The Effect of Publicly Provided Health Insurance on Education Outcomes in Mexico

Carlo Alcaraz, Daniel Chiquiar, María José Orraca, and Alejandrina Salcedo

In this paper we study the causal effect of a large expansion of publicly provided health insurance on school enrollment rates and on children’s academic performance using the case of Mexico. Access to free health insurance could improve education outcomes directly by making household members healthier or indirectly by raising the amount of resources available for education expenses. Using a panel of municipalities from 2007 to 2010, we find that the expansion of the Mexican public health insurance program, Seguro Popular, had a large positive, statistically significant effect on school enrollment rates and on standardized test scores. JEL codes: I13, I15, I25, I38.

Access to free health insurance could have a positive effect on education, which in turn is a relevant determinant of growth and economic development. In this paper we exploit the case of a large expansion of a publicly provided health insurance program in Mexico and find it had a large positive effect on education outcomes. It is possible to consider different mechanisms through which publicly provided health insurance could improve education (school attendance or performance). The most direct channel is through better health of both parents and children. (See Miguel (2005) for a review on evidence from various countries or Glewwe et al. (2001) for the Philippines, Alderman et al. (2001) for the case of Pakistan, Miguel and Kremer (2004) for Kenya, Todd and Winters (2011) for Mexico, and Lavy et al. (2012) for Israel.)

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Another mechanism through which access to free-of-charge publicly provided health insurance could improve educational outcomes is by increasing the amount of resources available for education expenses. Health insurance could reduce both out-of-pocket and catastrophic health expenditures. An increase in disposable income may facilitate access to food, transportation, books, pencils, and notebooks, which could in turn increase the return to time spent in school.1 (See Brown and Park (2002), Morán et al. (2003), and Lochner and Monge-Naranjo (2011) for evidence in this direction.) Moreover, a reduction on uncertainty regarding future income could also improve education outcomes when access to health insurance is provided (see Flug et al. (1998) and Gruber and Yelowitz (1999)).

Hanson and Woodruff (2003) argue that the main costs of education in poor countries are generally the foregone earnings of the child rather than the direct costs. Therefore, it is costly to keep children in school when they could instead be involved in productive activities. Access to free health insurance may alleviate budget constraints and therefore avoid the need to take children out of school and send them to work in order to reduce expenses and increase income. Edmonds and Schady (2012), Alcaraz et al. (2012) and Yang (2008) provide evidence in this direction.

In 2002, the Mexican government introduced Seguro Popular (SP), a health insurance program free of charge for households not covered by social security institutions, estimated to be around half of the country’s population. We use the introduction of this program to study the effect on enrollment rates of children attending primary and secondary school, and on standardized test scores for primary school children. We estimate a fixed effects model on a panel of municipalities where we control for the per capita amount of public transfers through the poverty reduction program Oportunidades, which has both a health and an education component. Although unfortunately we do not have pre-program data for education outcomes in the years before the introduction of SP, we perform a placebo test to show that there is no evidence that the evolution of education outcomes in municipalities that enrolled to SP earlier is statistically different from that in municipalities that received SP later on. Our findings suggest that SP coverage had a positive and statistically significant effect on children’s scores in standardized tests and on school enrollment of children to late primary and secondary school. Although the effect on younger children’s enrollment (early primary) is also positive, it is not statistically significant in the main specification.

Our reduced form estimates do not allow us to identify the relative importance of the different mechanisms through which health insurance improves schooling outcomes. However, given the strong evidence showing that the introduction of SP has led to savings in health expenditures that has been documented in previous papers (Gakidou et al. 2006; Knaul et al. 2006; Barros 2008; King et al.

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1. Budget constraints actually interfere with households’ education choices, particularly in higher grades. For example, according to a survey conducted by the Mexican Ministry of Education, 50 percent of Mexicans report lack of money to pay for material, transport or tuition as one of the main causes for not starting high school or dropping out from it (SEP 2012).
(Gala´rraga et al. 2010), it is likely that households are allocating part of those resources to education expenditures or that these additional resources are allowing parents to send children to school instead of work, thus increasing enrollment and helping children achieve higher test scores. We interpret the differential effect on older versus younger children in enrollment rate estimates as an indication that households could indeed have been budget constrained and that SP has relaxed these constraints.

I. Expansion of the Public Health Insurance System

The public health system in Mexico is divided in two sectors. One of them provides health services to the population covered by social security institutions managed by the government (mainly IMSS and ISSSTE). Access to these institutions is obtained through a formally registered employer and once workers are covered, their families can be beneficiaries as well. Households not covered by social security institutions, which comprise around half of the population, receive health services from the state governments. There was an important gap in terms of resources allocated to health care between these two sectors, and SP was introduced in 2002 as a means to close such gap and to improve health services in the latter sector (Barros 2008). The main eligibility criterion to enroll in SP is precisely not to be covered by a social security institution and health services are provided basically free of charge. (For a detailed description regarding SP, see Levy (2008), Barros (2008), and Bosch and Campos-Vazquez (2014).) Given the large segment of the population that SP intends to covers, the program was implemented gradually across the country and full coverage was expected to be achieved by 2013 (Levy 2008). As of 2012, SP had enrolled 52.7 million beneficiaries (Sistema de Protecci´on Social en Salud 2012). Some authors like Barros (2008) and Bosch and Campos-Vazquez (2014) have argued that political factors could have influenced the rollout schedule of the program.

The evidence on the impact of SP on health is somewhat mixed (see Barros 2008; Knox 2008; King et al. 2009; Sosa-Rub´ı et al. 2009a, b). Evidence seems more compelling with respect to the income channel: SP has been found to reduce out-of-pocket health expenditure (Barros 2008; Gala´rraga et al. 2010), and catastrophic health expenditures (Gakidou et al. 2006; Knaul et al. 2006; Barros 2008; King et al. 2009; Gala´rraga et al. 2010).
II. Empirical Model, Data, and Descriptive Statistics

In order to identify the effect of SP on education outcomes we estimate a fixed-effects model with school enrollment rates and academic performance at the municipality level as dependent variables, and SP coverage, along with an additional control, as independent variables. The regressions take the following form:

$$\text{education outcome}_{it} = \beta SP_{it} + \gamma \text{Op}_{it} + \pi_i + \tau_{st} \text{state}_s \cdot \text{year}_t + u_{it},$$

(1)

where $SP_{it}$ is SP coverage in municipality $i$ at time $t$; $\pi_i$ are municipality fixed effects; $state_s$ and $year_t$ are state and year dummies, respectively, so that by considering the interaction in the regression, we include state-specific time fixed effects to control for possible changes over time that could affect all municipalities in the same state in a similar fashion; $\text{Op}_{it}$ is per capita public expenditure in Oportunidades transfers in state $i$ at time $t$; and $u_{it}$ is the error term. Municipality fixed effects allow us to control for observable and unobservable characteristics at the municipality level that do not change over time and that could simultaneously affect education and SP enrollment levels. This addresses possible endogeneity problems related to constant-over-time unobservables. We control for Oportunidades transfers per capita because as is well known (see Levy and Rodríguez 2005), it is a poverty reduction conditional cash transfer program that has important education and health components, and Oportunidades beneficiaries were particularly targeted to be enrolled in SP. Additionally, because resources for education and health expenditures are provided federally to state governments, the state-specific fixed effects we include should control for the availability of such resources.

In order to estimate equation (1), we construct a panel of municipalities with annual data from 2007 to 2010. We restricted the analysis to this time period due to data availability. Regarding enrollment rates, we take the number of children attending grade three in preschool to grade three in primary school and divide it by the number of children aged five to nine in the municipality, and we refer to this indicator as the enrollment rate to early primary school. We will refer to the number of children attending grades five in primary school to two in secondary school divided by the number of children aged 10 to 14 in the municipality as the enrollment rate to late primary and secondary school. Data on the number of children enrolled in each grade were obtained from the Ministry of Education webpage. Estimations on yearly population size at the municipality

5. For example, the recent economic crisis of 2009 could have affected children’s academic performance, and this could have taken place differentially across states depending on the way the crisis affected the region.

6. Our sample consists of 2,419 municipalities (98% of the total) over the span of four years. We do not have information for every municipality each year. In particular, data on ENLACE test scores for the whole state of Michoacan in 2007 is unavailable.
level were obtained from the Ministry of Health webpage, which are based on projections by the National Population Council (CONAPO).

The academic performance variable we focus on is the publicly available score in the yearly national standardized test on academic achievement ENLACE (Evaluación Nacional de Logro Académico en Centros Escolares), which consists mainly of math and Spanish language questions, but may also include questions on other subjects, all related to topics in the official curricula. We use the mean score at the municipality level. Our fixed effects model should account for differences across time in the exam, such as possible changes in the difficulty of the questions or the implementation process.

Our indicator of yearly SP coverage by municipality was constructed as the number of persons enrolled in SP relative to the total population in the municipality. Data on the number of persons registered in SP at the end of each month come from the SP National Registry and was provided to us by the Ministry of Health. Again, estimations on yearly population size at the municipality level were obtained from the Ministry of Health webpage. A possible concern with this measure of SP coverage is that it may be correlated with some characteristics of the municipality such as the percentage of the population with access to social security institutions, which could in turn be linked to the municipality’s wealth, health status, or to the quality of its education system. However, municipality fixed effects address this concern under the assumption that the proportion of the population eligible for SP (without access to social security) is constant in time. This is reasonable considering the nature of the variable and the four years time span of this study.

Data on the total amount of money spent on Oportunidades at the municipality level were downloaded from INEGI’s National States and Municipalities Information System (SIMBAD). Using total population data from the Ministry of Health as before and the consumer price index, we constructed per capita Oportunidades transfers in constant pesos.

Figures 1a, 1b, and 1c show kernel density estimates for the education outcomes. It can be noted that there is important variation between municipalities.

7. A possible concern regarding the construction of our database is that CONAPO’s projections for 2006–2050 could be underestimating the size of the Mexican population (García 2011). This could be exacerbated when considering population by age group. It is also important to bear in mind that although in theory children in these age ranges should be attending the mentioned grades, there are some who lag behind or who did not enroll to school at the recommended age. Moreover, children from one municipality may go to school in a different municipality. Consequently, the enrollment rate variable may take values greater than one.

8. We took into account only those scores that according to the Ministry of Education satisfied a certain standard of quality, or were “representative” at the school level. For robustness we also performed exercises including all schools, and we find very similar results.

9. Given that school starts in August, the SP coverage variable used for the estimations of its effect on school enrollment rate corresponds to the coverage achieved up to that month of each year. In turn, we take SP coverage by April of each year for the estimation of its effect on standardized tests scores, since this exam takes place on that month.

10. As mentioned before, there is no evidence that SP has itself caused a shift in the proportion of households with and without access to social security.
throughout the period. Figure 1d shows that there is also important variation in SP coverage between municipalities in each of the four years that constitute our database. Also, in the early years of our sample a relevant proportion of municipalities had very low SP coverage (note the spike in 2007). Indeed, the distribution has shifted to the right over time, suggesting that coverage has increased across municipalities, which is important for our identification strategy.
III. Results

Table 1 presents the main results of the estimations of equation (1) for all three dependent variables.\textsuperscript{11} Once we control for Oportunidades, we do not find a statistically significant effect of SP on early primary school enrollment (column 2). The coefficients on SP coverage indicate a positive and statistically significant effect on the enrollment rate to late primary and secondary school (column 4). Attending secondary school is generally more expensive, not only in terms of direct educational expenses, but also because of the higher opportunity cost of older children in terms of their foregone earnings. It could be that the decrease in budget constraints is allowing households to pay for the additional expenditures that the assistance of children to secondary school entails. More importantly, SP may be allowing households to send children to school instead of sending them to work. The comparison of these results with those for younger children suggests that this channel may indeed be more important for older children. Therefore, the evidence is consistent with the hypothesis that one of the channels through which SP coverage affects education is through an indirect income effect. An additional explanation that may account for the lack of significance in the results for younger children is the little variation in accumulated schooling before the age of 10, given that primary school attendance has been mandatory for many years in Mexico (Hanson and Woodruff 2003). This implies that there is a lower margin for increasing enrollment rates to early primary school.

Our results imply that going from no coverage to having all the population registered to SP would translate in an increase of 2.5 percentage points in the enrollment rate to late primary and secondary school (column 4 of table 1). However, SP is targeted to the population not covered by social security, and therefore not every person in the municipality is expected to be enrolled. A more reasonable range would be to go from no coverage to an enrollment rate of 52 percent, which was the mean SP coverage across municipalities in 2010. Considering an increase of this magnitude, our coefficient implies an increase of 1.3 percentage points in enrollment to late primary and secondary school. This is an increase of considerable magnitude, as it represents 1.6\% of the mean enrollment rate to these grades in the relevant period.

With respect to the estimations on test scores of primary school children, the coefficient in column 6 indicates a positive and statistically significant effect of SP coverage on test scores. An increase in SP coverage of 52 percentage points would imply an increase of 5.9 points in the average test score, according to the reported coefficient. This corresponds to 15.6\% of a standard deviation of the average score across municipalities.\textsuperscript{12} According to the World Economic

\textsuperscript{11} In all cases standard errors are clustered at the municipality level.

\textsuperscript{12} As another reference point, the gap between the score of the state in the 90th percentile of test scores across states and that in the 10th percentile is equal to 43.39 points. An increase in SP coverage of 52 percentage points would be associated to an increase in test scores equal to 13.6\% of this gap.
Table 1. Fixed Effects Estimation Results of the Effect of SP on Education Outcomes

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Enrollment rate to early primary school</th>
<th>Enrollment rate to late primary and secondary school</th>
<th>ENLACE test score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>SP coverage</td>
<td>0.036*</td>
<td>0.020</td>
<td>0.035**</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.015)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>Oportunidades</td>
<td>0.004</td>
<td>0.004**</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.43)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.924***</td>
<td>0.926***</td>
<td>0.789***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.284</td>
<td>0.349</td>
<td>0.081</td>
</tr>
<tr>
<td>Observations</td>
<td>9,491</td>
<td>9,342</td>
<td>9,491</td>
</tr>
<tr>
<td>Number of municipalities</td>
<td>2,409</td>
<td>2,408</td>
<td>2,409</td>
</tr>
<tr>
<td>Municipality fixed effects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>State-specific time fixed effects</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Notes: Seguro Popular (SP) coverage is defined as the proportion of the population in the municipality enrolled in SP. ENLACE test scores correspond to the average score of the schools at the municipality. Enrollment rate to early primary school corresponds to the number of students registered to grades three in preschool to three in primary school at the municipality level divided by the population in the municipality aged five to nine years. Enrollment rate to late primary and secondary school corresponds to the number of students registered to grades five in primary school to two in secondary school at the municipality level divided by the population in the municipality aged 10 to 14 years.

***p < .01, **p < .05, *p < .1. Clustered standard errors in parenthesis.
Forum (2009), a policy that increases test scores in 10 percent of the standard deviation may be considered successful. We therefore believe that the effects we find are sizable, although in interpreting the results, one should remember that it may have taken a municipality around eight years to go from no coverage to 52 percent. On the other hand, it is also important to bear in mind that we are estimating the effects of a program that did not target academic performance directly.\textsuperscript{13}

We can provide suggestive evidence of the absence of pre-existing trends following a simple test (as was implemented by de Janvry et al. (2014)). The test basically consists of restricting the sample to those municipalities that, even though the program was already in place at the national level, enrolled to SP at a later stage, late enough for us to have information about the evolution of its education outcomes before SP was implemented. We then compare education outcomes of early adopters, among those in the restricted sample, with the outcomes of municipalities that enrolled to SP even later on. Using the restricted sample, we find evidence indicating that the trends in schooling outcomes are not correlated with the timing of enrollment to SP. The details are presented in the appendix.

IV. Final Remarks

The evidence presented in this paper suggests that the introduction of Seguro Popular, a program implemented in Mexico that intended to provide public health insurance essentially free of charge to population not covered by social security, had a positive and statistically significant effect on education outcomes, namely on enrollment rates to late primary and secondary school and on academic performance of children in primary school. Although the main mechanisms behind the effects are not identified in the paper, an income effect seems to be playing an important role. We find remarkable that SP has improved academic performance of Mexican children when its main goal is to provide better health services.

V. Appendix

In order to provide evidence on the absence of pre-existing trends in the education outcomes, we perform the following test. We restrict the sample to municipalities that had SP coverage below 10 percent by 2008, and estimate the following regression for the municipalities in this sub-sample:

\[
\Delta \text{education outcome}_{2007 - 2008_i} = \alpha + \delta \text{SP in 2009}_i + \gamma \text{Op 2009}_i + u_i \quad (2)
\]

where $\Delta \text{education outcome}_{2007 - 2008_i}$ is the change between 2007 and 2008 in the enrollment rate to early primary school, enrollment rate to late primary and secondary school, or ENLACE test score at municipality $i$; $\text{SP in 2009}_i$ is a

\textsuperscript{13}. As additional robustness checks we conducted exercises to consider other forms of time fixed effects. Results support those previously described.
<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received SP in 2009</td>
<td>-0.014 (0.010)</td>
<td>-0.015 (0.011)</td>
<td>-0.002 (0.010)</td>
<td>0.000 (0.010)</td>
<td>0.554 (3.458)</td>
<td>-0.594 (3.796)</td>
</tr>
<tr>
<td>Control for Oportunidades</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Municipalities with coverage below 10% in 2009</td>
<td>140</td>
<td>140</td>
<td>106</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipalities with coverage over 20% in 2009</td>
<td>43</td>
<td>43</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The sample is restricted to municipalities that by 2008 had SP coverage below 10 percent. Observations that in 2009 had between 10 and 20 percent coverage are dropped. Received SP in 2009 is a dummy variable indicating whether SP coverage at the municipality was above 20 by 2009. ENLACE test scores correspond to the average score of the schools at the municipality. Enrollment rate to early primary school corresponds to the number of students registered from grades three in preschool to three in primary school at the municipality level divided by the population in the municipality aged five to nine years. Enrollment rate to late primary and secondary school corresponds to the number of students registered from grades five in primary school to two in secondary school at the municipality level divided by the population in the municipality aged 10 to 14 years.

***p < 0.01, **p < 0.05, *p < 0.1. Robust standard errors in parenthesis.
dummy variable that takes value 1 when SP coverage in 2009 in municipality $i$ was above 20 percent (early adopter) and zero if it still was below 10% (late adopter)\(^{14}\); and $Op_{2009}$ is per capita public expenditure in Oportunidades transfers in 2009. Lack of significance of the $\delta$ coefficient would indicate that the date in which SP was introduced in a municipality is not correlated with the evolution of education outcomes, supporting the assumption of parallel trends in education outcomes across municipalities before the program was implemented. The first row of table A1 provides evidence supporting the assumption that pre-program trends in education outcomes were not correlated with the time of expansion of SP. Indeed, the coefficient of $SP_{2009}$ is not statistically significant for any of the three education outcomes we study.

**References**


14. Note that we have dropped those municipalities that had a coverage between 10 and 20 percent in 2009 with the purpose of not biasing our test towards not finding a significant result due to the fact that late adopters (control group) could be similar to those that registered a small increase in SP coverage, but large enough to be considered as early adopters (treatment group).


