A COST-EFFECTIVENESS EVALUATION OF SEGURO POPULAR IN RELATION TO ITS EFFECT ON POCKET EXPENDITURE 2004-2010

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ABSTRACT. This paper presents a cost-effectiveness evaluation of Seguro Popular (SP) in terms of its impact on pocket expenditure among households affiliated with the system. Data from the National Household Income and Expenditure Survey (ENIGH) from 2004 to 2010 are analysed. Following the work of Barros (2009), a triple difference-in-differences (DDD) estimator is implemented to estimate the causal effect of changes in the coverage of SP on household's pocket medical expenses exploiting variation in SP coverage among Mexican states. The study detects reductions in pocket expenditure in households with young children and in households with senior adults. In 2004, for every dollar saved by households affiliated to SP, the SP expended between 1.07 and 2.20 constant pesos of 2008. For 2010, the figure was between 2.84 and 5.68 constant 2008 pesos for each dollar saved by household affiliated to the system. The deterioration in the cost-effectiveness of the program as the coverage ratio becomes close to 1 is probably due to the increase in the marginal cost of affiliation and the gradual inclusion of households that use private medical services even when they have SP.

I. Introduction

The present paper assesses the cost-effectiveness of SP in terms of its effect on pocket expenditure savings among affiliated households. The analysis has two dimensions. First the impact of SP on household pocket expenditure is evaluated in order to provide evidence of whether the SP complies with its fundamental objective of providing financial protection from adverse health events to its target population. Second, beyond establishing whether the SP reduces pocket spending on member households, the paper tries to answer a fundamental question: How much SP households save in relation to the public cost of providing the program?

The paper is organized as follows. Section II presents a brief overview of the characteristics of the Sistema Nacional de Salud, to which SP belongs, to help the reader understand the reasons that led the creation of SP and to describe the main features of the Sistema de Protección Social en Salud (SPSS). Section III provides descriptive statistics on the evolution of public and private health expenditures in Mexico in recent years. This allows the reader to see, at a macro level, the relative size that public spending in the

Seguro Popular represents as a proportion of GDP as well as to dimension the scale of issues SP attempts to deal with. Namely, to reduce private pocket spending on health (which is its main goal). Section IV makes a review of previous evaluations of SP highlighting the fact that no previous attempt to do a cost-benefit analysis. Then section V describes the data used. Next, section VI presents the methodology of analysis and results are presented in section VII. Finally conclusions are offered.

II. National Health and Seguro Popular

The national health system (Sistema Naciona de Salud (SNS)) of was radically transformed in the XX century with the creation of the Mexican Social Security Institute (IMSS) and the Institute for Social Security and Services for State Workers (ISSSTE).[1] However, as it is well known, membership to both institutes depends upon employment status (or upon the employment status of the household head) and only those at work can access health services provided by IMSS and/or ISSSTE. This caused that a large proportion of the population (informal workers, rural workers, self-employed, independent professionals) did not have access to effective health services. The uncovered population could access health services in the units of the Ministry of Health (Secretaria de Salud (SS)) and, after the decentralization that took place in the 1990s, in units of the State Health Services (Servicios Estatales de Salud (SESA)) in a pay-per-visit basis but had no medical insurance as such.

Such a system caused that those who had no membership to a public social security institution ha no access to quality health services. In 2000 approximately 50% of the population did not have access to medical insurance. Moreover, quality, effectiveness and degree of financial protection of medical interventions varied substantially between health service institutions, and among different regions and socioeconomic groups. As a consequence, uncovered individuals incurred excessive healthcare expending that potentially damaged their wealth. In 1994 it was documented for the first time that private health spending in Mexico accounts for between 40 and 50 per cent of total health expenditure and that it was a major burden for families (Frenk et al, 1994). Moreover, the World Health Organization (WHO) in its Report on the 2000 World Health (WHO, 2000) stated that in Mexico considerable financial inequity was observed.

In 2003 the General Health Law (LGS) was amended to create the System of Social Protection in Health (SPSS), also known as Seguro Popular, which entered into force on 1 January 2004. The SP covers a list of more than 500 diseases and interventions and aims to cover the population who has no access to medical care through public institutions (IMSS,

ISSSTE, ISSSFAM and PEMEX) or does not have access to private healthcare. Incorporation to the SPSS is done upon voluntary request of the head of household. At the time of affiliation a socioeconomic study called CECASOEH is performed to determine the cost of insurance, which is valid for three years. At the end of each three-year perid re-affiliation is required and which time a new socioeconomic assessment is done. Beneficiary families receive coverage for a set of illnesses, medicines and health interventions listed in the Universal Health Services Catalogue (CAUSES) which includes, by 2014, 285 medical intervention and 634 drugs. In addition, through the Fund for Protection against Catastrophic Expenditures (FPGC), certain conditions that require highly specialized treatments (59 interventions) are covered.

By design, the SPSS is only in charge of the financial aspects of the health insurance of its affiliates. Medical services are actually provided by medical units belonging to the system of State Health Services (SESA) and by Hospitals managed by the Federation. The SP issues a certificate of coverage which users present in medical units of the SESAs to request service. In return, the SPSS (specifically the National Commission for Social Protection (CNPSS)) pays a flat fee per member family/individual to the Special Schemes for Social Protection in Health (REPSS), which are the administrative and financial arm of SPSS in each state, and the REPSSs transfer resources to the SESAs.[2] In other words, the SNPS splits the finance and budget management functions (exerted by the REPSSs) from the provision of health services (exercised by the SESAs). Each year REPSSs agree with the SPSS the number of people to affiliate on each state, and depending on the projected number of affiliates the SPSS transfers the resources allocated per capita for each of the states. The transfer is done by each affiliated family / person and has no direct relationship to the actual medical services provided by the SESAs to SP members. There are only rules for general spending categories that limit how resources are used by the SESAs and the SESAs do not keep detailed accounting of the services provided to SP members nor of the costs associated with each medical visit / intervention. In fact, SESAs do not keep detailed record of cost and services provided to their own system (which are not SP affiliates) Then, it is virtually impossible to isolate in detail the cost of services granted.

The SP seeks to reduce pocket medical expenses and catastrophic medical expenditure of its affiliated families through insurance. It also seeks to promote efficiency, distribute equitably resources and improve the quality of healthcare (Knaul and Frenk, 2005). Implicitly, the reform allows the federal government to regulate the action of states and exert more control over spending, while centralizing –using risk-aggregation

arguments– health spending associated with catastrophic expending (Martinez Aguilera and Chernichovsky, 2010).

With the reform of 2003, the population insured by public institutions in Mexico is composed by those who are members of IMSS, ISSSTE, ISSSFAM and PEMEX *(population insured by the social security)* plus the population covered by SPPS. To this the population with private health insurance is added in order to get the *total insured population*. The *uninsured* population is therefore people who for some reason do not have access to any of these insurance schemes and depends therefore on the services of SESAs, IMSS Opportunities, and pocket spending.

Nowadays institutions that are vertically integrated and segmented from each other compose the SNSS. Vertical integration means that each institution performs the three basic functions of any health system: i) financing, ii) organization and administration of health care (OACS) and iii) provision. This means that centralized management decisions are taken (with the exception of SESAs) and that health units receive global budgets by line of expenditure. In other words, institutions do keep financial and service accounting by medical visit/intervention provided making difficult to calculate the costs of service. Segmentation refers to the fact that each institution is a system by its own and there are no clear mechanisms to transfer economic resources among them to pay for services that one system carries out for another, though recently some effort has ben done to create a system of "trade of services" between SPSS/SESAs and IMSS and ISSSTE. This aspect of the organisation of the SNS becomes relevant to perform the cost-benefit evaluation (CBE) of the SP as to do so it is only necessary to analyse the SPSS, particularly the Seguro Popular (SP).

III. Evolution of private and public expenditure on health in Mexico

In this section a descriptive analysis of the evolution and distribution of public and private expenditure on health in Mexico is presented with the objective to motivate why the SP was introduced in the first place as well as dimension the scale of social issues that the SP is trying to address. According to data from SICUENTAS, as a proportion of GDP, private expenditure on health has remained relatively constant over the past decade and in 2010 represented 3.3% of total expenditure (Figure 1). However, due to growth in public spending, an inflection point in private expenditure relative to total expenditure was observed in 2002 from then on starts decreasing (except for 2004) from 55% to 51% between 2005 and 2010. During this period, health expenditure for the population without

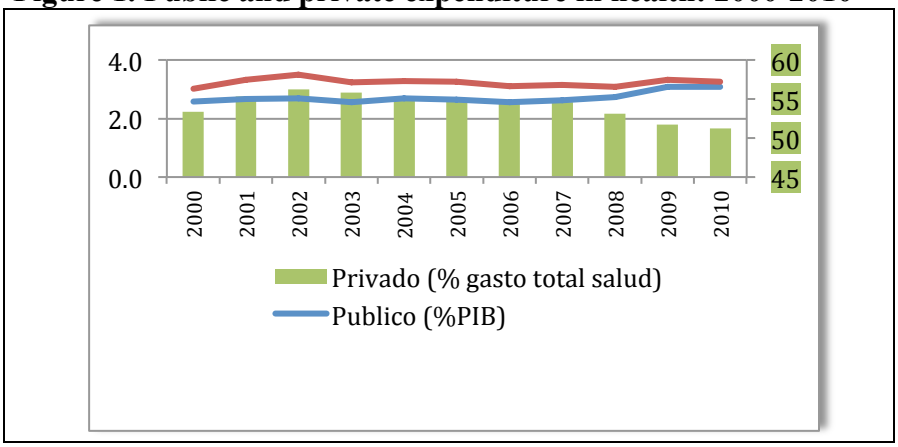
social security grew 57% (See Graph 2), mainly via the SP, which implies that each percentage point decline in the share of private expenditure required 15 points of growth in public spending.

Private expenditure per capita grew steadily during 2000-2007, but stops growing from that year, and converges towards the level of expenditure exerted by the public.

An interesting change is observed in the composition of expenditure in the first half of the decade, leading to a decreasing share of hospital spending and an increase from 38% to 45% on spending on medicines (See Figure 3). This structure is stable in the second half.

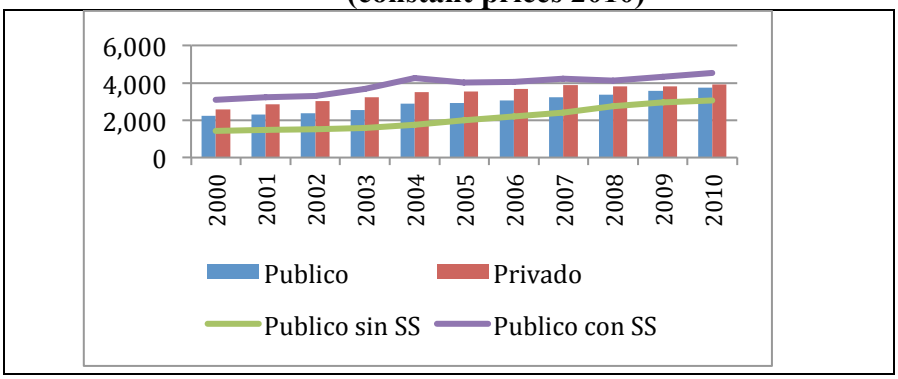
Finally, Figure 4 shows the composition of private health expenditure per capita by by income deciles and type of medical insurance in 2010. Here is shown that private spending is higher for SP affiliates than for affiliates to social security but also higher than those who do not have SP nor SS in all income deciles except for the first one.

Figure 1. Public and private expenditure in health: 2000-2010



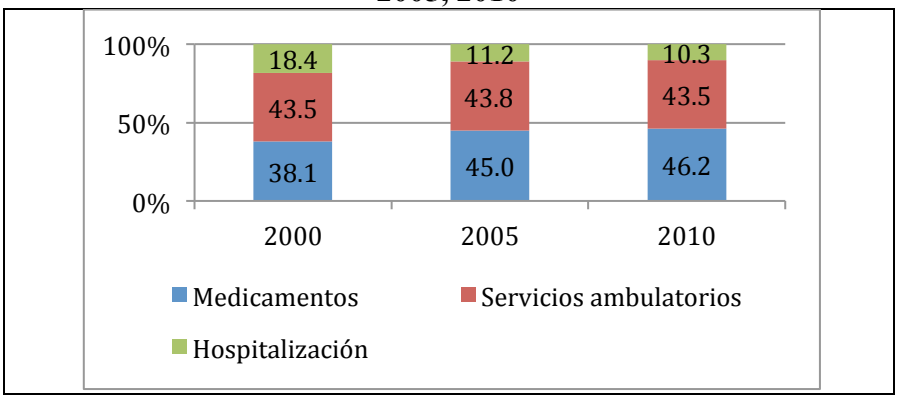
Source: Secretaría de Salud. Dirección General de Información en Salud. Sistema de Cuentas en Salud a Nivel Federal y Estatal (SICUENTAS), México 2011.

Figure 2. Per capita health expenditure 2000-2010 (constant prices 2010)



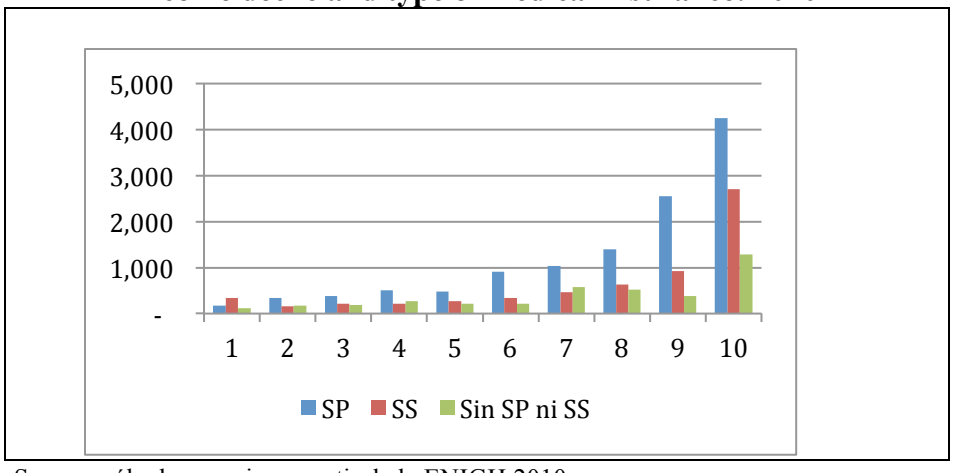
Source: Secretaría de Salud. Dirección General de Información en Salud. Sistema de Cuentas en Salud a Nivel Federal y Estatal (SICUENTAS) 2011.

Figure 3. Private health expenditure composition: 2000, 2005, 2010



Source: Secretaría de Salud. Dirección General de Información en Salud. Sistema de Cuentas en Salud a Nivel Federal y Estatal (SICUENTAS), México 2011.

Figure 4. Annual private health expenditure per capita by income decile and type of medical insurance: 2010



Source: cálculos propios a partir de la ENIGH 2010.

IV. Previous studies

There is a relatively large literature that has attempted to estimate the causal impact of Seguro Popular on pocket health spending, catastrophic health spending, impoverishing expenditures, use of health services, and health outcomes. In general, these studies have found negative effects of SP on pocket expenditure, and to lesser extent a positive effect on service utilization, but no effects on health outcomes. These include experimental studies from the database for evaluation of the program developed in 2005-2006 by the National Institute of Public Health and Harvard: King et al. (2009), Grogger y Arnold (2011) y Grogger et al. (2009), Grogger and Arnold (2011) and Grogger et al. (2011). The latter two conducted as part of the evaluation of SP coordinated by CIDE in 2011/12.

Grogger et al. Grogger et al. (2011) present results differentiated by size and proximity to local health units.

A number of quasi-experimental studies have been done that exploit the fact that the rollover of SP among Mexican States seem to have been a function of factors that are independent of the main outcome variables (Knaul et al 2006;. Gakidou et al 2006. ; Barros 2009; Knox 2008; Galarraga et al 2010).

The effects on pocket expenditure that are reported in the literature are significant and substantial. For instance, Barros (2009) finds an annual pocket spending saving of SP eligible households equivalent to 1,452 pesos, which represents a reduction of 4,271 pesos in expenditure among the treated population in 2006.[3] This is about half the expenditure per SP household undertaken by State and federal governments.

V. Data

The analysis is based on micro data from the National Household Income and Expenditure Survey (ENIGH) 2000-2010. The ENIGH is a cross-section survey that INEGI carries on biannually. Each year an independent and national representative sample is selected. No individual or household may be follow over time but all cross sections can be pooled to fit regression models with contextual time-varying characteristics at State level. Appendix 1 presents a brief summary of EINIGH's survey design.

For each year, we used the household module, which contains information about the characteristics of household members, household spending, and some housing

characteristics. In addition to the spouse, only those who have a first-degree relation to the head of the household were considered household members (i.e. children and parents). Socio-demographic variables such as number of household members, age, education, and income of the household head were built. In particular, relating to the sociodemographic profile, households with children between 0 and 11 years, households with members aged 12 to 59 years, and households with adults over 60 were carefully identified. Household income was calculated quarterly and put into 2008 constant pesos using the national consumer price index (CPI) as deflator.

Also, at the household level and year-by-year, pocket health expenditure was calculated from the micro data. Total expenditure consists of pocket spending on primary care, hospital spending, and spending on non-prescribed drugs. These are the response variables under investigation in the present study. Note that spending on primary care is subdivided into spending on medical services (general physician consultations, specialist consultation, clinical and radiological analysis) and spending on prescription drugs. In all cases quarterly information coming from the consolidated edition of ENIGH files are used. The monetary data were converted into constant 2008 pesos using the national consumer price index as a deflator.

The objective population of Seguro Popular is identified as the set of households for which no household member has affiliation to IMSS, ISSSTE, or the Medical Services of Petróleos Mexicanos, the armed forces, or other public institution that gives medical services to their employees. From 2006 ENIGH contains information about Seguro Popular membership of each household member. This information was also exploited to identify the target population and to generate a binary indicator for the SP affiliation status at household level.

In order to control for household wealth, information about dwelling materials are recorded and a set of dummy indicators generated.

A the State level a series of GDP for 2000-2010 was obtained. In the same way that total expenditure and income variables are put in 2008 constant prices, State GDP was put into 2008 constant prices using the GDP deflator.

Finally, in order to identify SP intensity of treatment, information about Seguro Popular's coverage by Mexican State in the period 2002-2010 reported by Grogger, Leon et al. (2012) is used.

The cost of SP by state between the years 2004-2010 was calculated by the Comision Nacional de Proteción Social en Salud (CNPSS) as the sum of the resources transferred to each state in the form of the Cuota Social (social fee) and the Aportación Solidaria Federal (Federal solidarity contribution), according to final SP membership calculated by the Dirección General de Afiliación y Operación (DGAO) (General directorate of operation and affiliation). State solidarity contributions are not considered due to lack of information. In the same way that all monetary variables, the cost of SP was put at constant 2008 prices.

Table 2.1 of Appendix 2 presents descriptive statistics, while Figure 2.1 the same appendix offers a graph of the kernel distribution of the logarithm of each pocket medical expenditure items analysed in the present paper.

VI. Methodology

This section describes the methodology used to evaluate the effect of SP on pocket medical expenditure as well as discussing how a cost-effectiveness measure of the program between 2004 and 2010 is developed. The methodology for estimating the effect of pocket spending follows the triple difference-in-differences (DDD) strategy suggested by Barros (2009). According to Barros (2009), the rollover of the SP in different Mexican States was done at different rates and in response to political and logistical considerations rather than to health needs or levels of private pocket medical expenditure in the target population of each state. Smaller states, such as Aguascalientes, experienced an expansion of SP coverage at faster rates, because in those States it was easy to reach high SP coverage levels, declare publicly universal coverage, and profit politically from it. The author also finds evidence that politics played a role and that states governed by the opposition expanded SP coverage at slower rates than states governed by the PAN, the political party who had control of the federal administration at the time. Here, following Barros (2009), we exploit variations in SP coverage rates by State due to political and logistical factors as a source of independent variation of SP treatment intensity by State in order to assess the causal effect of SP on household's pocket medical expenditure. The study presented here updates the original work exploiting data from ENIGH 2008 and ENlGH 2010, which were not available at the time of the Barros's study. Besides, unlike previous work, we investigate potential

heterogeneous effects among groups of households which are likely to be intensive users of health services such as those with young children and senior adults.

The identification strategy exploits differences in SP coverage among different Mexican States over time to insolate the causal effect of the program. The control group is the population with access to health services via public institutions such as ISSTTE, IMS, PEMEX, or SEDENA. These people were not affected by the introduction of SP. Coverage rates are reported by Grogger, Leon and Orme (2012). The regression model is as follows:

$$y_{hst} = \alpha_s + \delta_t + \beta_1 \text{noSS}_h + \beta_2^s \text{noSS}_h I_s + \beta_3^t \text{noSS}_h I_t + \beta_4 \text{covg}_{st} + \beta_5 \text{covg}_{st} \text{noSS}_h + \mathbf{X}'_{hst}\gamma + \mathbf{W}'_{st}\theta + \varepsilon_{hst}, \quad \text{VI.1}$$

where y_{hst} is the response variable for household h in State s at year t, and ε_{hst} is a random error term. The indicator variable noSS_h takes 1 if members of the h-th household have no access to health services in the institutional system (ISSSTE, IMSS, PEMEX, SEDENA, SEMAR) and 0 otherwise. That is, noSS_h indicates whether the h-th household is eligible to SP. The dummy I_s takes 1 for observations contributed by the s-th State and 0 otherwise. Similarly, I_t is an indicator variable taking 1 for observations collected on the t-th year and 0 otherwise. $\mathbf{X_{hst}}$ represents a vector of characteristics of the h-th household in the s-th State and the t-th year, while $\mathbf{W_{st}}$ represents a vector of State characteristics that vary over time. Variable covg_{st} represents the coverage rate of SP in the s-th State at the t-th year. This is the intensity of treatment variable and can take values between 0 and 1, where 1 represents universal coverage.

The regression includes State fixed effects α_s and year fixed effects δ_t. Variable noSS_h controls for systematic differences between individuals with and without access to public social security institutions at the baseline year 2004. Interactions $\text{noSS}_h I_s$ y $\text{noSS}_h I_t$ absorb differences in average pocket expenditure that may exist among people with and without access to public social security institutions between states and over time. The coefficient on covg_{st} noSS_h is the effect of the increase in the coverage of SP on the average pocket spending among the eligible population to SP, net of differences in average spending across states and over time. Therefore, coefficient β_5 is the triple difference-in-differences of interest and represents the effect of moving from a SP coverage level of 0 to universal coverage.

The methodology above described is used to investigate the effect of a change in the coverage level of SP on average quarterly pocket medical expenditure in households eligible to the program in each of the 32 federal entities of Mexico. In particular, we investigate the effect of SP coverage on the logarithm of pocket expenditure log (expenditure) and the effect of SP coverage on the probability that households make positive spending (expenditure> 0). All regressions control for age and education of the household head, total household revenue, presence of children aged 0 to 11 years, the presence of adults 60 and older, material in floors, walls, and ceilings of the dwelling as well as size of the locality and state GDP. The ENIGH 2002 is excluded since in 2001-2002 the SP pilot program was put in place.

All regressions are estimated by ordinary least squares (OLS) with robust standard errors clustered at State level to allow the error variance change with household characteristics as well as to accommodate for serial correlation among errors within the same state.[4]

The coefficient β_5 captures the effect of a change in SP coverage from 0 to 1 (universal coverage) among SP eligible households. Then β_5 gives an intention to treat effect (ITT) since not all eligible households are finally enrolled into the program. To get the effect of treatment on the treated (ETT) households is necessary to divide β_5 by the effect of the change in the coverage of SP on the take-up probability of the program. Following Barros (2009) this effect is obtained using a strategy of triple differences-in-differences where the response variable A_{hst} is a dichotomous indicator of whether the household h is affiliated to the SP in the state s and year t. The model is

$$A_{hst} = \pi_s + \kappa_t + \theta_1 \text{noSS}_h + \theta_2^s \text{noSS}_h I_s + \theta_3^t \text{noSS}_h I_t + \theta_4 \text{covg}_{st} + \theta_5 \text{covg}_{st} \text{noSS}_h + \mathbf{X}'_{hst}\phi + \mathbf{W}'_{st}\varphi + \varepsilon_{hst}. \qquad \text{VI.2}$$

Similarly to regression (VI.1) for expenditure variables, θ_5 is the triple difference-in-differences of interest and represents the effect of a change in SP coverage from 0 to 1 in the probability take up of the program. The model is estimated by OLS and robust standard errors are clustered at State level to do inference. The effect of a change in coverage SP from 0 to 1 on pocket spending among treated households is given by the intention to treat effect scaled by a factor $(1/\theta_5)$. To calculate the average savings in private medical expenditure in state-year st in the treated population is necessary to calculate the total. To do this, first the total saving in pocket expenditure in state s and year t is obtained based on the intention to treat; which we denote by Q_{st}. Following this, the pocket expenditure

savings for the treated population is Q_{st} scaled by a factor of $(1/\theta_5)$.[5] Then the savings in pocket expenditure due to a change in the SP coverage on the treated population in State s and year t, $\Delta y^*_{st,}$ is given by:

$$\Delta y^*_{st} = \left(\frac{1}{\theta_5}\right) Q_{st} = \left(\frac{1}{\theta_5}\right)\left\{\left[\exp\left(\bar{y}_{st} + \beta_5 \Delta \text{covg}_{st}\right) - \exp\left(\bar{y}_{st}\right)\right] \text{eH}_{st}\right\}$$

where $\mathbf{eH_{st}}$ represents the total number of eligible households to SP. $\mathbf{eH_{st}}$ is calculated on the basis of the ENIGH using expansion factors provided by the survey. The cost-effectiveness ratio is therefore obtained as

$$\text{ICE}_{st} = \frac{\Delta \text{cost}_{st}}{\Delta y^*_{st}} \quad . \qquad \text{VI.3}$$

We interpret the ICE as the average public cost (in pesos) of reducing one peso in pocket medical expenditure payed out by households treated by the SP. In the case of P(expenditure> 0) we have that

$$\Delta P\left(\text{expenditure}_{hst} > 0\right) = \left(\frac{\beta_5}{\theta_5}\right) \Delta \text{covg}_{st}$$

where ΔP(expenditure>0) represents the change in the probability of a positive pocket medical expenditure due to the change in the coverage of the SP among the treated population. Given that the units of P (expenditure> 0) are percentage points while the cost of SP are reported in pesos, defining the ICE for P(expenditure>0) in the same way we did for log(expenditure) does not produce a index that is easy to interpret. For this reason, we define the ICE to P (expenditure>0) as

$$\text{ICE}_{st} = \frac{\dfrac{\Delta P(\text{expenditure}^*_{hst} > 0)}{P(\text{expenditure}_{hst-1} > 0)}}{\dfrac{\Delta \text{cost}_{st}}{\text{cost}_{st-1}}} \qquad \text{VI.4}$$

so that we can interpret the ICE as the elasticity of P(expenditure>0) with respect to the cost of SP, which is a natural interpretation.

VII. Results

VII.1. Results from regression models.

VII.1.1 Effect of a change of SP coverage on the take-up probability.

We start the discussion by reporting the results of the effect of SP coverage of SP on the probability of SP affiliation. Table 1 contains the value of θ_5 estimated by fitting regression

(VI.2) as well as the coefficient obtained in various partitions of the sample: (1) the whole sample, (2) households with children aged 0 to 11 years without seniors 60, (2) households with members aged 12 to 59 without children under 11 and adults over 60, (3) households with adults over 60 without children 0 to 11 years. As expected, the increase in the coverage of SP increases the likelihood of SP take-up by about 0.41 percentage points. There is evidence of heterogeneous effects, as households without young children or seniors are considerably more difficult to reach.

Table 1. P(SP Affiliation)

	(1)	(2)	(3)	(4)
	All	0 a 11	12 a 59	60+
θ_5	0.414***	0.438***	0.362**	0.438
	(0.0916)	(0.0749)	(0.0887	(0.07
Observations	108,938	44,173	36,661	44,17
R2	0.31	0.36	0.28	0.29

Robust standard errors clustered at State level in brackets.
*** p<0.01, ** p<0.05, * p<0.1

VII.1.2. Effect of SP coverage on the log pocket expenditure [log (expenditure)].

Next, Table 2 presents results for regression IV.1 where the dependent variable is the logarithm of pocket expenditure. For the sample of all households we detect that a change in SP coverage from 0 to 1 lowers total pocket expenditure by -0.32 log units. However, the effect is statistically different from zero only at a 10% significance level. No statistically significant effect is found for a change in SP coverage on spending in primary care, hospitalization and non-prescribed drugs.

Young children and older adults are, in general, the population at higher risk of health shocks and thus the population that require medical attention more intensively. For this reason household with members in these age groups make more intensive use of the medical services and have an increased risk of adverse health events that lead to sizeable pocket medical expenditure. It is expected, therefore, that the financial protection provided by the SP should be felt more intensively in households with young children and senior members. Table 2 shows that, with confidence level of 95%, a change in SP coverage has no effect on (log) pocket expenditure in households without children and elder adults. No effect on total spending, nor on any of its components is detected.

In contrast, for households with children under 11 years we find that a increase on SP coverage from 0 to 1 reduces pocket expenditure by about -0.5 log points, which is clearly a higher effect than the -0.32 log points obtained when the model is fitted for the whole sample. In this case β_5 is statistically different from zero at 5%. Then, we find strong evidence that a increase from 0 to 1 in SP coverage decreases total pocket expenditure among the population of households with children under 11 years.

Table 2. Log(expenditure)

	(1) Total	(2) Primary	(3) Hospitalisation	(4) Drugs[(a)]
All households				
β_5	-0.318*	-0.0931	0.358	-0.258
	(0.163)	(0.160)	(0.737)	(0.204)
Observations	65,019	44,317	4,066	37,549
R2	0.183	0.198	0.245	0.152
Households with members aged between 12 and 59				
β_5	-0.0371	0.190	0.481	-0.277
	(0.249)	(0.263)	(0.786)	(0.276)
Observations	22,728	14,777	1,339	13,727
R2	0.175	0.178	0.274	0.150
Households with members aged between 0 and 11				
β_5	-0.485**	0.0114	-0.444	-0.870***
	(0.227)	(0.192)	(1.296)	(0.288)
Observations	27,636	19,250	2,140	15,724
R2	0.185	0.199	0.257	0.144
Households with members aged 60 and more				
β_5	-0.761**	-0.411	0.757	-0.379
	(0.361)	(0.532)	(1.370)	(0.412)
Observations	14,304	10,051	573	7,894
R2	0.207	0.207	0.414	0.161

Robust standard errors clustered at State level in brackets.
*** p<0.01, ** p<0.05, * p<0.1.
[(a)] Non-prescription drugs.

An interesting fact is that the decrease in total expenditure in households with children under 11 years is mainly associated with a decrease in spending on non-prescription drugs. In fact, according to Table 2, a change in SP coverage from 0 to 1 reduces pocket expenditure on non-prescription drugs by -0.87 log points. However, such

reduction is not statistically different from zero at 1%. Neither the hospital nor spending on primary care are affected at a significance level of 5%. Therefore, findings suggest that most health events suffered by households with young children are common episodes that do not warrant hospitalization (e.g. mild infectious events) but do require medical treatment with drugs, which in the absence of SP households must pay from their pocket. In the light of this result, it seems that the financial protection provided by SP is important.

For households with senior adults Table 2 shows that a change in SP coverage from 0 to 1 reduces pocket expenditure by -0.76 log points. The effect is statistically significant at 5%. Unfortunately, no significant effect of the change is detected in any of the subcomponents.

VII.1.3 Effect of SP coverage on the probability of positive pocket medical expenditure [P(expenditure>0)].

Table 3 presents results from fitting model IV.1 for the probability of positive pocket expenditure [P (expense> 0)] within the reference period. The upper panel, column 1, shows that an increase in coverage SP from 0 to 1 results in a reduction of -0.08 percentage points in the probability that households will make strictly positive spending. The result, however, is only significant at 10%. A change in the coverage of SP is, however, associated with a reduction -0.098 percentage points in the probability of positive spending on primary care and reduces -0.046 percentage points the probability of positive hospitalization expenses. In both cases the effect is statistically significant at 5%. No effect of SP on the likelihood of positive spending on non-prescription drugs is detected.

When we split the sample of households with children under 11 years old, households with seniors and households with members aged 12 to 59 years results show that virtually in all cases changes in SP coverage does not have a statistically significant effects on P(expenditure>0)]. The only exceptions are the probability of positive hospital expenditure in households with children younger than 12 years and the probability of positive hospital expenditure in households with adults over 60 years. Only in the latter case the effect is statistically different from zero at the 5% level. Then, households with elder adults are the ones who benefit the most by the SP in terms of reducing the probability of making a positive pocket expense due to hospitalization. It is important to underline that the population over 60 is without doubt more likely to suffer health events requiring hospitalization. Consequently, the result is intuitive.

Table 3. Probability of a positive pocket expense [P(expenditure>0)]

	(1) All	(2) Primary	(3) hospitalization	(4) Drugs[(a)]
All households				
β_5	-0.0874*	-0.0982**	-0.0458**	0.0199
	(0.0478)	(0.0404)	(0.0201)	(0.0573)
Observaciones	108,938	108,938	108,938	108,938
R2	0.075	0.066	0.019	0.051
Households with members aged between 12 and 59				
β_5	-0.123	-0.105	-0.0441	0.0349
	(0.0763)	(0.0666)	(0.0342)	(0.0881)
Observaciones	38,661	38,661	38,661	38,661
R2	0.073	0.067	0.019	0.052
Households with members aged between 0 and 11				
β_5	-0.0630	-0.0443	-0.0470*	0.0044
	(0.0635)	(0.0614)	(0.0269)	(0.0800)
Observaciones	44,173	44,173	44,173	44,173
R2	0.081	0.075	0.020	0.057
Households with members aged 60 and more				
β_5	-0.0406	-0.121	-0.0523**	-0.0061
	(0.0972)	(0.0742)	(0.0247)	(0.0840)
Observaciones	25,500	25,500	25,500	25,500
R2	0.080	0.080	0.028	0.045

Robust standard errors clustered at State level in brackets.
*** p<0.01, ** p<0.05, * p<0.1.
[(a)] Non-prescription drugs.

VII.2. Cost-effectiveness of SP.

We now proceed to discuss the results on the cost-effectiveness (ICE) measurements of SP in terms of their effects on spending pocket.

First we discuss the cost-effectiveness ratio of SP as a mechanism of financial protection of households who spent a strictly positive pocket expense. In this case the ICE is interpreted as the public expense, in constant 2008 pesos, to achieve a reduction of 1 peso on private pocket spending undertaken by the SP affiliated households.

Table 4 presents the results of the calculation of the ICE index under the assumption that the SP has the same effect on all households regardless of their demographic profile. It is possible to obtain the ICE index for log(expenditure) at three points in time, 2004, 2006

and 2008. For 2010, the ICE is not reported because the SP funding formula underwent significant changes in 2009 and therefore the data of 2010 is not comparable with previous years.

For Mexico as a whole we have that in 2004, at 95% of confidence, the public payed between 1.82 and 2.72 pesos for every peso that SP affiliated households stopped paying as pocket medical expenditure. The public cost for each peso saved by the private sector has been rising and by 2008 it is calculated that the public paid between 4.31 and 6.42 pesos, at 95% confidence, for each peso saved by SP households.

It is important at this point to put in context the differences in the cost-effectiveness of the SP over time. First, the decrease in cost-effectiveness reflects progress towards universal coverage. As we advance, the system cost becomes higher in part because near universal coverage is more difficult to recruit the marginal household (i.e. to enroll the last home that remains outside the program). Also, as the coverage increases households who become affiliated have most probably higher income and, because of their higher income, have preference to continue using private medical services –either due to subjective preference or due to difficulty for accessing the health services provided by SESAs– even when they belong to the SP. Therefore, the marginal affiliated household continues to make significant pocket expenses after joining the SP. As a consequence, a sort of diminishing returns is exhibited as the SP coverage increases.

Table 4. Costo-efectiveness index for log(expenditure) – Homogeneous effec. Confidence interval at 95%. 2008 constant pesos.

	Lower limit			Upper limit		
State	2004	2006	2008	2004	2006	2008
Aguascalientes	-0.66	-5.72	-5.63	-0.96	-8.54	-8.44
Baja California	-1.94	-1.58	-7.09	-2.91	-2.35	-10.54
Baja California Sur	-0.81	-0.44	-2.70	-1.21	-0.65	-4.05
Campeche	-1.75	-1.99	-3.09	-2.61	-2.95	-4.60
Coahuila	-0.61	-1.24	-2.20	-0.92	-1.85	-3.26
Colima	-1.70	-10.36	-4.01	-2.47	-15.56	-6.01
Chiapas	-5.14	-3.31	-10.80	-7.71	-4.92	-16.09
Chihuahua	0.00	-1.33	-3.93	0.00	-1.98	-5.86
Distrito Federal	0.00	-2.25	-2.80	0.00	-3.38	-4.19
Durango	0.00	-0.76	-2.60	0.00	-1.13	-3.86
Guanajuato	-1.18	-4.50	-6.15	-1.76	-6.63	-9.20
Guerrero	-5.73	-1.21	-7.18	-8.62	-1.79	-10.71
Hidalgo	-1.88	-1.24	-3.29	-2.82	-1.86	-4.89
Jalisco	-1.23	-2.20	-3.89	-1.84	-3.30	-5.78
México	-1.37	-2.12	-3.89	-2.06	-3.16	-5.79
Michoacán	-2.00	-2.11	-3.44	-3.00	-3.16	-5.12
Morelos	-1.79	-2.10	-4.49	-2.68	-3.13	-6.68
Nayarit	-0.76	-1.92	-1.39	-1.14	-2.86	-2.06

Nuevo León	-0.63	-0.86	-2.56	-0.95	-1.28	-3.82
Oaxaca	-3.50	-2.50	-7.49	-5.25	-3.72	-11.16
Puebla	-1.37	-6.28	-7.52	-2.04	-9.38	-11.26
Querétaro	-0.18	-1.44	-2.92	-0.27	-2.15	-4.32
Quintana Roo	-2.03	-0.96	-1.99	-3.05	-1.43	-2.96
San Luis Potosí	-2.78	-3.24	-3.14	-4.16	-4.82	-4.68
Sinaloa	-1.99	-0.40	-2.36	-2.96	-0.60	-3.53
Sonora	-1.78	-0.99	-6.00	-2.66	-1.46	-9.00
Tabasco	-4.26	-4.24	-2.86	-6.28	-6.22	-4.28
Tamaulipas	-1.83	-1.65	-3.74	-2.71	-2.47	-5.57
Tlaxcala	-1.34	-2.97	-2.37	-2.01	-4.44	-3.49
Veracruz	-1.69	-3.89	-5.33	-2.54	-5.80	-7.93
Yucatán	-0.89	-1.32	-6.40	-1.33	-1.96	-9.53
Zacatecas	-2.64	-1.44	-1.71	-3.96	-2.14	-2.53
Total	-1.82	-2.53	-4.31	-2.72	-3.77	-6.42

When comparing states based on the ICE index for log(expenditure) we detect significant variations in the cost-effectiveness of SP. Among the least efficient States we have Chiapas, Guerrero, Michoacan, Oaxaca, Quintana Roo, San Luis Potosí, Tabasco and Zacatecas. The most efficient States are Aguascalientes, Coahuila, Nuevo León, Querétaro and Yucatán.

The differences in cost-effectiveness between states reflect undoubtedly differences in economic development as well as differences in the size and capacity of state health services.

Take for instance the case of Chiapas. In 2004 Chiapas the public spent, at 95% confidence, between 5.14 and 7.71 pesos for every peso private households affiliated to SP saved in pocket expenditure. By 2008 the public cost per saved peso came to be between 10.8 and 16 pesos. This is the state in which the cost-effectiveness ratio is the lowest in the country. It is important to note that the high public cost in Chiapas reflects several things. First, it reflects the fact that, on average, households in Chiapas have a quarterly income of 20,840.91 constant pesos of 2008, which is significantly below the national average of 32,708 pesos. Similarly, among households with a strictly positive spending, households in Chiapas paid on average 676 pesos in pocket expenses while the country average was 1,158 pesos. That is, households make less pocket spending in Chiapas because they are relatively poorer. Consequently, there is less scope to produce pocket savings in response to the introduction of the SP. In other words, we cannot expect the average home in Chiapas to save the same as the average household in, for example, the Federal District. This certainly affects the cost-benefit ratio. Second, in 2004 the infrastructure and personnel of the SESAs was not the same throughout Mexico. Part of the goal of SP is to reduce that gap. For this

reason spending on the construction of new health centres and hospitals was different from state to state. Lagged States performed more effort. Surely such investment spending is reflected in the cost-benefit ratio and makes it look as if states that spent more to increase the capacity were more inefficient. So, part of the high cost-benefit that is detected for Chiapas reflects these factors. To correctly interpret the ICE index one needs to compare states with similar features.

Table 5. Cost-efectiveness index for log(expenditure) – heterogeneous effects. Confiendence interval at 95%. 2008 constant pesos.

	Lower limit			Upper limit		
State	2004	2006	2008	2004	2006	2008
Aguascalientes	-0.48	-4.12	-6.03	-0.87	-7.76	-10.62
Baja California	-1.26	-1.07	-4.82	-2.62	-2.21	-9.34
Baja California Sur	-0.61	-0.23	-1.86	-1.22	-0.50	-3.51
Campeche	-1.12	-1.21	-2.57	-2.27	-2.40	-4.79
Coahuila	-0.33	-0.99	-1.39	-0.73	-1.95	-2.69
Colima	-1.34	-5.07	-3.37	-2.54	-11.35	-6.75
Chiapas	-3.07	-2.02	-7.28	-6.45	-4.14	-14.52
Chihuahua	0.00	-0.83	-2.32	0.00	-1.77	-4.72
Distrito Federal	0.00	-1.03	-1.80	0.00	-2.36	-3.81
Durango	0.00	-0.36	-1.67	0.00	-0.78	-3.15
Guanajuato	-0.72	-2.93	-4.12	-1.49	-5.73	-8.13
Guerrero	-4.10	-0.72	-5.41	-8.52	-1.47	-10.52
Hidalgo	-0.98	-0.60	-1.91	-2.11	-1.30	-3.91
Jalisco	-0.61	-1.29	-2.45	-1.32	-2.75	-4.82
México	-0.91	-1.55	-2.93	-1.83	-3.03	-5.61
Michoacán	-0.98	-1.01	-2.32	-2.17	-2.21	-4.55
Morelos	-1.10	-1.46	-2.93	-2.34	-2.86	-6.16
Nayarit	-0.45	-1.19	-1.06	-0.92	-2.49	-2.08
Nuevo León	-0.34	-0.49	-1.96	-0.73	-1.10	-3.90
Oaxaca	-1.70	-1.50	-4.53	-3.74	-3.13	-9.63
Puebla	-0.88	-4.24	-4.53	-1.78	-8.45	-9.60
Querétaro	-0.12	-0.80	-2.09	-0.23	-1.59	-3.91
Quintana Roo	-1.41	-0.94	-1.82	-2.73	-1.76	-3.38
San Luis Potosí	-1.23	-1.75	-1.51	-2.62	-3.60	-3.21
Sinaloa	-1.12	-0.25	-2.13	-2.26	-0.48	-3.79
Sonora	-1.09	-0.59	-3.57	-2.26	-1.17	-7.58
Tabasco	-2.68	-2.92	-1.78	-5.39	-5.43	-3.68
Tamaulipas	-1.09	-1.08	-2.53	-2.16	-2.28	-5.29
Tlaxcala	-0.78	-1.70	-2.00	-1.69	-3.47	-3.50
Veracruz	-0.96	-2.18	-3.15	-2.02	-4.59	-6.56
Yucatán	-0.46	-0.68	-4.81	-0.97	-1.42	-8.89
Zacatecas	-1.33	-0.89	-0.78	-2.71	-1.81	-1.64
Total	-1.07	-1.54	-2.84	-2.20	-3.15	-5.68

To complete the analysis an estimate of the cost-benefit index for log(expenditure) was obtained considering that heterogeneous effects across households with different demographic profile were detected. In particular, in the previous section we found evidence that the SP reduces pocket spending, with a confidence level of 95%, only among households with children under 12 and among households with adults over 60. Table 5 presents the ICE index taking into account such heterogeneous effects. In general, the cost-effectiveness index of the SP is significantly improved. For example, in 2004 the nationwide public cost of reducing 1 peso of pocket spending by SP households was, with confidence level of 95%, between 1.07 and 2.20 constant 2008 pesos. This gives an ICE range that is substantially better from the 1.82 and 2.72 pesos reported in Table 4 under the assumption that the SP has a homogeneous effect. However, the trend is the same. Indeed, Table 5 shows that the cost-effectiveness ratio is on the rise over time.

Now to discuss how cost-effective is the SP to prevent a positive pocket medical expense [P (expense> 0)] among affiliated households. The ICE calculation is based on formula VI.4 and regression results discussed in the previous section. In this case the ICE is interpreted as the elasticity of P(expenditure> 0) to changes in the cost of SP. Note that in the case of P(expenditure> 0) only the indices for 2006 and 2008 are calculated because the SP began operations in 2004 and to calculate the ICE in 2004 would need to know the cost of the program in previous years. Neither ICE is calculated for 2010 because in 2009 there was a change in the SP funding formula and the cost data in 2010 are not comparable with previous years. The ICE for P (expenditure> 0) was calculated based on the results obtained for total spending and using all the available sample. We do no split the sample to fit the model for households with different demographic profile (heterogeneous effects) because no significant effect of an increase on the coverage of SP on P expenditure>0) was detected for any subsample considered in the previous section. Table 6 presents the ICE at State level for P(expenditure>0). Note that in this case the ICE represents the elasticity of the probability of observing a positive pocket expense with respect to the cost of Seguro Popular. In order to reflect uncertainty about our ICE calculations, a 95% confidence interval is offered.

One of the main findings reported in Table 6 is the fact that the elasticity of P(expenditure> 0) is relatively small with respect to changes in the cost of SP. It is difficult to explain why this is the case and several interpretations are possible. What is certain is that a good proportion of households continue to make positive pocket medical expenses despite being affiliated to the SP, and that increasing SP coverage does not seems to affect

such behaviour. However the reasons for a low elasticity of P(expenditure> 0), we detect substantial heterogeneity in the ICE from state to state and from year to year.

Table 6. Cost-effectiveness index for P(expenditure>0). Confidence interval at 95%.

	Lower limit		Upper limit	
State	2006	2008	2006	2008
Aguascalientes	-0.022	-0.069	-0.018	-0.058
Baja California	-0.061	-0.042	-0.051	-0.035
Baja California Sur	-0.124	-0.043	-0.103	-0.036
Campeche	-0.062	-0.147	-0.052	-0.122
Coahuila	-0.008	-0.050	-0.006	-0.042
Colima	-0.028	-0.146	-0.023	-0.122
Chiapas	-0.033	-0.035	-0.027	-0.029
Chihuahua	-	-0.032	-	-0.026
Distrito Federal	-	-0.019	-	-0.016
Durango	-	-0.036	-	-0.030
Guanajuato	-0.012	-0.157	-0.010	-0.131
Guerrero	-0.018	-0.021	-0.015	-0.017
Hidalgo	-0.048	-0.046	-0.040	-0.038
Jalisco	-0.018	-0.049	-0.015	-0.041
México	-0.008	-0.039	-0.006	-0.033
Michoacán	-0.003	-0.021	-0.002	-0.018
Morelos	-0.020	-0.056	-0.016	-0.047
Nayarit	-0.016	-0.163	-0.014	-0.136
Nuevo León	-0.018	-0.040	-0.015	-0.034
Oaxaca	-0.028	-0.030	-0.023	-0.025
Puebla	-0.008	-0.036	-0.007	-0.030
Querétaro	-0.004	-0.042	-0.004	-0.035
Quintana Roo	-0.026	-0.048	-0.022	-0.040
San Luis Potosí	-0.057	-0.124	-0.048	-0.103
Sinaloa	-0.338	-0.087	-0.282	-0.073
Sonora	-0.036	-0.049	-0.030	-0.041
Tabasco	-0.154	-0.407	-0.128	-0.339
Tamaulipas	-0.182	-0.089	-0.152	-0.074
Tlaxcala	-0.010	-0.072	-0.008	-0.060
Veracruz	-0.009	-0.055	-0.007	-0.046
Yucatán	-0.008	-0.040	-0.007	-0.033
Zacatecas	-0.035	-0.124	-0.029	-0.104

Note: The SP started operations in 2005 in Chihuahua, Mexico City, and Durango. For this reason do not have available data on the cost of SP in these states in 2004 and is not possible to calculate the increase in the cost of the program between 2004 and 2006.

At this point we should underline that a lot of the ICE variation is due to differences in SP coverage across states and over time. Clearly, those states that have achieved universal coverage are subject to less variation whereas states that are still making efforts to increase program coverage are subject to more variation. For example, Baja California Sur in 2006 had coverage of 54% and by 2008 coverage was reported to have increased to 64%.

In contrast, Aguascalientes had 70% coverage in 2006 and was reported to increase to 77% in 2008. Clearly, if a State begins with low coverage levels it would find easy to increase SP coverage and P(expenditure> 0) will be relatively elastic compared with a State that starts near universal coverage. This is a possible explanation of why the ICE of Baja California Sur in 2006 was -0.12 and by 2008 the figure went down to -0.043. Instead, Aguascalientes's ICE remained relatively stable over the 2006-2008 period. In other words, to get a grasp of the cost-effectiveness, one should compare the ICE of States that had approximately a similar level of coverage in 2006 and expanded coverage at more or less the same rate over the 2006-2008 period. The truth is that as all Mexican States achieve universal coverage we will be able to do direct comparisons. Meanwhile some care should be taken when interpreting the ICE of different States.

VII. Conclusions

The present study aims to perform a cost-effectiveness (ECE) evaluation of Seguro Popular. While several studies in the past have investigated the effect of SP on pocket medical expenditure no previous work have undertaken the task of measuring its cost-effectiveness, or considered that Seguro popular may have heterogeneous effects for households with young children and elder adults. The present paper intends to fill the gap and to provide some directions to improve public policy.

An ideal cost-effectiveness evaluation should be able to carefully identify all costs of the program under investigation as well as to carefully document outcomes that are attributable to the program. From such point of view, the present study has important limitations. First, the financing of the Sistema de Protección Social en Salud falls within the general budgeting rules for providing health care to the population without social security. This includes sources other than direct SP funding. In particular resources budgeted as Ramo 33, Ramo12, State level health budgeting, and resources of IMSS-Opportunities are part of Seguro Popular funding. It is a complex formula and even the SP administration authorities are not able to set apart what is the SP cost and what are resources to spent to provide healthcare to the population without access to social security institutions. Second, public accounting rules do not require the Servicios Estatales de Salud (SESAs) to record the costs of goods and services provided in each doctor visit and medical intervention performed by the SESAs to SP affiliates. Only general rules of line of expenditure are laid down and the SESAs manage the SP resources paid to them on behalf of SP affiliates as part of their total budget, making no detailed accounting separation of what is spent on consultations and medical interventions performed to SP affiliates from what is spent on

consultations and medical interventions performed to their own system affiliates. Third, a cost-effectiveness analysis should be based on causal effects of the program, i.e. in the basis of rigorous impact studies. While there is an random control trial (RTC) study that identifies the causal effects of the program, the scope of such study is not representative for the whole country, has a significant rural bias, and was carried out when the program was beginning to expand. All subsequent studies that have been done since then use a quasi-experimental evaluation approach, which fall short of producing causality evidence with the same level of rigor and confidence that an experimental study.

The present study attempts to isolate the causal effects of the program using a quasi-experimental approach that evaluates the cost-effectiveness of the program to reduce pocket medical expenditure. The aim is to get an estimate of what is public cost in pesos for every peso that SP affiliated households stop paying as medical pocket expenditure as a direct result of the program.

Results indicate that SP has a mixed effect on pocket expending depending on the demographic profile of affiliated household. With confidence level of 95%, findings show that the SP reduces pocket spending in households with young children and in households with senior adults. There is no evidence that the SP has effect, at any standard level of significance, on pocket medical spending among households without children or elder adults. For Mexico as a whole it is estimated, with confidence level of 95%, that for every peso that affiliated SP households stopped spending in 2004, the federation spent between 1.07 and 2.20 constant 2008 pesos. For the year 2010 the public spent between 2.84 and 5.68 constant 2008 pesos for every peso saved by private households. Therefore, the evidence is that the public cost of each peso saved by SP affiliated households has increased over time.

The fall in the cost-effectiveness of the program should not necessarily be interpreted as a consequence of less effective use of resources. In part, the decline in the cost-effectiveness is to be expected given that the cost of affiliating the marginal household increases as we approach universal coverage. Also, as SP approaches universal coverage the marginal household is has probably higher income, and is likely to continue using private medical services even after affiliation to SP (either because of subjective preference or because of difficult access to State health services (SESAs)). This may also reflect a subjective belief that the services provided by the SESAs are of low quality, which may well reflect reality, and that is why the Mexican middle class keeps using private medical care even after securing affiliation to SP.

Significant differences in cost-effectiveness among Mexican states are detected. Among the least efficient we find Chiapas, Guerrero, Michoacán, Oaxaca, Quintana Roo, San Luis Potosí, Tabasco and Zacatecas. The most efficient are Aguascalientes, Coahuila, Nuevo León, Querétaro and Yucatán. It is important to interpret these differences in the correct context, since, in addition to efficiency in reducing medical pocket expenditure, differences in cost-effectiveness are partly driven by differences in the degree of economic development of each State. Differences in the size and capacity of state health services also play an important role.

To conclude the following points are noted:

• The findings of the present paper reinforce previous evidence that the SP reduces, causally, pocket medical spending of affiliated households.

• Findings suggests that the Mexican government spends more funding the SP than SP affiliated households save in pocket expenditure as a direct effect of Seguro Popular. This reflects more the fact that the SP provides health insurance to the poorest households in Mexico than an inefficiency problem. Clearly, the low-income population respond with what they have, which is little, to adverse health events. In many cases, what they can pay is far from the real cost of the health services they need. Then, in the absence of SP, poor households would not have access to health services. No surprise, then, that the cost of SP is greater than the savings affiliated households do due to the program. To put it in other words, it is likely that the SP has significant redistributive effects. This is a desirable effect and thus, in the author's opinion, the public should not backtrack.

• It is expected that the cost-effectiveness of the SP should tend to stabilize in the future.

• It is also expected that health effects of SP will be produced in the medium and long term.

• The present cost-effectiveness analysis shows that there is heterogeneity in the effect of SP across Mexican States. It is the opinion of the author that further research is needed to investigate the nature of such differences and take effective steps to limit variation acorss States.

• It is necessary to review the rules of financing, organization, and accounting rules of the whole system so that it is possible to know the cost of each doctor visit and medical intervention undertook by the State Health services on behalf of the Seguro Popular.

Money should follow the patient. This will allow creating the right set of incentives to users, payers, and providers of health services.

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Appendix 1. ENIGH Design

The ENIGH is a cross-section survey that the National Statistics Institute (INEGI) collects biannually. Each year an independent, nationally representative, sample is selected. It is not possible to follow any household or individual over time. The 2000-2002 ENIGHs use the sampling frame built by INEGI from the Census 1995, while ENIGHs 2004 to 2010 use the National Housing Framework 2002 INEGI as sample frame, which is constructed from the Census 2000. The ENIGHs design has small changes from year to year but in all cases has a probabilistic, stratified, multistage cluster sampling, where the last unit of selection is the household. ENIGH is stratified at the State level and within each entity selection is

stratified in high urban areas (cities with 100,000 inhabitants or more), urban supplement (populations of 2.500 to 999,000 inhabitants) and rural (population of 2,500 inhabitants and less). The design also considers stratification by socioeconomic. The primary sampling units (PSUs) have a minimum of 80 and a maximum of 160 dwellings in the high urban stratum, a minimum of 160 and maximum of 300 dwellings in the urban complement, and a minimum 160 and maximum 300 homes in the rural stratum. Sample selection is done independently in each stratum and State. In the first stage PSUs are selected with equal probability. In the second stage in urban areas and urban plug housing or housing segments with equal probability are selected. In stage 2 dwellings or blocks of dwellings are selected in the urban and in the complement urban strata with equal probability. In the rural stratum dwellings are selected with equal probability. ENIGHs has a design such that it is possible to accurately estimate population characteristics at national level and for localities with less than 2,500 inhabitants. For some years and some States, the sample size is boosted to allow representative samples at the State level.

Appendix 2. Descriptive statistics

Table A2.1. Descriptives

Variable	Description	Obs.	Mean	Dev.	Min	Max
State	State	11044	16.69	8.73	1	32
Year	Year	11044	2007	2.97	2000	2010
Segpop	=1 if affiliated to SP	11044	0.19	0.39	0	1
noSS	=1 if no social security	11044	0.58	0.49	0	1
Lexp	Log(pocket expenditure)	65890	5.81	1.68	-0.09	13.40
laten pri	Log(primary care expenditure)	44894	6.17	1.37	0.34	13.07
Lmedica	Log(non-prescription drugs)	38000	4.49	1.51	-0.09	12.56
expve	=1 if total expenditure > 0	11044	0.60	0.49	0	1
aten prive	=1 if primary care>0	11044	0.41	0.49	0	1
Medicave	=1 if non-precriptionndrugs>0	11044	0.34	0.48	0	1
Tamhog	Total household members	11044	3.48	1.67	1	13
p0a11	=1 if children 0 a 11 years	11044	0.40	0.49	0	1
p60mas	=1 if adults 60+ years	11044	0.23	0.42	0	1
p0a11y60mas	=1 if members 0 a 11 and 60+	11044	0.01	0.07	0	1
Age	Age of the haousehold head	11044	47.44	15.83	0	97
Lincome	log(total income)	11044	10.09	0.86	1.20	15.29
Inprim	=1 if hh incomplete primary	11044	0.21	0.41	0	1
Cprim	=1 if hh complete primary	11044	0.19	0.39	0	1
Ices	=1 if hh incomplete secondary	11044	0.06	0.24	0	1
Csec	=1 if hh complete secondary	11044	0.18	0.38	0	1
Iprep	=1 iff hh incomp. high school	11044	0.04	0.19	0	1
Cprep	=1 if hh comp. High school	11044	0.07	0.26	0	1
Ilic	=1 if incomp. First degree	11044	0.03	0.16	0	1
Clic	=1 if comp. First degree	11044	0.09	0.29	0	1
Posgrad	=1 if hh posgrad	11044	0.02	0.13	0	1
Cuartos	No. of rooms in dwelling	10987	3.68	1.76	0	25
Ptierra	=1 non covered floor	10893	0.08	0.26	0	1
Pcemento	=1 cement floor	10893	0.52	0.50	0	1
Totro	=1 ceiling other material	11044	0.11	0.31	0	1

Tlamina	=1 ceiling laminate metal	11044	0.22	0.41	0	1
Mdesecho	=1 walls other	11044	0.01	0.09	0	1
Mmadera	=1 walls wood	11044	0.15	0.36	0	1
Madobe	=1 walls adobe	11044	0.09	0.28	0	1
pop15k99k	=1 si 15k <loc.<99k hab.	11044	0.18	0.38	0	1
pop25h14k	=1 si 2,500<loc.< 14k hab.	11044	0.10	0.30	0	1
pop25hless	=1 loc.<2,500 hab.	11044	0.25	0.43	0	1
GDP	GDP constant 2008 pesos	11044	499.92	515.6	40.49	2006.7

Notes

1. There are other institutions that provide health insurance as described below.

2. In Articles 77 Bis 11 to 13 and 21 and 25 of the LGS establish the funding sources of the SPSS. The funding model is based on a tripartite scheme where the Federation, the States, and SP beneficiaries contribute all to pay for the medical services provided by the SP. The Federal Government covers an annual membership fee for each person/household affiliated equivalent to 3.92 per cent of a current minimum daily wage in the DF and updated annually based on the CPI (in 2011 it was $847.80 pesos). In top of that, the Federal Government and State governments do solidarity contributions equivalent to half the membership fee ($423.90 pesos in 2011). The contribution of the Federation, called the Solidarity Federal Contribution should represent at least one and half times the amount of the membership fee. The beneficiaries of SP contribute an annual membership fee, which is progressive, and that is determined on the basis of socioeconomic status of each family and a contributions table, with the particularity that families who fall in the first four income deciles are exempt. In practice, the family fee is symbolic and cost more to manage than the resources it raises. In 2011 only 184.5 million pesos were collected as family contributions, compared with a total program cost of 58,137.8 million.

3. Not all eligible households to SP are finally affiliated to the system. Therefore, to obtain the effect of SP in private pocket medical spending among the treated population we must scale the average pocket spending among the households eligible to SP by a factor of 2.94. For more details see the methodology section of this chapter.

4. The OLS estimator is consistent under the assumption that variations in coverage of SP are uncorrelated with unobserved variables affecting household's pocket expenditures in both the population with access to social security and the eligible population to Seguro Popular. For the regressions P (expenditure> 0) the OLS estimator is a consistent estimator of β_5 (Wooldridge 2002, p. 454). To make inference, however, it is necessary to use a robust estimator of the covariance matrix to account for the heteroskedasticicty that the model necessarily exhibits (Wooldridge 2002, p. 454).

5. This strategy of calculating the total savings in private spending for each State and year takes into account that the exponential transformation is nonlinear.