep these categories given that we are interested in studying the role of formal insurance in influencing occupational choices in the Mexican labor market; we do not include family and unpaid workers in our analysis of the self-employed. We then define salaried workers as categories 4 and 5; salaried employees in the private and public sector.

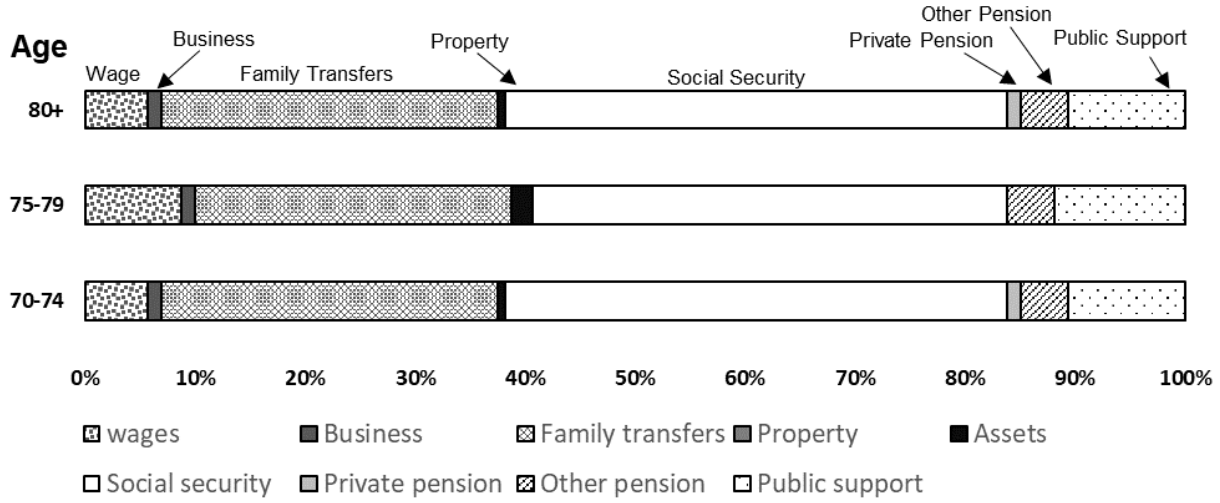
There is no universal social security or health insurance in Mexico. Most workers—58%--are in the informal sector and receive a considerably smaller non-contributory pension. The informal sector includes mainly low-wage, low-income workers (Aguila et al., 2015). Some self-employed who choose to contribute receive social security and health care benefits, while those who do not contribute can receive non-contributory pension benefits and health care provided by the government. Figure A1 in the appendix shows the scheme of public and private systems of social protection during our period of analysis (see Dantés et al. (2011) for a description of the Mexican Protection system).

Figure 1. Sources of Income by Age Bracket for Self-employed (panel a) and Salaried (panel b) Workers

[1] We do not include 1. Boss at a business or company or 9. Other, because there are few observations.



a) Self-employed workers



b) Salaried workers

Figure 1 shows the sources of income for older adults in our study at the baseline by age brackets for self-employed (panel a) and salaried workers (panel b). We observe the main sources of income at older ages for self-employed and salaried workers are wages, family transfers, social security benefits, and public support programs. Public support includes programs from the Mexican government to alleviate poverty and transfers from non-family individuals. Public

support programs includes the conditional cash transfers program *Progresa* for families in poverty with children, and *Procampo* that was cash-transfer program for low-income farmers. However, the self-employed rely more on wages, family transfers, and public support programs than salaried workers. Reliance on wages reduces as individuals get older but the reduction is higher for salaried workers than for self-employed. For salaried workers, the main sources of income were social security benefits and family transfers, whereas for self-employed, they were family transfers and public support programs. Public support programs are a more important source of income for the self-employed than for salaried workers.

3.2. Outcomes

Health and Wellbeing: Data have several measures of objective health and well-being outcomes. About objective health we include three outcomes. First, the highest peak expiratory flow for lung disease, measured from three readings taken 30 seconds apart. Second, the low hemoglobin levels (protein levels in the blood), with a binary indicator, 1 = yes and 0 = no, based on a blood test following cutoff values of<13 g/dL for males and<12 g/ dL for females. Third, the maximum grip strength in kg. Moreover, we consider a subject well-being variable, satisfied with health. The variable has 5-scale category 1. Very unsatisfied 2. Unsatisfied 3. Never 4. Satisfied 5. Very satisfied. We build a dummy for each variable with value 1 for categories 4 and 5 and 0 otherwise.

Health care utilization: It is possible that health care utilization differs between for self-employed and salary workers, and income supplement can increase the health care utilization. We analyze two outcomes of health care utilization in the prior three months: number of doctor visits, and whether they visited a doctor (1. Yes 0. No).

Food availability: We also consider six variables related to food availability, as it can affect health by allowing individuals to use the supplemental income to buy additional food. We use the following variables based on individuals' responses about how often in the last 3 months:

1. *Runout of food:* did you run out of food, and you didn't have the money or resources to get more.

2. *Hungry but not eat because couldn't afford enough food:* were (you or other adults in your household you) hungry but didn't eat because you couldn't afford enough food?

3. *Not eat all day because not enough money for food:* did you or another person in your household not eat all day because there wasn't enough money for food?

4. *Get emergency food from institutions*: did you or another person in your household ever get emergency food from a church, government institution or other institution?

5. *Eat any meals in a community kitchen:* did you or another person in your household eat any meals in a community dining hall or kitchen?

6. *Receive meals from government institutions:* did you receive meals from DIF or another government institution?

In all variables the individuals report whether 1. Never 2. Sometimes 3. Usually 4. Always. We build a binary variable equal to 1 when individuals report 2-4 and 0 if individuals say Never.

3.3. Control variables

Our control variables are a female dummy, three categorical age dummies (ranges 70-74, 75-79, and over 80). We also controlled for years of education, living alone, and the mean of the number of household residents.

3.4 Sample

We use longitudinal data where we follow the same individuals in Wave 1 and Wave 2. The original sample consisted of 2,285 individuals aged 70 or older. We only include in our sample individuals who participated in both Wave 1 and Wave 2 and were classified as self-employed or salaried workers. Our final sample consists of 1,472 individuals aged 70 or older, 955 self-employed and 517 salaried workers in each wave. We excluded those that responded that they never worked for pay in their lives and those who were bosses at a business or company.

4. Descriptive Statistics

Table 1 shows the descriptive statistics at baseline for self-employed and salaried workers in the treatment and control groups. Salaried workers have, on average, higher mean number of years of education than self-employed workers. Overall, the level of education is quite low for both groups. Self-employed workers have an average of 1.8 years of education, while salaried workers have between 2.7 and 3.4 years of education on average. There is more variation on average number of years of education for salaried workers than for self-employed workers, as shown by the standard deviation reported in Table 1. The proportion of individuals living alone ranges between 9.8% and 15.3%. Self-employed and salaried workers have similar average number of household residents, between 3.3 and 3.4.

In terms of health and well-being outcomes, the proportion of older adults with low hemoglobin levels or anemia is similar between self-employed and salaried workers, as there are no statistically significant differences, ranging between 48.8% to 54.0%. Salaried workers have a higher maximum peak expiratory flow than self-employed workers, but differences are not statistically significant across groups. A higher proportion of self-employed workers are satisfied with their health compared to salaried workers, but these differences are only significant in the

treatment town. Satisfaction with their health ranges between 47.7% and 56.3%, with no statistically significant differences within groups. We find higher health care utilization in terms of the proportion of respondents visiting a doctor in the previous three months and number of doctor visits for salaried workers compared to self-employed workers in the treatment town, but similar health care utilization between groups in the control town. The proportion of respondents visiting the doctor ranges between 37.8% and 51.4% and the average number of doctor visits is between 0.9 and 1.4. Overall, self-employed workers face more issues with food availability than salaried workers. A higher proportion of self-employed report running out of food, being hungry, not eating all day, getting emergency food, and receiving meals from a government institution.

Table 1. Descriptive Statistics

	Treatment (Valladolid)	Control (Motul)			Treatment (Valladolid)	Control (Motul)						
	% or Mean (SD)	% or Mean (SD)	Diff	T test, P value	% or Mean (SD)	% or Mean (SD)	Diff	T test, P value	Diff (1)-(5)	T test, P value	Diff (2)-(6)	T test, P value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Self-employed				Salaried Workers							
Demographic												
Female (1=yes, 0=no)	42.59	42.89	0.00	0.92	48.59	42.06	-0.07	0.14	-0.06	0.10	0.01	0.84
Age 70-74 (1=yes, 0=no)	42.59	41.26	-0.01	0.68	42.96	38.20	-0.05	0.27	0.00	0.92	0.03	0.44
Age 75-79 (1=yes, 0=no)	29.85	33.33	0.03	0.25	31.69	24.03	-0.08	0.05	-0.02	0.59	0.09	0.01
Age 80+ (1=yes, 0=no)	27.57	25.41	-0.02	0.45	25.35	37.77	0.12	0.00	0.02	0.49	-0.12	0.00
Mean years of education	1.90	1.89	-0.02	0.88	3.41	2.70	-0.71	0.01	-1.51	0.00	-0.82	0.00
	(0.10)	(0.09)			(0.20)	(0.16)						
Lives alone (1=yes, 0=no)	14.83	15.38	0.56	0.81	9.86	12.45	2.59	0.36	4.97	0.04	2.94	0.29
No. of household residents	3.37	3.42	0.06	0.69	3.37	3.45	0.08	0.67	0.00	1.00	-0.02	0.90
	(0.09)	(0.10)			(0.12)	(0.14)						
Health and Wellbeing												
Hemoglobin level low (1=yes, 0=no)	54.07	48.81	-5.25	0.14	53.68	50.53	-3.15	0.52	-0.39	0.92	1.71	0.70
Maximum peak expiratory flow, L/min	234.05	247.80	13.75	0.06	244.85	252.96	8.11	0.44	-10.80	0.24	-5.16	0.57
	(5.18)	(5.15)			(7.54)	(7.38)						
Satisfied with health (1=yes, 0=no)	56.36	53.75	-2.61	0.45	47.72	48.00	0.28	0.95	-8.64	0.03	-5.75	0.21
Health care												
Visited a doctor (1=yes, 0=no)	37.83	47.32	9.49	0.00	51.41	48.93	-2.48	0.58	13.58	0.00	1.61	0.69
No. doctor visits	0.95	1.30	0.35	0.03	1.45	1.26	-0.19	0.22	-0.50	0.00	0.04	0.83
	(0.07)	(0.14)			(0.12)	(0.11)						
Food availability												
Run out of food (1=yes, 0=no)	56.82	51.91	-4.91	0.14	49.61	42.60	-7.01	0.13	-7.21	0.06	-9.31	0.02
Hungry, couldn't afford enough food (1=yes, 0=no)	36.33	24.40	-11.92	0.00	23.44	22.87	-0.57	0.88	-12.89	0.00	-1.53	0.66
Not eat all day, not enough money (1=yes, 0=no)	26.07	16.27	-9.80	0.00	16.02	9.87	-6.15	0.04	-10.05	0.00	-6.40	0.02
Emergency food from institution (1=yes, 0=no)	8.11	3.35	-4.76	0.00	3.50	2.69	-0.81	0.61	-4.61	0.01	-0.66	0.64
Eat meals in community kitchen (1=yes, 0=no)	4.88	2.39	-2.49	0.04	2.33	1.79	-0.54	0.68	-2.54	0.06	-0.60	0.61
Receive meals from gov. institution (1=yes, 0=no)	4.67	3.11	-1.56	0.22	1.95	1.35	-0.60	0.60	-2.73	0.03	-1.76	0.13
No. of observations	526	429			284	233						

Notes: Standard deviation in parentheses.

5. Empirical Model

We estimate the effects of the income supplemental program on health, well-being, health care use, and food availability of older self-employed and salaried workers. We compared the differences between the treatment and control towns using differences-in-mean outcomes between W1 and W2 (pre vs post estimator). To identify the causal effect of the supplemental income program, we use a difference-in-differences (DID) estimator of means to compare the changes in outcomes for the treatment and control groups. The main identification assumption of the DID analysis is the parallel trends assumption, which requires that, in the absence of treatment, the differences in levels between treatment and control groups remain constant over time (Cameron and Trivedi, 2013). We found that both towns satisfied the common-trends assumption (see Appendix Table A1 and previous analysis in Aguila et al., 2017). To account for multiple hypotheses testing, we applied a Holm-Bonferroni correction (Holm, 1979). To check the robustness of our results, we also estimated the intention-to-treat (ITT) differences-in-difference (DID) OLS regression with the covariates described above that were not affected by the non-contributory pension programs:

$$Y_{it} = \alpha_0 + \alpha_1 w_t + \alpha_2 SI_i + \alpha_3 (SI_i * w_t) + \alpha_4 X_{it} + \varepsilon_{it}$$

where Y_{it} is the outcome variable of interest for individual i in wave t, w_t is a wave dummy (W2 = 1, W1 = 0), SI_i is a supplemental income program dummy (treatment = 1, control = 0), and X_{it} includes sociodemographic characteristics. α_3 measures the causal effect of the supplemental income program. We estimate robust and clustered standard errors at the household level. Additionally, we employ non-parametric propensity score matching that compares recipients with similar characteristics in the treatment and control groups, using the same covariates as in the OLS regression analysis. The propensity score is estimated using a probit model. We impose the region

of common support and dropped fewer than eight observations in the estimations by each outcome variable. We use Kernel matching with the Epanechnikov Kernel function. We compute standard errors using the bootstrap method with 1,000 replications. We used covariates in the parametric methods using OLS regression and in the non-parametric method to improve the precision of our estimates. To assess potential sample selection issues, we conducted a robustness analysis. To assess sample attrition bias, we compared W1 characteristics of individuals who did not complete W2 with those who did complete it. We found no indication of sample selection issues in these analyses (see Appendix Table A2 for self-employed and Table A3 for salaried).

6. Results

In this section, we examine the effects of the supplemental income program on health, well-being, health care utilization, and food availability for self-employed and salaried workers. Tables 2 and 3 present the difference-in-differences (DID) estimates of the mean outcomes for self-employed and salaried workers, respectively.

Table 2 shows that for self-employed individuals, the proportion with anemia decreased between Wave 1 and Wave 2 for the treatment group and increased for the control group. This results in an overall decline in anemia for the treatment group relative to the control group of 15.5 percentage points. Similarly, maximum peak expiratory flow improved for both groups, with a greater improvement observed in the treatment group, resulting in a 3.1 percent (7.456/235.833) increase relative to the control group. Satisfaction with health also increased for the treatment group, while there was no change for the control group. The proportion of respondents who visited a doctor in the previous three months increased in the treatment group, but remained unchanged in the control group, leading to a 14.0 percentage point improvement for the treatment group. The

number of doctor visits followed a similar pattern, with the treatment group showing a 42.3 percent (0.403/0.952) increase in visits compared to the control group.

Regarding food availability, the treatment group in comparison to the control group for self-employed workers improved their food availability reducing more issues with running out food, being hungry, and not eating all day. Additionally, the proportion of individuals receiving emergency food, eating meals at a community kitchen, and receiving meals from a government institution declined more significantly in the treatment group compared to the control group. Overall, these findings indicate significant improvements in food availability for the treatment. All the effects observed in Table 2 remain statistically significant even after adjusting for multiple hypothesis testing.

Table 3 provides the same analysis for salaried workers, revealing different effects of the supplemental income program. Unlike the self-employed, there were no significant effects of the supplemental income program on health, well-being, and health care outcomes for salaried workers. However, there were some improvements in food availability, particularly in the reduction of the proportion of individuals not eating all day and receiving emergency food or meals from government institutions. These effects were statistically significant even after correcting for multiple hypothesis testing.

In summary, the supplemental income program had significant differences or more pronounced impact on health, well-being, health care utilization, and food availability of self-employed workers compared to salaried workers. While salaried workers showed some improvements in food availability, the effects were more consistent and widespread for self-employed workers.

Table 2. Effects of the Supplemental Income Program on Health, Wellbeing, Health Care, and Food Availability of Self-employed Workers

Variables	Treatment town (Valladolid) Wave 1 Mean (SE)	Control town (Motul) Wave 1 Mean (SE)	Treatment town (Valladolid) Diff	P value	Control town (Motul) Diff	P value	DID	P value	HB
			Self-employed						
Health and Wellbeing									
Hemoglobin level low (1=yes, 0=no)	0.540	0.479	-0.075 ***	0.000	0.080 ***	0.000	-0.155 ***	0.000	††
	(0.025)	(0.027)	(0.020)		(0.021)		(0.029)		
Maximum peak expiratory flow, L/min	235.833	254.314	34.814 ***	0.000	17.358 ***	0.000	7.456 ***	0.001	††
	(5.453)	(5.576)	(3.764)		(3.661)		(5.251)		
Satisfied with health (1=yes, 0=no)	0.568	0.535	0.104 ***	0.000	0.016	0.489	0.088 ***	0.004	††
	(0.024)	(0.026)	(0.020)		(0.023)		(0.030)		
Health care									
Visited a doctor (1=yes, 0=no)	0.378	0.473	0.112 ***	0.000	-0.028	0.166	0.140 ***	0.000	††
	(0.021)	(0.024)	(0.019)		(0.020)		(0.027)		
No. doctor visits	0.952	1.300	0.139 **	0.021	-0.265 ***	0.009	0.403 ***	0.001	††
	(0.072)	(0.140)	(0.060)		(0.101)		(0.117)		
Food availability									
Run out of food (1=yes, 0=no)	0.569	0.520	-0.133 ***	0.000	-0.051 **	0.017	-0.083 ***	0.005	††
	(0.023)	(0.025)	(0.020)		(0.021)		(0.029)		
Hungry, couldn't afford enough food (1=yes, 0=no)	0.369	0.246	-0.194 ***	0.000	-0.075 ***	0.000	-0.119 ***	0.000	††
	(0.022)	(0.021)	(0.019)		(0.018)		(0.026)		
Not eat all day, not enough money (1=yes, 0=no)	0.263	0.164	-0.179 ***	0.000	-0.070 ***	0.000	-0.109 ***	0.000	††
	(0.020)	(0.018)	(0.016)		(0.015)		(0.022)		
Emergency food from institution (1=yes, 0=no)	0.083	0.034	-0.043 ***	0.000	0.010	0.268	-0.053 ***	0.000	††
	(0.013)	(0.009)	(0.010)		(0.009)		(0.014)		
Eat meals in community kitchen (1=yes, 0=no)	0.048	0.024	-0.044 ***	0.000	-0.012 **	0.050	-0.032 ***	0.001	††
	(0.010)	(0.008)	(0.007)		(0.006)		(0.009)		
Receive meals from gov. institution (1=yes, 0=no)	0.046	0.031	-0.033 ***	0.000	0.017 *	0.085	-0.050 ***	0.000	††
	(0.010)	(0.009)	(0.008)		(0.010)		(0.012)		
No. of observations	526	429							

Note. *p < .10; **p < .05; ***p < .01; †p < .10; ††p < .05 after HB correction.

Table 3. Effects of the Supplemental Income Program on Health, Wellbeing, Health Care, and Food Availability of Salaried Workers

Variables	Treatment town (Valladolid) Wave 1 Mean (SE)	Control town (Motul) Wave 1 Mean (SE)	Treatment town (Valladolid) Diff	P value	Control town (Motul) Diff	P value	DID	P value	HB
			Salaried						
Health and Wellbeing									
Hemoglobin level low (1=yes, 0=no)	0.510	0.503	-0.005	0.852	0.000	1.000	-0.005	0.900	
	(0.036)	(0.039)	(0.027)		(0.030)		(0.040)		
Maximum peak expiratory flow, L/min	255.908	262.681	31.434 ***	0.000	24.493 ***	0.000	6.941	0.371	
	(8.916)	(8.429)	(5.400)		(5.568)		(7.756)		
Satisfied with health (1=yes, 0=no)	0.478	0.460	0.185 ***	0.000	0.140 ***	0.000	0.045	0.314	
	(0.035)	(0.041)	(0.028)		(0.035)		(0.045)		
Health care									
Visited a doctor (1=yes, 0=no)	0.514	0.489	0.127 ***	0.000	0.103 ***	0.000	0.024	0.536	
	(0.030)	(0.033)	(0.026)		(0.028)		(0.038)		
No. doctor visits	1.457	1.262	0.386 ***	0.007	0.099	0.265	0.287 *	0.088	
	(0.116)	(0.107)	(0.143)		(0.089)		(0.168)		
Food availability									
Run out of food (1=yes, 0=no)	0.486	0.423	-0.170 ***	0.000	-0.118 ***	0.000	-0.052	0.193	
	(0.032)	(0.033)	(0.029)		(0.027)		(0.040)		
Hungry, couldn't afford enough food (1=yes, 0=no)	0.240	0.227	-0.159 ***	0.000	-0.123 ***	0.000	-0.036	0.226	
	(0.027)	(0.028)	(0.021)		(0.021)		(0.030)		
Not eat all day, not enough money (1=yes, 0=no)	0.159	0.095	-0.138 ***	0.000	-0.014	0.431	-0.125 ***	0.000	††
	(0.023)	(0.020)	(0.017)		(0.017)		(0.024)		
Emergency food from institution (1=yes, 0=no)	0.036	0.027	-0.012	0.274	0.045 ***	0.001	-0.058 ***	0.001	††
	(0.012)	(0.011)	(0.011)		(0.014)		(0.018)		
Eat meals in community kitchen (1=yes, 0=no)	0.024	0.018	-0.020 ***	0.002	-0.018 ***	0.005	-0.002	0.819	
	(0.010)	(0.009)	(0.006)		(0.006)		(0.009)		
Receive meals from gov. institution (1=yes, 0=no)	0.016	0.014	0.008	0.372	0.055 ***	0.000	-0.046 ***	0.004	††
	(0.008)	(0.008)	(0.009)		(0.013)		(0.016)		
No. of observations	284	233							

Note. *p < .10; **p < .05; ***p < .01; †p < .10; ††p < .05 after HB correction.

We further explore the effects of the supplemental income program on health, well-being, health care utilization, and food availability for both self-employed and salaried workers with other

empirical strategies. Table 4 presents the causal effects of the program for self-employed individuals, utilizing three different analytical approaches: difference-in-differences (DID) of means, DID regression, and DID propensity score matching. These methods help ensure the robustness of our findings by providing multiple perspectives on the data. Table 5 applies a similar analysis for salaried workers, allowing for a comparative view of the program's impact on these two distinct groups.

Table 4 shows consistent results across the three methods, with similar sign and magnitude of coefficients and statistical significance, even after correcting for multiple hypothesis testing. We found improvements on health, well-being, health care, and food availability for treatment group of self-employed compared to the control group. Table 5 shows that the effects of the supplemental income program for salaried workers are also consistent in terms of sign, magnitude, and statistical significance, demonstrating comparable outcomes across the various methods used.

Table 4. Effects of the Supplemental Income Program on Health, Wellbeing, Health Care, and Food Availability of Self-employed Workers using DID of means, regressions, and propensity score matching

Variables	DID of means		DID regressions		DID propensity score	
	Coef (SE)	HB	Coef (SE)	HB	Coef (SE)	HB
	Self-employed					
Health and Wellbeing						
Hemoglobin level low (1=yes, 0=no)	-0.155 (0.029) ***	††	-0.130 (0.040) ***	††	-0.157 (0.043)***	††
Maximum peak expiratory flow, L/min	17.456 (5.251) ***	††	16.500 (7.460) **	†	17.789 (7.465)***	††
Satisfied with health	0.088 (0.030) ***	††	0.080 (0.040) *	†	0.086 (0.044)**	††
Health care						
Visited a doctor (1=yes, 0=no)	0.140 (0.027) ***	††	0.140 (0.040) ***	††	0.134 (0.039)***	††
No. doctor visits	0.403 (0.117) ***	††	0.400 (0.170) **	††	0.354 (0.159)**	††
Food availability						
Run out of food (1=yes, 0=no)	-0.083 (0.029) ***	††	-0.080 (0.040) *	†	-0.084 (0.041)**	††
Hungry, couldn't afford enough food (1=yes, 0=no)	-0.119 (0.026) ***	††	-0.120 (0.040) ***	††	-0.127 (0.039)***	††
Not eat all day, not enough money (1=yes, 0=no)	-0.109 (0.022) ***	††	-0.110 (0.030) ***	††	-0.113 (0.032)***	††
Emergency food from institution (1=yes, 0=no)	-0.053 (0.014) ***	††	-0.050 (0.020) ***	††	-0.053 (0.020)***	††
Eat meals in community kitchen (1=yes, 0=no)	-0.032 (0.009) ***	††	-0.030 (0.010) **	††	-0.034 (0.013)***	††
Receive meals from gov. institution (1=yes, 0=no)	-0.050 (0.012) ***	††	-0.050 (0.020) ***	††	-0.051 (0.018)***	††
No. of observations	1,910		1,910		1,910	

Note. *p < .10; **p < .05; ***p < .01; †p < .10; ††p < .05 after HB correction.

Table 5. Effects of the Supplemental Income Program on Health, Wellbeing, Health Care, and Food Availability of Salaried Workers using DID of means, regressions, and propensity score matching

Variables	DID of means		DID regressions		DID propensity score	
	Coef (SE)	HB	Coef (SE)	HB	Coef (SE)	HB
	Salaried					
Health and Wellbeing						
Hemoglobin level low (1=yes, 0=no)	-0.005 (0.040)		-0.030 (0.050)		-0.008 (0.060)	
Maximum peak expiratory flow, L/min	6.941 (7.756)		4.460 (10.390)		11.462 (10.753)	
Satisfied with health	0.045 (0.045)		0.040 (0.060)		0.053 (0.065)	
Health care						
Visited a doctor (1=yes, 0=no)	0.024 (0.038)		0.020 (0.060)		0.009 (0.055)	
No. doctor visits	0.287 (0.168) *		0.300 (0.240)		0.286 (0.233)	
Food availability						
Run out of food (1=yes, 0=no)	-0.052 (0.040)		-0.080 (0.060)		-0.042 (0.056)	
Hungry, couldn't afford enough food (1=yes, 0=no)	-0.036 (0.030)		-0.040 (0.040)		-0.048 (0.042)	
Not eat all day, not enough money (1=yes, 0=no)	-0.125 (0.024) ***	††	-0.120 (0.030) ***	††	-0.130 (0.035)***	††
Emergency food from institution (1=yes, 0=no)	-0.058 (0.018) ***	††	-0.060 (0.030) **		-0.055 (0.026)**	†
Eat meals in community kitchen (1=yes, 0=no)	-0.002 (0.009)		0.000 (0.010)		-0.004 (0.012)	
Receive meals from gov. institution (1=yes, 0=no)	-0.046 (0.016) ***	††	-0.050 (0.020) **		-0.045 (0.021)**	†
No. of observations	1,034		1,034		1,034	

Note. *p < .10; **p < .05; ***p < .01; †p < .10; ††p < .05 after HB correction.

6. Conclusion

We analyze how a non-contributory pension program affects health of self-employed and salaried workers differently. Using results from a cluster-randomized controlled trial that provides supplement incomes in poor towns among adults aged 70 or older. We compared supplemental income effects over two waves for two towns in Yucatan, Mexico: Valladolid, where eligible individuals received a monthly income supplement throughout the analysis period, and Motul, a demographically matched control town. This paper examines how a supplemental income program affect individuals in varying states of health who have had different employment trajectories during their life cycle. Salaried workers have more social protection than the self-employed, and less income volatility.

Our primary health outcome results for the self-employed workers show a decline in anemia and an improvement on peak expiratory flow. The secondary outcomes were included health care use and well-being variables. We found a positive effect on the health care use increasing the proportion of self-employed workers who visited the doctor, as well as an improvement in well-being for the self-employed, while no significant effects were observed for these variables among salaried workers. Finally, we found improvements in food availability for both self-employed and salaried workers after the introduction of the supplemental income program, but the effects were more consistent and widespread corroborated in our robustness tests for the self-employed in terms of food availability outcomes.

These findings highlight the differential impacts of supplemental income on various aspects of health and well-being, emphasizing the importance of considering employment status when designing and evaluating social protection programs, especially in countries with underdeveloped welfare systems.

Acknowledgements.

We thank the staff in Yucatan—supervisors, directors, coordinators, interviewers, programmers, and administrators—who made the project possible. We would like to thank Simon Lord, Stephany Maqueda, and Jorge Peniche for their excellent research assistance.

Funding

This research was supported by funding from the State of Yucatan and by Grants R01AG035008, P01AG022481, R21AG033312, and P30AG017265 from the National Institute on Aging and various units at the RAND Corporation. This research is also part of the program of the Research Chair in Intergenerational Economics at UQAM. Errors are our own.

Data Availability

The following publicly available datasets have been used for the analysis in this article:

Yucatan Aging Data. Experimental Design of a Non-Contributory Social Security Program in Mexico that can be downloaded at https://dornsife.usc.edu/cesr/yucatan-aging-data/

Declarations

Conflict of interest. The authors declare no competing interests.

Financial and non-financial interests: The authors have no relevant financial or non-financial interests to disclose.

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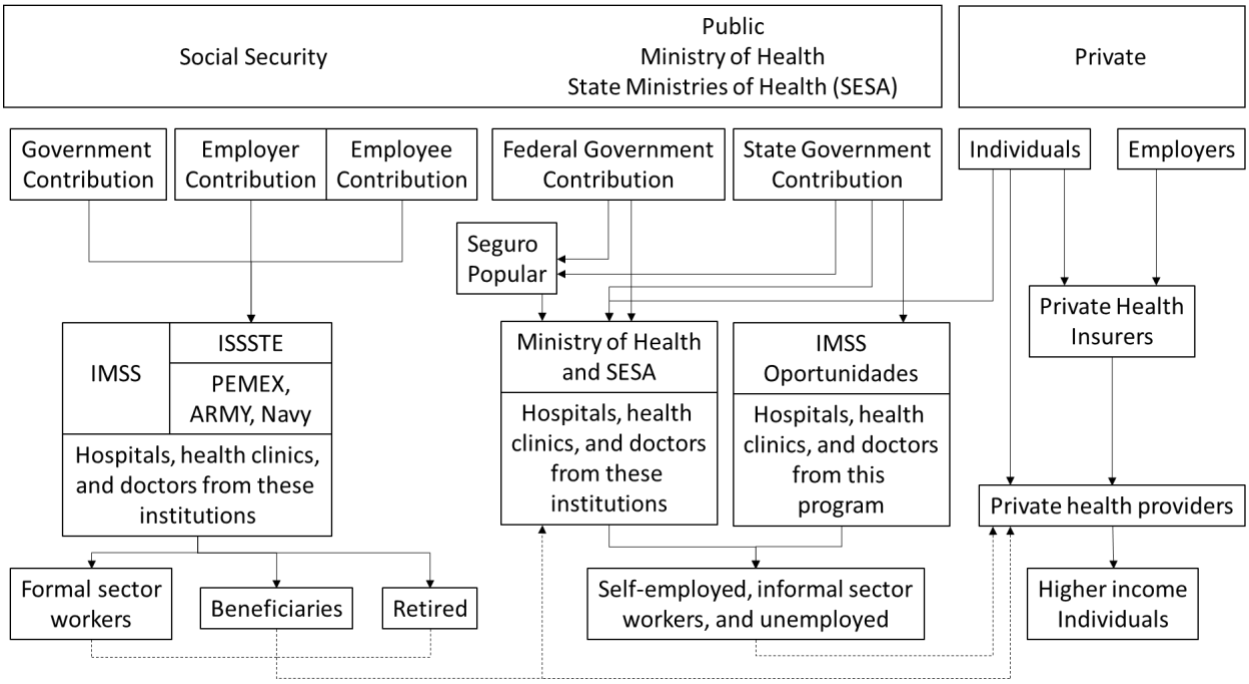
Supplementary Material

Figure A1. Healthcare and Social Security System in Mexico during our period of analysis



Source: Translated from Dantes et al. (2011)

Table A1. OLS Regressions to Test for Common Trends for Households with Individuals 70 or older in Treatment and Control Localities using Census data 1990-2010

	Lives alone	Earthen floor	Cement floor	Number of sleeping householdrooms	Piped water	Sewage system	Health insurance
Treatment	-0.00	0.10	-0.16**	0.17	-0.01	0.01	-0.15**
	(0.05)	(0.07)	(0.07)	(0.12)	(0.02)	(0.02)	(0.06)
Interaction terms							
Treatment* 1995	0.08	0.27	0.09	-0.07	0.01	-0.01	
	(0.18)	(0.21)	(0.24)	(0.35)	(0.02)	(0.02)	
Treatment* 2000	-0.05	-0.07	-0.13	-0.09	0.01	-0.01	
	(0.07)	(0.08)	(0.09)	(0.15)	(0.02)	(0.02)	
Treatment* 2005	-0.00	0.02	-0.11	-0.08	0.01	-0.01	0.00
	(0.06)	(0.08)	(0.09)	(0.16)	(0.02)	(0.02)	(0.08)
Treatment* 2010	-0.06	-0.04	0.08	-0.03	0.11***	-0.00	0.22***
	(0.06)	(0.07)	(0.09)	(0.15)	(0.03)	(0.02)	(0.08)
Year							
1995	-0.01	-0.11	-0.06	0.07	-0.03	-0.01	
	(0.12)	(0.13)	(0.18)	(0.26)	(0.02)	(0.01)	
2000	0.01	-0.16***	0.23***	0.17*	-0.03	-0.01	
	(0.05)	(0.05)	(0.07)	(0.10)	(0.02)	(0.01)	
2005	-0.04	-0.20***	0.23***	0.22**	-0.03	-0.01	0.08
	(0.05)	(0.05)	(0.07)	(0.10)	(0.02)	(0.01)	(0.06)
2010	0.07	-0.20***	0.12*	0.31***	-0.01	-0.00	0.11**
	(0.05)	(0.05)	(0.06)	(0.09)	(0.02)	(0.01)	(0.05)
Constant	0.14***	0.24***	0.44***	1.43***	0.03	0.01	0.54***
	(0.04)	(0.05)	(0.06)	(0.07)	(0.02)	(0.01)	(0.04)
No. Observations	1,183	1,177	1,177	1,173	1,179	1,169	989
R-squared	0.01	0.09	0.06	0.02	0.06	0.01	0.05
F (interaction)	0.36	1.94	0.91	0.13	0.50	0.19	-
Prob > F (interaction)	0.78	0.12	0.44	0.94	0.48	0.66	-

Notes. *p < .10; **p < .05; ***p < .01; †p < .10. The year 1990 was the reference category for lives alone, earthen floor, cement floor, number of sleeping household rooms, piped water, and sewage system. The year 2000 was the reference category for health insurance. Health Insurance was only available for years 2000, 2005, 2010. Joint F-test of interactions treatment*year were not computed for health insurance because this variable was only available in 2000 and 2005 before the introduction of the non-contributory pension program.

Table A2. Comparison of Baseline Descriptive Characteristics for Baseline and Panel Self-employed Workers

	Treatment (Valladolid)			Control (Motul)			
	Self-employed workers panel 1: Baseline vs. Panel Respondents						
	Baseline Respondents (a)	Panel Respondents (b)	Difference (b) - (a) = (c)	Baseline Respondents (d)	Panel Respondents (e)	Difference (e) - (d) = (f)	DID (c) - (f)
Female (1=yes, 0=no)	0.43	0.43	-0.01	0.43	0.43	0.00	-0.01
Age 70-74 (1=yes, 0=no)	0.43	0.43	0.00	0.41	0.41	0.00	0.00
Age 75-79 (1=yes, 0=no)	0.30	0.30	-0.01	0.34	0.33	-0.01	0.00
Age 80+ (1=yes, 0=no)	0.27	0.28	0.01	0.25	0.25	0.01	0.00
Years of education	1.89	1.90	0.02	1.89	1.89	0.00	0.02
Lives alone (1=yes, 0=no)	0.16	0.15	-0.01	0.15	0.15	0.00	-0.01
No. of household residents	3.34	3.37	0.03	3.44	3.42	-0.01	0.04
No. Observations	550	526		439	429		

Note. *p < .10; **p < .05; ***p < .01; †p < .10

Table A3. Comparison of Baseline Descriptive Characteristics for Baseline and Panel Salaried Workers

	Treatment (Valladolid)			Control (Motul)			
	Salaried workers panel 1: Baseline vs. Panel Respondents						
	Baseline Respondents (a)	Panel Respondents (b)	Difference (b) - (a) = (c)	Baseline Respondents (d)	Panel Respondents (e)	Difference (e) - (d) = (f)	DID (c) - (f)
Female (1=yes, 0=no)	0.47	0.49	0.01	0.41	0.42	0.01	0.00
Age 70-74 (1=yes, 0=no)	0.43	0.43	0.00	0.38	0.38	0.00	-0.01
Age 75-79 (1=yes, 0=no)	0.32	0.32	0.00	0.24	0.24	0.00	0.00
Age 80+ (1=yes, 0=no)	0.25	0.25	0.00	0.38	0.38	0.00	0.01
Years of education	3.45	3.41	-0.04	2.76	2.70	-0.06	0.01
Lives alone (1=yes, 0=no)	0.10	0.10	0.00	0.13	0.12	0.00	0.00
No. of household residents	3.37	3.37	0.00	3.47	3.45	-0.02	0.02
No. Observations	297	284		238	233		

Note. *p < .10; **p < .05; ***p < .01; †p < .10