TEXTO PARA DISCUSSÃO

No.701

The Value of Health Insurance: A Household Job Search Approach

Gabriella Conti

Rita Ginja

Renata Narita

PUC RIO

DEPARTAMENTO DE ECONOMIA

The Value of Health Insurance: A Household Job Search Approach

Gabriella Conti* Rita Ginja† Renata Narita§

December 8, 2024

Abstract

Do households value access to free health insurance when making labor supply decisions? We address this question by exploiting the 2002 introduction of universal health insurance in Mexico (Seguro Popular, SP), that broke the link between access to health care and job contract. Reduced-form estimates show that SP increased informality among less educated families with children by 3.5%. We develop and estimate a household search model that incorporates the value of formal sector amenities relative to pre-reform alternatives, and the value of health insurance. Model estimates show that households value SP by, at most, 1.33 per unit of net cost.

JEL Codes: J64, D10, I13, J46
Keywords: Search, Household behavior, Health insurance, Informality, Unemployment

*University College London, Department of Economics, Drayton House, 30 Gordon St., London WC1H 0AX, United Kingdom. Tel.:+(0)2076794696, and Institute for Fiscal Studies. Email: gabriella.conti@ucl.ac.uk.

†University of Bergen, Department of Economics, Fosswinckelsgate 14, 5007 Bergen, Norway. Tel.: +47 55 58 92 00. Email: rita.ginja@uib.no.

‡PUC-Rio, Department of Economics, Rua Marquês de São Vicente 225, Rio de Janeiro, RJ, 22451-900, Brazil. Tel.: +55 21 3527 1078 . Email: rnarita@econ.puc-rio.br.

§This paper previously circulated under the title: "Non-Contributory Health Insurance and Household Labor Supply: Evidence from Mexico". We thank the comments of Joe Altonji, Orazio Attanasio, Jesper Bagger, Matteo Bobba, Raphael Corbi, Jan Eeckhout, Christopher Flinn, Manolis Galenianos, Santiago Levy, Travis Lybbert, Costas Meghir, Fabien Postel-Vinay, Jean-Marc Robin, Cezar Santos, Kjetil Storesletten, anonymous referees and seminar participants at Université Catholique de Louvain, IFS, 2015 SOLE Meetings, 2015 ESWC, 2016 NEUDC, Stockholm School of Economics, University of Bath, University of Essex, University of Oslo, Banco de Portugal, PUC-Rio, UFJF, IPEA, 4th World Bank-Banco de España Conference, 2016 EEA Meetings, 2016 LACEA Meetings, 2016 IZA-SOLE Meetings, 2017 REAP Meetings, UFPE, 2017 Brazilian Econometric Society Meetings, INSPER, EPGE-FGV, EESP-FGV, University of São Paulo, UFABC, University of Tor Vergata, York University, Federal Reserve Bank of Chicago, IDB and Barcelona GSE Workshop on Macroeconomics and Social Insurance. Eloiza Almeida, Alexandre Abreu da Silva, Ítalo de Paula Franca, Igor Azevedo and Manuel D'Avila provided excellent research assistance. This paper is part of a project financially supported by the Swedish Research Council (Vetenskapsrådet), Grant No.348-2013-6378, the British Academy Newton Advanced Fellowship, Grant No.AF150049, and the Development Bank of Latin America (CAF). Renata Narita thanks FAPESP grant No.2013/23045-0, 2017/18731-2, 2019/04705-5 and FIPE Research Fellowship 2013-2016.

1 Introduction

A central topic in the global health agenda is universal health care coverage. The World Health Organization has defined universal coverage as access for all people to comprehensive health services at affordable cost and without financial hardship through protection against catastrophic health expenditures. The primary goal of social health insurance schemes is to protect beneficiaries from the health and financial consequences of adverse health events. However, limited access to social health insurance programs by the poor and the informal sector workers has been a common problem in low-income countries, contributing to poor health outcomes (Bennett et al., 1998). While for this reason there is scope for government intervention in providing free or highly subsidized health insurance, the impacts of such policies on labor markets in developing countries are less clear. We study this issue in the context of a large health insurance expansion in Mexico.

The *Seguro Popular* (SP, hereafter) was introduced in 2002 in Mexico as a noncontributory health insurance program and was directed to the half of the country's population uncovered by social protection or employer-provided health insurance (i.e., the informal sector workers and the nonemployed). Prior to the reform, health insurance in Mexico was tightly linked to employment. One of the few free health insurance services before SP was provided through the conditional cash transfer program Prospera/Oportunidades (called Progresa until 2002), which targets poor families with children; however, it still left many disadvantaged poor families uncovered and without access to free health care services. Consequently, in 2002 half of the population of Mexico - uncovered by employer-provided health insurance - was eligible for SP.

Since uninsured individuals before SP could only access affordable health care through their employer, the introduction of a non-contributory public health insurance scheme such as SP could have resulted in large effects on the labor market.[1] In practice, the SP is a transfer(tax) to informal(formal) sector workers and to the nonemployed. On the one hand, if the value placed on its benefits is high, SP can lead to a negative impact on employment and/or formality rates. On the other hand, wages in equilibrium might compensate for the increase in benefits in the informal sector, and in this case, the impact on formality rates and employment is ambiguous. Thus, the labor supply and welfare impacts of a non-contributory health insurance program like SP depend on how much households value free healthcare and how firms in each sector adjust wages given benefits.

[1]This concern was voiced in the Mexican press (see, for example, `http://archivo.eluniversal.com.mx/finanzas/59102.html`).

In this paper, we analyze the effects of the introduction of SP on labor market outcomes and provide an estimate for the value of this free health insurance scheme. We start by exploiting its staggered introduction across municipalities in Mexico in a difference-in-differences strategy. Using data from the Mexican Labor Force Survey between 2000 and 2012, we show that among less educated households with children the implementation of SP in a municipality increases the share of households without any member working in the formal sector (henceforth, *informal households*) by 2.3 percentage points (3.5 percent), while there are no impacts for the other groups studied (i.e., less educated households without children or more educated households) or for the salaries in the formal or the informal sector.

Although a reduced-form approach is crucial to measure the impact of the reform, it does not allow the analysis of counterfactual outcomes and welfare. More importantly, it does not take into account endogenous labor market mobility when estimating parameters such as the value of job amenities and of free health care for uninsured individuals. Hence, in order to understand how access to such schemes is valued by households when their members (head and spouse) make labor market decisions, we develop and estimate a household search model that incorporates the value of free health care as well as the pre-reform value assigned to the amenities in the formal sector relatively to informal sector and nonemployment.

Our model is designed to capture the main features of the introduction and expansion of free health care coverage to the uninsured population as well as existing amenities such as employer-provided health insurance and social protection. In our baseline model, each member of a couple can be in one of three employment states: working in the formal sector, working in the informal sector, or not working at all. If one of the members joins the formal sector, the other spouse is automatically covered by employer-provided health insurance as well as other social security benefits, which are treated as public goods within the household. If none of the members work in the formal sector, the household is uninsured and, as such, becomes eligible to SP after its implementation. We also extend the model to allow for heterogeneous households by health status.

The framework we use builds on the Burdett and Mortensen (1998) model, in which workers search randomly on and off the job, with the additional feature that they may receive offers from heterogeneous formal or informal firms. The non-employed and the informal sector workers are not entitled to any employment protection benefits, while the formal sector workers have access to employer-provided health insurance and other benefits secured by labor laws such as minimum wage and retirement pensions.

The main contribution of our paper is to combine three features: (i) a household search model with on-

the-job search, (ii) two working states that have a one-to-one relationship with the introduction of free health care for the informal but not formal workers, and (iii) a structure that accounts for pre-existing amenities across formal and informal/non-employment sectors. These features are key to understand the labor market and welfare consequences of introducing free health care systems by taking into account empirically relevant household dynamics and job attributes that may be shared within the household. In particular, our model captures the nature of a dual system in which each sector has distinct job attributes and offers access to different health systems.[2]

The model is estimated using indirect inference and data from the Mexican Labor Force Survey, and conveys two main findings. First, we estimate a marginal willingness to pay for SP between zero and 6 percent of the mean household income, respectively, for high and low education households. These estimates show that the value of SP to families is always less than the government's cost to provide it. For less educated households, the value is around 0.53 per each Peso spent in the program. However, if we consider that the government bears the incidence of uncompensated-care payments for this population, then the relevant cost should be net of such transfers. In this case, the estimated value for less educated households is 1.33 per unit of net cost of providing SP. In the model extension that allows for household heterogeneity by health status, we find a higher estimated value of the program for good-health households. These figures are similar to those found for subsidized health insurance in US; in particular, recipients value Medicaid at 0.5-1.2 per dollar spent in the program in Oregon (Finkelstein, Hendren and Luttmer, 2019) and less than 50 cents per dollar spent in the Massachusetts' subsidized insurance exchange for low income adults (Finkelstein, Hendren and Shepard, 2019). Generally, free/subsidized systems are valued below their cost, suggesting that individuals/families would rather be uninsured than buy the insurance at its full cost.

Second, we take advantage of the estimated model to simulate counterfactual scenarios of changes in the valuation of SP on employment, labor informality and welfare. Our results show that the changes in employment are small, consistent with an estimated value of SP between 0.53 and 1.33 for low education households with children. Household informality increases by 2.9-4 percentage points across different simulations, driven mainly by men leaving the formal sector to informal sector jobs and fewer women moving from nonemployment to the formal sector. In the model extension that allows for differences across health status, we find qualitatively the same results. Our results suggest that the welfare gains of a policy like

[2]While the focus on family labor supply is not new (see Ashenfelter and Heckman, 1974; Lundberg, 1985; Goux, Maurin and Petrongolo, 2014; Blundell, Pistaferri and Saporta-Eksten, 2016), it has not received much attention, specially in the context of low and medium income countries.

SP are limited because wages decrease in the informal sector compensating for the introduction of SP, and workers leave the formal sector where wages are higher and productivity is higher, on average.

This paper contributes to three strands of literature. First, it adds to the work studying the impacts of SP by uncovering a mechanism behind the small impacts found for informality; namely, that families assign little value to a health insurance scheme like SP when taking labor market decisions. The evidence on the labor market effects of the reform is mixed (see the review in Bosch, Cobacho and Pages (2012)). The estimates range from no impact on informality (Gallardo-Garcia, 2006; Barros, 2008; Campos-Vazquez and Knox, 2013; Aguilera, 2011) to small increases in the share of informal workers with less than nine years of schooling, married women with children or caring for older adults (Azuara and Marinescu, 2013; Aterido, Hallward-Driemeier and Pages, 2011; Pérez-Estrada, 2011; Bosch and Campos-Vazquez, 2014). The evidence about the impact of SP on wages is even scarcer, and the findings range from no effects (Barros, 2008; Azuara and Marinescu, 2013) to negative impact on informal wages (Aterido, Hallward-Driemeier and Pages, 2011; Pérez-Estrada, 2011).[3] Finally, evidence on the welfare effects of SP is only available indirectly: via study of wages effects and health improvements driven by reductions in infant mortality (Conti and Ginja, 2023), miscarriages (Pfutze, 2014) and increased use of medical services in poor municipalities (Conti and Ginja, 2023).

Second, we contribute to two theoretical lines of work. On the one hand, we contribute to the literature on household search. Dey and Flinn (2008) were the first to develop a household search framework to estimate the marginal willingness to pay for employer-provided health insurance in the US. The authors show the importance of considering the spouse's job status to recover unbiased estimates of the willingness to pay. More recently, Fang and Shephard (2019) study the recent reform in the US health system, building on Dey and Flinn (2008) by adding health shocks (following Aizawa and Fang (2020)) and endogenous compensation packages comprising a wage and a menu of insurance offerings (premiums and coverage) that workers can select from.[4] We complement this line of work by modelling and estimating the first

[3]Recent U.S. reforms that have relaxed the link between employment and health insurance provision have led to numerous studies examining the effects of public health insurance on labor supply. Baicker et al. (2014) study the expansion of Medicaid eligibility in Oregon and find no significant effect on employment but an increase in welfare dependence. Kolstad and Kowalski (2016) analyze the 2006 Massachusetts Health Reform and find compensating wage differentials due to employer-provided health insurance but no effects on employment or wages. Garthwaite, Gross and Notowidigdo (2014) estimate large increases in the labor supply associated with an abrupt reduction in the Medicaid coverage in Tennessee. While this recent evidence has significantly improved our understanding of the link between health insurance and employment, it all comes from a developed economy.

[4]Rendon and García-Pérez (2020) and Mankart and Oikonomou (2016) develop household search models with one employment sector to study the role of the added worker effect for the cyclical labor market behavior of household members. Relative to their work, we have two sectors of employment: one that benefited from the free health insurance introduction (the informal sector) and one that did not (the formal sector).

household search model adapted to the context of middle and low income countries that have a sizable informal sector, where workers are not covered by employer-provided health insurance. On the other hand, our work relates to a growing body of literature on search models with formal and informal sectors (see, for instance, Albrecht, Navarro and Vroman, 2009; Ulyssea, 2010; Bosch and Esteban-Pretel, 2012; Meghir, Narita and Robin, 2015; Bobba, Flabbi and Levy, 2022).[5] Our paper adds to this literature by estimating a dual spouse search model allowing for intra-household dependency in labor market decisions.

Finally, we contribute to a fairly recent literature that relies on structural estimation to recover the welfare benefits of subsidized health programs. Finkelstein, Hendren and Luttmer (2019) compare alternative utility frameworks for valuing a Medicaid expansion for low-income, uninsured adults that occurred by lottery assignment in Oregon. They find that the welfare benefit to recipients per dollar of government spending is between \$0.5-\$1.2. Similarly, Finkelstein, Hendren and Shepard (2019) find that the willingness to pay is less than half of expected costs in the Massachusetts' subsidized insurance system. A more recent contribution accounting for the relation between labor market and health insurance options in the U.S. is Aizawa and Fu (2023), who estimate a willingness to pay of 21% of the cost of Medicaid. Our estimates suggest that the welfare benefits of public health insurance are less than the government's costs to provide it. However, while the US and Mexican's contexts have similarities (namely, that in the absence of the public program individuals would be uninsured) there are striking differences. Unlike Medicaid, SP is not means-tested but it targets all households not covered by Social Security (i.e., without any member of the household employed in a formal job). By using a household search model we account for these intra-household dynamics in our approach and show that disregarding them leads to biased estimates of the value of a public program such as SP.[6]

[5] Bobba, Flabbi and Levy (2022) also study the effects of SP using an individual search and matching environment with formal and informal sectors and schooling decisions taken prior to entering the labor market. They estimate the model using a sample of males and data from municipalities with and without the program based on a single year of data (2005).

[6] Other papers have estimated the value of job amenities using individual on-the-job search models. Search frictions can explain why workers with strong preference for amenities are paid higher wages, against the conventional result of compensating wage differentials. Hwang, Mortensen and Reed (1998) estimate a general equilibrium on-the-job search model in which workers in each period may receive an offer that is characterized by a wage and by amenities. Firms have different cost of producing amenities and are, thus, differentiated by amenities, and workers select into jobs, trading lower wages for better amenities. Bonhomme and Jolivet (2009) estimate a partial equilibrium version of Hwang, Mortensen and Reed (1998) allowing two types of job-to-job mobility: voluntary and involuntary. Using data for several European countries and five different amenities (none related to health insurance), they generally find absence of compensating differentials because wages and amenities correlate in job offers and due to search frictions. Alternative approaches include survey-based methods such as contingent valuation (e.g. Ahmed et al., 2016).

2 Background: The Mexican Health System and the Seguro Popular

Labor Relations Mexico is characterized by a dual system. Firms hire workers under salaried contractual relations which broadly include three main components. First, a salary at least equal to the minimum wage. Second, Social Security coverage including access to the public health care system, of which the Mexican Social Security Institute (IMSS) is the largest provider of services, with benefits including basic health care and medications, attention to occupational accidents, care for illnesses, disability benefits and retirement pensions. In exchange for these benefits and rights, together employees and their employers pay payroll taxes.[7] However, many firms evade the payment of Social Security contributions and also hire workers without access to the benefits above (Antón, Hernández and Levy, 2013). Firms can be monitored and fined if they do not comply with labor regulations. There is considerable evidence of extensive random work-site inspections undertaken in thousands of firms by both the Ministry of Labor and the IMSS. The cost of being caught with informal workers is high: employers are fined by IMSS for each unregistered worker (from 20 to 250 minimum daily wages) and must pay back due payroll taxes. Employers can also be charged with providing false information, which carries an additional fine of 20 to 250 minimum wages for each worker (de la Parra and Bujanda, 2020).

The Health Care System before *Seguro Popular* Up to 2002, the healthcare was characterized by a two-tiered system. About half of the population was covered through a contributory system guaranteed by the Social Security Institutions: the IMSS, covering the private sector workers; the Institute for Social Security and Services for State Workers (ISSSTE), covering the civil servants; and Mexican Petroleums (PEMEX), covering the employees in the oil industries. Health care coverage was provided by these institutions in public hospitals; individuals could also pay for care in private hospitals, or buy private health insurance. In 2000, IMSS covered 40%, and ISSSTE 7% of the population, respectively (Frenk et al., 2006).

The remaining half of the population, mostly uninsured, could access healthcare through limited government programs such as the Expansion of Coverage Program (PAC), launched in 1996, and the anti-poverty program Progresa (launched in 1997 and later renamed Oportunidades). The program has some overlap with SP, as it includes a health component offered in medical units managed by the IMSS-Oportunidades

[7] The taxes are about 25% of their salaries, but this figure excludes other state and federal taxes. There is no unemployment insurance system in Mexico; e.g., workers insured by the IMSS who become unemployed may withdraw a maximum of 30 days' worth of pension savings every five years.

and the Ministry of Health.[8] Those outside these programs had to pay out-of-pocket for medical services, and by 2000, nearly 50% of healthcare expenditures came from individual payments. As a result, around 50 million Mexicans lacked guaranteed health insurance (Frenk et al., 2009).

The Implementation of *Seguro Popular* SP was launched as a pilot program in 2002 in 26 municipalities of 5 states (Campeche, Tabasco, Jalisco, Aguascalientes and Colima) under the name Health for All (*Salud para Todos*), with the goal of a gradual expansion to the rest of the country. During 2002, 15 additional states implemented the program, and six more did it by the end of 2003.[9] The System of Social Protection in Health was officially introduced in 2004 by the General Health Law, seeking to extend coverage to the uninsured population. The expansion focused on states with low social security coverage, a high number of uninsured in lower-income groups, and the capacity to deliver services. In 2004, three more states introduced the program (Nayarit, Nuevo Leon and Querétaro) and the last three joined in 2005 (Chihuahua, Distrito Federal and Durango).

Individuals who were not beneficiaries of social security institutions were eligible for SP. Enrollment was voluntary and required basic documentation, such as proof of residence in Mexico, self-declared lack of health insurance, and the ID. By 2012, 98% of the Mexican population was covered by some health insurance (Knaul et al., 2012). In 2019, both Seguro Popular and the *Oportunidades* program were discontinued and replaced by a new initiative, the Institute of Health for Welfare (INSABI).

Funding SP was funded by revenues from general taxes, based on a tripartite structure similar to that adopted by the two major social insurance agencies in Mexico, IMSS and ISSSTE. This included federal government social contributions, solidarity contributions from both federal and state governments, and a family contribution (in 2010, 96.1% of the enrolled families were exempted from paying it due to low self-reported income; own calculations from the registry of enrolled families).

From 1999 to 2007, public health expenditure as a percentage of GDP remained stable at 2.6%, one of

[8] *Progresa* beneficiaries receive free of charge a basic package of health services. The nutrition of both children and pregnant women is monitored through monthly consultations and nutritional supplements are distributed in case of malnutrition. It is also includes information on preventive health behaviors through community workshops; emergency services related to pregnancy and childbirth. Beneficiary families protected by Social Security have also access to second- and third-level care in the units administered by IMSS, while those unprotected have only limited access to second-level care. See `https://www.gob.mx/cms/uploads/attachment/file/79547/2005.pdf` (accessed November 13, 2023).

[9] Baja California, Chiapas, Coahuila, Guanajuato, Guerrero, Hidalgo, Mexico, Morelos, Oaxaca, Quintana Roo, San Luis Potosi, Sinaloa, Sonora, Tamaulipas and Zacatecas launches SP during 2002. In 2003, the program was introduced in Baja California Sur, Michoacán, Puebla, Tlaxcala, Veracruz and Yucatán.

the lowest among OECD countries. Between 1999 and 2004, public health spending was divided between insured individuals (1.8% of GDP) and uninsured individuals eligible for SP (0.9% of GDP). After the introduction of SP in 2004, health spending for the uninsured rose steadily, reaching nearly 1.5% of GDP by 2009 (Conti and Ginja, 2023).

Coverage and Delivery of Health Services Families enrolled in SP were assigned to a health center, linked to a hospital, and a family doctor for primary care. They received access to a package of health services, which expanded over time—from 78 services in 2002 to 284 by 2012. These services included preventive care, family planning, prenatal and obstetric care, ambulatory and emergency services, hospital care, and some surgeries. In 2004, SP introduced the Fund for Protection against Catastrophic Expenses to cover high-cost treatments for severe illnesses, such as breast and cervical cancers and childhood leukemia. In 2006, the program further expanded with the Health Insurance for a New Generation, which provided coverage for high-cost conditions affecting children under five years old.

The non-contributory and contributory health systems used separate networks of hospitals and health centers, serving only their respective members. SP services were delivered through hospitals and health centers operated by the Ministry of Health.

One of the key goals of the health reform was to increase investment in healthcare infrastructure and promote a fairer distribution of resources. To support this, the Ministry of Health allocated a larger share of the budget to health infrastructure (Conti and Ginja, 2023). Furthermore, facilities providing services under SP were required to complete an accreditation process to ensure they had the necessary resources to deliver the interventions covered by the program (Frenk et al., 2009).

Other Policy Changes The period from 2000 to 2012 was relatively stable in terms of reforms that might have influenced household labor market choices; the tax also system remained largely unchanged. The only reform was the introduction of the program Child Care Centers to Support Working Mother, between 2007 and 2010, that aimed at children from families without Social Security coverage, where women were seeking employment, enrolled in school, or working (Calderon, 2014).

3 Data and Empirical Facts

3.1 Data

We use two main data sources. The first data are the *Padrón*, which is the consolidated registry of all families with a valid enrollment in SP by December 31st of each year between 2002 and 2010. These data were used by the Federal Government and States to decide the allocation of the funds to the program. The data contain the exact date of affiliation, residence and the identifiers of the health center and general hospital assigned to each family at the time of enrollment in the program. The date of affiliation of families is used to construct the date of implementation of the program at the level of the municipality.[10]

We consider that SP had been introduced in a municipality when the number of families affiliated to the program is at least 10. We adopt this number for three reasons. First, we prefer an absolute to a percentage measure to capture the fact that the residents of a municipality can use the services provided by SP (and not the fact that a certain proportion of the population has been covered). Second, this definition has become relatively common in the SP-related literature (Bosch and Campos-Vazquez, 2014; del Valle, 2021; Conti and Ginja, 2023). Finally, Conti and Ginja (2023) show that the impacts of SP are not sensitive to the threshold number of families used to define program introduction.

Second, we use data from the Mexican labor force surveys, the *Encuesta Nacional de Empleo* (ENE) 2000-2004 and the *Encuesta Nacional de Ocupación y Empleo* (ENOE) 2005-2012. These data have a quarterly frequency and are rotating panels at the individual and household level similar to the Current Population Survey in the US, where households can be interviewed for a maximum of five consecutive quarters. The survey covers more than 11 million individuals between ages 18 and 59 between the second quarter of 2000 to the fourth quarter of 2012 and, for each interview, it contains information about the employment status, Social Security coverage and labor income.[11]

[10] For the years 2002 and 2003 (the pilot-phase), only information on the date of enrollment and on the state of residence was recorded. However, we are able to identify the exact date of implementation of SP in a given municipality by backtracking the relevant information from the subsequent years because each family has a unique identifier. We have confirmed the accuracy of the implementation date obtained with this procedure by cross-checking it against the official list of municipalities that adopted SP in the pilot period.

[11] Although the ENE-ENOE is not designed to be representative at the municipality level, this should not be a source of concern as long as the degree misrepresentative is unrelated to the rollout of SP. In the reduced form model used, we control for municipality fixed effects that should account for this misrepresentation across municipalities, as long as it is invariant over time. del Valle (2021), who uses the same data, provides several robustness checks addressing this issue and he shows the lack of representativeness of ENE-ENOE does not affect point estimates. **The choice of period spanning from 2000 to 2012 should not be a concern. Despite recessionary episodes in 2001-02 and 2009, Mexico had a fairly stable GDP growth between 2000 and 2012, between 2.1% and 2.3%, respectively (World Bank, 2020)** DO WE NEED THIS BOLD PART?.FOI UM REFEREE ANTIGO QUE PEDIU....

An individual is defined as an informal worker if he/she does not have access to the health services provided by his/her job through one of the Social Security institutions in the country. Since Social Security coverage is extended to the spouse and children in the household, a household is considered informal if neither the head nor the spouse have Social Security coverage through the job contract. In our analyses, we pool informal employees and the self-employed as the definition of informality is based on the absence of Social Security coverage; for example, in the 2012 ENOE data, 99% of the self-employed are not registered with any Social Security institution. Thus, we follow Bosch and Esteban-Pretel (2012) and Meghir, Narita and Robin (2015) that also estimate search models with formal and informal sectors, and combine informal employees and the self-employed into a single category to simplify the model estimation within a dual-spouse job search framework.

Definition of Sample and Variables Our sample is comprised of half-million of couples residing in 628 (out of almost 2,500) municipalities that are covered by ENE-ENOE between 2000 and 2012. We provide the details of sample construction in Appendix B.

We follow individuals between the first and second quarters they are surveyed. Specifically, we obtain the job-to-job, unemployment-to-job, and job-to-unemployment transitions for each individual in our sample (i.e., heads and their spouses), conditional on their state at the first interview.[12] We also classify households into "bad health status" if the head or spouse has a health condition that prevents them from working, working the usual hours, or seeking work; otherwise, they are categorized as having "good health status." This classification allows us to calculate health transition probabilities between the first and second interviews, which are used to calibrate the model (see Table A.1). The proportion of households in bad health status at the first interview is used to derive moments for evaluating model fit and to calculate the average value of SP (see section 6). Finally, from the first interview, we obtain the proportion of households by employment status, and the distribution of earnings in the formal and informal sectors.

We present results for four groups of households, namely the education level of the head of the household and the presence of children aged 0-14 years. We define a family to be in the low education group if the head has at most 6 years of completed education, which corresponds to elementary education in Mexico. We also allow for heterogeneity by the presence of children aged 0-14 years in the household, for two reasons. First, the package of services covered by SP is especially generous for conditions prevalent among poor

[12]Note that we exclude job-to-job transitions within the same sector from our analysis, as the data lacks information on job changes or job duration.

children (such as treatment of respiratory and intestinal infections; see Conti and Ginja (2023)). Second, the extension of coverage of Social Security to children depends on the age of the child: if the parent works in the private(public) sector the coverage is extended to children under 16(18).[13] Finally, we allow for heterogeneity by the household health status.

3.2 Basic Descriptives

We start by presenting some basic facts regarding the labor market in Mexico, using the Mexican Labor Force Survey. Panel A of Table 1 presents basic statistics for the four main groups of households studied in the periods before and after the introduction of SP in the municipality of residence. Columns (1) to (4) of the table show that among households with children, before the introduction of SP, about 33%(59%) of households in the high(low)-education group did not have Social Security coverage. After the introduction of SP, the proportion of households without Social Security coverage increased by 2.2 percentage points (p.p.) and 4.4p.p. in the high- and low-educations groups, respectively. Columns (5) to (8) show that the proportion of informal households without children was similar in the periods before and post implementation of SP.

The table also includes the nine possible types of households according to the labor market situation of each member of the couple (i.e., not working, which includes individuals unemployed or out of the labor force, working in the formal sector or working in the informal sector). The stocks are denoted by $m_{zz'}$, that stand for the fraction of households where the head is in status z and the spouse is in status z' (with $z, z' = f, i, n$). The most striking pattern is that among the less educated there is an increase in the proportion of households with both members working in the informal sector (m_{ii}), and a reduction in the proportion of households where the head is a formal worker and the spouse is not working (m_{fn}; see columns (3), (4), (7) and (8)).

Panel B of Table 1 includes the mean for the distribution of (ln) wages for the heads and spouses in both formal and informal households.[14] The means of the salaries of heads and spouses are lower in the informal sector than in the formal sector, while the standard deviation is higher in the informal than in the formal sector for males. These differences partly reflect unobserved productivity differences between the individuals who select into either sector within educational groups. After the introduction of SP, there is

[13] To keep the model treatable, we do not distinguish between parents working in private or public sectors and we use the most stringent definition of child's age, 16, which also coincides with the minimum school leaving age in Mexico. We consider the presence of children under 15 in the household since the Labor Force Survey does not contain the date of birth and thus we do not know whether the child may be close to turn 16 at the survey date. If children are studying, coverage can be extended up to age 24.

[14] All monetary values presented are deflated to the first quarter of 2011 using the CPI of Banco de Mexico.

an increase in the salaries of the heads, regardless of the group and sector. For high-educated families, the salaries of spouses working in the informal sector decreased.

3.3 Reduced-Form Analysis

To motivate the structural model we develop below, we analyze the causal impact of SP on the proportion of formal and informal households both overall and on the mean wages for husbands and spouses.

Empirical Strategy We present reduced-form evidence of the impact on informality of SP exploiting the variation in the timing of implementation of the program at the municipality level. Such variation has been explored before to evaluate the program effects using differences-in-difference models (Azuara and Marinescu, 2013; Aterido, Hallward-Driemeier and Pages, 2011; Pérez-Estrada, 2011; Bosch and Campos-Vazquez, 2014; del Valle, 2021; Conti and Ginja, 2023). Here, we compare changes in the labor market outcomes of households for municipalities that introduced SP in different years between 2002 and 2007 (the last year a municipality implemented SP in our sample).[15] We estimate the following model at the municipality-quarter level:

$$Y_{kqt} = \beta SP_{kqt} + \gamma X_{kqt} + \mu_k + \pi_{qt} + \varepsilon_{kqt} \tag{1}$$

where Y_{kqt} is households' employment status or salaries, k indexes the municipality, q the quarter and t the year. SP_{kqt} is an indicator variable equal to one if municipality k in quarter q of year t has implemented SP. We control for unrestricted municipality effects (μ_k) to account for unobserved determinants of Y that are constant at municipality level and can also be correlated with the timing of implementation of SP; and for unrestricted quarter effects (π_{qt}) to account for common shocks. X_{kqt} includes linear trends in characteristics of the municipality of residence measured in 2000 (or 2001, depending on data availability), namely, an indicator for large city, index of deprivation, (log of) total population in 2000, number of hospitals, health centers, and total number of doctors and nurses in hospitals per 1,000 uninsured individuals in 2001.[16] The

[15] Relative to Azuara and Marinescu (2013); Aterido, Hallward-Driemeier and Pages (2011); Pérez-Estrada (2011); Bosch and Campos-Vazquez (2014); del Valle (2021) that also study the effects of the reform on informality, we use a longer data frame. This can affect estimates because differences in the impacts of SP on informality found by different authors do not seem driven by the identification strategy employed, but rather by the period studied - with smaller effects found in studies that relied in data from the earlier period of implementation of SP. In addition, we provide estimates for a different sample: married men and women.

[16] Conti and Ginja (2023) provide details on the determinants of the timing of the municipality-level implementation of SP. They find that, after accounting for state fixed effects, earlier implementation of SP occurred in more populous and richer municipalities, with a smaller proportion of eligible individuals and of children 0-4 years old, with more hospitals, health centers and doctors

parameter of interest is β, the effect of access to SP, which is identified from variation across municipalities and quarters. The standard errors are clustered at the municipality level to account for autocorrelation in the outcomes (Bertrand, Duflo and Mullainathan, 2004).

Finally, to account for multiple hypothesis testing when studying treatment effects, we use the iterative procedure outlined in algorithms 4.1 and 4.2 of Romano and Wolf (2005). This method iteratively rejects or accepts hypotheses at a fixed significance level, thus in the tables presented we indicate the coefficients that are remain significant at a level of 10 percent. We use 1000 block-bootstrap replications to obtain the adjusted critical values (the block is the municipality).

Results Table 2 shows the estimates impacts on informality rate and mean salaries of formal and informal workers. Column (1) shows that the implementation of SP in a municipality is associated with an increase in informality for less educated households with children of 2.3p.p. (Panel A), in line with previous work (Azuara and Marinescu, 2013; Aterido, Hallward-Driemeier and Pages, 2011; Pérez-Estrada, 2011; Bosch and Campos-Vazquez, 2014; del Valle, 2021). There are no impacts on informality any on other groups or on salaries, in general (columns (2)-(5)). Note that only the increase in informality rates among less educated households with children is robust to adjustment of inference to multiple hypothesis testing and alternative specifications.[17]

The estimates in Table A.3 examine how the impacts of SP on informality vary based on the household's health status, measured during the first interview. These results suggest that the increase in informality in Table 2 is driven by households classified in "good health".

In sum, applying a similar reduced-form approach that has been used in previous work, we find that the introduction of SP increased the informality rates among the most disadvantaged families with children but we are unable to detect any robust impacts on informality for any other group or on salaries of different groups of individuals.

per eligible, and with alignment between the party of the mayor and that of the governor of the state in the year in which the program was launched. These pre-existing differences in levels are accounted for by the municipality fixed effects. The rollout of the program was also unrelated with pre-existing municipality trends in health (Conti and Ginja, 2023) and labor market outcomes (Bosch and Campos-Vazquez, 2014).

[17] In Table 2, 20 hypotheses are tested. Table A.2 in the Appendix includes the estimates for β using two alternative specifications: (i) including a quadratic yearly state trend, and (ii) removing the linear trends in baseline municipality characteristics. We present estimates for the informality rate in less educated households with children and for salaries of heads in more educated households without children (i.e., for the two main estimates that survive adjustment of inference to multiple hypotheses testing).

4 Joint Labor Search Model

4.1 The Basic Setup

We now present our household search model with two working sectors. We build on the model by Burdett and Mortensen (1998), where workers search randomly on and off the job, with the additional feature of two searchers per household who may receive offers from formal or informal firms. In this continuous time model, the future discount rate is r and households seek to maximize their expected lifetime income. We assume a unitary approach like Dey and Flinn (2008) in which all income and benefits are shared within the household. This is an appropriate approach as the free health insurance is not targeted to any particular household member, therefore, it is less likely that strategic interactions due to this policy play any important role here (see also Blundell, Pistaferri and Saporta-Eksten, 2016).[18]

Individuals can be in one of three labor market states: nonemployed (n), formal worker (f), or informal worker (i). Conditional on the labor market state, the individual receives a new or alternative job offer that is characterized by a wage, that is a random draw from a distribution of wage offers, F, specific to each sector and spouse. At each point in time, only one of the two household members – the head or the spouse – can receive a shock, i.e., spouse 1 (head/man) and spouse 2 (spouse/woman) face mutually exclusive shocks in the labor market. However, a shock that destroys the job of the employed spouse can instantly induce the nonemployed spouse to exert more effort to move to the informal sector. This effort is taken as exogenous and is interpreted as the probability that an instant added worker effect can occur. The instant utility of the household is given by:

$\mathtt{u}(w_1 + w_2) + a(1 - \mathbf{I}) + \gamma\mathbf{I}$, if both spouse 1 and 2 work

$\mathtt{u}(w_1 + b_2) + a(1 - \mathbf{I}) + \gamma\mathbf{I}$, if only spouse 1 works

$\mathtt{u}(b_1 + w_2) + a(1 - \mathbf{I}) + \gamma\mathbf{I}$, if only spouse 2 works

$\mathtt{u}(b_1 + b_2) + \gamma$, if neither works

where $\mathbf{I}$ is an indicator function for informal household (when no household member is in the formal sector), w_1 is the labor income of spouse 1, w_2 the labor income of spouse 2, b_1 the flow of income during

[18] Although the collective model has become the benchmark model in the intra-household allocation literature, empirically, unitary and collective models under CARA preferences are not distinguishable (Mazzocco, 2007; Browning, Chiappori and Weiss, 2014)

nonemployment of spouse 1, and b_2 the flow of income during nonemployment of spouse 2. In the formal sector, the wage is net of taxes and Social Security contributions, while in the informal sector no taxes or contributions are made, so the wage is the gross wage.

In the pre-reform period (ie, before the introduction of SP) γ is set to zero. The parameter a captures the utility value of all amenities in the formal sector relative to those in the informal sector in the pre-reform period. In section 5, we discuss how we explore the introduction of SP to identify γ. Note that as modelled, γ includes not only the value directly assigned to the health services covered by SP, but also to its benefits, such as the value assigned to the reduction in infant mortality (Conti and Ginja, 2023) and miscarriages (Pfutze, 2014).

Finally, rather than assuming linear preferences, the function $\mathtt{u}$ takes a CARA form and we estimate the coefficient of absolute risk aversion (θ) from data. For example, when spouse 1 and 2 work, $\mathtt{u}(w_1 + w_2) = \frac{1-\exp[-\theta(w_1+w_2)]}{\theta}$.

4.2 Household's Value Functions

Let $W_{zz'}$ be the value function for a household where spouse 1 is in labor market status z and spouse 2 is in labor market status z' ($z, z' = f, i, n$). There are nine value functions, and we now describe each of them.

4.2.1 Only one member works

In the formal sector We start with the case of a household with only one member working in the formal sector; this is a formal household, i.e., with Social Security coverage. The flow value is:

$$\begin{aligned} rW_{fn}(w_1) = \mathtt{u}(w_1 + b_2) + a + \delta_f^1(1-p_2)\left(W_{nn} - W_{fn}(w_1)\right) + \\ \delta_f^1 p_2 \int \max\left\{W_{ni}(x) - W_{fn}(w_1), W_{nn} - W_{fn}(w_1)\right\} dF_i^2(x) + \\ \lambda_{ff}^1 \int \max\left\{W_{fn}(x) - W_{fn}(w_1), 0\right\} dF_f^1(x) + \\ \lambda_{fi}^1 \int \max\left\{W_{in}(x) - W_{fn}(w_1), 0\right\} dF_i^1(x) + \\ \lambda_{nf}^2 \int \max\left\{W_{ff}(w_1, x) - W_{fn}(w_1), W_{nf}(x) - W_{fn}(w_1), 0\right\} dF_f^2(x) + \\ \lambda_{ni}^2 \int \max\left\{W_{fi}(w_1, x) - W_{fn}(w_1), 0\right\} dF_i^2(x) \end{aligned} \tag{2}$$

where δ_f^1 is the rate at which spouse 1 faces formal job destruction, and p_2 captures an instant added worker effect, i.e. the probability that spouse 2 moves from nonemployment to informality given that spouse 1 loses a formal job.[19] λ_{ff}^1 and λ_{fi}^1 are the arrival rates of formal and informal job offers respectively for spouse 1, and λ_{nf}^2 and λ_{ni}^2 are the arrival rates of formal and informal job offers respectively for spouse 2. When the head loses a formal job by a δ_f^1 shock, with probability p_2 the spouse finds an opportunity to move to the informal sector. In this case, the household decides considering the flow of gains which will accrue if the spouse takes the informal offer paying x, $W_{ni}(x) - W_{fn}(w_1)$, against the option of not taking it, $W_{nn} - W_{fn}(w_1)$. With probability $1 - p_2$ the spouse does not find an opportunity to work in the informal sector, then there is no decision to be made by the household. New offers from the formal sector to the head arrive at the rate λ_{ff}^1, and the household decides whether the head will take the offer. New offers from the informal sector to the head arrive at the rate λ_{fi}^1, and the household decides whether the head will take the offer. Job offers from the formal sector to the spouse arrive at rate λ_{nf}^2, and the spouse decides whether to take the formal offer or remain nonemployed. Following Dey and Flinn (2008), we allow endogenous quitting in our model when the spouse finds a formal sector job since these jobs have the potential to replace the consumption lost if the head decides to quit (formal sector jobs are, on average, better paid and more stable). Finally, job offers from the informal sector for the spouse arrive at a rate of λ_{ni}^2. When this occurs, the household compares its current situation—where the head is employed in the formal sector and the spouse is non-employed—with the scenario where the spouse enters the informal sector.

The value function $W_{nf}(w_2)$ is similar to the above, the only difference is an exchange of the status between spouses 1 and 2 (see Appendix C.1).

In the informal sector In this case one member is working in the informal sector. This is an informal household, i.e., without Social Security coverage. The flow value is given by:

[19] Spouses may find an opportunity to move immediately to job activities in the informal sector such as self-employment. We assume that, conditional on one spouse losing a job, there is no such opportunity for the other spouse to move to the formal sector since this would require more time, such as a formal application process. Given the importance of such likelihoods in the data (see, e.g. (Table A.4)), we explicitly model this feature, despite the fact that the standard household model allows for the exit rate hazard from nonemployment to the informal sector of an individual to vary discontinuously whenever their spouse loses a job with a wage above the reservation wage.

$$
\begin{aligned}
rW_{in}(w_1) = \mathtt{u}(w_1 + b_2) + \gamma + \delta_i^1(1-q_2)\left(W_{nn} - W_{in}(w_1)\right) + \\
\delta_i^1 q_2 \int \max\left\{W_{ni}(x) - W_{in}(w_1), W_{nn} - W_{in}(w_1)\right\} dF_i^2(x) + \\
\lambda_{ii}^1 \int \max\left\{W_{in}(x) - W_{in}(w_1), 0\right\} dF_i^1(x) + \\
\lambda_{if}^1 \int \max\left\{W_{fn}(x) - W_{in}(w_1), 0\right\} dF_f^1(x) + \\
\lambda_{nf}^2 \int \max\left\{W_{if}(w_1, x) - W_{in}(w_1), W_{nf}(x) - W_{in}(w_1), 0\right\} dF_f^2(x) + \\
\lambda_{ni}^2 \int \max\left\{W_{ii}(w_1, x) - W_{in}(w_1), 0\right\} dF_i^2(x)
\end{aligned} \tag{3}
$$

where δ_i^1 is the rate at which spouse 1 faces informal job destruction, and q_2 is the probability that spouse 2 moves from nonemployment to informality, given that spouse 1 loses his informal job, thus capturing an instant added worker effect in the case a job is lost in the informal sector. When the head loses the informal job by a δ_i^1 shock, with probability q_2 the spouse finds an opportunity to move to the informal sector. In this case, the household decides considering the flow of gains that will accrue if the spouse takes the informal offer paying x, $W_{ni}(x) - W_{in}(w_1)$, against the option of not taking it, $W_{nn} - W_{in}(w_1)$. With probability $1 - q_2$ the spouse does not find an opportunity to work in the informal sector. New offers from the informal (formal) sector to the head arrive at rate λ_{ii}^1 (λ_{if}^1), and the household decides whether the head will take the offer. Job offers from the formal sector to the spouse arrive at rate λ_{nf}^2, and the spouse decides whether to remain nonemployed or to take the formal offer and acquire the benefits of this sector for the household, in which case the head may quit. Finally, job offers from the informal sector to the spouse arrive at rate λ_{ni}^2.

The value function $W_{ni}(w_2)$ is similar to the above, the only difference is an exchange of the status between spouses 1 and 2 (see Appendix C.1).

4.2.2 Both members work

Households with both members working in the informal sector These are households without Social Security coverage. When spouse 1 or spouse 2 receives and accepts an offer from the formal sector, the household will have Social Security coverage; however the other spouse (who did not receive the shock) may quit.

Households with at least one of the members working in the formal sector These are households with Social Security coverage. For sake of brevity, the value functions corresponding to such cases are also presented in Appendix C.1.

4.2.3 Neither member of the couple works

This is an informal household (i.e., without Social Security coverage).

$$
\begin{aligned}
rW_{nn} = {} & \mathtt{u}(b_1 + b_2) + \gamma + \\
& \lambda^1_{nf} \int \max\left\{W_{fn}(x) - W_{nn}, 0\right\} dF^1_f(x) + \lambda^1_{ni} \int \max\left\{W_{in}(x) - W_{nn}, 0\right\} dF^1_i(x) + \\
& \lambda^2_{nf} \int \max\left\{W_{nf}(x) - W_{nn}, 0\right\} dF^2_f(x) + \lambda^2_{ni} \int \max\left\{W_{ni}(x) - W_{nn}, 0\right\} dF^2_i(x).
\end{aligned} \tag{4}
$$

Each member of the couple may receive offers from the formal (informal) sector with arrival rates λ^1_{nf} and λ^2_{nf} (λ^1_{ni} and λ^2_{ni}), respectively for spouse 1 and 2.

Households make their decisions based on reservation wages. Since the value functions are strictly increasing in wages, there exists a reservation wage for each pair of choices. For example, when a λ^1_{fi} shock arrives to spouse 1 in the formal sector while spouse 2 is also formal, the household decides to take the offer if the resulting wage is higher than $\hat{w}_{ff->if}(w_1, w_2)$. This critical value is the solution of $W_{ff}(w_1, w_2) = W_{if}(\hat{w}_{ff->if}, w_2)$. Figure A.1 in the Appendix shows one possible scenario with the value function $W_{if}(w_1, w_2)$ dominating $W_{ff}(w_1, w_2)$ for lower wages of spouse 1 and given the wage of spouse 2 in the formal sector, w_2. Note that in this case, spouse 1 is willing to take a lower wage in the informal sector than his current wage in the formal sector. When households are faced with three options, the choice algorithm is a bit more complex because it will depend on the relative steepness and location of three instead of two curves. However, since the value functions are always non-decreasing in wages, there will be reservation wages that determine the choice made by each individual across three such options.

As noted in the joint search literature, the fact that certain shocks will lead to simultaneous changes in the labor market status of both members of the household raises concerns about equilibrium multiplicity (Dey and Flinn, 2008). In this paper, we numerically solve the equilibrium using the method described in section 5. Through extensive numerical simulations, we always find a unique solution.

4.3 Model with health shocks

We also extend the model to incorporate household heterogeneity based on health status. We consider two possible health status, H = {good ("GH"), bad ("BH")}, and assume that health status is exogenous but subject to random shocks according to a Poisson process, with transition rates $\nu(h'|h)$, with $h, h' \in H$ and $h \neq h'$, that are independent of job status. In this extension, the value of leisure (b^h), the value of formal job's attributes (a^h), and the value of SP (γ^h) all depend on the health status.

All value functions have a similar structure to the baseline expressions presented in subsection 4.2, with an additional term that corresponds to the change in the health status. The details are included in Appendix C.2.

4.4 Firms and Endogenous Wages

A key difference between an individual and a household search model is that in the household context the reservation wage of one spouse depends on the job state and wage of the other spouse. In a standard wage posting models with single and homogeneous searchers, firms have to pay above a common reservation wage of the unemployed. In this model, with two searching spouses, we assume that firms with productivity p pay a wage higher than the *minimum* reservation wage for each spouse and sector.

For simplicity, we assume that wages of spouse 1 (men) and spouse 2 (women) in the formal (f) and in the informal (i) sectors are determined in separate markets. By doing so, we assume that the labor markets are segmented by gender and sector, and they do not compete directly. While, this assumption can be seen as a limitation, however it allows to control for important observable differences in wages across groups.[20] In each submarket, firms are ex-ante heterogeneous in their productivity p with continuous distributions: $\Gamma_f^1(p)$ and $\Gamma_i^1(p)$ for spouse 1 in the formal and informal sectors, respectively; and, $\Gamma_f^2(p)$ and $\Gamma_i^2(p)$ for spouse 2 in the formal and informal sectors, respectively. We denote as Γ the distribution of productivities of active firms, and thus we assume that a firm does not offer a wage such that the total labor cost exceeds its revenue p. Moreover, any wage offer is at least greater than the workers' minimum reservation wage denoted by $\underline{\hat{w}}_f^s$ and $\underline{\hat{w}}_i^s$ ($s = 1, 2$), in the formal and informal sectors, respectively. Otherwise, firms never attract any worker.

[20] Alternatively, motivated by the private health insurance system in the US, Fang and Shephard (2019) propose an extension of Burdett and Mortensen (1998) that allows firms to choose wages and whether to provide insurance. In their household setting, they aggregate marginal productivity of workers and labor force size across the two genders, and assume that firms of productivity p choose a wage that varies by the insurance option but does not vary by spouse (gender).

In the formal sector, in addition to payroll taxes, τ, we also consider a legal minimum wage, mw, to capture the labor market institutions in the Mexican regulatory setting. In such sector, wage offers are greater than $\max\{\underline{\hat{w}}_f^s, \mathsf{mw}\}$. In the market of spouse $s = 1, 2$, a formal firm maximizes its steady-state profit flow by solving:

by choosing wages to take into account for inflow and outflow of workers

$$\max_{w \geq \max\{\underline{\hat{w}}_f^s, \mathsf{mw}\}} (p - (1+\tau)w)\ell_f^s(w) \tag{5}$$

where $\ell_f^s(w)$ is the equilibrium size of a formal firm in the market of spouse s offering w, i.e. a steady-state measure of workers that takes into account the inflow and outflow of workers in firms that choose to pay w.[21] Normalizing the number of formal firms to one in each market $s = 1, 2$, we have

$$\ell_f^s(w) = m_f^s \frac{dG_f^s(w)}{dF_f^s(w)} \tag{6}$$

where m_f^s is the stationary measure of employment in the formal sector and $G_f^s(w)$ the stationary earnings distribution in the formal sector for spouse s.[22]

In the informal sector, minimum wages are not enforced and firms do not pay taxes. However, firms can be caught by enforcement authorities or face constraints such as having no access to credit markets. We assume that this imposes a cost on informal firms that is embedded in the level of productivity at which they operate in the labor market. The informal sector firm solves:

$$\max_{w \geq \underline{\hat{w}}_i^s} (p - w)\ell_i^s(w) \tag{7}$$

where $\ell_i^s(w)$ is analogous to function (6) defining the equilibrium size of an informal firm in the market of spouse s offering w.

Since the distributions of productivity of active firms in each submarket (by sector and spouse) are continuous, the solution to the maximization problem is unique following Bontemps, Robin and van den Berg (1999, 2000). Furthermore, monotonicity of optimal wages [$w = K_{j,s}(p)$] implies $F_j^s(w) = \Gamma_j^s(K_{j,s}^{-1}(w))$; $j = f, i$ and $s = 1, 2$.[23]

[21] Steady-state profit is the limiting case of the expected present value of future profit as the rate of time discount goes to zero (Mortensen, 2000).

[22] As in an individual search environment with two employment sectors and direct transitions across the two sectors (see e.g. Meghir, Narita and Robin, 2015; Narita, 2020), the stocks and earnings distributions in this context can be solved for through a system of flow equations that are functions of the transition rates and wage offers distributions. In our estimation, this is simplified because we simulate the households' trajectories, so we do not need to use the flow equations to recover the stocks and earnings distributions.

[23] These equilibrium properties, derived in Bontemps, Robin and van den Berg (1999, 2000), depend on the shape of the wage

5 Estimation

In this paper, we develop an estimation strategy suitable for a model with two searching spouses, two sectors of employment, and direct transitions that may occur between them. To keep it as simple as possible, we estimate the model using simulated method of moments.

We exploit the fact that, given the equilibrium wage offer distributions, F_j^s, and observed wages, worker's behavior is sufficient to identify the transition and utility parameters. Estimation of such parameters does not require computing the productivity distributions.

Since we cannot obtain F_j^s non-parametrically (i.e., as functions of observed wages using the flow equations), we assume that these distributions have a non-standard $\mathsf{Beta}(\underline{\mathsf{w}}, \overline{\mathsf{w}}, \alpha_{\mathsf{j}}, \beta_{\mathsf{j}})$ CDF. Although we allow for this flexible shape by calculating α_j and β_j using all data moments, we calibrate the minimum and maximum support points from the data on wages by sector and spouse. We then interpolate using a uniformly spaced grid with 50 points.

Given $(\alpha_f, \beta_f, \alpha_i, \beta_i)$, the model primitives include job offers arrival rates ($\boldsymbol{\lambda}$), job destruction rates ($\boldsymbol{\delta}$), added worker effect probabilities ($\boldsymbol{p}, \boldsymbol{q}$), as well as utility parameters including the measure of risk aversion (θ), the nonemployment incomes (b_1 and b_2), the relative value of amenities in the formal sector (a), and the value of Seguro Popular (γ). All are denoted by:

$$\Theta = (\alpha_f, \beta_f, \alpha_i, \beta_i, \lambda_{if}^1, \lambda_{fi}^1, \lambda_{ni}^1, \lambda_{nf}^1, \delta_i^1, \delta_f^1, \lambda_{if}^2, \lambda_{fi}^2, \lambda_{ni}^2, \lambda_{nf}^2, \delta_i^2, \delta_f^2, p_1, q_1, p_2, q_2, \theta, b_1, b_2, a, \gamma) \quad (8)$$

5.1 Two-step Estimation

Formally, we follow a two-step estimation procedure. In the first stage, we use data from the pre-reform period, where we set $\gamma = 0$ and search over the parameter vector Θ to find the combination that minimizes a distance criterion (see below) between the simulated and empirical moments. All 24 parameters are jointly estimated.[24] In the second step, we use data from the post-reform period and we keep all parameters fixed at the value obtained from the first stage, and search over γ (and wage offers parameters) to find the value that minimizes the distance criterion. This estimation approach, which uses differences in labor supply patterns

distributions. As we are unable to derive the admissible shapes of such distributions given the interdependence of different sectors and individuals in the current environment, in practice, we rely on the first-order condition to provide a unique solution to the firm's decision and then we check whether the second-order condition is satisfied. The latter is equivalent to $K'_{j,s}(p) > 0$.

[24] We set all the transition rates within the same sector (such as λ_{ff}^1) equal to zero because transitions within the same sector are not observed in our data.

induced by a reform among those with and without insurance to identify the value of health insurance, is similar in spirit to that in French and Jones (2011).

We define our method by

$$\hat{\Theta}_{MSM} = \arg\min_{\Theta} \left(\upsilon(\Theta) - \tilde{\upsilon}\right)^T W \left(\upsilon(\Theta) - \tilde{\upsilon}\right)$$

where $\dim(\upsilon(\Theta)) = \dim(\tilde{\upsilon}) > \dim(\Theta)$ and W is a weighting matrix in which the diagonal elements are the inverses of the bootstrap variances.

For each sample, we use two groups of moments. The first contains individual moments: wages by sector and by spouse (mean, standard deviation, 10th, 25th, 50th, 75th, and 90th percentiles) and transition probabilities between any two labor market status and by spouse (variation in occupation status between interviews for the first and second quarters). The second includes cross moments, i.e., moments that relate spouses 1 and 2 in any dimension. In particular, we target the joint employment proportions and conditional transition probabilities, such as the probability of the head finding a job in the informal sector conditional on the spouse losing a job, and vice versa.[25] In total, in the first step we use 53 moments to estimate 24 parameters. In the second step, to estimate the utility value of SP, γ, and the new equilibrium offers distribution parameters, we use 9 employment moments and 8 wage moments by sector and spouse (namely, mean and standard deviation) in treated municipalities, after the implementation of SP. Finally, we obtain the standard errors using nonparametric bootstrapping with 100 replications.

Up to this point, we have shown how we estimate the transition rates, wage offers and utility parameters. These estimates did not require computing the distributions of productivity. However, counterfactual policy experiments under general equilibrium, where offered wages are endogenous, will use the estimated distributions of productivity to compute the new equilibrium. In a completely separate step, we exploit the first-order condition from the profit-maximization problems (5) and (7) to estimate the productivity support for each member and sector (see Appendix D for details).

5.2 Identification

As is well known in the literature on household search model estimation (see, e.g., Dey and Flinn, 2008; Flabbi and Mabli, 2018), it is difficult to analytically solve for all structural parameters, so a formal proof

[25] Additionally, we could have also matched the joint distribution of wages of couples. However, we do not use these moments in our approach, since the majority of women does not work.

of identification cannot be provided. Specifically, writing up flow equations and theoretical transitions is intractable since the individual exit hazard is not constant over the time period, i.e. it depends on the job state and wage of the spouse that may change during the interval in which the individual receives a shock. However, we are able to provide formal identification arguments for the key parameters of the model under the assumption of stable reservation wages (see Appendix E).

By conditioning on the spouse's job state and wage at a given point in time, the model can be identified in three steps. First, we use the equilibrium steady-state relationships between the observed joint earnings distributions, $G_{jj'}$, and the sampling distributions, F_j^s ($j, j' = f, i$ and $s = 1, 2$) to calculate the sampling distributions, given the transition and utility parameters. As equations E.1 and E.2 in Appendix E illustrate, the earnings CDFs are the primary link to the wage offers distributions. Second, we construct theoretical transition probabilities to recover the transition parameters, conditional on the wage offers distributions and utility parameters.

We then combine the first two results to identify the preference parameters. To do so, we exploit the Bellman equations and assume strong monopsony power for the lowest wage earners in both formal and informal sectors. This assumption implies restrictions that we use to identify the utility parameters. To separately identify a (the utility value of amenities in the formal sector) and γ (the value of health insurance provided by SP), we exploit the variation in the timing of the introduction of SP in municipalities as we do in reduced-form analysis.[26] Essentially, our strategy relies on the fact that there are no other changes to programs or reforms, such as payroll taxation, changes to formal sector benefits or to cash transfers, happening simultaneously with the implementation of SP in a municipality, so that any changes in employment transitions and wages from the pre- to the post-implementation period can only be attributed to SP (see section 2).[27] Thus, with linear utility ($\theta = 0$) and using data before the SP program (when $\gamma = 0$), we obtain a, b_1 and b_2. Then, using data from the treated municipalities in the post-SP implementation period we show that γ follows from the same restriction as the one used to calculate a (see Appendix E.1).

Given that utility is additively separable, θ is the only parameter related to "consumption" and it is identified from the variation in incomes associated with households changing between labor market states. For

[26] A different identification strategy is implemented by Bobba, Flabbi and Levy (2022) to estimate the utility value of SP from an individual search and matching model. They use data for only one year (2005).

[27] We assume that the first-step structural parameters are the same across the municipalities that implemented the program in different years (ie, earlier or later). This assumption is supported by strong evidence that the timing of SP implementation was not correlated with pre-existing trends in labor market characteristics (Azuara and Marinescu, 2013; Bosch and Campos-Vazquez, 2014).

example, consider the value of households that are initially in the state "ii" earning at (w_1, w_2), $W_{ii}(w_1, w_2)$, and the least value that the households could have for the husband to accept an offer from the formal sector, i.e. $W_{fi}(\hat{w}_f^1, w_2)$. Given w_1, w_2 and all other parameters, one can use these two value functions and a fixed point algorithm in order to recover θ.

As the parameters are jointly estimated, i.e. there is no one-to-one mapping between each moment and parameter. However, in Appendix Table E.1 we show that, in general, the baseline estimates of the model are robust to small perturbations to the value of each parameter values. This comparative static exercise also highlights the importance of considering joint search. The simulations show that each individual responds to changes in his/her moments but also to those of his/her spouse. Importantly, cross-effects are not symmetric. For example, the fraction of husbands without work responds relatively more to changes in the transition rates of wives, while the unconditional transition probabilities of women are more sensitive to variation in the transition parameters of men.

Extension with health shocks The identification of the model extension provided in Appendix C.2 follows similar arguments to those presented above. With health shocks there are the following new parameters: $\nu(h'|h)$, b_1^h, b_2^h, a^h and γ^h where $h, h' \in H$ = {good health ("GH"), bad health ("BH")}.

The two transition rates $\nu(GH|BH)$ and $\nu(BH|GH)$ are identified from the probabilities of changing health status from the first to the second interview, using data from the pre-SP period. In addition to the remaining parameters, we estimate a total of 29 parameters using 64 moments in the first step (taken before the introduction of SP). In the second step, we estimate the utility values of SP, γ^h, and the new equilibrium offers distribution parameters using 18 employment moments and 8 wage moments by sector and spouse (namely, mean and standard deviation).

6 Results

We now present the model estimates. Our benchmark model is estimated for households with two spouses - where the head is male and the spouse is female - with and without children less than 15 years old. We focus our analysis on households with children, although at the end of this section we also highlight the main differences in the estimates relative to households without children. The estimation is performed for two groups of households: low and high education (recall a household belongs to the high-education sample

if the head has more than 6 years of education).

We start by estimating all parameters using the period before the introduction of SP. To do so, we set the value of free health insurance in the informal sector and nonemployment, γ, to zero. In the sample of municipalities covered by the Labor Force Survey, SP was implemented in a staggered manner between 2002 and 2007. We then use the period after the introduction of SP to estimate γ as described in subsection 5.2, keeping all other parameters fixed as estimated on data from the pre-reform period.

The time period in the model is one quarter. We set the discount rate to $r = 0.036$, which corresponds to the average for the Mexican benchmark interest rate in the period 2000-2004 and $\tau = 0.10$ for employer contributions to social security following Satchi and Temple (2009).

6.1 The Model Fit

Overall, the model closely reproduces the patterns observed in the data. Appendix Table A.4 compares the stocks of households – where members can be employed in the formal or informal sector or non-working – and the transitions, as predicted by the model and observed in the data, in the pre-SP period. The stocks are denoted by $m_{zz'}$, which show the fraction of households where the head is in status z and the spouse is in status z' ($z, z' = f, i, n$). Both the model and the data show that the largest fractions of households are those where the head is employed in either the formal or informal sectors, while the spouse is non-employed. The model also reproduces remarkably well the share of heads and spouses in nonemployment for both low and high-education households.

The transitions are less well fitted because our estimation method penalizes the moments that are rare the data. Thus, the model underestimates the fraction of heads who move from formal to informal and in the opposite direction between two consecutive quarters. It also underestimates the share of spouses moving from nonemployment to an informal job when the head loses his job, again reflecting that these transitions are rare in the data.

The model replicates well also the main patterns in distributions of accepted wages in the data. Appendix Table A.5 presents selected moments for the distribution of wages in the data and as predicted by the model. For instance, wages in the formal sector are on average higher than in the informal sector for both head and spouse. The male-female wage gaps predicted by the model and observed in the data are similar.

Finally, we perform a model validation exercise that performs an out-of-sample using the estimated benchmark model. Our results in Appendix G show that the model is able to predict the stocks of households

of each type and formal sector wages for a period not used in the model estimation.

6.2 Model Estimates

6.2.1 Transition Rates and Wage Offers Distributions

Table 3 reports estimates of the transition parameters across sectors of employment and nonemployment by spouse. The job arrival rates are 6 to 12 times higher for women in relation to men. The estimates show that the market is more frictional for women as the ratio of job arrival to job destruction rate is low for them. For men, the arrivals rates are 8 to 22 times larger than destruction rates, depending on the destination and sample, while these numbers range between 0.2 and 1.1 for women. Additionally, on the job search is more effective than out of the job to receive offers in the formal sector, while the contrary is observed for offers in the informal sector.

The high informality stock can be attributed to the following (see Table A.4). First, the arrival rate of offers from the informal sector for nonemployed individuals (λ^s_{ni}) is higher than that from the formal sector (λ^s_{nf}). This difference is more pronounced for men, who also have much lower and similar job destruction rates across sectors, meaning that these rates play a smaller role in explaining informality. Second, the probabilities of transitioning from nonemployment to the informal sector when a spouse loses their job, $p's$ and $q's$, range between 0.2 and 0.8 indicating a significant instant added worker effect that contributes to increase informality.

Appendix Table A.6 reports the estimates for the parameters of the wage offer distributions. The parameters vary by sector - formal (α_f and β_f) and informal (α_i and β_i). Additionally, the minimum and maximum support points vary by sector and spouse. The implied mean offered wage is typically higher for husbands than for wives. In low-education households, offered wages are 10% higher for men compared to women in the formal sector, and 20% higher for men in the informal sector. For high-education households, average formal wage offers are similar for men and women, while informal wage offers are 24% higher for men. Interestingly, the mean wage offer in the informal sector is lower for high-education households compared to low-education households. One potential explanation for this result is that wage offers must be relatively more attractive in the informal sector to justify the high informality rate among low-education households.

6.2.2 Utility parameters

The model allows for risk aversion and different flow of nonemployment income of heads and spouses. The first row of Table 4 presents the estimates for the coefficient of absolute risk aversion (θ). The point estimate for high education is higher than for low education, but both are imprecise, and we fail to not reject concavity for both groups. The absolute risk aversion estimates are smaller than the median estimate in Cohen and Einav (2007), which is $3.0 \cdot 10^{-5}$ under the assumption of CARA utility. Our values are also smaller than the values reported in Fang and Shephard (2019) (that range between 1.1 and 1.2) in their study of health insurance in the US using a household search model and CARA utility. We translate the CARA estimate into relative risk aversion multiplying θ by the quarterly average household income. Then, we obtain relative risk aversion coefficients of 0.00013 and 0.0098 for low and high-education households with children, respectively. Although the risk aversion parameter is small, the reservation wages of one spouse may still depend on the other spouse's job status and wage because the health insurance is an amenity shared within the household. This means that within couple decisions cannot be uncoupled in the sense that the decision of spouse *j* to accept a job offer will depend on the health insurance status and wage of spouse *j'* as well as their own current wage and health insurance status (see Dey and Flinn (2008) and Appendix F).

The second and third rows of Table 4 show that the nonemployment incomes, b_1 and b_2, are negative, reflecting that job offers are more likely to be accepted by individuals out of work for both spouses. Nonemployment income is lower for men than for women, because they are more likely to have a non-working spouse, resulting in less household insurance in case of nonemployment. Our estimates are consistent with other on-the-job search models that also found very small or negative estimates for the flow income of unemployment (e.g. Bontemps, Robin and van den Berg, 2000; Aizawa and Fang, 2020; Meghir, Narita and Robin, 2015).[28]

The fourth row of Table 4 presents the estimates for a, which represents the value of pre-existing amenities in the formal sector compared to those in the informal sector or nonemployment. While the estimate for low-education households is negative and imprecise, the estimate for high-education households is positive. To understand what these estimates represent in terms of earnings, we compute the willingness to pay, that is, how much households would need to give up to be indifferent between being formal or outside the formal sector. Specifically, we calculate the marginal willingness to pay as the ratio of the marginal utility of the

[28]Our choice of CARA utility function is very flexible allowing for example a negative total income, that is possible given a negative nonemployment income. We think this is more appropriate than using CRRA utility and having to assume $b \geq 0$.

job amenity in the formal sector to the marginal utility of the wage. This is reported in the sixth row of the Table 4. Since the absolute risk aversion estimates are close to zero, the marginal utility of income is almost flat. As a result, the willingness to pay is approximately equal to the utility value for low-education households (column 1) and is slightly higher for high-education households (column 2). A negative or low value for a can be explained by several factors: (1) preferences for more flexible work schedules in the informal sector (Perry et al., 2007); (2) behavioral biases, such as myopia and the tendency to outweigh the immediate burden of paying taxes compared to the future benefits of pensions and formal sector benefits; (3) access to generous welfare programs for disadvantaged households such, as *Progresa/Oportunidades*, and even (4) differential frictions across sectors, namely a more frictional formal sector. Column (2) of Table 4 shows that high-education households are willing to pay 18% of their mean earnings to be in the formal sector, capturing the value they place on the non-wage benefits of the formal sector. In comparison, Table A2.1 in Antón, Hernández and Levy (2013) indicates that taxes amount to 22% of earnings (excluding pensions, housing and state taxes). Hence, our finding suggests that even those more likely to be formal workers do not seem to value enough formal health benefits.

We also estimate an extended version of the model that includes health shocks (see Appendix C.2). In Table A.18, we report the utility parameters for the samples of households with children; this table shows important changes in the nonemployment income for women relative to the estimates for the baseline model.[29] When the parameters b_2^h vary by health status, nonemployment income is lower for women in less educated households with bad health status. For example, a woman becomes less reluctant to accept a job offer if her husband is in bad health.

Allowing the values of formal sector attributes (a^h) to vary with health status leads to similar estimates for low-education and high-education households without kids. For high education households with kids, the value for households in the bad health status (a^{BH}) is less than half that in good health households (Table A.18). As utility becomes more linear in the extended model, the decline can be interpreted as a reduction in disposable income due to higher medical expenditures for high-education households with bad health. Although these households in the formal sector are more likely to access health treatment because of their coverage through the formal health care system, not all treatments or medications are covered. Consequently, families often face out-of-pocket expenses.

[29] All other parameters and model fit for all samples are in the Appendix Tables A.12-A.20.

6.2.3 The Value of Seguro Popular

The estimate of γ and the corresponding marginal willingness to pay in Table 4 (fifth and seventh rows, respectively) show that the value added of SP for low-education households is positive and significant, representing 6% of their mean earnings.[30] Although the SP does not target specifically low-education households, it is perceived as having a higher value for this group. Nevertheless, even among low-education households, the marginal willingness to pay for SP is low when we compare it to the gross cost of funding the program per family. The government spends per quarter MXP 1,306 (in 2010 pesos; about 100USD) per family enrolled in the program (CNPSS, 2013). Thus, our estimate suggests that low-education households assign a value of only 0.53 for every MXP spent on the program.[31]

Prior to SP, health care was also available to the poorest through PAC or *Progresa/Oportunidades* (see section 2). As a result, some low-education households already had access to services that partially overlapped with those of SP, reducing the value of γ. Also, from the beginning of the 20th century, Mexico had recognized that health care for the uninsured should have been covered as part of governmental assistance, rather than by the families themselves or by public or private charities (Frenk et al., 2009). Therefore, SP did not transferred significant resources to the newly insured households. Instead, it redirected resources to government institutions that had previously borne the costs of their implicit insurance. Consequently, if the government bears the incidence of uncompensated care payments, the cost to the government of providing SP would be net of such transfers. Assuming that the net costs are 40% of the gross costs, as estimated for Medicaid (Finkelstein, Hendren and Luttmer, 2019), our estimate for low-education households would be $\gamma/(0.4 \times 1306)$, which equals 1.33 per unit of net cost for providing SP.

We also estimate the model for the samples of households without children (Appendix Table A.11).[32] For low-education households, the estimate of γ is positive, similar to the sample with children, but smaller at 4% of mean earnings, with $\gamma/(0.4 \times 1,306)$ equal to 0.76 per unit of net cost. This lower value is expected, as the benefit of health care provided by SP should be greater for households with children.

[30] Our estimate is robust to including moments that capture the variation in labor supply patterns of those with and without insurance before and after the reform. In particular, by targeting the increase of 3.5% in informality obtained in the reduced form estimation (in addition to the usual wage moments) in the second estimation step, we obtain $\gamma = 538$ ($S.E. = 99$), which is within the confidence interval of our baseline estimate where $\gamma = 695$ ($S.E. = 147$).

[31] Using different approaches, Finkelstein, Hendren and Luttmer (2019) find that the willingness to pay for Medicaid by recipients per dollar of net cost is between 0.5 and 1.2. Similarly, Finkelstein, Hendren and Shepard (2019) estimate a willingness to pay of less than 0.5 for enrollees in the Massachusetts' subsidized insurance exchange.

[32] The corresponding model fit tables, transitions and wage offer parameters are reported in Appendix Tables A.7-A.9 and A.6, respectively.

For high education households, γ is negative whether they have small children or not. It is reasonable to expect that an important part of the incidence of the transfers is on richer households, such as the privately insured. This is consistent with Appendix Table A.10 that shows that high education households spent more in health than low education families in 2002 (before SP).[33] If high education recipients bear the ultimate incidence of the transfers, we can use $(\gamma + 0.6 \times 1,306)/1,306$ as the relevant measure, following the estimate for the crowd-out of implicit insurance in the US (i.e., 60% of gross cost). This calculation suggests that the value of SP relative to its costs is 0.10 for high-education households with children and 0.23 for those without children. However, if we assume that richer households have a welfare weight of 0.5, as Hendren (2020), then the estimated value should be $(\gamma + 0.3 \times 1,306)/1,306$, resulting in negative estimates of -0.20 and -0.06 for households with and without children, respectively.

Nevertheless, even considering that the government bears the costs for low-education households while high-education households bear the ultimate incidence of the transfers, the average value of SP across all household types ranges between 0.46 and 0.62, depending on how the richest households are accounted for in the social welfare function.[34]

Turning to the model with health shocks, Table A.18 shows that allowing for different values of SP according to the health status (γ^{GH} for good health and γ^{BH} for bad health) increases the value for households with good health while it shows an insignificant value for those with bad health in the sample of low education with children (column 1). Notably, these households are precisely the group driving the increase in informality attributed to the SP in the reduced-form model (see Table A.3). A similar pattern is observed for the sample of households without children (Appendix Table A.19). The most direct interpretation of these estimates is that SP adds less value for bad health households, possibly due to the limited coverage offered by SP for certain treatments or medications, which may not fully meet their healthcare needs. For high-education households with or without children (column 2), the value of SP is similar between good and bad health statuses and comparable to the value in the model without health shocks.

We can use the analysis above to calculate the value of SP relative to its costs. Recall that the relevant

[33] Appendix Table A.10 presents basic descriptive statistics of the amount of out-of-pocket health expenditures and its share in overall household expenditures. These statistics are obtained using data from the Household Income and Expenditure Survey for 2002 (before SP) and 2008 (post SP). Table A.10 shows that over 99% of households do not report any expenditures on health insurance. The share of less educated households with children without health expenditures increased from 42% to 44% between 2002 and 2008, suggesting an improvement of health status and/or increased availability of free health services for these households. In the sample period, the share of high-education households with children without expenditures remained constant.

[34] We use the number of households by education and the presence of kids, before the program, reported in Table 1 to calculate the averages across all households.

measures are $\gamma/(0.4\times1,306)$ for low-education households and $(\gamma+0.3\times1,306)/1,306$ for high-education households. These imply that for low-education households, the value per unit of cost ranges from 0.27 to 1.56 for those with children, and from 0.51 to 1 for those without children; while for high-education households, the estimated value per unit of cost ranges from -0.02 to -0.16 for those with children, and from -0.14 to -0.22 for those without children. By averaging across all household types, we obtain the values of SP of 0.63 and 0.19 per unit of cost, for good and bad health households, respectively.

In summary, our estimates for γ indicate that, given all parameters fixed in the pre-SP period, only low-education households assign a positive value to SP. This value represents 6% and 4% of mean household earnings for households with and without children, respectively. Except for low-education households with children, the value of SP is generally below the cost per family, even when accounting for health shocks.

6.3 Individual vs. Household Search Model

As argued in the literature (e.g. Dey and Flinn (2008)), in the presence of amenities that are shared within the household – that cannot be uncoupled – modeling decisions as a single-agent model will be misleading. As Dey and Flinn (2008) show, even when households are risk neutral, an amenity such as health insurance that is a public good in the household causes the decision of one spouse of whether to accept a job offer to depend on the job status as well as wage of the other spouse. Appendix F documents the interdependence between the reservation wages of each household member and the current job status and wage of his/her partner.

7 Policy Experiments

Having estimated the model, and the preference parameters, we can now examine the welfare of households and changes in employment and informality under different counterfactual policies. We perform two main simulations. First, to assess the welfare changes of the actual policy, we take as benchmark the model estimated in the period before the programs' implementation, where γ is set to zero. We then vary γ to the estimated value as reported in Table 4. Second, we explore alternative policy reforms that could improve the current health system. One natural question is the welfare impact of changing the quality of health insurance. It is reasonable to expect that the free public health insurance may be provided less efficiently and that the quality of care may be lower. To understand if this is the case, we then simulate an increase in

the value of SP that is twice the estimated parameter.

We assume that the economy is in a steady state, represented by the situation in the pre-program period and moves to a new steady state after the policy change. We conduct the simulations under three different assumptions. First, the policy is simulated in a setting with exogenous wage offers: we call it "partial equilibrium". Second, we assume endogenous wage offers using the firm side of the model presented in subsection 4.4 and Appendix D. Finally, we simulate the policy in an environment with endogenous wages and a revenue-neutral introduction of SP; to do so, we assume that the government's expenditure in the program is paid by all households through a lump-sum tax in the form of dividends, akin to a per period tax on "consumption".[35]

We focus on the sample of low-education households with children for which the value of γ is non-zero, as this is the only sample where we detect effects of the instruction of SP in the reduced-form analysis.

SP expanded health care to the half of the Mexican population previously uncovered by any contributory health insurance. We then expect that this reform increased the incentives for households to be outside the formal sector – that is, when spouses are working in the informal sector or nonemployed. Under endogenous wage offers, as workers leave the formal sector, formal-sector firms may raise the wage to retain them, while firms in the informal sector may lower wage offers. This should counteract at least some of the increase in value of being informal attributed to SP.[36] Furthermore, if the government funds the SP through a lump-sum tax paid by all households in every period – as in our third counterfactual – then there is further reduction of incentives to become informal due taxation.

Table 5 reports the results on household stocks, mean wages and welfare, while Appendix Table A.21 presents the results for transitions. Column (1) of these tables shows partial equilibrium results. They indicate that if the pre-SP economy is simulated with the estimated value of SP, almost all household stocks in the formal sector decline, leading to an aggregate increase in household informality of 2.9p.p. (6.2%). This is mainly due to a 2.8p.p. (6.9%) increase in the stock of households with an informal head and a nonemployed spouse, and a 1.9p.p. (6.4%) decrease in the fraction of households with a formal head and a nonemployed spouse. Exits from the formal sector to the informal sector increase for both men and women. Additionally, there are fewer men transiting from informal to the formal sector, and fewer women moving

[35] In practice, this form of taxation is easier to reach the informal sector (Gordon and Li, 2009) and is more adequate to the fact that SP has been funded through general taxation rather than adjusting formal sector taxes.

[36] General equilibrium effects (through wages) are expected to be smaller because they may result only from changes in labor supply, given that firms bear no cost related to the health insurance provided by SP.

from nonemployment to the formal sector.[37] Nonemployment decreases among men by 0.15p.p. (3.5%), but increases among women by 0.8p.p. (1.1%).

The partial equilibrium results also show that the formal sector wages increase as workers become more reluctant to accept formal sector job offers. In contrast, informal sector wages decrease for heads of households because, after the introduction of SP, they are more willing to accept a job offer in this sector. Together, the introduction of SP – corresponding to a value of 6% of the mean household income – and the reduction in overall wages imply an increase in the average welfare of workers of 3%.[38] Welfare increases for informal workers and the nonemployed mainly due to an increase in the value of SP, which increases utility. Welfare also increases for formal sector individuals mainly because of higher wages, as reservation wages are now higher in this sector.

With endogenous wages (column 2), we see the expected compensating differential for men working in the informal sector. Specifically, wages of men in the informal sector decrease, while their formal sector wages increase beyond the levels in the partial equilibrium scenario (column 1). General equilibrium effects through changes in the wage offers are non-negligible, but not substantially large compared with the partial equilibrium results. These results are associated to larger increase on household informality, around 4p.p. (8.4%), and workers' welfare increases by 3.3%.

In column (3), we report the results obtained under a revenue-neutral implementation of SP. In this counterfactual scenario, the government expenditure of SP is funded by all households through a lump-sum tax in the form of dividends. This tax disproportionately penalizes lowest earners, particularly informal workers and the nonemployed. Relative to the general equilibrium results in column (2), wages offers for men increase even more in the formal sector as they attempt to leave this sector. Women become more reluctant to accept informal sector jobs but less hesitant to take formal sector jobs. Despite the increase in utility due to SP, the welfare of workers decreases by 3.8%. Finally, the impact on informality is similar to the general equilibrium counterfactual in column (2), increasing by 3.8 (8%). Across all simulations, the partial equilibrium effect on informality is closer to the reduced-form estimates in Table 2 (3.5% impact).

In columns (4) to (6) of Table 5, we simulate an increase in the value of SP that is twice the estimated parameter. Accordingly, in the revenue neutral simulation, we also adjust the cost of providing SP by

[37] These results are consistent with the reduced-form evidence about the impact of SP on labor market transitions. The transitions from informal to formal jobs decline for men, driven by those with low education. Women however stay more in nonemployment as transitions from nonemployment to the formal sector reduce among those with low education (results available from the authors).

[38] The welfare measures are calculated using the lifetime value of households and their density in each joint status and wage.

assuming that the program's cost per family doubles. The main results show that informality increases by 1.4 to 1.7 times relative to the simulations of columns (1) to (3). In general equilibrium, informal wage offers decline further because the informal sector attracts more workers, leading to lower informal wages. Additionally, in the revenue neutral simulation (column (6)), these changes in salaries – and the reduction in the formal sector wage for women – reduce the incentives to work, and nonemployment increases among females. Collectively, these effects explain the welfare decline of 6.8% when we consider the increased costs of providing SP. Finally, we find evidence supporting that SP increased firms' profits (see Appendix H).

Table A.22 presents the effects of increasing the value of SP using the model with health shocks. By increasing the value of SP from zero to the value estimates in column 1 of Table A.18, we find similar results to the simulations of the baseline model. The main difference lies in the magnitude of welfare effects that are larger in the model with health shocks because the point estimate of γ is larger for households in good health (the majority in our sample).

Summing up, our main findings suggest that SP generates incentives for household informality, that increases between 4.9 and 8.0% across different simulations and models. Despite the reform providing coverage to 53% of households with low education, the overall impact on informality is modest, aligning with reduced-form evidence. We rationalize this result with our estimate of the marginal willingness to pay for SP, which is 0.53—less than the program's gross cost per household—but this value increases to 1.33 when considering our measure of the net cost of SP. We also find that introducing free health insurance or improving a system like SP has limited potential to enhance the welfare of workers due to the negative effect on the government's budget.

8 Conclusion

In this paper, we examine how access to free health insurance affects the labor market decisions of households. To do do, we develop and estimate—for the first time—a household-level job search model applicable to a developing or middle-income country. Specifically, we focus on Mexico, which in 2002 introduced Seguro Popular (SP), a non-contributory health insurance scheme aimed at the half of the population not covered by Social Security protection. Difference-in-differences estimates using the staggered introduction of SP across municipalities show that the program increased informality by 2.3 percentage points (3.5%) for less educated households with children, with no impacts for the other groups studied (i.e., less educated

households without children or more educated households).

Then, to understand why the policy change had limited impacts on the labor market, we develop and estimate a household search model that incorporates the value of free health care by SP and the pre-reform valuation assigned to the amenities in the formal sector relative to the alternatives (i.e., informal sector and non-employment). This approach allows us to recover the value of SP as perceived by households.

Our results show that the marginal willingness to pay for health insurance coverage provided by SP is low, ranging from zero to 6% of the mean household income, with the largest value coming from the poorest group of households – less educated families with children. Our estimates also indicate that the value is generally below the government's average cost of providing it. The model simulations show that the welfare gains are limited. However, they ignore considerations that could justify the provision of subsidized or free health insurance to the uninsured population, such as uncompensated care, that may be important for lower-income populations (e.g., Finkelstein, Hendren and Shepard, 2019). Therefore, despite a private willingness to pay below the gross cost, if the government bears the incidence of uncompensated-care payments, then the cost of SP should be net of such transfers. Alternatively, if the relatively richer beneficiaries bear the ultimate incidence of the transfers – as is the case of the privately insured – then the estimate of willingness to pay should also account for these transfers. Nevertheless, even considering that the government bears the costs of providing uncompensated care to the uninsured low-education households, and that high-education recipients bear the ultimate incidence of the transfers, the average value of SP across household types ranges from 0.46 and 0.62 per unit of cost, depending on how the wealthiest households enter the social welfare function.

Finally, our results have important policy implications for those countries introducing and/or expanding schemes that decouple access to health services from employment contracts—such as Medicaid expansions for low-income uninsured individuals or the 2010 Affordable Care Act in the US, suggesting that equilibrium adjustments might preclude large cross-sectoral shifts to the sector benefiting from the publicly subsidized health insurance.

References

Aguilera, Nelly. 2011. "The Short Term Causal Effects of Seguro Popular on Formal Employment." *Inter-American Center for Social Security Studies*, 1–27.

Ahmed, Sayem, Mohammad Enamul Hoque, Abdur Razzaque Sarker, Marufa Sultana, Ziaul Islam, Rukhsana Gazi, and Jahangir AM Khan. 2016. "Willingness-to-pay for community-based health insurance among informal workers in urban Bangladesh." *PloS one*, 11(2): e0148211.

Aizawa, Naoki, and Chao Fu. 2023. "Interaction of the Labor Market and the Health Insurance System: Employer-Sponsored, Individual, and Public Insurance." *University of Wisconsin-Madison, Mimeo*.

Aizawa, Naoki, and Hanming Fang. 2020. "Equilibrium Labor Market Search and Health Insurance Reform." *Journal of Political Economy*, 128(11): 4258–4336.

Albrecht, James, Lucas Navarro, and Susan Vroman. 2009. "The Effects of Labour Market Policies in an Economy with an Informal Sector." *The Economic Journal*, 119(539): 1105–1129.

Antón, Arturo, Fausto Hernández, and Santiago Levy. 2013. "The End of Informality in Mexico?: Fiscal Reform for Universal Social Insurance." *IADB Working Paper Series. Available at* `https://publications.iadb.org/handle/11319/3479`.

Ashenfelter, Orley, and James Heckman. 1974. "The Estimation of Income and Substitution Effects in a Model of Family Labor Supply." *Econometrica*, 42(1): 73–85.

Aterido, Reyes, Mary Hallward-Driemeier, and Carmen Pages. 2011. "Does Expanding Health Insurance Beyond Formal-Sector Workers Encourage Informality?: Measuring the Impact of Mexico's Seguro Popular." *IZA Discussion Paper No. 5996*.

Azuara, Oliver, and Ioana Marinescu. 2013. "Informality and the expansion of social protection programs: Evidence from Mexico." *Journal of Health Economics*, 32(5): 938–950.

Baicker, Katherine, Amy Finkelstein, Jae Song, and Sarah Taubman. 2014. "The Impact of Medicaid on Labor Market Activity and Program Participation: Evidence from the Oregon Health Insurance Experiment." *American Economic Review*, 104(5): 322–28.

Barros, Rodrigo. 2008. "Wealthier But Not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico." Stanford Institute for Economic Policy Research Discussion Papers 09-002.

Bennett, Sara, Andrew L Creese, Roeland Monasch, Research World Health Organization. Division of Analysis, and Assessment. 1998. "Health insurance schemes for people outside formal sector employment / Sara Bennett, Andrew Creese, Roeland Monasch."

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-In-Differences Estimates?" *The Quarterly Journal of Economics*, 119(1): 249–275.

Blundell, Richard, Luigi Pistaferri, and Itay Saporta-Eksten. 2016. "Consumption Inequality and Family Labor Supply." *American Economic Review*, 106(2): 387–435.

Bobba, Matteo, Luca Flabbi, and Santiago Levy. 2022. "Labor Market Search, Informality, and Schooling Investments." *International Economic Review*, 63(1): 211–259.

Bonhomme, Stéphane, and Grégory Jolivet. 2009. "The pervasive absence of compensating differentials." *Journal of Applied Econometrics*, 24(5): 763–795.

Bontemps, Christian, Jean-Marc Robin, and Gerard J. van den Berg. 2000. "Equilibrium Search with Continuous Productivity Dispersion: Theory and Nonparametric Estimation." *International Economic Review*, 41(2): 305–58.

Bontemps, Christian, Jean-Marc Robin, and Gerard van den Berg. 1999. "An Empirical Equilibrium Job Search Model With Search on the Job and Heterogeneous Workers and Firms." *International Economic Review*, 40(4): 1039–1074.

Bosch, Mariano, and Julen Esteban-Pretel. 2012. "Job Creation and Job Destruction in the Presence of Informal Markets." *Journal of Development Economics*, 98(2): 270–86.

Bosch, Mariano, and Raymundo M. Campos-Vazquez. 2014. "The Trade-Offs of Welfare Policies in Labor Markets with Informal Jobs: The Case of the "Seguro Popular" Program in Mexico." *American Economic Journal: Economic Policy*, 6(4): 71–99.

Bosch, Mariano, M Belén Cobacho, and C Pages. 2012. "Taking Stock of Eight Years of Implementation of Seguro Popular in Mexico." *Washington, DC, United States: Inter-American Development Bank. Mimeographed document*.

Browning, Martin, Pierre Chiappori, and Yoram Weiss. 2014. *Economics of the Family.* Cambridge University Press.

Burdett, Kenneth, and Dale T. Mortensen. 1998. "Wage Differentials, Employer Size, and Unemployment." *International Economic Review*, 39(2): 257–273.

Calderon, Gabriela. 2014. "The effects of child care provision in Mexico." *Working Papers 2014-07, Banco de México*.

Campos-Vazquez, Raymundo M., and Melissa A. Knox. 2013. "Social Protection Programs and Employment: The Case of Mexico's Seguro Popular Program." *Economía Mexicana NUEVA ÉPOCA*, XXII.2: 403–408.

CNPSS. 2013. "Informe de Resultados 2013 of the Sistema de Protección Social en Salud (SPSS)." *Comision Nacional de Proteccion Social en Salud, Secretaría de Salud. Available at* `http://gaceta.diputados.gob.mx/Gaceta/62/2014/feb/Inf_SS-20140205.pdf`.

Cohen, Alma, and Liran Einav. 2007. "Estimating Risk Preferences from Deductible Choice." *American Economic Review*, 97(3): 745–788.

Conti, Gabriella, and Rita Ginja. 2023. "Who Benefits from Free Health Insurance?" *Journal of Human Resources*, 58(1): 146–182.

de la Parra, Brenda Samaniego, and León Fernández Bujanda. 2020. "Increasing the Cost of Informal Workers: Evidence from Mexico." Banco de México Working Papers 2020-19.

del Valle, Alejandro. 2021. "The effects of public health insurance in labor markets with informal jobs: Evidence from Mexico." *Journal of Health Economics*, 77: 102454.

Dey, Matthew S., and Christopher J. Flinn. 2008. "Household search and health insurance coverage." *Journal of Econometrics*, 145(1–2): 43–63.

Fang, Hanming, and Andrew Shephard. 2019. "Household Labor Search, Spousal Insurance, and Health Care Reform." *NBER Working Paper No. 26350*.

Finkelstein, Amy, Nathaniel Hendren, and Erzo F.P. Luttmer. 2019. "The Value of Medicaid: Interpreting Results from the Oregon Health Insurance Experiment." *Journal of Political Economy*, 127(6): 2836–2874.

Finkelstein, Amy, Nathaniel Hendren, and Mark Shepard. 2019. "Subsidizing Health Insurance for Low-Income Adults: Evidence from Massachusetts." *American Economic Review*, 109(4): 1530–67.

Flabbi, Luca, and James Mabli. 2018. "Household Search or Individual Search: Does It Matter?" *Journal of Labor Economics*, 36(1): 1–46.

French, Eric, and John Bailey Jones. 2011. "The Effects of Health Insurance and Self-Insurance on Retirement Behavior." *Econometrica*, 79(3): 693–732.

Frenk, Julio, Eduardo González-Pier, Octavio Gómez-Dantés, Miguel A Lezana, and Felicia Marie Knaul. 2006. "Comprehensive reform to improve health system performance in Mexico." *The Lancet*, 368(9546): 1524 – 1534.

Frenk, Julio, Eduardo González-Pier, Octavio Gómez-Dantés, Miguel A Lezana, and Felicia Marie Knaul. 2009. "The democratization of health in Mexico: financial innovations for universal coverage." *Bulletin of the World Health Organization*, , (87): 542–548.

Gallardo-Garcia, Jorge. 2006. "Health Insurance and Pregnancy Outcomes: An Analysis of Fertility, Prenatal Care and Employment in Mexico." *Ph.D. thesis at University of Pennsylvania*.

Garthwaite, Craig, Tal Gross, and Matthew J. Notowidigdo. 2014. "Public Health Insurance, Labor Supply, and Employment Lock." *The Quarterly Journal of Economics*, 129(2): 653–696.

Gordon, Roger, and Wei Li. 2009. "Tax structures in developing countries: Many puzzles and a possible explanation." *Journal of Public Economics*, 93(7): 855–866.

Goux, Dominique, Eric Maurin, and Barbara Petrongolo. 2014. "Worktime Regulations and Spousal Labor Supply." *American Economic Review*, 104(1): 252–76.

Guler, Bulent, Fatih Guvenen, and Giovanni L. Violante. 2012. "Joint-search theory: New opportunities and new frictions." *Journal of Monetary Economics*, 59(4): 352 – 369.

Hendren, Nathaniel. 2020. "Measuring Economic Efficiency Using Inverse-Optimum Weights." *Journal of Public Economics*, 187.

Hwang, Hae-shin, Dale T. Mortensen, and W. Robert Reed. 1998. "Hedonic Wages and Labor Market Search." *Journal of Labor Economics*, 16(4): 815–847.

Knaul, Felicia Marie, Eduardo González-Pier, Octavio Gómez-Dantés, David García-Junco, Héctor Arreola-Ornelas, Mariana Barraza-Lloréns, Rosa Sandoval, Francisco Caballero, Mauricio Hernández-Avila, Mercedes Juan, et al. 2012. "The quest for universal health coverage: achieving social protection for all in Mexico." *The Lancet*, 380(9849): 1259–1279.

Kolstad, Jonathan T., and Amanda E. Kowalski. 2016. "Mandate-based health reform and the labor market: Evidence from the Massachusetts reform." *Journal of Health Economics*, 47: 81 – 106.

Lundberg, Shelly. 1985. "The Added Worker Effect." *Journal of Labor Economics*, 3(1): 11–37.

Mankart, Jochen, and Rigas Oikonomou. 2016. "Household Search and the Aggregate Labour Market." *The Review of Economic Studies*, 84(4): 1735–1788.

Mazzocco, Maurizio. 2007. "Household Intertemporal Behaviour: A Collective Characterization and a Test of Commitment." *The Review of Economic Studies*, 74(3): 857–895.

Meghir, Costas, Renata Narita, and Jean-Marc Robin. 2015. "Wages and Informality in Developing Countries." *American Economic Review*, 105(4): 1509–46.

Mortensen, Dale T. 2000. "Equilibrium Unemployment with Wage Posting: Burdett-Mortensen Meet Pissarides." In *Panel Data and Structural Labour Market Models*. *Contributions to Economic Analysis*, 281–292. Emerald Group Publishing Limited.

Narita, Renata. 2020. "Self-employment in developing countries: A search-equilibrium approach." *Review of Economic Dynamics*, 35: 1 – 34.

Pérez-Estrada, Javier. 2011. "The Employment and Wages Effects of Expanding Health Insurance Coverage: The Case of Mexico." *UCLA, Mimeo*.

Perry, G., W. Maloney, O. Arias, P. Fajnzylber, A. Mason, and J. Saavedra-Chanduvi. 2007. *Informality: Exit or Exclusion.* Washington, DC: World Bank.

Pfutze, Tobias. 2014. "The Effects of Mexico's Seguro Popular Health Insurance on Infant Mortality: An Estimation with Selection on the Outcome Variable." *World Development*, 59: 475–486.

Rendon, Silvio, and J. Ignacio García-Pérez. 2020. "Family Job Search and Wealth: The Added Worker Effect Revisited." *Quantitative Economics*, 11: 1431–1459.

Romano, Joseph P., and Michael Wolf. 2005. "Stepwise Multiple Testing as Formalized Data Snooping." *Econometrica*, 73(4): 1237–1282.

Satchi, Mathan, and Jonathan Temple. 2009. "Labor markets and productivity in developing countries." *Review of Economic Dynamics*, 12(1): 183 – 204.

Ulyssea, Gabriel. 2010. "Regulation of entry, labor market institutions and the informal sector." *Journal of Development Economics*, 91(1): 87–99.

World Bank. 2020. "GDP growth (annual %) - Mexico." *World Development Indicators. Available at* `https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2012&locations=MX&start=2000`.

9 Tables and Figures

Table 1: Employment and wages in the formal and informal sector.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	With children				**Without children**			
	High Education		Low Education		High Education		Low Education	
	Before	After	Before	After	Before	After	Before	After
Panel A: Proportion of households, by employment type								
Number of Households	65,775	81,723	51,882	46,779	15,937	25,415	21,671	23,367
Share of Households without Social Security coverage (informal hhlds.)	0.330	0.352	0.588	0.632	0.396	0.407	0.620	0.634
Households by type								
With Social Security								
Head Formal-Spouse Formal (m_{ff})	0.127	0.133	0.041	0.040	0.149	0.152	0.038	0.041
Head Formal-Spouse Informal (m_{fi})	0.077	0.103	0.054	0.065	0.072	0.093	0.049	0.063
Head Formal-Spouse Not Working (m_{fn})	0.412	0.352	0.282	0.226	0.310	0.271	0.255	0.217
Head Informal-Spouse Formal (m_{if})	0.045	0.050	0.031	0.031	0.055	0.056	0.029	0.035
Head Not Working-Spouse Formal (m_{nf})	0.008	0.010	0.005	0.006	0.018	0.021	0.009	0.011
Without Social Security/Informal								
Head Informal-Spouse Informal (m_{ii})	0.060	0.082	0.098	0.136	0.069	0.086	0.095	0.131
Head Informal-Spouse Not Working (m_{in})	0.239	0.231	0.433	0.431	0.209	0.191	0.387	0.364
Head Not Working-Spouse Informal (m_{ni})	0.007	0.011	0.013	0.017	0.013	0.020	0.024	0.033
Head Not Working-Spouse Not Working (m_{nn})	0.025	0.028	0.043	0.048	0.105	0.110	0.113	0.106
Panel B: Wages in the formal and informal sectors								
Wages (ln): Formal Sector								
Head								
Mean	9.78	9.80	9.56	9.65	9.81	9.82	9.57	9.63
SD	8.84	8.81	8.64	8.66	8.88	8.83	8.69	8.67
Observations	40,561	48,032	19,554	15,491	8,470	13,092	7,407	7,503
Spouse								
Mean	9.69	9.71	9.40	9.44	9.70	9.73	9.40	9.45
SD	8.82	8.82	8.54	8.55	8.86	8.83	8.56	8.58
Observations	11,854	15,834	3,982	3,608	3,534	5,822	1,659	2,021
Wages (ln): Informal Sector								
Head								
Mean	9.66	9.67	9.44	9.52	9.68	9.70	9.45	9.53
SD	8.91	8.89	8.74	8.76	8.94	8.93	8.80	8.82
Observations	22,618	29,699	29,185	27,972	5,307	8,474	11,090	12,369
Spouse								
Mean	9.11	9.08	8.83	8.91	9.25	9.19	8.91	8.98
SD	8.80	8.71	8.46	8.47	8.85	8.78	8.53	8.57
Observations	9,470	15,969	8,589	10,193	2,461	5,048	3,658	5,299

NOTE: ENE-ENOE between 2000 and 2012, sample of families whose head is 20-59 years old. A household belongs to the "high education" group if the head has more than six years of education. Wages in the formal and informal sector by education group are measured by quarter. "Before" ("After") refers to the period before (post) the introduction of SP in the municipality of residence.

Table 2: Reduced-Form Estimates: Impact of SP on Salaries and Informality Rate.

	(1)	(2)	(3)	(4)	(5)
	Informal	Head		Spouse	
	Households	Ln(w) Formal	Ln(w) Informal	Ln(w) Formal	Ln(w) Informal
Panel A: Low Education - With Children					
SP	0.023*	-0.011	0.005	-0.030	-0.003
	(0.010)	(0.013)	(0.013)	(0.025)	(0.027)
Mean in 2001	.657	9.45	9.27	9.32	8.61
N	13036	7376	11455	3194	6855
Panel B: Low Education - Without Children					
SP	0.006	-0.010	-0.002	0.013	0.038
	(0.015)	(0.018)	(0.021)	(0.030)	(0.036)
Mean in 2001	.674	9.47	9.24	9.34	8.71
N	9780	5026	7736	2175	4358
Panel C: High Education - With Children					
SP	-0.002	-0.036	0.002	-0.012	-0.071
	(0.011)	(0.011)	(0.014)	(0.016)	(0.029)
Mean in 2001	.415	9.66	9.46	9.6	8.85
N	13698	10893	10979	6403	7378
Panel D: High Education - Without Children					
SP	-0.004	-0.004	0.054*	-0.037	0.008
	(0.019)	(0.017)	(0.025)	(0.023)	(0.043)
Mean in 2001	.409	9.72	9.52	9.59	9.06
N	8365	5966	5231	3762	3649

NOTE: OLS estimates obtained using the ENE/ENEO data aggregated at the municipality-quarter level. Estimates are weighted by the population of the municipality in 2000. Controls excluded from table are: the share of households in each municipality-quarter by education group (incomplete primary, complete primary, complete lower secondary education or complete upper secondary and higher education) and by age of the head (20-29; 30-39; 40-49 and 50-59); municipality of residence fixed effects, quarter fixed effects, and a linear trend in the characteristics of the municipality of residence taken in 2000 (indicator for large city, index of deprivation, log of total population, number of hospitals and health centers in 2001, total number of doctors and nurses in hospitals per 1,000 uninsured individuals in 2001). The pre-SP mean is measured in 2001. Standard errors clustered by municipality. * significant at 10% after adjusting for multiple hypothesis testing using the Romano and Wolf (2005) method.

Table 3: Model Estimates: Transition Rates - Benchmark model

(Sample of households with children 0 to 14 years old)

	(1)	(2)
Education	Low	High
Head		
δ_f^1	0.042	0.058
	(0.005)	(0.006)
δ_i^1	0.065	0.041
	(0.008)	(0.004)
λ_{nf}^1	0.496	0.466
	(0.04)	(0.036)
λ_{ni}^1	0.715	0.909
	(0.026)	(0.024)
λ_{fi}^1	0.698	0.548
	(0.027)	(0.028)
λ_{if}^1	0.665	0.647
	(0.04)	(0.033)
p_1	0.212	0.410
	(0.04)	(0.039)
q_1	0.613	0.671
	(0.056)	(0.042)
Spouse		
δ_f^2	0.260	0.631
	(0.037)	(0.04)
δ_i^2	0.727	0.479
	(0.024)	(0.021)
λ_{nf}^2	0.280	0.292
	(0.036)	(0.034)
λ_{ni}^2	0.682	0.532
	(0.036)	(0.035)
λ_{fi}^2	0.181	0.415
	(0.029)	(0.039)
λ_{if}^2	0.282	0.472
	(0.039)	(0.036)
p_2	0.677	0.551
	(0.035)	(0.035)
q_2	0.822	0.597
	(0.019)	(0.028)

NOTE: All parameters estimates presented in the table are obtained from the benchmark model in Section 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. The bootstrap standard errors in parenthesis are computed using 100 replications.

Table 4: Model Estimates: utility parameters, including the value of Seguro Popular - Benchmark model

(Sample of households with children 0 to 14 years old)

	(1)	(2)
Education	Low	High
(1) θ	1.10E-08	6.85E-07
	(2.77E-08)	(5.07E-07)
(2) b_1	-5,677.32	-6,298.71
	(489.32)	(453.99)
(3) b_2	-1,216.00	-4,316.67
	(196.5)	(477.1)
(4) a	-325.27	2,504.82
	(227.27)	(205.78)
(5) γ	695.05	-651.29
	(147.49)	(93.71)
(6) $MWP(a) = a \times (1/u'_I)$	-325.31	2,529.46
	(227.35)	(212.62)
(7) $MWP(\gamma) = \gamma \times (1/u'_I)$	695.15	-657.89
	(147.54)	(95.36)

NOTE: All parameters estimates presented in the table are obtained from the benchmark model in Section 4.2 and using data from the period before the introduction of SP in the municipality of residence. The exception is γ, which, conditional on the estimate of all other parameters, is obtained from the period after the introduction of SP. We define high education as households where the head has at least primary education. I is the quarterly mean household income, MXP 11,461 and MXP 14,283 for low and high education, respectively. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table 5: Counterfactual Experiments: Effects of changes in the utility value of Seguro Popular (γ) on stocks, wages and welfare.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\gamma = \hat{\gamma}$			$\Delta\gamma = 2\hat{\gamma}$		
	Partial Eq.	General Eq.	General Eq. (rev. neutral)	Partial Eq.	General Eq.	General Eq. (rev. neutral)
Stocks (p.p)						
m_{ff}	-0.540	-0.300	-0.500	-0.970	-0.520	-0.600
m_{fi}	0.300	-0.170	-0.440	0.270	0.210	-0.240
m_{fn}	-1.860	-2.760	-2.480	-3.730	-5.330	-3.820
m_{if}	-0.750	-0.700	-0.380	-0.570	-0.450	-0.660
m_{nf}	-0.080	-0.050	-0.020	0.010	0.030	-0.050
m_{ii}	0.200	-0.040	0.180	0.750	1.070	0.020
m_{in}	2.800	3.700	3.190	3.750	4.680	5.190
m_{ni}	0.100	0.440	0.500	0.500	0.310	0.220
m_{nn}	-0.170	-0.120	-0.050	-0.010	0.000	-0.060
Household informality (p.p.)	2.930	3.980	3.820	4.990	6.060	5.370
Nonemployment – head (p.p.)	-0.150	0.270	0.430	0.500	0.340	0.110
Nonemployment – spouse (p.p.)	0.770	0.820	0.660	0.010	-0.650	1.310
Mean Wage:						
Head: Formal Sector (%)	1.064	1.578	1.831	2.571	1.220	2.949
Head: Informal Sector (%)	-2.374	-2.506	-3.689	-4.584	-6.355	-6.049
Spouse: Formal Sector (%)	1.380	0.951	0.284	1.707	2.200	-0.049
Spouse: Informal Sector (%)	-3.192	2.102	-0.611	1.069	-2.259	-5.883
Welfare workers: average (%)	2.976	3.285	-3.826	5.377	3.378	-6.760
Welfare per sector – head (%)						
formal sector	2.977	3.536	-2.931	5.905	4.038	-6.062
informal sector	2.376	3.077	-3.915	4.978	2.686	-7.062
nonemployment	23.430	25.282	-7.801	46.306	41.462	-18.033
Welfare per sector – spouse (%)						
formal sector	4.915	4.917	-2.446	6.366	3.961	-5.779
informal sector	5.202	1.737	-6.628	7.782	6.425	-7.868
nonemployment	2.243	3.153	-3.691	4.972	3.016	-6.919

NOTE: We simulate the benchmark model in Section 4.2 using the estimate of γ reported in Table 4. The table shows changes in relation to benchmark levels (pre-SP period, where γ is set to 0). The simulation for General Equilibrium (columns 2 and 5) is computed allowing endogenous wages implied by the wage posting structure as explained in section 4.4. Columns 3 and 6 consider that the Seguro Popular program is financed out of dividends, paid equally by all workers in every period. In column 6, we assume that the official cost of SP per family doubles. Sample of less educated households with children 0-14.

The Value of Health Insurance: A Household Job Search Approach

Gabriella Conti, Rita Ginja, & Renata Narita

ONLINE APPENDIX

A Additional Tables and Figures

Table A.1: Proportion of Households by Health Status and Health Dynamics.

	(1)	(2)	(3)	(4)
Education	**Low education**		**High Education**	
Children	Yes	No	Yes	No
$Pr(BH\|GH)$	0.024	0.049	0.015	0.024
$Pr(GH\|BH)$	0.711	0.617	0.742	0.670
Proportion of Household with "Bad Health"	0.035	0.069	0.021	0.028

NOTE: Health status uses information obtained using the ENE/ENEO to classify households into "bad health status" if the head or the spouse are "not working, working reduced hours due to health motives or not looking for work" (and "good health status" otherwise). The table includes the probabilities of transitions between status from the first to the second interview to calibrate the model, $Pr(GH|BH)$ and $Pr(BH|GH)$, where "GH" and "BH" stand for good and bad health, respectively. The bottom row presents the proportion of households in the "Bad Health" status in the first interview.

Table A.2: Reduced Form Estimates: Sensitivity to functional form.

	(1)	(2)
	State Trends	Reduced set of controls
Panel A: Informality among low educated with children		
SP	0.024	0.023
	(0.011)	(0.010)
Panel B: Salary of Head among high educated without children		
SP	0.043	0.051
	(0.027)	(0.025)

NOTE: OLS estimates obtained using the ENE/ENEO data aggregated at the municipality-quarter level. Estimates are weighted by the population of the municipality in 2000. In column (1) the model estimated includes a quadratic yearly state (s) trend

$$Y_{ksqt} = \beta SP_{ksqt} + \eta X_{ksqt} + \mu_k + \pi_{qt} + \psi 0st + \psi_{1s}t^2 + \varepsilon_{ksqt} \tag{A.1}$$

and X includes the share of households in each municipality-quarter by education group (incomplete primary, complete primary, complete lower secondary education or complete upper secondary and higher education) and by age of the head (20-29; 30-39; 40-49 and 50-59), and it also includes a linear trend in the characteristics of the municipality of residence taken in 2000 (indicator for large city, index of deprivation, log of total population, number of hospitals and health centers in 2001, total number of doctors and nurses in hospitals per 1,000 uninsured individuals in 2001). In column (2), we remove the linear trends in baseline municipality characteristics. Standard errors clustered by municipality.

Table A.3: Reduced-Form Estimates: Impact of SP on Informality Rate With Health Shocks.

	(1)	(2)	(3)	(4)
	Low Education		High Education	
	With Children	Without Children	With Children	Without Children
SP (β_1)	0.038***	0.011	0.015	-0.001
	(0.010)	(0.014)	(0.012)	(0.018)
"Bad Health" (β_2)	0.123***	0.158***	0.130***	0.213***
	(0.012)	(0.013)	(0.018)	(0.029)
SP $\times$ "Bad Health" (β_3)	-0.047	-0.021	-0.039**	-0.074**
	(0.014)	(0.018)	(0.020)	(0.034)
p-value $H_0 : \beta_1 + \beta_3 = 0$	0.545	0.609	0.240	0.041
N	16970	11555	17970	9289

NOTE: OLS estimates obtained using the ENE/ENEO data aggregated at the municipality-quarter level. Estimates are weighted by the population of the municipality in 2000. Controls excluded from table are: the share of households in each municipality-quarter by education group (incomplete primary, complete primary, complete lower secondary education or complete upper secondary and higher education) and by age of the head (20-29; 30-39; 40-49 and 50-59); municipality of residence fixed effects, quarter fixed effects, and a linear trend in the characteristics of the municipality of residence taken in 2000 (indicator for large city, index of deprivation, log of total population, number of hospitals and health centers in 2001, total number of doctors and nurses in hospitals per 1,000 uninsured individuals in 2001). Standard errors clustered by municipality. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table A.4: Model Fit: Stocks and Transitions - Benchmark model

(Sample of households with children 0 to 14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A: Employment				
m_{ff}	0.041	0.089	0.127	0.102
m_{fi}	0.054	0.078	0.077	0.087
m_{fn}	0.282	0.293	0.412	0.276
m_{if}	0.031	0.055	0.045	0.086
m_{nf}	0.005	0.010	0.008	0.011
m_{ii}	0.098	0.036	0.060	0.062
m_{in}	0.434	0.407	0.239	0.349
m_{ni}	0.013	0.022	0.007	0.012
m_{nn}	0.043	0.012	0.025	0.015
Panel B				
Transitions: Head				
Nonemployment-Formal	0.111	0.252	0.234	0.170
Nonemployment-Informal	0.496	0.455	0.351	0.436
Formal-Nonemployment	0.024	0.029	0.018	0.032
Formal-Informal	0.155	0.057	0.087	0.047
Informal-Nonemployment	0.052	0.040	0.039	0.029
Informal-Formal	0.099	0.058	0.146	0.060
Nonemp.-Inf., if spouse loses formal job	0.046	0.012	0.014	0.037
Nonemp.-Inf., if spouse loses informal job	0.038	0.079	0.023	0.029
Transitions: Spouse				
Nonemployment-Formal	0.015	0.032	0.025	0.077
Nonemployment-Informal	0.081	0.079	0.073	0.097
Formal-Nonemployment	0.149	0.193	0.111	0.334
Formal-Informal	0.081	0.018	0.044	0.037
Informal-Nonemployment	0.382	0.383	0.357	0.261
Informal-Formal	0.037	0.058	0.069	0.131
Nonemp.-Inf., if head loses formal job	0.087	0.008	0.082	0.004
Nonemp.-Inf., if head loses informal job	0.101	0.016	0.079	0.005

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.5: Model Fit: Log-wages - Benchmark model

(Sample of households with children 0 to 14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A - Formal wage: head				
P10	8.990	8.889	9.175	9.194
P25	9.222	9.258	9.435	9.527
P50	9.487	9.573	9.710	9.880
P75	9.744	9.812	10.007	10.115
P90	9.991	9.975	10.240	10.261
Mean	9.564	9.577	9.779	9.865
Std.Dev.	8.642	8.549	8.842	8.835
Panel B - Informal wage: head				
P10	8.633	8.600	8.883	7.895
P25	8.990	9.010	9.212	9.010
P50	9.347	9.360	9.567	9.664
P75	9.672	9.619	9.895	9.964
P90	9.949	9.825	10.200	10.168
Mean	9.439	9.384	9.658	9.624
Std.Dev.	8.743	8.478	8.912	9.014
Panel C - Formal wage: spouse				
P10	8.879	8.651	9.039	8.889
P25	9.051	8.947	9.312	9.258
P50	9.290	9.303	9.589	9.573
P75	9.539	9.565	9.917	9.880
P90	9.825	9.734	10.183	10.115
Mean	9.396	9.332	9.692	9.640
Std.Dev.	8.542	8.400	8.823	8.793
Panel D - Informal wage: spouse				
P10	7.692	7.593	7.868	7.145
P25	8.199	8.136	8.372	7.593
P50	8.669	8.745	8.896	8.951
P75	9.051	9.196	9.353	9.558
P90	9.397	9.558	9.825	9.933
Mean	8.827	8.881	9.110	9.134
Std.Dev.	8.462	8.452	8.800	8.949

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.6: Model Estimates: Wage Offer Parameters and Mean - Benchmark model

	(1)	(2)	(3)	(4)
Education	Low	High	Low	High
Children 0-14	yes	yes	no	no
α_f	0.848	1.106	0.915	0.858
	(0.090)	(0.112)	(0.092)	(0.078)
β_f	5.948	2.898	6.387	2.838
	(0.367)	(0.181)	(0.263)	(0.128)
α_i	0.850	0.207	0.714	0.397
	(0.104)	(0.038)	(0.111)	(0.080)
β_i	7.107	2.286	4.740	2.740
	(0.610)	(0.220)	(0.359)	(0.186)
Head				
$E_{F^f}(w)$	9.100	9.529	9.102	9.422
$E_{F^i}(w)$	8.801	8.693	8.917	8.903
Spouse				
$E_{F^f}(w)$	9.000	9.529	9.102	9.213
$E_{F^i}(w)$	8.592	8.451	8.734	8.722

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. E_{F^f} (E_{F^i}) is the mean of log wage offer in the formal (informal) sector. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table A.7: Model Fit: Stocks and Transitions - Benchmark model

(Sample of households without children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A: Employment				
m_{ff}	0.038	0.059	0.149	0.135
m_{fi}	0.049	0.044	0.072	0.084
m_{fn}	0.255	0.298	0.310	0.363
m_{if}	0.029	0.033	0.055	0.038
m_{nf}	0.009	0.019	0.018	0.020
m_{ii}	0.095	0.036	0.069	0.020
m_{in}	0.387	0.450	0.209	0.297
m_{ni}	0.024	0.039	0.013	0.023
m_{nn}	0.113	0.024	0.105	0.020
Panel B				
Transitions: Head				
Nonemployment-Formal	0.064	0.158	0.102	0.181
Nonemployment-Informal	0.290	0.394	0.161	0.337
Formal-Nonemployment	0.035	0.032	0.026	0.021
Formal-Informal	0.139	0.077	0.084	0.032
Informal-Nonemployment	0.092	0.061	0.082	0.061
Informal-Formal	0.087	0.058	0.145	0.066
Nonemp.-Inf., if spouse loses formal job	0.023	0.004	0.019	0.038
Nonemp.-Inf., if spouse loses informal job	0.053	0.043	0.025	0.019
Transitions: Spouse				
Nonemployment-Formal	0.013	0.027	0.028	0.063
Nonemployment-Informal	0.075	0.062	0.070	0.072
Formal-Nonemployment	0.131	0.230	0.120	0.248
Formal-Informal	0.079	0.040	0.057	0.041
Informal-Nonemployment	0.366	0.332	0.324	0.324
Informal-Formal	0.034	0.077	0.084	0.104
Nonemp.-Inf., if head loses formal job	0.061	0.006	0.027	0.003
Nonemp.-Inf., if head loses informal job	0.075	0.028	0.039	0.016

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.8: Model Fit: Log-wages - Benchmark model

(Sample of households without children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A - Formal wage: head				
P10	8.979	8.796	9.184	8.975
P25	9.215	9.126	9.446	9.428
P50	9.487	9.478	9.726	9.812
P75	9.753	9.738	10.046	10.089
P90	10.032	9.944	10.282	10.238
Mean	9.572	9.499	9.809	9.816
Std.Dev.	8.691	8.555	8.879	8.886
Panel B - Informal wage: head				
P10	8.592	8.601	8.846	8.125
P25	8.979	9.091	9.225	9.166
P50	9.327	9.418	9.589	9.707
P75	9.686	9.707	9.944	9.996
P90	9.978	9.897	10.219	10.194
Mean	9.446	9.438	9.676	9.676
Std.Dev.	8.797	8.611	8.939	8.997
Panel C - Formal wage: spouse				
P10	8.846	8.693	9.033	8.892
P25	9.039	8.975	9.297	9.353
P50	9.291	9.318	9.589	9.667
P75	9.572	9.573	9.935	9.940
P90	9.873	9.776	10.198	10.127
Mean	9.402	9.359	9.698	9.681
Std.Dev.	8.565	8.413	8.862	8.795
Panel D - Informal wage: spouse				
P10	7.789	7.149	8.053	7.599
P25	8.276	7.899	8.591	8.329
P50	8.745	8.740	9.060	9.041
P75	9.148	9.372	9.527	9.608
P90	9.481	9.693	9.893	9.933
Mean	8.905	8.970	9.251	9.231
Std.Dev.	8.529	8.683	8.849	8.899

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.9: Model Estimates: Transition Rates - Benchmark model

(Sample of households without children 0-14 years old)

	(1)	(2)
Education	Low	High
Head		
δ_f^1	0.056	0.042
	(0.006)	(0.004)
δ_i^1	0.119	0.107
	(0.008)	(0.007)
λ_{nf}^1	0.312	0.353
	(0.014)	(0.017)
λ_{ni}^1	0.655	0.694
	(0.022)	(0.018)
λ_{fi}^1	0.630	0.660
	(0.025)	(0.02)
λ_{if}^1	0.693	0.548
	(0.016)	(0.022)
p_1	0.202	0.486
	(0.022)	(0.026)
q_1	0.274	0.165
	(0.021)	(0.018)
Spouse		
δ_f^2	0.353	0.396
	(0.017)	(0.019)
δ_i^2	0.621	0.664
	(0.013)	(0.016)
λ_{nf}^2	0.542	0.618
	(0.022)	(0.025)
λ_{ni}^2	0.574	0.613
	(0.016)	(0.019)
λ_{fi}^2	0.206	0.336
	(0.019)	(0.024)
λ_{if}^2	0.398	0.590
	(0.020)	(0.031)
p_2	0.675	0.425
	(0.017)	(0.025)
q_2	0.857	0.827
	(0.008)	(0.019)

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. The bootstrap standard errors in parenthesis are computed using 100 replications.

Table A.10: Expenditures in Health and Health Insurance.

	High Education		**Low Education**	
	Before 2002	After 2008	Before 2002	After 2008
Households without children 0-14	1,678	4,124	1,809	2,640
Health Insurance (HI) Expenditure	27.83	106.56	9.37	19.41
Health Expenditure	906.30	1067.98	561.87	402.98
Proportion without Expenditures on HI	0.99	0.97	0.99	0.99
Proportion without Expenditures on Health	0.46	0.42	0.47	0.47
Ratio (Expenditures HI/Total Expenditures)	0.00	0.00	0.00	0.00
Ratio (Expenditures Health/Total Expenditures)	0.02	0.02	0.03	0.02
Total Expenditures	38130.11	33166.34	16297.85	15622.73
Households with children 0-14	4,634	9,121	5,256	6,433
Health Insurance (HI) Expenditure	20.62	74.19	1.29	7.32
Health Expenditure	879.05	855.96	485.45	437.10
Proportion without Expenditures on HI	0.99	0.99	1.00	0.99
Proportion without Expenditures on Health	0.37	0.37	0.42	0.44
Ratio (Expenditures HI/Total Expenditures)	0.00	0.00	0.00	0.00
Ratio (Expenditures Health/Total Expenditures)	0.02	0.02	0.03	0.02
Total Expenditures	30769.35	28473.93	15806.98	16745.68

NOTE: The table is constructed using data from the Household Income and Expenditure Survey (*Encuesta Nacional de Ingresos y Gastos de los Hogares*) for the years of 2002 (before SP) and 2008 (post SP). This survey is available biannually. A household belongs to the "high education" group if the head has more than six years of education. All monetary values are deflated to the first quarter of 2011 using the CPI of Banco de Mexico.

Table A.11: Model Estimates: utility parameters including the value of Seguro Popular - Benchmark model

(Sample of households without children 0-14 years old)

	(1)	(2)
Education	Low	High
(1) θ	4.93E-10	7.59E-07
	(2.84E-10)	(3.34E-07)
(2) b_1	-6,549.48	-5,449.48
	(193.63)	(191.15)
(3) b_2	-1,059.76	-1,873.57
	(154.24)	(233.35)
(4) a	-374.83	1,871.11
	(34.62)	(212.11)
(5) γ	396.58	-465.06
	(113.03)	(81.96)
(6) $MWP(a) = a \times (1/u'_I)$	-374.83	1,891.96
	(34.62)	(215.46)
(7) $MWP(\gamma) = \gamma \times (1/u'_I)$	396.58	-470.49
	(113.03)	(82.99)

NOTE: All estimates presented in the table are obtained from the benchmark model in subsection 4.2 and using data from the period before the introduction of SP in the municipality of residence. The exception is γ, which, conditional on the estimate of all other parameters, is obtained from the period after the introduction of SP. We define high education as households where the head has at least primary education. I is the quarterly mean household income, MXP 11,233 and MXP 14,608 for low and high education, respectively. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table A.12: Model Fit: Stocks and Transitions - Health Shocks

(Sample of households with children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Employment				
m_{ff}^{GH}	0.043	0.070	0.130	0.105
m_{fi}^{GH}	0.056	0.054	0.079	0.087
m_{fn}^{GH}	0.284	0.306	0.411	0.405
m_{if}^{GH}	0.032	0.043	0.046	0.052
m_{nf}^{GH}	0.004	0.009	0.008	0.008
m_{ii}^{GH}	0.102	0.034	0.061	0.029
m_{in}^{GH}	0.434	0.445	0.237	0.282
m_{ni}^{GH}	0.009	0.023	0.006	0.012
m_{nn}^{GH}	0.036	0.017	0.023	0.021
m_{ff}	0.041	0.070	0.127	0.104
m_{fi}	0.054	0.054	0.077	0.088
m_{fn}	0.282	0.307	0.412	0.405
m_{if}	0.031	0.042	0.045	0.052
m_{nf}	0.005	0.009	0.008	0.007
m_{ii}	0.098	0.034	0.060	0.029
m_{in}	0.433	0.444	0.239	0.283
m_{ni}	0.013	0.023	0.007	0.012
m_{nn}	0.043	0.017	0.025	0.021
Transitions: Head				
Nonemployment-Formal	0.111	0.218	0.234	0.223
Nonemployment-Informal	0.496	0.430	0.351	0.470
Formal-Nonemployment	0.024	0.030	0.018	0.027
Formal-Informal	0.155	0.062	0.087	0.040
Informal-Nonemployment	0.052	0.043	0.039	0.039
Informal-Formal	0.099	0.057	0.146	0.091
Nonemp.-Inf., if spouse loses formal job	0.046	0.007	0.014	0.018
Nonemp.-Inf., if spouse loses informal job	0.038	0.097	0.023	0.035
Transitions: Spouse				
Nonemployment-Formal	0.015	0.031	0.025	0.060
Nonemployment-Informal	0.081	0.059	0.073	0.074
Formal-Nonemployment	0.149	0.256	0.111	0.309
Formal-Informal	0.081	0.016	0.044	0.027
Informal-Nonemployment	0.382	0.377	0.357	0.350
Informal-Formal	0.037	0.064	0.069	0.106
Nonemp.-Inf., if head loses formal job	0.087	0.005	0.082	0.005
Nonemp.-Inf., if head loses informal job	0.101	0.015	0.079	0.004
Household health transitions				
$\Pr\{BH\|GH\}$	0.024	0.035	0.015	0.035
$\Pr\{GH\|BH\}$	0.711	0.723	0.742	0.747

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.13: Model Fit: Log-wages - Health Shocks

(Sample of households with children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A - Formal wage: head				
P10	8.990	8.975	9.175	9.194
P25	9.222	9.258	9.435	9.573
P50	9.487	9.527	9.710	9.880
P75	9.744	9.776	10.007	10.115
P90	9.991	9.913	10.240	10.261
Mean	9.564	9.555	9.779	9.883
Std.Dev.	8.642	8.432	8.842	8.837
Panel B - Informal wage: head				
P10	8.633	8.465	8.883	8.309
P25	8.990	8.826	9.212	9.299
P50	9.346	9.165	9.567	9.787
P75	9.672	9.472	9.895	10.056
P90	9.949	9.664	10.200	10.194
Mean	9.439	9.215	9.658	9.737
Std.Dev.	8.743	8.346	8.912	8.999
Panel C - Formal wage: spouse				
P10	8.879	8.760	9.039	8.796
P25	9.051	9.029	9.312	9.126
P50	9.290	9.241	9.589	9.527
P75	9.539	9.518	9.917	9.847
P90	9.825	9.734	10.183	10.061
Mean	9.396	9.321	9.692	9.571
Std.Dev.	8.542	8.296	8.823	8.773
Panel D - Informal wage: spouse				
P10	7.692	7.901	7.868	7.593
P25	8.199	8.327	8.372	8.136
P50	8.669	8.853	8.896	9.039
P75	9.051	9.267	9.353	9.607
P90	9.397	9.506	9.825	9.933
Mean	8.827	8.952	9.110	9.208
Std.Dev.	8.462	8.347	8.800	8.891

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.14: Model Fit: Stocks and Transitions - Health Shocks

(Sample of households without children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Employment				
m_{ffh}	0.041	0.043	0.153	0.168
m_{fih}	0.053	0.052	0.074	0.092
m_{fnh}	0.261	0.304	0.311	0.359
m_{ifh}	0.031	0.032	0.057	0.046
m_{nfh}	0.008	0.015	0.016	0.025
m_{iih}	0.101	0.048	0.071	0.019
m_{inh}	0.394	0.441	0.208	0.236
m_{nih}	0.017	0.039	0.012	0.023
m_{nnh}	0.093	0.026	0.098	0.033
m_{ff}	0.038	0.043	0.149	0.169
m_{fi}	0.049	0.052	0.072	0.091
m_{fn}	0.255	0.304	0.310	0.360
m_{if}	0.029	0.032	0.055	0.046
m_{nf}	0.009	0.015	0.018	0.025
m_{ii}	0.095	0.048	0.069	0.019
m_{in}	0.387	0.440	0.209	0.235
m_{ni}	0.024	0.039	0.013	0.022
m_{nn}	0.113	0.027	0.105	0.032
Transitions: Head				
Nonemployment-Formal	0.064	0.229	0.102	0.166
Nonemployment-Informal	0.290	0.361	0.161	0.341
Formal-Nonemployment	0.035	0.038	0.026	0.034
Formal-Informal	0.139	0.093	0.084	0.035
Informal-Nonemployment	0.092	0.065	0.082	0.063
Informal-Formal	0.087	0.058	0.145	0.098
Nonemp.-Inf., if spouse loses formal job	0.023	0.004	0.019	0.022
Nonemp.-Inf., if spouse loses informal job	0.053	0.036	0.025	0.012
Transitions: Spouse				
Nonemployment-Formal	0.013	0.016	0.028	0.096
Nonemployment-Informal	0.075	0.076	0.070	0.088
Formal-Nonemployment	0.131	0.252	0.120	0.280
Formal-Informal	0.079	0.035	0.057	0.024
Informal-Nonemployment	0.366	0.337	0.324	0.352
Informal-Formal	0.034	0.071	0.084	0.080
Nonemp.-Inf., if head loses formal job	0.061	0.010	0.027	0.003
Nonemp.-Inf., if head loses informal job	0.075	0.026	0.039	0.011
Household health transitions				
$\Pr\{BH\|GH\}$	0.049	0.055	0.024	0.023
$\Pr\{GH\|BH\}$	0.617	0.625	0.670	0.673

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.15: Model Fit: Log-wages - Health Shocks

(Sample of households without children 0-14 years old)

	(1)	(2)	(3)	(4)
Education	Low		High	
	Data	Model	Data	Model
Panel A - Formal wage: head				
P10	8.979	8.889	9.184	8.975
P25	9.215	9.258	9.446	9.428
P50	9.487	9.573	9.726	9.812
P75	9.753	9.812	10.046	10.089
P90	10.032	9.975	10.282	10.261
Mean	9.572	9.578	9.809	9.816
Std.Dev.	8.691	8.609	8.879	8.912
Panel B - Informal wage: head				
P10	8.592	8.466	8.846	8.125
P25	8.979	8.826	9.225	8.923
P50	9.327	9.235	9.589	9.620
P75	9.686	9.524	9.944	9.931
P90	9.978	9.748	10.219	10.141
Mean	9.446	9.277	9.676	9.583
Std.Dev.	8.797	8.484	8.939	8.975
Panel C - Formal wage: spouse				
P10	8.846	8.693	9.033	8.985
P25	9.039	8.975	9.297	9.289
P50	9.291	9.318	9.589	9.621
P75	9.572	9.617	9.935	9.940
P90	9.873	9.847	10.198	10.155
Mean	9.402	9.375	9.698	9.678
Std.Dev.	8.565	8.491	8.862	8.816
Panel D - Informal wage: spouse				
P10	7.789	7.899	8.053	8.139
P25	8.276	8.322	8.591	8.626
P50	8.745	8.945	9.060	9.122
P75	9.148	9.387	9.527	9.559
P90	9.481	9.693	9.893	9.968
Mean	8.905	9.065	9.251	9.283
Std.Dev.	8.529	8.548	8.849	8.812

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education.

Table A.16: Model Estimates: Transition Rates - Health Shocks

(Sample of households with children 0-14 years old)

	(1)	(2)
Education	Low	High
Head		
δ_f	0.051	0.039
	(0.004)	(0.002)
δ_i	0.071	0.048
	(0.005)	(0.002)
λ_{nf}	0.467	0.452
	(0.016)	(0.012)
λ_{ni}	0.666	0.809
	(0.016)	(0.011)
λ_{fi}	0.702	0.613
	(0.016)	(0.016)
λ_{if}	0.611	0.685
	(0.012)	(0.011)
p_1	0.264	0.355
	(0.014)	(0.015)
q_1	0.664	0.643
	(0.017)	(0.012)
Spouse		
δ_f	0.362	0.619
	(0.014)	(0.013)
δ_i	0.688	0.602
	(0.016)	(0.008)
λ_{nf}	0.325	0.129
	(0.021)	(0.008)
λ_{ni}	0.694	0.360
	(0.016)	(0.013)
λ_{fi}	0.145	0.530
	(0.017)	(0.014)
λ_{if}	0.332	0.415
	(0.019)	(0.011)
p_2	0.625	0.587
	(0.012)	(0.009)
q_2	0.810	0.700
	(0.013)	(0.014)
Health shocks		
$\nu(BH\|GH)$	0.036	0.037
	(0.007)	(0.005)
$\nu(GH\|BH)$	0.703	0.727
	(0.015)	(0.012)

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. The bootstrap standard errors in parenthesis are computed using 100 replications.

Table A.17: Model Estimates: Transition Rates - Health Shocks

(Sample of households without children 0-14 years old)

	(1)	(2)
Education	Low	High
Head		
δ_f	0.069	0.061
	(0.006)	(0.006)
δ_i	0.112	0.112
	(0.005)	(0.009)
λ_{nf}	0.476	0.366
	(0.028)	(0.025)
λ_{ni}	0.668	0.664
	(0.020)	(0.031)
λ_{fi}	0.684	0.556
	(0.017)	(0.030)
λ_{if}	0.787	0.556
	(0.013)	(0.032)
p_1	0.138	0.266
	(0.014)	(0.032)
q_1	0.316	0.221
	(0.021)	(0.031)
Spouse		
δ_f	0.392	0.468
	(0.021)	(0.035)
δ_i	0.742	0.672
	(0.021)	(0.027)
λ_{nf}	0.229	0.510
	(0.017)	(0.027)
λ_{ni}	0.617	0.625
	(0.018)	(0.033)
λ_{fi}	0.244	0.374
	(0.020)	(0.026)
λ_{if}	0.477	0.406
	(0.019)	(0.030)
p_2	0.698	0.305
	(0.019)	(0.024)
q_2	0.788	0.691
	(0.016)	(0.031)
Health shocks		
$\nu(BH\|GH)$	0.056	0.024
	(0.010)	(0.008)
$\nu(GH\|BH)$	0.611	0.658
	(0.022)	(0.025)

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. The bootstrap standard errors in parenthesis are computed using 100 replications.

Table A.18: Model Estimates: utility parameters, including the value of Seguro Popular - Health Shocks

(Sample of households with children 0 to 14 years old)

	(1)	(2)
Education	Low	High
(1) θ	1.25E-08	1.14E-08
	(3.53E-09)	(2.00E-09)
(2) b_1^{GH}	-6345.12	-7495.70
	(134.21)	(131.31)
(3) b_1^{BH}	-5723.69	-5910.30
	(164.86)	(114.01)
(4) b_2^{GH}	-1031.17	-3076.00
	(150.55)	(128.06)
(5) b_2^{BH}	-1586.68	-3362.10
	(129.44)	(116.42)
(6) a^{GH}	-566.31	2929.60
	(76.99)	(68.60)
(7) a^{BH}	-485.79	1163.50
	(63.81)	(65.23)
(8) γ^{GH}	816.45	-414.61
	(85.28)	(170.34)
(9) γ^{BH}	140.42	-596.70
	(225.09)	(205.05)
(10) $MWP(a^{GH}) = a^{GH} \times (1/u_I')$	-566.39	2930.10
	(77.01)	(68.60)
(11) $MWP(a^{BH}) = a^{BH} \times (1/u_I')$	-485.86	1163.70
	(63.82)	(65.23)
(12) $MWP(\gamma^{GH}) = \gamma^{GH} \times (1/u_I')$	816.58	-414.68
	(85.29)	(170.36)
(13) $MWP(\gamma^{BH}) = \gamma^{BH} \times (1/u_I')$	140.44	-596.80
	(225.13)	(205.09)

NOTE: All parameters estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP in the municipality of residence. The exceptions are γ^{GH} and γ^{BH}, which, conditional on the estimate of all other parameters, are obtained from the period after the introduction of SP. We define high education as households where the head has at least primary education. I is the quarterly mean household income, MXP 11,461 and MXP 14,283 for low and high education, respectively. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table A.19: Model Estimates: utility parameters, including the value of Seguro Popular - Health Shocks

(Sample of households without children 0-14 years old)

	(1)	(2)
Education	Low	High
(1) θ	3.45E-09	1.90E-07
	(1.19E-09)	(1.55E-07)
(2) b_1^{GH}	-6019.07	-6023.71
	(202.03)	(287.90)
(3) b_1^{BH}	-4042.90	-6123.18
	(188.36)	(327.98)
(4) b_2^{GH}	-70.74	-1167.75
	(126.76)	(218.97)
(5) b_2^{BH}	-1892.54	-509.88
	(261.44)	(234.39)
(6) a^{GH}	-761.89	1884.28
	(97.46)	(187.18)
(7) a^{BH}	-720.92	1884.19
	(76.89)	(217.46)
(8) γ^{GH}	528.69	-674.54
	(99.35)	(62.30)
(9) γ^{BH}	264.03	-572.76
	(119.39)	(79.70)
(10) $MWP(a^{GH}) = a^{GH} \times (1/u_I')$	-761.92	1889.53
	(97.47)	(188.55)
(11) $MWP(a^{BH}) = a^{BH} \times (1/u_I')$	-720.95	1889.44
	(76.90)	(218.73)
(12) $MWP(\gamma^{GH}) = \gamma^{GH} \times (1/u_I')$	528.71	-676.51
	(99.36)	(62.55)
(13) $MWP(\gamma^{BH}) = \gamma^{BH} \times (1/u_I')$	264.04	-574.44
	(119.40)	(79.75)

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP in the municipality of residence. The exceptions are γ^{GH} and γ^{BH}, which, conditional on the estimate of all other parameters, are obtained from the period after the introduction of SP. We define high education as households where the head has at least primary education. The bootstrap standard errors in parenthesis are computed from 100 replications. I is the quarterly mean household income, MXP 11,233 and MXP 14,608 for low and high education, respectively.

Table A.20: Model Estimates: Wage Offer Parameters and Mean - Health Shocks

	(1)	(2)	(3)	(4)
Education	Low	High	Low	High
Children 0-14	yes	yes	no	no
α_f	0.840	0.761	0.491	0.667
	(0.062)	(0.059)	(0.062)	(0.082)
β_f	6.813	2.802	4.924	2.306
	(0.153)	(0.099)	(0.207)	(0.165)
α_i	0.677	0.185	0.811	0.308
	(0.057)	(0.015)	(0.057)	(0.055)
β_i	7.806	2.418	6.447	2.828
	(0.181)	(0.096)	(0.196)	(0.223)
Head				
$E_{F^f}(w)$	9.046	9.373	8.976	9.402
$E_{F^i}(w)$	8.657	8.625	8.826	8.768
Spouse				
$E_{F^f}(w)$	8.938	9.373	8.976	9.187
$E_{F^i}(w)$	8.403	8.361	8.619	8.551

NOTE: All estimates presented in the table are obtained from the model which is extended to have health shocks in Appendix C.2 and using data from the period before the introduction of SP. We define high education as households where the head has at least primary education. E_{F^f} (E_{F^i}) is the mean of log wage offer in the formal (informal) sector. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table A.21: Counterfactual Experiments: Effects of changes in the utility value of Seguro Popular (γ) on transitions.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\gamma = \hat{\gamma}$			$\Delta\gamma = 2\hat{\gamma}$		
	Partial Eq.	General Eq.	General Eq. (rev. neutral)	Partial Eq.	General Eq.	General Eq. (rev. neutral)
Transitions: Head (p.p.)						
Nonemployment-Formal	0.188	-5.438	-3.777	1.130	-1.417	0.052
Nonemployment-Informal	-2.218	2.353	-0.327	-5.371	-1.610	-0.909
Formal-Nonemployment	-0.318	-0.085	-0.567	0.092	-0.041	-0.836
Formal-Informal	0.249	0.594	0.363	0.968	1.168	0.932
Informal-Nonemployment	-0.405	-0.227	-0.058	-0.314	-0.134	-0.467
Informal-Formal	-0.676	-0.518	0.048	-0.279	-1.543	-0.453
Nonemp.-Inf., if spouse loses formal job	0.767	-0.508	-0.954	-0.748	-0.734	-0.484
Nonemp.-Inf., if spouse loses informal job	2.703	4.355	2.668	1.678	2.658	1.166
Transitions: Spouse (p.p.)						
Nonemployment-Formal	-0.507	0.145	-0.057	-0.197	-0.042	-0.347
Nonemployment-Informal	0.305	0.382	0.289	0.210	0.797	-0.516
Formal-Nonemployment	-0.680	1.000	0.443	-0.030	-0.196	0.878
Formal-Informal	1.387	0.199	-0.306	1.351	0.461	0.947
Informal-Nonemployment	0.074	1.685	0.640	0.720	-0.782	-2.585
Informal-Formal	0.321	0.049	-0.100	0.282	-0.605	0.665
Nonemp.-Inf., if head loses formal job	-0.119	-0.106	-0.188	-0.155	-0.234	-0.345
Nonemp.-Inf., if head loses informal job	0.011	-0.046	0.139	0.014	0.185	-0.098

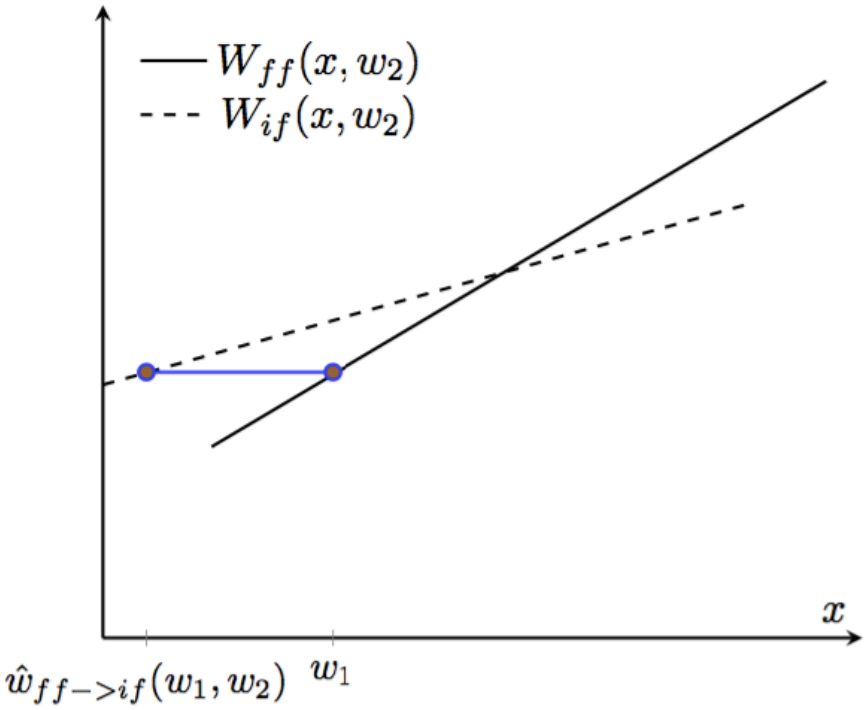
NOTE: We simulate benchmark model in Section 4.2 using the estimate of γ reported in Table 4. The table shows changes in relation to benchmark levels (pre-SP period, where γ is set to 0). The simulation for General Equilibrium (columns 2 and 5) is computed allowing endogenous wages implied by the wage posting structure as explained in section 4.4. Columns 3 and 6 consider that the Seguro Popular program is financed out of dividends, paid equally by all workers in every period. In column 6, we assume that the official cost of SP per family doubles. Sample of less educated households with children 0-14.

Table A.22: Counterfactual Experiments: Effects of changes in the utility value of Seguro Popular (γ^{GH} and γ^{BH}) on stocks, wages and welfare.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\gamma^h = \hat{\gamma}^h$			$\Delta\gamma^h = 2\hat{\gamma}^h$		
	Partial Eq.	General Eq.	General Eq. (rev. neutral)	Partial Eq.	General Eq.	General Eq. (rev. neutral)
Stocks (p.p)						
m_{ff}^{GH}	-0.610	-0.736	-0.736	-1.059	-1.017	-1.199
m_{fi}^{GH}	-0.091	-0.484	-0.238	-0.414	-0.624	-0.596
m_{fn}^{GH}	-1.823	-2.665	-1.508	-4.740	-4.277	-4.817
m_{if}^{GH}	-0.259	-0.638	-0.154	-0.603	-0.638	-0.568
m_{nf}^{GH}	0.056	0.063	0.217	0.021	0.210	0.084
m_{ii}^{GH}	0.414	0.701	0.231	1.374	0.877	0.848
m_{in}^{GH}	2.097	3.702	2.062	5.112	5.259	6.073
m_{ni}^{GH}	0.449	0.084	0.316	0.449	0.358	0.302
m_{nn}^{GH}	-0.231	-0.028	-0.189	-0.140	-0.147	-0.126
m_{ff}	-0.607	-0.727	-0.760	-1.047	-1.000	-1.233
m_{fi}	-0.087	-0.393	-0.213	-0.353	-0.500	-0.500
m_{fn}	-1.933	-2.760	-1.660	-4.813	-4.407	-4.953
m_{if}	-0.207	-0.587	-0.093	-0.593	-0.607	-0.520
m_{nf}	0.060	0.040	0.187	0.020	0.227	0.073
m_{ii}	0.287	0.580	0.127	1.300	0.820	0.793
m_{in}	2.253	3.747	2.253	5.187	5.267	6.113
m_{ni}	0.447	0.140	0.320	0.460	0.327	0.293
m_{nn}	-0.213	-0.040	-0.160	-0.160	-0.127	-0.067
Household informality (p.p.)	2.773	4.427	2.540	6.787	6.287	7.133
Nonemployment – head (p.p.)	0.293	0.140	0.347	0.320	0.427	0.300
Nonemployment – spouse (p.p.)	0.107	0.947	0.433	0.213	0.733	1.093
Mean Wage:						
Head: Formal Sector (%)	1.866	0.533	2.317	4.041	3.316	3.825
Head: Informal Sector (%)	-2.156	-3.271	-6.781	-5.649	-7.864	-6.094
Spouse: Formal Sector (%)	2.388	0.770	1.847	5.089	3.046	3.160
Spouse: Informal Sector (%)	1.374	3.224	-3.716	2.165	-2.171	0.319
Welfare workers: average (%)	4.656	2.588	-4.778	8.899	6.856	-5.729
Welfare workers: good health (%)	4.663	2.610	-4.775	8.896	6.889	-5.667
Welfare workers: bad health (%)	4.464	1.976	-4.860	9.000	5.945	-7.447
Welfare per sector – head (%)						
formal sector	4.578	2.152	-3.435	9.077	7.388	-5.773
informal sector	4.565	2.695	-5.392	8.129	6.061	-5.468
nonemployment	101.578	78.867	-29.717	203.771	187.370	-32.560
Welfare per sector – spouse (%)						
formal sector	4.866	2.674	-6.285	10.370	6.799	-7.202
informal sector	3.701	3.743	-8.488	10.778	9.360	-8.998
nonemployment	4.815	2.301	-4.278	8.744	6.537	-5.371

NOTE: We simulate the model which is extended to have health shocks in Appendix C.2 using the estimates of γ^{GH} and γ^{BH} reported in Table A.18. The table shows changes in relation to benchmark levels (pre-SP period, where γ^{GH} and γ^{BH} are set to 0). The simulation for General Equilibrium (columns 2 and 5) is computed allowing endogenous wages implied by the wage posting structure as explained in section 4.4. Columns 3 and 6 consider that the Seguro Popular program is financed out of dividends, paid equally by all workers in every period. In column 6, we assume that the official cost of SP per family doubles. Sample of less educated households with children 0-14.

Figure A.1: Two Value Functions and the Reservation Wage



NOTE: The graph displays the value functions for the case in which both spouses initially work in the formal sector.

B Sample Construction

The ENE covers just over 640 municipalities every quarter, whereas the ENOE covers about 1000. To keep a consistent sample of municipalities throughout the period of analysis, we focus on the sample of municipalities surveyed since 2000. Thus, we restrict our analysis to 640 municipalities that are included both in ENE and ENOE. Then, we impose the additional restriction that a municipality must be present in the data for at least eight quarters; this reduces the sample to 628 municipalities with 8 million observations for heads or spouses (corresponding to 2.2 million of individuals). We then drop 37,100 observations without information on work and Social Security statuses, and 1% of the workers with a formal contract who earn less than the minimum wage (21,495 observations) and 895 observations with missing information on wage on the formal sector. We restrict the sample to married couples where the head is male and the spouse is female, between 20 (when the likelihood of returning to full-time education upon leaving is very low) and 59 years old (before age-eligibility for any non-contributory pension program for poor elderly). After imposing this restriction, the sample includes 640,000 couples. We then drop about 20,000 (3%) households headed by women.[39] Lastly, we trim the top of the wage distributions for the formal and informal sector to 36,000 pesos (95th percentile of the total sample) and the bottom 5% of the informal sector wages for each spouse. Our final sample includes just over 512,000 couples.

[39] In Mexico, 65 is the usual retirement age, but the participation rate among informal workers is high among individuals between 65 and 70 years: 47% and 6% of males in this age range report to be informal and formal workers, respectively (own calculations from the ENE/ENOE).

C Additional Value Functions for Baseline Model and Model Extension

C.1 Other Value Functions

Here we include the additional value functions for the baseline model, not included in the main text.

Spouse 2 works in the formal sector and spouse 1 does not work The value function $W_{nf}(w_2)$ is similar to that for a household where the head works in the formal sector and the spouse is non-employed ($W_{fn}(w_1)$, see Equation 2). There is only an exchange in the status between spouses 1 and 2:

$$\begin{aligned} rW_{nf}(w_2) = w_2 + b_1 + a + \delta_f^2(1-p_1)\left(W_{nn} - W_{nf}(w_2)\right) + \\ \delta_f^2 p_1 \int \max\left\{W_{in}(x) - W_{nf}(w_2), W_{nn} - W_{nf}(w_2)\right\} dF_i^1(x) + \\ \lambda_{ff}^2 \int \max\left\{W_{nf}(x) - W_{nf}(w_2), 0\right\} dF_f^2(x) + \\ \lambda_{fi}^2 \int \max\left\{W_{ni}(x) - W_{nf}(w_2), 0\right\} dF_i^2(x) + \\ \lambda_{nf}^1 \int \max\left\{W_{ff}(x, w_2) - W_{nf}(w_2), W_{fn}(x) - W_{nf}(w_2), 0\right\} dF_f^1(x) + \\ \lambda_{ni}^1 \int \max\left\{W_{if}(x, w_2) - W_{nf}(w_2), 0\right\} dF_i^1(x). \end{aligned} \tag{C.1}$$

where p_1 is the probability that spouse 1 moves from nonemployment to informality given that spouse 2 moves from a formal job to nonemployment.

Spouse 2 works in the informal sector and spouse 1 does not work The value function $W_{ni}(w_2)$ is similar to that for a household where the head works in the informal sector and the spouse is non-employed ($W_{in}(w_1)$, see Equation 3). There is only an exchange in the status between spouses 1 and 2:

$$\begin{aligned} rW_{ni}(w_2) = w_2 + b_1 + \gamma + \delta_i^2(1-q_1)\left(W_{nn} - W_{ni}(w_2)\right) + \\ \delta_i^2 q_1 \int \max\left\{W_{in}(x) - W_{ni}(w_2), W_{nn} - W_{ni}(w_2)\right\} dF_i^1(x) + \\ \lambda_{ii}^2 \int \max\left\{W_{ni}(x) - W_{ni}(w_2), 0\right\} dF_i^2(x) + \\ \lambda_{if}^2 \int \max\left\{W_{nf}(x) - W_{ni}(w_2), 0\right\} dF_f^2(x) + \\ \lambda_{nf}^1 \int \max\left\{W_{fi}(x, w_2) - W_{ni}(w_2), W_{fn}(x) - W_{ni}(w_2), 0\right\} dF_f^1(x) + \\ \lambda_{ni}^1 \int \max\left\{W_{ii}(x, w_2) - W_{ni}(w_2), 0\right\} dF_i^1(x). \end{aligned} \tag{C.2}$$

where q_1 is the probability that spouse 1 moves from nonemployment to informal given that spouse 2 moves from an informal job to nonemployment.

Both members work in the formal sector This is a household with Social Security coverage.

$$
\begin{aligned}
rW_{ff}(w_1,w_2) = \mathtt{u}(w_1+w_2) + a + \delta_f^1\left(W_{nf}(w_2) - W_{ff}(w_1,w_2)\right) + \\
\delta_f^2\left(W_{fn}(w_1) - W_{ff}(w_1,w_2)\right) + \\
\lambda_{ff}^1 \int \max\left\{W_{ff}(x,w_2) - W_{ff}(w_1,w_2), 0\right\} dF_f^1(x) + \\
\lambda_{fi}^1 \int \max\left\{W_{if}(x,w_2) - W_{ff}(w_1,w_2), 0\right\} dF_i^1(x) + \\
\lambda_{ff}^2 \int \max\left\{W_{ff}(w_1,x) - W_{ff}(w_1,w_2), 0\right\} dF_f^2(x) + \\
\lambda_{fi}^2 \int \max\left\{W_{fi}(w_1,x) - W_{ff}(w_1,w_2), 0\right\} dF_i^2(x).
\end{aligned} \tag{C.3}
$$

Jobs in the formal sector can be destroyed at the rate δ_f^1 and δ_f^2 for the head and spouse, respectively. Each member of the couple may receive offers from either the current sector of employment (formal), or from the other sector (informal), and the household will decide if either member will take the offer.

Both members work in the informal sector This is a household without Social Security coverage.

$$
\begin{aligned}
rW_{ii}(w_1,w_2) = \mathtt{u}(w_1+w_2) + \gamma + \delta_i^1\left(W_{ni}(w_2) - W_{ii}(w_1,w_2)\right) + \\
\delta_i^2\left(W_{in}(w_1) - W_{ii}(w_1,w_2)\right) + \\
\lambda_{ii}^1 \int \max\left\{W_{ii}(x,w_2) - W_{ii}(w_1,w_2), 0\right\} dF_i^1(x) + \\
\lambda_{if}^1 \int \max\left\{W_{fi}(x,w_2) - W_{ii}(w_1,w_2), W_{fn}(x) - W_{ii}(w_1,w_2), 0\right\} dF_f^1(x) + \\
\lambda_{ii}^2 \int \max\left\{W_{ii}(w_1,x) - W_{ii}(w_1,w_2), 0\right\} dF_i^2(x) + \\
\lambda_{if}^2 \int \max\left\{W_{if}(w_1,x) - W_{ii}(w_1,w_2), W_{nf}(x) - W_{ii}(w_1,w_2), 0\right\} dF_f^2(x).
\end{aligned} \tag{C.4}
$$

Each member of the couple may receive offers from either sector. In particular, when spouse 1 or spouse 2 receives an offer from the formal sector (at rate λ_{if}^1 and λ_{if}^2, respectively) the household decides whether to remain informal or to take the formal sector offer. In this latter case, the household will have Social Security coverage; however the other spouse (who did not receive the shock) may quit.

Spouse 1 works in the formal sector and spouse 2 works in the informal sector This is a household with Social Security coverage.

$$
\begin{aligned}
rW_{fi}(w_1,w_2) = {} & \mathtt{u}(w_1+w_2) + a + \delta_f^1\left(W_{ni}(w_2) - W_{fi}(w_1,w_2)\right) + \\
& \delta_i^2\left(W_{fn}(w_1) - W_{fi}(w_1,w_2)\right) + \\
& \lambda_{ff}^1 \int \max\left\{W_{fi}(x,w_2) - W_{fi}(w_1,w_2), 0\right\} dF_f^1(x) + \\
& \lambda_{fi}^1 \int \max\left\{W_{ii}(x,w_2) - W_{fi}(w_1,w_2), 0\right\} dF_i^1(x) + \\
& \lambda_{ii}^2 \int \max\left\{W_{fi}(w_1,x) - W_{fi}(w_1,w_2), 0\right\} dF_i^2(x) + \\
& \lambda_{if}^2 \int \max\left\{W_{ff}(w_1,x) - W_{fi}(w_1,w_2), W_{nf}(x) - W_{fi}(w_1,w_2), 0\right\} dF_f^2(x).
\end{aligned} \tag{C.5}
$$

Head and spouse may have their jobs destroyed at rate δ_f^1 and δ_i^2, respectively. The head receives job offers from the formal or informal sector at rates λ_{ff}^1 or λ_{fi}^1, respectively; the spouse receives job offers from the informal sector or formal sector at rates λ_{ii}^2 or λ_{if}^2, respectively.

Spouse 1 works in the informal sector and spouse 2 works in the formal sector The value function for a household where spouse 2 works in the formal sector and spouse 1 works in the informal sector is given by:

$$
\begin{aligned}
rW_{if}(w_1,w_2) = {} & \mathtt{u}(w_1+w_2) + a + \delta_i^1\left(W_{nf}(w_2) - W_{if}(w_1,w_2)\right) + \\
& \delta_f^2\left(W_{in}(w_1) - W_{if}(w_1,w_2)\right) + \\
& \lambda_{ii}^1 \int \max\left\{W_{if}(x,w_2) - W_{if}(w_1,w_2), 0\right\} dF_i^1(x) + \\
& \lambda_{if}^1 \int \max\left\{W_{ff}(x,w_2) - W_{if}(w_1,w_2), W_{fn}(x) - W_{if}(w_1,w_2), 0\right\} dF_f^1(x) + \\
& \lambda_{ff}^2 \int \max\left\{W_{if}(w_1,x) - W_{if}(w_1,w_2), 0\right\} dF_f^2(x) + \\
& \lambda_{fi}^2 \int \max\left\{W_{ii}(w_1,x) - W_{if}(w_1,w_2), 0\right\} dF_i^2(x).
\end{aligned} \tag{C.6}
$$

C.2 Model with health shocks

In this appendix we present the details when we relax the assumption of homogeneous households and allow households to vary depending on their health status, which we restrict to have two values, H = {good ("GH"), bad ("BH")}. We consider that health status is exogenous but subject to occasional random changes following a Poisson process with transition rates $\nu(h'|h)$, with $h, h' \in H$ and $h \neq h'$, that are independent of job status. However, we allow the health status to change the value of leisure (b^h), the value of formal job's attributes (a^h) and the value of Seguro Popular (γ^h).

The household's lifetime value with health status h when the husband works in the formal sector and the wife is not working is given by the following Bellman equation:

$$
\begin{aligned}
rW_{fn}(w_1|h) = \mathtt{u}(w_1 + b_2^h) + a^h + \delta_f^1(1-p_2)\left(W_{nn}(h) - W_{fn}(w_1|h)\right) + \\
\delta_f^1 p_2 \int \max\left\{W_{ni}(x|h) - W_{fn}(w_1|h), W_{nn}(h) - W_{fn}(w_1|h)\right\} dF_i^2(x) + \\
\lambda_{ff}^1 \int \max\left\{W_{fn}(x|h) - W_{fn}(w_1|h), 0\right\} dF_f^1(x) + \\
\lambda_{fi}^1 \int \max\left\{W_{in}(x|h) - W_{fn}(w_1|h), 0\right\} dF_i^1(x) + \\
\lambda_{nf}^2 \int \max\left\{W_{ff}(w_1, x|h) - W_{fn}(w_1|h), W_{nf}(x|h) - W_{fn}(w_1|h), 0\right\} dF_f^2(x) + \\
\lambda_{ni}^2 \int \max\left\{W_{fi}(w_1, x|h) - W_{fn}(w_1|h), 0\right\} dF_i^2(x) + \\
\nu(h'|h)\left(W_{fn}(w_1|h') - W_{fn}(w_1|h)\right).
\end{aligned} \tag{C.7}
$$

On the right-hand side, the flow utility captures any direct effect of health status, while the discounted continuation value contains the expected value of the joint labor status where labor shocks or a new health condition can be drawn.

For a household with health status h where the husband works in the informal sector and the wife is not working, the value function is given by:

$$
\begin{aligned}
rW_{in}(w_1|h) = \mathtt{u}(w_1 + b_2^h) + \gamma^h + \delta_i^1(1-q_2)\left(W_{nn}(h) - W_{in}(w_1|h)\right) + \\
\delta_i^1 q_2 \int \max\left\{W_{ni}(x|h) - W_{in}(w_1|h), W_{nn}(h) - W_{in}(w_1|h)\right\} dF_i^2(x) + \\
\lambda_{ii}^1 \int \max\left\{W_{in}(x|h) - W_{in}(w_1|h), 0\right\} dF_i^1(x) + \\
\lambda_{if}^1 \int \max\left\{W_{fn}(x|h) - W_{in}(w_1|h), 0\right\} dF_f^1(x) + \\
\lambda_{nf}^2 \int \max\left\{W_{if}(w_1, x|h) - W_{in}(w_1|h), W_{nf}(x|h) - W_{in}(w_1|h), 0\right\} dF_f^2(x) + \\
\lambda_{ni}^2 \int \max\left\{W_{ii}(w_1, x|h) - W_{in}(w_1|h), 0\right\} dF_i^2(x) + \\
\nu(h'|h)\left(W_{in}(w_1|h') - W_{in}(w_1|h)\right).
\end{aligned} \tag{C.8}
$$

All remaining value functions have a similar structure to the baseline expressions presented in subsection 4.2, with the additional changes as implemented in the above equations C.7 and C.8.

D Productivity distributions

The distributions of firm productivity can be identified based on the restrictions from profit-maximization (see equations (5), (7)). Given the distributions of wage offers, F_j^s, and the transition parameters, we can recover the uniquely associated productivity distributions Γ_j^s if we have strict monotonicity of $K_{j,s}(p)$.

We derive the support of the productivity distributions using the first-order conditions of the firm's optimization problem. We then check whether the second-order condition is satisfied which is equivalent to $K'_{j,s}(p) > 0$. For each spouse s, we estimate the productivity support in the formal and informal sector from, respectively,

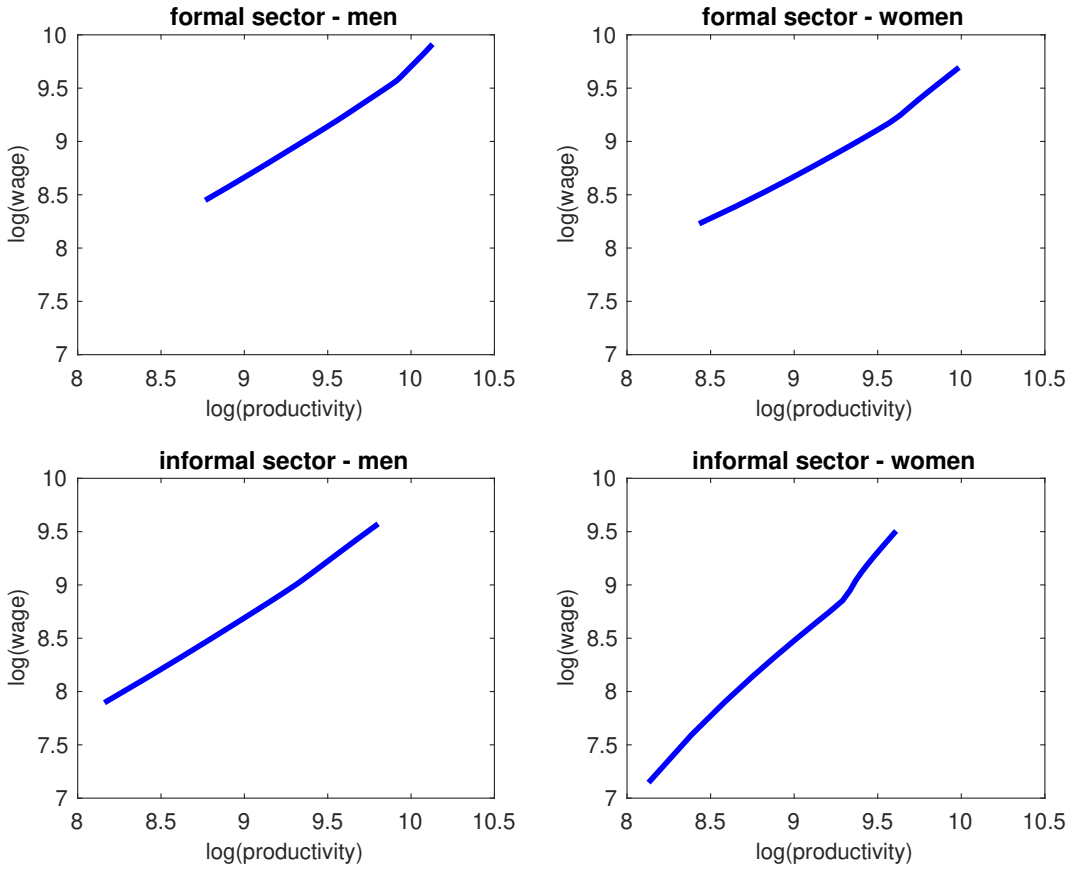
$$K_{f,s}^{-1}(w) = (1+\tau)\left[w + \frac{\ell_f^s(w)}{\ell_f^{s'}(w)}\right] \tag{D.1}$$

$$K_{i,s}^{-1}(w) = \left[w + \frac{\ell_i^s(w)}{\ell_i^{s'}(w)}\right] \tag{D.2}$$

where $\ell_f^s(w)$ is the labor force size in the formal sector (equation (6)) with first derivative $\ell_f^{s'}(w)$. $\ell_i^s(w)$ and $\ell_i^{s'}(w)$ are analogously obtained for the informal sector. Note, that we are aware that using a simulation procedure to obtain the g distributions and thus calculate the labor supply functions does not guarantee that such functions are differentiable. An alternative procedure to solve the firm productivities without relying on differentiability of the labor supply functions is to use the envelope theorem and solve for $K_{j,s}(p)$ through a fixed point algorithm.

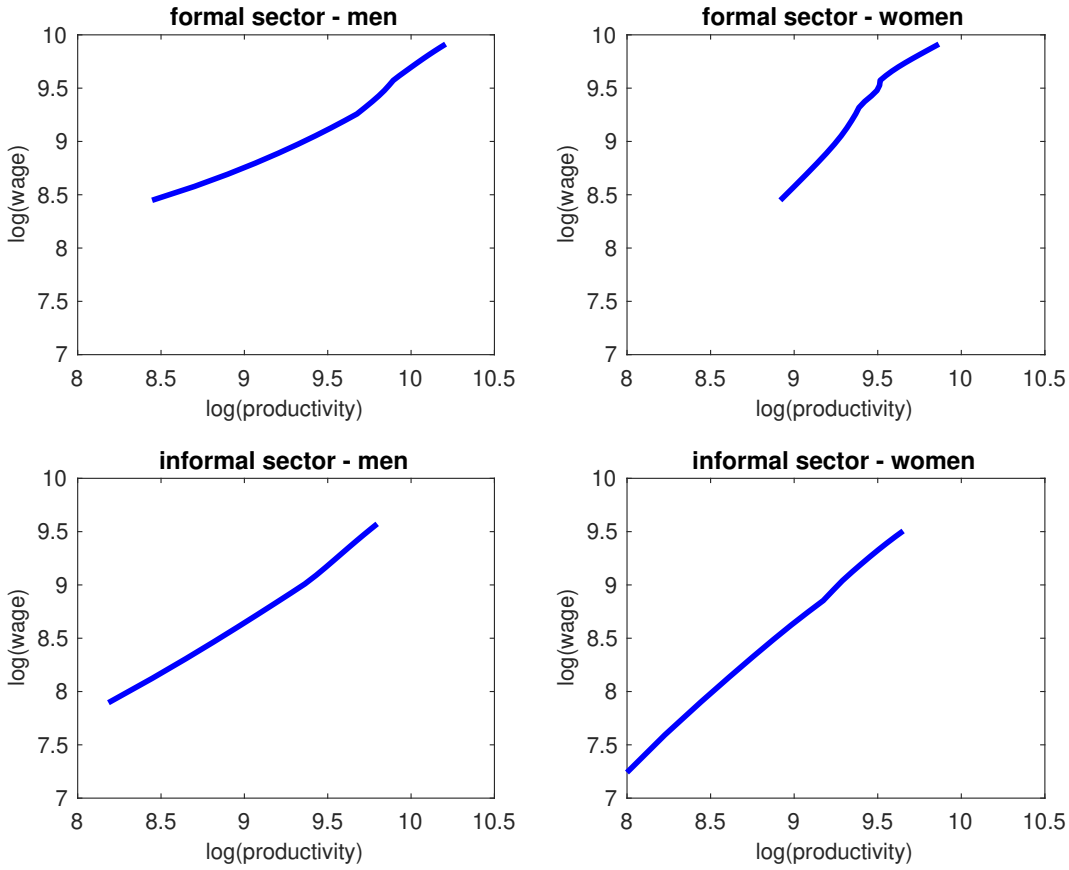
For each point of the wage grid, w, we can calculate a corresponding point on the productivity grid $p = K_{f,s}^{-1}(w)$.

Figure D.1: Wage-Productivity: Low Education



Note: This table reports the estimates of productivity by wage for each sector, men and women, using conditions D.1 and D.2. Sample of less educated households with children 0-14.

Figure D.2: Wage-Productivity: High Education



Note: This table reports the estimates of productivity by wage for each sector, men and women, using conditions D.1 and D.2. Sample of more educated households with children 0-14.

E Formal and Empirical Identification Arguments

E.1 Formal identification arguments under the reservation wages stability assumption

In this section, we show that if we condition on the spouse's job state and wage at a given point in time, we can provide a formal discussion on identification of the model parameters and distributions. Note that heterogeneity of reservation wages for an individual of a given state and wage is still present in the model, however the assumption implies that the reservation wages are stable over the interval of time within which the individual receives a shock, which is crucial for the derivations that will follow.

Sampling distribution of wage offers Conditional on the transition and utility parameters, we can use the equilibrium steady-state relationships between the observed joint earnings distributions, $G_{jj'}$, and the sampling distributions, F_j^s ($j, j' = f, i$ and $s = 1, 2$) to calculate the sampling distributions.

The stock of households where spouse 1 is in status h and spouse 2 is in status h' is $m_{hh'}$ ($h, h' = f, i, n$). We assume that the mass of households is equal to 1, so that the stocks across all household types add up to 1. $g_{jj'}$ is the joint earnings PDF. In steady state, the fraction of couples in which spouse 1 is in status h and spouse 2 is in status h' remains stable. For example, the proportion of couples when both individuals are in the formal sector earning up to w_1 (spouse 1) and w_2 (spouse 2) is balanced when the flows in are equal to the flows out; this is described by:

$$
\begin{aligned}
m_{ff}G_{ff}(w_1,w_2)\left[\delta_f^1+\delta_f^2+\lambda_{ff}^1\overline{F}_f^1(w_1)+\lambda_{ff}^2\overline{F}_f^2(w_2)\right]+ \qquad (E.1)\\
\lambda_{fi}^1 m_{ff}\int^{w_2}\int^{w_1}\overline{F}_i^1(\hat{w}_{ff->if}(x,w_2))g_{ff}(x,w_2)dxdw_2+\\
\lambda_{fi}^2 m_{ff}\int^{w_1}\int^{w_2}\overline{F}_i^2(\hat{w}_{ff->fi}(w_1,x))g_{ff}(w_1,x)dxdw_1=\\
\lambda_{nf}^1 m_{nf}\int^{w_2}\max\left(F_f^1(w_1)-F_f^1\left(\hat{w}_{nf->ff}(w_2)\right),0\right)g_{nf}(w_2)\,dw_2+\\
\lambda_{nf}^2 m_{fn}\int^{w_1}\max\left(F_f^2(w_2)-F_f^2\left(\hat{w}_{fn->ff}(w_1)\right),0\right)g_{fn}(w_1)\,dw_1+\\
\lambda_{if}^1 m_{if}\int^{w_2}\int^{w_1}\max\left(F_f^1(w_1)-F_f^1\left(\hat{w}_{if->ff}(x,w_2)\right),0\right)g_{if}(x,w_2)\,dxdw_2+\\
\lambda_{if}^2 m_{fi}\int^{w1}\int^{w_2}\max\left(F_f^2(w_2)-F_f^2\left(\hat{w}_{fi->ff}(w_1,x)\right),0\right)g_{fi}(w_1,x)\,dxdw_1.
\end{aligned}
$$

The outflow from the formal sector (LHS) is given by the job separation to nonemployment, to other jobs paying higher than w_1 (spouse 1) or w_2 (spouse 2) in the formal sector and to other jobs in the informal sector paying above the reservation wages. The inflow in the formal sector (RHS) is given by the job acceptance by the nonemployed and informal sector workers willing to take the formal sector job offering until w_1 (spouse 1) or w_2 (spouse 2). For ease of exposition, notice we shut down the possibility of endogenous quitting by the spouse that could occur when a nonemployed household member receives an arrival shock from the "superior" (formal) sector.

The balance equation is similar when both spouses are in the informal sector, and it is given by:

$$m_{ii}G_{ii}(w_1,w_2)\left[\delta_i^1+\delta_i^2+\lambda_{ii}^1\overline{F}_i^1(w_1)+\lambda_{ii}^2\overline{F}_i^2(w_2)\right]+ \tag{E.2}$$

$$\lambda_{if}^1 m_{ii}\int^{w2}\int^{w1}\overline{F}_f^1\left(\hat{w}_{ii->fi}(x,w_2)\right)g_{ii}(x,w_2)dxdw_2+$$

$$\lambda_{if}^2 m_{ii}\int^{w1}\int^{w2}\overline{F}_f^2\left(\hat{w}_{ii->if}(x,w_2)\right)g_{ii}(w_1,x)dxdw_1=$$

$$\lambda_{ni}^1 m_{ni}\int^{w2}\max\left(F_i^1(w_1)-F_i^1(\hat{w}_{ni->ii}(w_2)),0\right)g_{ni}(w_2)dw_2+$$

$$\lambda_{ni}^2 m_{in}\int^{w1}\max\left(F_i^2(w_2)-F_i^2(\hat{w}_{in->ii}(w_1)),0\right)g_{in}(w_1)dw_1+$$

$$\lambda_{fi}^1 m_{fi}\int^{w2}\int^{w1}\max\left(F_i^1(w_1)-F_i^1(\hat{w}_{fi->ii}(x,w_2)),0\right)g_{fi}(x,w_2)dxdw_2+$$

$$\lambda_{fi}^2 m_{if}\int^{w1}\int^{w2}\max\left(F_i^2(w_2)-F_i^2(\hat{w}_{if->ii}(w_1,x)),0\right)g_{if}(w_1,x)dxdw_1.$$

The remaining seven flow equations are available from the authors upon request. The proportions $m_{hh'}$ can be estimated by setting w_1 and w_2 in equations E.1 and E.2 and remaining ones equal to their largest value and making use of the fact that $\sum_h\sum_{h'}m_{hh'}=1$.

We can estimate the earnings CDF by $\hat{G}_{jj'}(w_1,w_2)=\frac{1}{2N}\sum_{k=1}^{N}\sum_{\mathrm{k'}=1}^{\mathrm{N}}\mathbf{1}(\mathrm{w_{1k}}<\mathrm{w_1})\mathbf{1}(\mathrm{w_{2k'}}<\mathrm{w_2})$, where N is the number of couples in the cross sectional sample. Then we obtain $\hat{g}_{jj'}$ by differentiation of $\hat{G}_{jj'}$.

However, as we notice in all flow equations, F_j^s is not an obvious function of the earnings distributions such that we cannot implement a nonparametric estimation, for instance, as in Bontemps, Robin and van den Berg (2000). Conditional on the Poisson rates, utility parameters and assuming a parametric form for F_j^s, an iterative method for finding the parameter values of such distributions using the stationary relationships can be implemented.

Transition rates As argued earlier, if reservation wages were stable, i.e. if the state and wage of an individual's spouse is stable over an interval of time, then we could use the following theoretical moments to recover the transition rates.

Given F_j^s and the utility parameters, we would estimate the transition rates using minimum distance. We follow the individual from the first interview to the next quarter (second interview), and we obtain the transitions from the data, $\hat{D}$, which are probabilities of transition conditional to job status at the first interview. We assume that remaining durations can be exponentially distributed, and we construct theoretical counterparts for each probability from the data, D, as follows:

- Transitions to nonemployment:

$$D_{jn}^s=\int\frac{\delta_j^s}{d_j^s(x)}(1-e^{-d_j^s(x)\times 1})dG_j^s(x),\ j=f,i\text{ and }s=1,2 \tag{E.3}$$

where, in the denominator (for $j=f,i$ and $k\neq j$),

$$d_j^1(w_1)=\delta_j^1+\lambda_{jj}^1\overline{F}_j^1(w_1)+$$

$$\frac{\lambda_{jk}^1}{m_j^1}\left[\sum_{j'=f,i}m_{jj'}\int\overline{F}_k^1(\hat{w}_{jj'->kj'}(w_1,w_2))g_{jj'}(w_1,w_2)dw_2+m_{jn}\overline{F}_k^1(\hat{w}_{jn->kn}(w_1))\right]$$

is the total job separation rate from sector j for spouse 1 and,

$$d_j^2(w_2) = \delta_j^2 + \lambda_{jj}^2 \overline{F}_j^2(w_2) + \frac{\lambda_{jk}^2}{m_j^2}\left[\sum_{j'=f,i} m_{j'j}\int \overline{F}_k^2(\hat{w}_{j'j->j'k}(w_1,w_2))g_{j'j}(w_1,w_2)dw_1 + m_{nj}\overline{F}_k^2(\hat{w}_{nj->nk}(w_2))\right]$$

for spouse 2. $m_j^1 = m_{jf} + m_{ji} + m_{jn}$ and $m_j^2 = m_{fj} + m_{ij} + m_{nj}$.

- Transitions out of nonemployment:

For spouse 1,

$$D_{nf}^1 = \frac{\frac{\lambda_{nf}^1}{m_n^1}\left[\sum_{j'=f,i} m_{nj'}\int \overline{F}_f^1(\hat{w}_{nj'->fj'}(w_2)g_{nj'}(w_2)dw_2 + m_{nn}\overline{F}_f^1(\hat{w}_{nn->fn})\right]}{a^1}(1-e^{-a^1\times 1}), \quad \text{(E.4)}$$

$$D_{ni}^1 = \frac{\frac{\lambda_{ni}^1}{m_n^1}\left[\sum_{j'=f,i} m_{nj'}\int \overline{F}_i^1(\hat{w}_{nj'->ij'}(w_2)g_{nj'}(w_2)dw_2 + m_{nn}\overline{F}_i^1(\hat{w}_{nn->in})\right]}{a^1}(1-e^{-a^1\times 1}), \quad \text{(E.5)}$$

$$D_{ni|2\,had\,a\,\delta_f\,shock}^1 = \frac{\delta_f^2 p_1 \int \overline{F}_i^1(\hat{w}_{nf->in}(w_2))g_{nf}(w_2)dw_2}{a^1}(1-e^{-a^1\times 1}), \quad \text{(E.6)}$$

$$D_{ni|2\,had\,a\,\delta_i\,shock}^1 = \frac{\delta_i^2 q_1 \int \overline{F}_i^1(\hat{w}_{ni->in}(w_2))g_{ni}(w_2)dw_2}{a^1}(1-e^{-a^1\times 1}), \quad \text{(E.7)}$$

where

$$a^1 = \frac{\lambda_{nf}^1}{m_n^1}\left[\sum_{j'=f,i} m_{nj'}\int \overline{F}_f^1(\hat{w}_{nj'->fj'}(w_2)g_{nj'}(w_2)dw_2 + m_{nn}\overline{F}_f^1(\hat{w}_{nn->fn})\right] + \frac{\lambda_{ni}^1}{m_n^1}\left[\sum_{j'=f,i} m_{nj'}\int \overline{F}_i^1(\hat{w}_{nj'->ij'}(w_2)g_{nj'}(w_2)dw_2 + m_{nn}\overline{F}_i^1(\hat{w}_{nn->in})\right] + \delta_f^2 p_1 \int \overline{F}_i^1(\hat{w}_{nf->in}(w_2))g_{nf}(w_2)dw_2 + \delta_i^2 q_1 \int \overline{F}_i^1(\hat{w}_{ni->in}(w_2))g_{ni}(w_2)dw_2,$$

is the total job acceptance rate for spouse 1 when he is nonemployed. Similar expressions can be obtained for spouse 2.

- Job-to-job transitions:

Within the same sector,

$$D^s_{jj} = \int \frac{\lambda^s_{jj}\overline{F}^s_j(x)}{d^s_j(x)}(1 - e^{-d^s_j(x)\times 1})dG^s_j(x),\ j = f, i \text{ and } s = 1, 2 \tag{E.8}$$

and, across different sectors (i.e. for $j, k = f, i$ with $k \neq j$),

$$D^1_{jk} = \int \frac{\frac{\lambda^1_{jk}}{m^1_j}\left[\sum_{j'=f,i} m_{jj'}\int \overline{F}^1_k(\hat{w}_{jj'->kj'}(w_1, w_2))g_{jj'}(w_1, w_2)dw_2 + m_{jn}\overline{F}^1_k(\hat{w}_{jn->kn}(w_1))\right]}{d^1_j(x)}(1 - e^{-d^1_j(x)\times 1})dG^1_j(x), \tag{E.9}$$

for spouse 1. And,

$$D^2_{jk} = \int \frac{\frac{\lambda^2_{jk}}{m^2_j}\left[\sum_{j'=f,i} m_{j'j}\int \overline{F}^2_k(\hat{w}_{j'j->j'k}(w_1, w_2))g_{j'j}(w_1, w_2)dw_1 + m_{nj}\overline{F}^2_k(\hat{w}_{nj->nk}(w_2))\right]}{d^2_j(x)}(1 - e^{-d^2_j(x)\times 1})dG^2_j(x). \tag{E.10}$$

for spouse 2.

In total, there are 16 transitions probabilities that can be used to recover the 16 transition parameters. These parameters can be estimated by minimizing the distance between the model (D) and the observed ($\hat{D}$) transition probabilities using fixed point iteration.

Preference parameters We can impose model restrictions that would enable us to pin down preference parameters. For instance, assume strong monopsony power for the lowest wage earners in both formal and informal sectors. This would justify at least the following restrictions: $W_{ni}(\underline{w}_2) = W_{nn}$, $W_{in}(\underline{w}_1) = W_{ii}(\underline{w}_1, \underline{w}_2)$, and $W_{in}(\underline{w}_1) = W_{fn}(\underline{w}_1)$, with which we obtain b_1, b_2, a and γ, respectively. Assume linear utility ($\theta = 0$), so that the calculations are more transparent. Conditional on transition parameters and wage offers distributions, we can estimate a, b_1 and b_2 by imposing such model restrictions and using data before the SP program (when $\gamma = 0$):

$$\hat{b}_1 = rW_{nn} - \underline{w}_2 - A \tag{E.11}$$

$$\hat{b}_2 = rW_{ii}(\underline{w}_1, \underline{w}_2) - \underline{w}_1 - B \tag{E.12}$$

$$\hat{a} = rW_{in}(\underline{w}_1) - \hat{b}_2 - \underline{w}_1 - C \tag{E.13}$$

where

$$A = \delta_i^2 q_1 \int \max\{W_{in}(x) - W_{ni}(\underline{w}_2), 0\}\, dF_i^1(x) + \lambda_{ii}^2 \int \max\{W_{ni}(x) - W_{ni}(\underline{w}_2), 0\}\, dF_i^2(x) +$$
$$\lambda_{if}^2 \int \max\{W_{nf}(x) - W_{ni}(\underline{w}_2), 0\}\, dF_f^2(x) + \lambda_{nf}^1 \int \max\{W_{fi}(x, \underline{w}_2) - W_{ni}(\underline{w}_2), W_{fn}(x) - W_{ni}(\underline{w}_2), 0\}\, dF_f^1(x) +$$
$$\lambda_{ni}^1 \int \max\{W_{ii}(x, \underline{w}_2) - W_{ni}(\underline{w}_2), 0\}\, dF_i^1(x),$$

$$B = \delta_i^1 (1 - q_2)\,(W_{nn} - W_{in}(\underline{w}_1)) + \delta_i^1 q_2 \int \max\{W_{ni}(x) - W_{in}(\underline{w}_1), W_{nn} - W_{in}(\underline{w}_1)\}\, dF_i^2(x) +$$
$$\lambda_{ii}^1 \int \max\{W_{in}(x) - W_{in}(\underline{w}_1), 0\}\, dF_i^1(x) + \lambda_{if}^1 \int \max\{W_{fn}(x) - W_{in}(\underline{w}_1), 0\}\, dF_f^1(x) +$$
$$\lambda_{nf}^2 \int \max\{W_{if}(\underline{w}_1, x) - W_{in}(\underline{w}_1), W_{nf}(x) - W_{in}(\underline{w}_1), 0\}\, dF_f^2(x) + \lambda_{ni}^2 \int \max\{W_{ii}(\underline{w}_1, x) - W_{in}(\underline{w}_1), 0\}\, dF_i^2(x),$$

$$C = \delta_f^1 (1 - p_2)\,(W_{nn} - W_{fn}(\underline{w}_1)) + \delta_f^1 p_2 \int \max\{W_{ni}(x) - W_{fn}(\underline{w}_1), W_{nn} - W_{fn}(\underline{w}_1)\}\, dF_i^2(x) +$$
$$\lambda_{ff}^1 \int \max\{W_{fn}(x) - W_{fn}(\underline{w}_1), 0\}\, dF_f^1(x) + \lambda_{fi}^1 \int \max\{W_{in}(x) - W_{fn}(\underline{w}_1), 0\}\, dF_i^1(x) +$$
$$\lambda_{nf}^2 \int \max\{W_{ff}(\underline{w}_1, x) - W_{fn}(\underline{w}_1), W_{nf}(x) - W_{fn}(\underline{w}_1), 0\}\, dF_f^2(x) + \lambda_{ni}^2 \int \max\{W_{fi}(\underline{w}_1, x) - W_{fn}(\underline{w}_1), 0\}\, dF_i^2(x),$$

Given $\hat{a}$, $\hat{b}_1$ and $\hat{b}_2$, an estimate for γ follows from the same restriction as the one used to calculate a and using data from a period after the SP implementation:

$$\hat{\gamma} = rW_{fn}(\underline{w}_1) - \hat{b}_2 - \underline{w}_1 - B \tag{E.14}$$

E.2 Comparative Static Exercises

As the parameters are jointly estimated, i.e. there is no one-to-one mapping between each moment and parameter, it is useful to understand the relationships between them. In Table E.1 below, we provide comparative static exercises that show how the moments change when we change parameters. The table presents results for the sample of less educated households with children less than 15 years old. For this exercise, we simulate the model under partial equilibrium based on parameter estimates obtained in the first step of the estimation. Then each column (columns (2) to (25)) includes the percent change in the moment (relative to column (1)) when the parameter in the column increases by 10%, keeping all other parameters constant.

Notice that this comparative static exercise also highlight the importance of considering joint search. Clearly, the labor market environment of one individual will not only affect the moments of that individual, but also those of his/her spouse. Importantly, such cross-effects are not symmetric. For instance, the fraction of husbands in nonemployment responds relatively more to changes in wives' transition rates. Whereas women's unconditional transition probabilities are more sensitive to variation in transition parameters of men. For further discussion about the importance of modelling household decisions in a setup of shared amenities within the couple see also Appendix F.

Table E.1: Comparative Static Exercises

(Sample of less educated households with children 0-14 years old).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
	Benchmark	Household parameters						Heads' parameters									Spouses' parameters								
	(level)	θ	a	α_f	β_f	α_i	β_i	b_1	δ_f^1	δ_i^1	λ_{nf}^1	λ_{ni}^1	λ_{fi}^1	λ_{if}^1	p_1	q_1	b_2	δ_f^2	δ_i^2	λ_{nf}^2	λ_{ni}^2	λ_{fi}^2	λ_{if}^2	p_2	q_2
Employment																									
m_{ff}	0.089	2.5	-1.7	7.0	-6.1	-0.6	10.7	9.2	-1.9	5.4	9.0	0.8	2.4	2.1	-1.1	0.4	-4.0	-5.7	2.7	2.0	-0.4	7.4	4.7	-4.8	-19.3
m_{fi}	0.078	-2.8	-5.2	3.6	-6.6	4.6	-0.6	7.1	-8.2	2.1	4.1	0.5	5.7	1.7	-4.3	7.1	-9.7	-0.5	-4.3	-7.2	5.7	-3.0	4.1	-1.7	-22.3
m_{fn}	0.293	-2.3	0.5	1.7	-0.8	-3.2	6.2	-1.8	-4.4	9.0	1.8	0.4	-1.6	-2.6	1.0	-2.2	3.3	0.4	2.9	-0.2	-0.9	0.2	-2.9	14.2	-19.4
m_{if}	0.055	-0.6	-7.3	-11.4	-10.8	-2.4	-11.4	-1.8	-4.0	-16.9	-9.5	-1.3	-5.7	-7.0	-4.8	-4.4	-11.6	-16.0	-13.9	-3.7	-7.3	-2.0	1.1	-18.2	-17.6
m_{nf}	0.010	5.1	-11.1	17.2	2.0	-12.1	-4.0	-4.0	13.1	8.1	-12.1	11.1	-8.1	-12.1	20.2	1.0	-14.1	6.1	7.1	14.1	4.0	6.1	-4.0	-11.1	-22.2
m_{ii}	0.036	1.7	-1.4	-13.2	7.7	5.0	-10.2	0.3	-4.4	1.1	5.2	-6.9	-2.2	0.3	-0.6	-8.3	-7.7	-7.2	-11.3	-3.3	-5.0	-7.2	4.1	-18.2	1.1
m_{in}	0.407	0.9	1.9	-1.2	3.3	1.1	-4.4	-1.7	5.7	-6.4	-2.9	-0.2	0.8	2.6	0.2	1.1	2.7	4.3	0.6	1.6	1.8	-0.4	-0.2	-4.2	24.4
m_{ni}	0.022	6.5	5.6	-3.7	13.5	17.7	11.6	1.4	1.4	10.2	2.3	1.9	7.0	-0.5	16.3	15.3	10.7	-9.8	7.9	3.7	-7.4	5.1	1.4	0.0	20.0
m_{nn}	0.012	5.2	5.2	7.8	-5.2	-10.4	-11.3	-4.3	0.0	-7.8	-7.8	1.7	-14.8	-10.4	-16.5	-18.3	-9.6	-3.5	-7.0	-12.2	-13.9	-8.7	0.9	-10.4	-9.6
Household Informality	0.476	1.3	1.9	-2.0	3.9	1.8	-4.3	-1.4	4.6	-5.1	-2.1	-0.5	0.4	2.0	0.4	0.6	1.9	2.6	-0.2	1.0	0.5	-0.9	0.2	-5.2	21.6
Nonemployment head	0.043	5.8	1.6	4.2	5.8	3.3	1.9	-1.4	3.7	4.9	-3.7	4.0	-2.3	-5.8	8.4	3.0	-0.5	-4.4	3.7	1.9	-6.5	1.6	0.0	-5.4	2.3
Nonemployment spouse	0.711	-0.3	1.4	0.2	1.5	-0.9	-0.2	-1.8	1.4	-0.1	-1.0	0.1	-0.5	0.3	0.2	-0.5	2.7	2.6	1.4	0.7	0.4	-0.3	-1.3	3.3	5.9
Transitions: Head																									
Nonemployment-Formal	0.252	13.7	-14.4	-15.6	-19.5	-13.9	-5.5	-8.9	-1.8	-3.8	-2.9	-6.5	-8.0	-8.6	-5.2	-1.1	-8.8	-11.8	-8.1	-16.4	-6.9	-8.0	-10.2	-17.8	7.7
Nonemployment-Informal	0.455	-10.4	0.9	1.9	11.9	5.8	-4.3	-3.3	-10.5	2.2	-4.1	1.1	0.8	-8.5	-3.0	3.5	-4.2	1.4	3.3	3.2	1.5	-1.6	-13.3	11.1	3.7
Formal-Nonemployment	0.029	3.7	-9.0	-6.6	-5.6	-1.7	-4.9	-16.5	0.0	-3.1	-13.6	-19.2	-4.9	-18.0	1.1	-12.7	-19.3	-31.7	-14.2	-14.2	-24.3	-7.7	-5.8	-24.7	-17.4
Formal-Informal	0.057	-3.6	-4.2	-3.0	-4.2	3.3	-2.7	-1.4	9.2	1.6	-1.6	7.1	6.9	-0.6	9.2	-0.3	-8.9	-4.5	0.2	5.6	-5.7	-8.2	-4.0	-10.8	31.9
Informal-Nonemployment	0.040	-10.2	-12.5	-7.0	-15.7	-11.3	-4.1	-7.0	2.5	11.3	-7.7	-4.2	-10.3	1.1	-8.1	-10.3	-0.3	-7.6	-5.7	-7.1	-9.7	-6.4	1.7	-7.7	-1.9
Informal-Formal	0.058	-3.2	0.4	-6.3	-21.9	1.8	-4.6	4.4	-16.0	13.1	-8.3	5.6	-2.9	-3.4	10.8	-7.4	-10.3	-10.4	1.6	-9.9	-6.4	-4.8	-3.0	1.7	-14.8
Nonemp.-Inf., if spouse loses formal job	0.012	-43.3	-41.0	-42.4	-5.5	54.9	-41.1	-59.4	-80.7	-61.9	-58.5	-3.8	-18.1	-78.8	-26.2	-41.8	-79.9	-37.2	-3.6	-21.5	28.4	-41.0	-100.0	-57.7	-60.9
Nonemp.-Inf., if spouse loses informal job	0.079	8.4	18.7	-6.8	25.1	45.3	47.3	7.4	-0.8	45.8	46.6	24.5	41.5	6.2	30.2	39.9	35.9	13.9	38.9	50.1	25.9	27.3	11.8	-0.6	46.6
Transitions: Spouse																									
Nonemployment-Formal	0.032	-1.0	2.1	13.6	9.1	13.0	11.7	15.8	-8.0	11.2	21.7	9.2	5.8	-7.3	0.7	5.5	5.6	-6.4	3.0	12.1	-10.2	7.0	-9.9	8.5	-20.2
Nonemployment-Informal	0.079	-4.0	2.5	1.3	-4.8	10.2	0.0	12.3	3.1	9.3	7.3	-0.6	-1.0	-5.9	-0.6	5.7	-0.9	-3.2	1.9	-4.7	-1.5	1.0	12.8	-6.6	-12.1
Formal-Nonemployment	0.193	7.4	-1.5	1.6	-4.6	5.1	-19.4	-3.9	-6.2	0.0	-7.4	-6.4	1.9	-1.0	-5.8	-4.5	3.2	6.8	-6.0	-11.1	4.4	-2.2	-1.5	-6.1	1.3
Formal-Informal	0.018	27.6	31.6	24.5	47.7	96.4	38.1	49.0	58.2	44.1	90.6	6.6	79.9	66.3	46.0	61.3	71.9	78.3	56.4	61.7	52.1	88.8	69.2	89.2	37.0
Informal-Nonemployment	0.383	3.6	-1.7	-6.2	4.7	3.9	0.7	4.0	-3.8	0.0	2.9	2.6	4.4	-1.3	-3.7	2.9	5.9	3.7	18.3	3.0	3.9	5.7	-0.2	4.8	0.7
Informal-Formal	0.058	-12.7	13.0	17.8	2.1	5.6	14.3	0.7	0.6	19.4	10.8	-6.5	0.1	23.2	5.1	-6.6	-7.3	6.6	4.4	0.6	15.8	8.2	34.8	-3.3	-10.9
Nonemp.-Inf., if head loses formal job	0.008	5.9	-8.7	-2.0	-14.2	-6.6	-11.0	-30.2	-6.9	-5.5	-19.6	-35.2	-20.0	-16.9	-0.2	-23.7	-24.3	-42.2	-36.1	-17.2	-37.3	-16.4	-2.4	-17.5	-49.3
Nonemp.-Inf., if head loses informal job	0.016	-5.9	-5.7	-13.4	-13.7	-8.0	-4.3	-3.6	16.0	20.5	-4.3	-8.9	-0.4	-0.3	4.2	1.4	-6.1	6.1	-4.0	2.8	-10.1	-2.3	8.5	-7.4	36.3
Mean Wage																									
Head: Informal Sector	11898	-1.4	0.4	0.1	-0.3	3.0	-5.4	-0.2	-2.3	0.3	1.0	0.2	0.1	-0.1	-0.5	-0.7	0.1	0.3	-1.7	-0.6	0.8	0.8	0.8	0.5	-4.4
Head: Formal Sector	14425	-0.5	0.2	1.7	-5.2	0.0	0.9	-0.9	0.7	-1.6	-1.1	-0.2	0.4	1.7	0.3	-0.6	0.2	-0.4	-0.1	0.8	-0.4	-0.2	-0.4	0.5	2.7
Spouse: Informal Sector	7192	2.2	1.7	2.8	2.0	5.1	-2.5	0.5	3.7	-1.4	-0.1	0.8	1.5	-0.2	-1.6	0.8	2.3	4.3	-1.9	-0.2	1.4	2.8	0.4	1.5	-0.8
Spouse: Formal Sector	11295	-0.3	1.1	1.9	-6.2	1.9	-1.6	-0.7	1.1	-1.8	0.8	1.1	0.6	1.8	-0.2	1.0	-0.7	-0.9	1.1	1.3	-0.4	-0.5	0.9	3.0	2.0

NOTE: We simulate the benchmark model in partial equilibrium based on parameter estimates obtained in the first step of the estimation. Then each column (columns (2) to (25)) includes the percent change in the moment (relative to column (1)) when the parameter in the column increases by 10%, keeping all other parameters constant.

F Individual vs. Household Search Model

Figure F.1 depicts the reservation wages of men and women with kids estimated from the joint-search model and from an individual search model for men and women separately. In the joint-search scenario (represented by solid lines), we show two main reservation wage functions for each spouse when they are deciding on moving from nonemployment to the formal (green lines, denoted $\hat{w}_{ni\to fi}$) or informal sector (blue lines, denoted $\hat{w}_{ni\to ii}$), conditional on the other spouse working in the informal sector and on the wage. In the individual search case (represented by dashed lines), reservation wages are all unconditional on the other spouse's job and wage, thus the lines are horizontal by construction. Panel (a) plots the reservation wage of men for each wage in the informal sector of his spouse, while panel (b) plots the reservation wage of women for each wage in the informal sector of her spouse. In both panels, the lines are the reservation wages resulting from estimating the models on the baseline economy, with $\gamma = 0$.

Two main facts stand out from these plots:

1. The head of household (men) reacts much less to the spouse's wage, except when she has higher wages in more educated households (see Panel a.2),

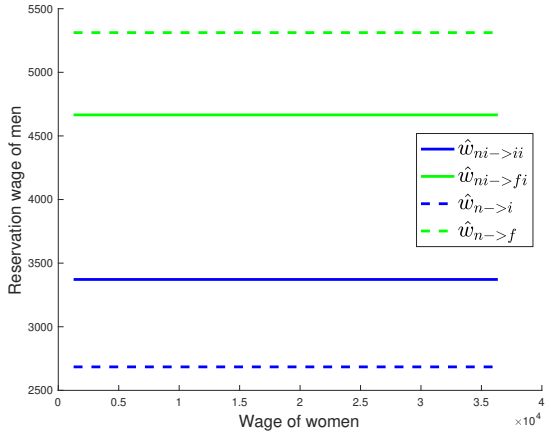
2. The male reservation wages are increasing on male wages (Panel b).

In line with the literature, these figures show the interdependence of labor supply decisions at the household level. They show how increasing the income for one couple member, increases the likelihood that the other spouse, especially women, remains nonemployed (see Guler, Guvenen and Violante, 2012; Flabbi and Mabli, 2018; Dey and Flinn, 2008). In particular, Dey and Flinn (2008) shows that in the presence of shared amenities, that cannot be uncoupled, the decision of one spouse depends on the employment status and wage of the other spouse, even when utility is linear.

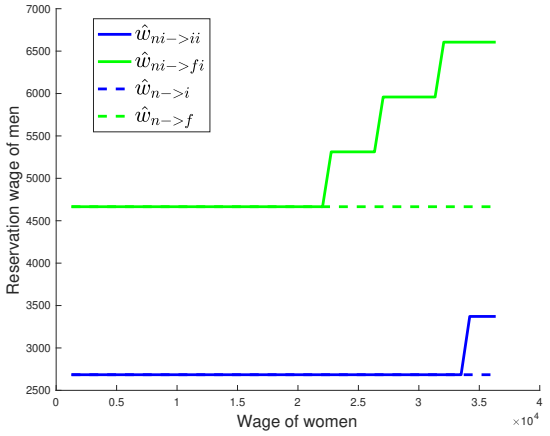
Tables F.1 to F.4 present the model fit and parameter estimates for the single agent model. We additionally observe that reservation wages are in general underestimated if we do not account for joint-search dynamics, which is consistent with household members providing insurance to each other. This result explains why the estimated job arrival rates are so much smaller for women (and for men to a certain degree) in the individual search model compared to the household search model in the sample of the less educated with children (Table F.2). They must be small to compensate for a high acceptance rate and generate the employment proportions we observe in the data. This is also consistent with our findings that women and men value more formal sector amenities and their value of leisure are smaller in the individual search than in the joint-search context (Table F.3). For women, this table also shows that the value of SP is also higher when estimated from an individual search model.

Figure F.1: Reservation wages: Individual vs. Household Search Model

(a) Reservation wage of spouse 1 (*men*)

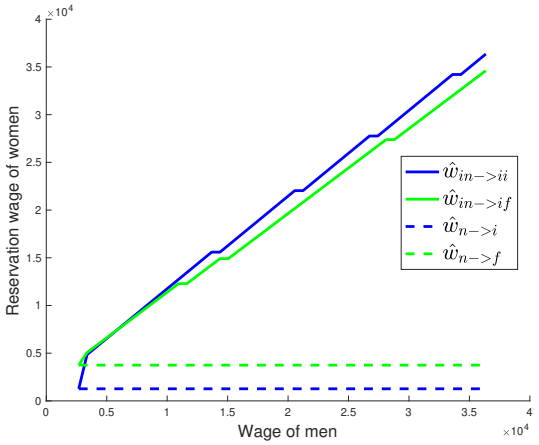


(a.1) Low education

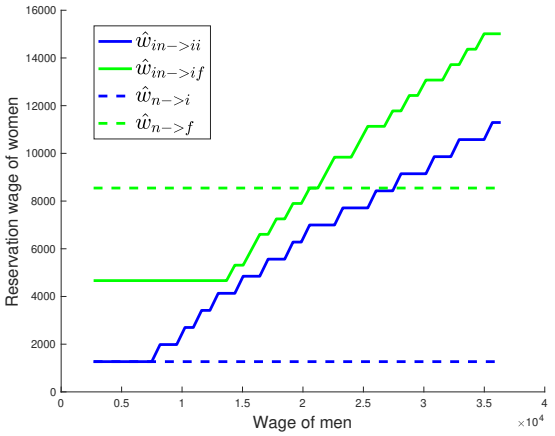


(a.2) High education

(b) Reservation wage of spouse 2 (*women*)



(b.1) Low education



(b.2) High education

NOTE: Panel (a) plots the reservation wage of men for each wage in the informal sector of his spouse. The blue line plots the reservation wage for the informal sector (denoted $\hat{w}_{ni\to ii}$), the green line plots the reservation wage for the formal sector (denoted $\hat{w}_{ni\to fi}$). Panel (b) plots the reservation wage of women for each wage in the informal sector of her spouse. The blue line plots the reservation wage for the informal sector (denoted $\hat{w}_{in\to ii}$); the green line plots the reservation wage for the formal sector (denoted $\hat{w}_{in\to if}$). In both panels, the solid lines are the reservation wages resulting from estimating our benchmark joint-search model with $\gamma = 0$ on the sample of low education households with kids. The dashed lines are the reservation wages obtained from estimating an individual search model with $\gamma = 0$ on the same sample for men and women separately.

Table F.1: Model Fit: Stocks, Transitions and Wages - Individual Search

(Sample of less educated households with children 0 to 14 years old)

	(1)	(2)	(3)	(4)
	Men		Women	
	Data	Model	Data	Model
Employment				
m_f	0.377	0.386	0.077	0.088
m_i	0.563	0.539	0.166	0.146
m_n	0.061	0.075	0.758	0.766
Transitions				
Nonemployment-Formal	0.111	0.162	0.015	0.019
Nonemployment-Informal	0.496	0.477	0.081	0.085
Formal-Nonemployment	0.024	0.031	0.149	0.197
Formal-Informal	0.155	0.078	0.081	0.005
Informal-Nonemployment	0.052	0.050	0.382	0.381
Informal-Formal	0.099	0.065	0.037	0.031
Formal wage				
Mean	9.564	9.550	9.396	9.411
Std.Dev.	8.642	8.526	8.542	8.483
Informal wage				
Mean	9.439	9.457	8.827	8.861
Std.Dev.	8.743	8.681	8.462	8.550

NOTE: All estimates presented in the table are obtained from estimating an individual search model for men and women separately using data from the period before the introduction of SP.

Table F.2: Model Estimates: Transition Rates - Individual vs. Household Search

(Sample of less educated households with children 0 to 14 years old)

	(1)	(2)	(3)
Model	Men	Women	Joint search
Head			
δ_f^1	0.035	-	0.042
	(0.002)		(0.005)
δ_i^1	0.057	-	0.065
	(0.003)		(0.008)
λ_{nf}^1	0.329	-	0.496
	(0.019)		(0.04)
λ_{ni}^1	0.715	-	0.715
	(0.011)		(0.026)
λ_{fi}^1	0.480	-	0.698
	(0.025)		(0.027)
λ_{if}^1	0.752	-	0.665
	(0.023)		(0.04)
p_1	-	-	0.212
			(0.04)
q_1	-	-	0.613
			(0.056)
Spouse			
δ_f^2	-	0.219	0.260
		(0.019)	(0.037)
δ_i^2	-	0.397	0.727
		(0.012)	(0.024)
λ_{nf}^2	-	0.016	0.280
		(0.002)	(0.036)
λ_{ni}^2	-	0.096	0.682
		(0.006)	(0.036)
λ_{fi}^2	-	0.195	0.181
		(0.032)	(0.029)
λ_{if}^2	-	0.044	0.282
		(0.005)	(0.039)
p_2	-	-	0.677
			(0.035)
q_2	-	-	0.822
			(0.019)

NOTE: The estimates presented in Column (3) are obtained from the benchmark model in Appendix C.2 while in Columns (1)-(2) we show the parameters obtained from an individual search model estimated for men and women separately. We use data from the period before the introduction of SP. The bootstrap standard errors in parenthesis are computed using 100 replications.

Table F.3: Model Estimates: utility parameters including the value of Seguro Popular - Individual vs. Household Search

(Sample of less educated households with children 0 to 14 years old)

	(1)	(2)	(3)
Model	Men	Women	Joint search
(1) θ	4.35E-09	1.56E-09	1.10E-08
	(1.60E-09)	(1.97E-09)	(2.77E-08)
(2) b_1	-6,202.33	-	-5,677.32
	(257.15)		(489.32)
(3) b_2	-	-6,884.26	-1,216.00
		(316.27)	(196.5)
(4) a	1,204.14	4,603.34	-325.27
	(421.39)	(149.94)	(227.27)
(5) γ	337.81	898.81	695.05
	(130.74)	(121.51)	(147.49)
(6) $MWP(a) = a \times (1/u'_I)$	1,204.20	4,603.38	-325.31
	(421.41)	(149.96)	(227.35)
(7) $MWP(\gamma) = \gamma \times (1/u'_I)$	337.83	898.82	695.15
	(130.74)	(121.52)	(147.54)

NOTE: The estimates presented in Column (3) are obtained from the benchmark model in Appendix C.2 while in Columns (1)-(2) we show the parameters obtained from an individual search model estimated for men and women separately. We use data from the period before the introduction of SP. The exception is γ, which, conditional on the estimate of all other parameters, is obtained from the period after the introduction of SP. I is the quarterly mean household income, MXP 11,461 and MXP 14,283 for low and high education, respectively. The bootstrap standard errors in parenthesis are computed from 100 replications.

Table F.4: Model Estimates: Wage Offer Parameters and Mean - Individual vs. Household Search

(Sample of less educated households with children 0 to 14 years old)

	(1)	(2)	(3)
Model	Men	Women	Joint search
α_f	0.375	1.807	0.848
	(0.041)	(0.148)	(0.090)
β_f	5.514	5.096	5.948
	(0.236)	(0.402)	(0.367)
α_i	0.493	0.710	0.850
	(0.046)	(0.070)	(0.104)
β_i	4.113	4.123	7.107
	(0.174)	(0.382)	(0.610)
Head			
$E_{F^f}(w)$	8.866	-	9.100
$E_{F^i}(w)$	8.806	-	8.801
Spouse			
$E_{F^f}(w)$	-	9.433	9.000
$E_{F^i}(w)$	-	8.825	8.592

NOTE: The estimates presented in Column (3) are obtained from the benchmark model in subsection 4.2 while in Columns (1)-(2) we show the parameters obtained from an individual search model estimated for men and women separately. We use data from the period before the introduction of SP. E_{F^f} (E_{F^i}) is the mean of log wage offer in the formal (informal) sector. The bootstrap standard errors in parenthesis are computed from 100 replications.

G Model Validation

In this Appendix, we show the results of an out-of-sample validation exercise. In our estimation sample, we use data from 2000 to 2012 containing all municipalities that implemented the SP program between 2002 and 2007.

We consider municipalities that introduced SP only in 2006 and 2007, i.e. 4 to 5 years later than the first implementers. We know that such municipalities are, on average, smaller, poorer, and had less health capacity in terms of hospitals, health centers and doctors per eligible individuals (Conti and Ginja, 2023). A useful test of our model, therefore, is to see if it can predict the behavior of these group of municipalities. Specifically, we try to predict the estimated change in labor market stocks and wages from the policy implemented in 2006-2007 using our model with the parameters obtained from the estimation sample. We simulate the model at estimated values in our first stage using data from 2000-2004 and generate a counterfactual labor market using the variation in γ from zero to the estimated value as well as other parameters of the second stage estimation.

Then, we take advantage of more recent data that we did not use in our estimation sample, covering the period of 2013 to 2016, in order to capture changes for the late implementers, up to 10 years after the policy, which was implemented in 2006-2007.

We next compare the change in labor market outcomes from 2000-2004 to 2013-2016 in the data and predicted by the model, by simulating an increase in the value of SP. In Table G.1, the "Data" column reports the change in labor market outcomes from the period 2000-2004 and 2013-2016 for the sample of municipalities which implemented the program in 2006 and 2007. The data on the municipalities that implemented the program "later" suggest that the SP coincides with a decrease in labor formality, especially for households where men work in the formal sector and women are nonemployed. The "Model" column shows the effects of SP on the labor market proportions and wages using the model parameters from our estimation sample, i.e. from households residing in municipalities that implemented the program between 2002 and 2007. Table G.1 shows that the model predicts correctly the direction of most effects of the policy implemented in 2006-2007. The exceptions are the changes in the proportions m_{fi}, m_{nf}, and m_{nn}, which vary in opposite direction, but these are small fractions in the data. The variation observed in the formal wages are well predicted. However, the model predicts a fall in informal sector wages while the data for the later implementers does not, which is likely due to the samples being different. Households were less informal and earned more in the estimation sample.

Table G.1: Model Validation

	Data	Model
Stocks:		
m_{ff}	-0.015	-0.005
m_{fi}	-0.002	0.003
m_{fn}	-0.110	-0.019
m_{if}	-0.004	-0.008
m_{nf}	0.001	-0.001
m_{ii}	0.073	0.002
m_{in}	0.034	0.028
m_{ni}	0.012	0.001
m_{nn}	0.011	-0.002
Mean Wage (%):		
Head: Formal Sector	0.008	0.011
Head: Informal Sector	0.014	-0.024
Spouse: Formal Sector	0.004	0.014
Spouse: Informal Sector	0.000	-0.032

NOTE: The "Model" column shows the effects of Seguro Popular on labor market proportions and wages using the model parameters from our estimation sample, i.e. from households from municipalities which implemented the program from 2002 to 2007. The "Data" column reports the change in labor market outcomes from the period 2000-2004 and 2013-2016 for the sample of municipalities which implemented the program only from 2006 to 2007. Sample of less educated households with children 0 to 14 years old.

H Policy Experiments: Impacts on Firms

In this Appendix, we show the results of the impacts of the counterfactual experiments on firms' profits and size.

According to Table H.1 below, profits per male worker decrease in formal firms but increase in informal firms. This shift is attributed to higher wages in the formal sector and lower wages in the informal sector, despite changes in wage offer distributions (see Table 5). For female workers, profits per worker in formal firms increase in some simulations due to a reduced share of women in the formal sector. In contrast, in the informal sector, profits per female worker decrease in all simulations because informal wages rise and more women are employed informally.

Overall, when considering total profits and the gender distribution of workers, firms are better off in the simulations presented in columns 1 to 6. This suggests that the SP policy negatively affects workers but not firms under a revenue-neutral scenario. However, when health shocks are incorporated into the model, both the actual policy and a policy with a higher SP value lead to a small increase in firms' profits (see columns 3 and 6 of Table H.2). This is mainly because formal wages increase more significantly compared to the model without health shocks.

In general, there is a decline in the formal firm size and an increase in the informal firm size across most simulations (see Appendix Table H.1). This is mostly due to an increase in the mass of workers in the informal sector. The exception, is the revenue-neutral simulation with a large increase in the value of SP, where firm size decreases for women in the informal sector (column 6). Note that the relation between firm size and wage offers is described by $\ell_i^s(w) = m_i^s \frac{dG_i^s(w)}{dF_i^s(w)}$ (the results on wage offer effects are available upon request).

Table H.1: Counterfactual Experiments: Effects of changes in the utility value of Seguro Popular (γ) on firm profits and size.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\gamma = \hat{\gamma}$			$\Delta\gamma = 2\hat{\gamma}$		
	Partial Eq.	General Eq.	General Eq. (rev. neutral)	Partial Eq.	General Eq.	General Eq. (rev. neutral)
Total profit - head (%)	8.760	7.280	8.548	6.925	10.479	13.069
Profit per worker - head (%)						
Formal sector	-4.772	-5.849	-1.659	-4.434	-14.226	-13.080
Informal sector	7.288	4.779	5.520	2.703	5.861	9.650
Total profit - spouse (%)	-2.909	-5.120	-1.734	-9.879	-7.128	-18.815
Profit per worker - spouse (%)						
Formal sector	2.974	-5.031	2.754	-15.771	-9.539	-25.332
Informal sector	-2.574	-2.167	-1.322	-0.885	-6.868	-0.662
Mean size (%)						
Head: Formal Sector	-4.572	-7.032	-7.446	-9.645	-12.280	-10.146
Head: Informal Sector	4.520	5.946	6.006	7.895	10.647	9.140
Spouse: Formal Sector	-8.919	-6.836	-5.859	-9.961	-6.120	-8.529
Spouse: Informal Sector	4.431	1.699	1.773	11.226	11.743	-3.803

NOTE: We simulate benchmark model in Section 4.2 using the estimate of γ reported in Table 4. The table shows changes in relation to benchmark levels (pre-SP period, where γ is set to 0). The simulation for General Equilibrium (columns 2 and 5) is computed allowing endogenous wages implied by the wage posting structure as explained in section 4.4. Columns 3 and 6 consider that the Seguro Popular program is financed out of dividends, paid equally by all workers in every period. In column 6, we assume that the official cost of SP per family doubles. Sample of less educated households with children 0-14.

Table H.2: Counterfactual Experiments: Effects of changes in the utility value of Seguro Popular (γ^{GH} and γ^{BH}) on firm profits and size.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\gamma^h = \hat{\gamma}^h$			$\Delta\gamma^h = 2\hat{\gamma}^h$		
	Partial Eq.	General Eq.	General Eq. (rev. neutral)	Partial Eq.	General Eq.	General Eq. (rev. neutral)
Total profit - head (%)	-3.258	8.249	0.406	-1.653	0.108	0.883
Profit per worker - head (%)						
Formal sector	3.996	5.704	4.217	1.463	5.771	3.570
Informal sector	-7.359	0.358	-3.957	-12.239	-9.879	-10.815
Total profit - spouse (%)	-2.732	-12.563	-2.631	-12.531	-4.435	-6.797
Profit per worker - spouse (%)						
Formal sector	-4.216	-9.457	1.449	-13.065	-2.229	-0.355
Informal sector	3.539	-4.770	-2.209	-4.525	4.254	0.099
Mean size (%)						
Head: Formal Sector	-6.097	-9.006	-6.113	-14.423	-13.711	-15.522
Head: Informal Sector	4.483	7.185	4.393	11.322	10.528	12.269
Spouse: Formal Sector	-6.212	-10.500	-5.498	-13.359	-11.380	-13.854
Spouse: Informal Sector	5.826	2.943	2.102	12.673	5.826	5.285

NOTE: We simulate the model which is extended to have health shocks in subsection C.2 using the estimate of γ^{GH} and γ^{BH} reported in Table A.18. The table shows changes in relation to benchmark levels (pre-SP period, where γ^{GH} and γ^{BH} are set to 0). The simulation for General Equilibrium (columns 2 and 5) is computed allowing endogenous wages implied by the wage posting structure as explained in section 4.4. Columns 3 and 6 consider that the Seguro Popular program is financed out of dividends, paid equally by all workers in every period. In column 6, we assume that the official cost of SP per family doubles. Sample of less educated households with children 0-14.