DO SUPPLY-SIDE-ORIENTED AND DEMAND-SIDE-ORIENTED EDUCATION PROGRAMS GENERATE SYNERGIES?

THE CASE OF COMPENSATORY EDUCATION AND OPORTUNIDADES SCHOLARSHIPS IN RURAL MEXICO*

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Abstract: Mexico’s compensatory education program provides extra resources to primary schools that enroll disadvantaged students in highly disadvantaged rural communities. By reducing the price of schooling through stipends conditional on attendance, OPORTUNIDADES increases demand for schooling among eligible households. This study tests the degree of complementarity between the two interventions. We focus on the effects on intermediate school quality indicators (failure, repetition and dropout) of teacher training, supplies and empowerment of parent associations on the supply side; and conditional cash transfers on the demand side. Results prove reducing the opportunity cost of schooling and decentralizing school management as effective measures in improving outcomes.

JEL Codes: I20, I21, I28

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Executive Summary

Beginning in 1992 the Mexican government undertook a large set of education reform measures under the National Agreement for the Modernization of Basic Education. These reforms involved the decentralization of educational services from the federal to the state level and aimed at improving Mexico’s education indicators. As a result of these efforts, Mexico has made substantial progress in expanding access to primary and secondary education, especially in rural areas and for the poor. However, investments in secondary education are still low, especially given Mexico’s income level. More worryingly, primary education is not imparting functional literacy to its graduates. The consequences of low quality schooling include failure, grade repetition and low learning achievement. This study tests the degree of complementarity (or substitutability) in terms of intermediate school quality indicators (failure, repetition and drop out) between two key education interventions: the Secretariat of Public Education’s (SEP) compensatory education program (implemented by CONAFE) and the Secretariat of Social Development’s (SEDESOL) conditional cash transfer program, OPORTUNIDADES, education scholarships.

The compensatory program is a supply-side intervention started by the Mexican Secretariat of Public Education (SEP) in the early 1990s to improve the supply and quality of education in schools with the lowest educational performance in highly disadvantaged communities. The program channels extra monetary and in-kind resources to the state governments in the poorest areas in order to reach the most disadvantaged students and reduce schooling inequalities. It now serves more than four million students in preschool and primary education and about 300,000 students in telesecundaria (lower secondary schooling imparted by satellite and television) education, in 29,534 rural and urban schools across the 31 Mexican states. The compensatory program seeks to reduce schooling inequalities by providing support in developing curricula and learning materials for bilingual education in indigenous schools; and by providing improved technology, infrastructure and teacher training to disadvantaged rural (and an increasing number of urban) schools. The compensatory program also provides school management grants to parent groups (Apoyo a la Gestión Escolar, AGEs) to be spent on the educational purpose of their choosing (although limited to small civil works and infrastructure improvements) to increase their involvement in school management.

OPORTUNIDADES (formerly known as PROGRESA) is a demand-side intervention launched by the Mexican Government in 1997 to alleviate poverty and break its intergenerational transmission by inducing parents to invest in the human capital of their children. Cash transfers from OPORTUNIDADES are given to the female head of the household, and are conditional on children attending school and family members obtaining sufficient preventive medical care. The money comes bimonthly in two forms: a nutritional stipend intended for families to spend on more and better nutrition; and an educational stipend given to each child less than 18 enrolled between the third grade of primary and the third (last) grade of junior high school, conditional on the child attending a minimum number of school days and not repeating a grade more than twice. Starting in 2000, high school scholarships are also granted to all beneficiaries younger than 21 years and enrolled in school. The educational stipend increases with the grade of the child and is higher for girls than boys during junior high and high school. Beneficiary children also receive money for school supplies once a year. There is an upper limit in the total transfer amount received per household. OPORTUNIDADES is the largest conditional cash transfer program of its kind. It distributed approximately $3 billion to some 5 million beneficiary households in 2004 in both rural and urban areas.
The extra household income the OPORTUNIDADES program provides may lead families to curtail their children’s labor activities in favor of going to school. This would in turn increase enrollment and enhance accumulated learning overall. However, the new students entering the system – due to the reduction in the price of schooling, might not be prepared for school and may thus be unable to fully take advantage of new educational opportunities. In addition, they may be entering poorly performing schools. Through increasing schooling opportunities and school quality in the highly marginalized areas where OPORTUNIDADES operates, the compensatory intervention might help solve, at least partly, schooling deficiencies and satisfy the needs of an increasing demand for schooling. Therefore, there are reasons to believe that the marginal effects of each program might be larger in the schools where they coexist.

This paper uses existing school census data (Censo Escolar 911) and CONAFE’s and OPORTUNIDADES’ administrative coverage data to test the existence of synergies between supply- and demand-side interventions in this unique situation. Taking advantage of the considerable overlap over the population both programs are attending, we estimate the impact of both Compensatory Education and OPORTUNIDADES on failure, repetition and drop out rates. More precisely, we focus on the impact of those interventions applied from 1998 until 2001. These correspond to the PIARE-8 and Phase I of the PAREIB compensatory programs, and to the starting years of the OPORTUNIDADES intervention. We define the set of CONAFE and/or OPORTUNIDADES treatment schools as the set of schools that started receiving either (or both) intervention(s) between 1998 and 2001, and received it continuously ever since. The comparison group consists of those schools that started receiving compensatory support and OPORTUNIDADES beneficiary students from 2002 onwards.

The gradual phasing in of both programs over time provides the required variation to identify difference-in-difference (triple differences) estimates of the individual (joint) impacts of either (both) programs. However, because the CONAFE-supported intervention targeted disadvantaged schools with very poor performance first, treatment and control school are likely to have experienced different evolutions over time. Thus, the methodological challenge relies in finding a comparable set of schools that can be used as a valid control group. Ideally, the group of control schools should only differ from the group of treatment schools in their treatment status; that is, post-intervention trends between intervened and non-intervened schools should be identical in the absence of the intervention. Unfortunately, this assumption cannot be tested as the counterfactual is never observed. Therefore, the identifying strategy we use relies on equal trends in the evolution of the dependent variables before the start of either intervention. If pre-intervention trends were not significantly different between treatment and control schools, there is no reason to believe they would be significantly different in the post intervention periods were the interventions not in place.

In order to maximize the likelihood of working with a well-balanced (comparable) sample, we restrict the study sample to the balanced panel of 5,383 rural non-indigenous primary schools observed continuously between 1995 and 2003. We check the validity of the identifying assumption and find no significant differences in the evolution of the outcomes between treatment and control schools before the start of the intervention period in 1998.

We estimate a school fixed effects model that additionally controls for time variant school and state characteristics. In particular, we control for other co-existing educational programs in the school, the student-teacher ratio, a crowding class index, treatment specific time trends, and state-time dummies. The inclusion of treatment specific time trends attempts to capture additional differences in the evolution of the outcomes between treatment and control
schools; the state specific time dummies aim to account for state-specific aggregate time effects that might be correlated with schooling outcomes: changes in demographic trends in the state that might affect enrollment; or changes in the state government characteristics, for example, shifts in tastes and priorities about education that might alter the allocation of resources.

Depending on the specification, a CONAFE treatment school will be identified with a dummy equal to one if the school receives CONAFE support, or with a continuous variable reflecting the number of periods the school has received CONAFE supports continuously. Similarly, two different variables will identify an OPORTUNIDADES treatment school in different specifications: the ratio of OPORTUNIDADES’ beneficiaries to total students in the school, which is a measure of the intensity of OPORTUNIDADES in the school; and a dummy equal to one if 25 percent or more of the students in the school are OPORTUNIDADES beneficiaries. The interaction between the CONAFE and the OPORTUNIDADES treatment indicator variables will identify the existence of super-additive effects resulting from both interventions.

The compensatory education intervention is composed of several different interventions. Not all of them might have the same impact, if any, on educational outcomes. If there is heterogeneity in the impact of each individual intervention, treating CONAFE as a homogenous package might be misleading. Therefore, in further specifications we will decompose the CONAFE treatment variable into the three CONAFE interventions for which we have enough data variation: monetary support to parents and leaders for school management (AGEs), provision of school and student supplies, and teacher training. In these cases we will control for the reception of other (sporadic) CONAFE supported interventions, namely improvement of existing or building of new facilities, provision of equipment (desks, bookcases, typewriters) and performance based incentives to teachers.

The evolution of failure, grade repetition and intra-year dropout rates over time are presented in Figures A, B and C. For each set of graphs, the first figure plots the mean of the dependent variable at the end of each school year for CONAFE treatment and CONAFE control schools. Similarly, the second figure plots the mean of the dependent variable over time for OPORTUNIDADES treatment and OPORTUNIDADES control schools. The vertical line at 1997 marks the beginning of the intervention period. Although these graphs cannot capture either the simultaneity of treatments or the variation in intensity of the different interventions in a school over time, they provide suggestive evidence. By simply eyeballing them, one can assess the validity of the identification strategy: pre-intervention trends are rather parallel which denotes schools in the treatment and control groups had similar evolutions. Moreover, the graphs show that failure and repetition rates for CONAFE treatment schools fall below those of CONAFE control schools from school year 2000-01 onwards. A similar pattern is observed regarding the effects of the OPORTUNIDADES intervention.
Nonetheless, fixed effects estimation results show that the larger reduction in repetition and failure trends for CONAFE supported schools observed graphically is not statistically significant, and less so once we control for the intensity of the OPORTUNIDADES treatment indicator in the regression. On the other hand, estimation results consistently show a significant effect of OPORTUNIDADES in reducing failure, grade repetition and dropout, regardless of the measure of the intensity of OPORTUNIDADES used and whether the CONAFE intervention is controlled for. Note that receiving the OPORTUNIDADES scholarship is not only conditional on school enrollment but also on not repeating more than twice a grade. This last requirement might partly explain the observed effects. Another mechanism through which OPORTUNIDADES might impact learning outcomes are the improved nutrition and better health practices the program enforces.

Interestingly enough, if we break up the CONAFE intervention into its different components, the effect of empowering parents’ associations (AGEs) on educational outcomes persists even after controlling for OPORTUNIDADES. This gives suggestive evidence that supply-oriented interventions should be redirected towards decentralizing school management and decision-making to the local level rather than focusing in centralized input provision. Concerning the number of periods the school receives school supplies, we find that they contribute to the reduction of failure and repetition. This effect also persists after accounting for OPORTUNIDADES in the regression, which could potentially be read as it takes time for quality inputs to take effect. Figure D depicts the estimated average percentage decreases in failure, grade repetition and intra-year dropout rate in response to the AGEs and the OPORTUNIDADES
interventions. Note that the effect of the CONAFE intervention as a whole is not illustrated in the graph as it is not significant.

Finally, we find no robust evidence of joint effects. We surmise such finding as an inability of the econometric specification to capture super-additive effects given the data available rather than as evidence of no synergies between the two interventions.

For robustness purposes, we re-run all specifications on the sub-sample of schools with similar educational indicators according to an index CONAFE constructed using school census data for the school year 1999-00 and census data to target schools to be intervened. Results are consistent and show larger effects on this restricted sub-sample, as expected.

We also re-do the analysis on the sub-sample of schools receiving AGEs and supplies and teacher training between 1998 and 2001 to address potential concerns with program placement bias. If better performing schools received all of the CONAFE interventions first, then the estimated average treatment effects would be larger on this restricted sample of schools. Results show that estimates on the AGEs and the school supplies coefficients are around twice the size of those found on the unrestricted sub-sample. This raises the natural concern that the identified effect on AGEs may disappear over time as worse performing schools (less motivated, etc.) join the program. Probably in anticipation of such a pattern CONAFE already started introducing, since 2003, a new support called CAPAGEs (*Capacitación para el Apoyo a la Gestión Escolar*) aimed at providing guidance on the administration of the monetary resources provided by the AGEs support.

Finally, we dismiss that the observed effects come from changes in the distribution of students (and students’ skills) in the class. Treatment could affect the individual decision of enrolling in school, thus changing the total number of students attending school which would in turn affect outcomes. In this case, the effect of the intervention would be upward (downward) biased if better (worse) performing students are attracted. We test for the existence of changes in the school distribution and find that the total number of students enrolled does not vary as a result of the interventions.

The AGEs are a very cost effective intervention. While the unit cost of the compensatory education program overall is $50, the AGEs are a much less costly component. Parents at each participating school receive between $500 and $700 a year depending on school size. There are over 45,000 schools and over 4.5 million students participating in the AGEs. The total cost of the AGE school grants is about $26 million a year; for 4.4 million students this comes to $5.86 per student annually. Oportunidades, which is also very effective and has other important benefits, pays students at the primary school level between $100 and $200 depending on which school grade they attend.

Mexico’s AGE substantially improve schooling outcomes. The strong and significant effects persist even after controlling for Oportunidades, suggesting that decentralizing decisions over education to local levels can have positive impacts on outcomes. Also, given the low cost of AGEs, pouring more resources into schools may not be necessary to improve outcomes if parental participation exists and is strong. The results suggest that it may be wise to increase decision-making power to local levels and schools; and increase parental participation at schools. All this will improve the school climate.
1 Introduction

Theoretical and empirical analysis of the relationships between income, productivity, better health or economic growth, and the quantity of schooling of individuals has resulted in an increased interest in improving education. Indeed, the focus placed on education in the Millennium Development Goals shows the existence of a large interest from policymakers, academics and donors in the quantity of education (educational attainment).\(^1\) This is particularly so in developing countries with very low schooling attainment rates. However, in both developing and developed economies, quality of education (learning attainment) is attracting increasing attention for several reasons.

First, returns to education are high in most countries and in developing countries in particular (Psacharopoulos and Patrinos 2004; OECD 2001; Duflo 2001). Moreover, it is believed that quality has the same payoffs as quantity of schooling. Indeed, several investigations find substantial effects of higher achievements on standardized tests on earnings (Blackburn and Neumark 1993, 1995; Murnane and Levy 1995).\(^2\) Second, performance in math and science standardized examinations is also shown to have a dramatic impact (larger than the impact of years of schooling) on productivity and national growth rates (Hanushek and Kimko 2000). Third, better performing students stay longer in school and are more likely to continue to higher education (Hanushek 1996; Behrman et al. 1998). Finally, and as a consequence of the former, improving quality of schooling and learning achievements can help equalize income levels between racial and social groups (Hanushek 2003).

The early literature on academic performance pointed at family background and socioeconomic status as the main determinants of student academic performance. Since Hanushek’s (1986) work on education production functions, the number of studies emphasizing the differential effects of school characteristics and institutional factors in reducing learning inequalities and increasing learning outcomes has grown extensively (Hanushek and Luque 2003;

\(^1\) Two of the eight Millennium Development Goals (MDGs) adopted at the United Nations Millennium Summit in 2000 focus on education: first, for all children to complete primary school by 2015; and second, to achieve gender equality at all levels of education by 2015.

\(^2\) As Heckman and Vytlacil (2001) point, the difficulty in separating cognitive skills from pure schooling complicates the estimation and leaves ambiguity about the exact magnitude of effects.
Hanushek and Kimko 2000).\textsuperscript{3} Even so, the quality of schooling continues to be very low in middle-income and low-income countries. Many schools lack the basic equipment and school supplies, teacher absenteeism runs high, and many children learn much less than the learning objectives set in the official curriculum, often inadequate and ignoring of the needs of particular population groups.

Aware of such problems, the Mexican Government is currently running two key educational programs – the Secretariat of Public Education’s compensatory education program implemented by CONAFE (hereafter, CONAFE) and OPORTUNIDADES education scholarships, as part of a larger educational reform that began in 1992. They are both aimed at increasing quantity and quality of schooling amongst Mexico’s most disadvantaged population by assessing school and household related factors. CONAFE’s compensatory program is a supply-side intervention that channels extra resources to the worst performing schools in the most disadvantaged areas. CONAFE seeks to reduce schooling inequalities by providing support in developing curricula and learning materials for bilingual education in indigenous schools; and by providing improved technology, infrastructure, and teacher training to disadvantaged rural (and an increasing number of urban) schools. CONAFE also provides school management grants to parent groups (Apoyo a la Gestión Escolar, AGEs) to be spent on the educational purpose of their choosing (although limited to small civil works and infrastructure improvements) to increase their involvement in school management.

The AGEs allow for the funding of Parents Associations on school management. The AGEs receive annual grants that vary from $500-$700 according to school size. The AGEs are not allowed to spend money on teacher salaries. Most of the funds go to infrastructure. The program promotes school-parent cooperation. Thus, AGEs increase school autonomy through improved mechanisms for participation of directors, teachers and parents’ associations in the management of the schools. By 2005, 46 percent of all public primary schools participated in the AGEs.

OPORTUNIDADES (formerly known as PROGRESA) is a demand-side intervention that provides cash grants to poor families contingent on them sending their children to school. This added income may lead families to curtail their children’s labor activities in favor of going

\textsuperscript{3} Also, see Glewwe and Kremer (2006) for an exhaustive review of selected empirical work in developing countries.
to school, thus increasing enrollment and improving accumulated learning overall. OPORTUNIDADES also provides money for improved nutrition conditional on household members obtaining sufficient free preventive care. The final purpose of the program is to build the human capital of young children and thereby break the intergenerational transmission of poverty. However, the new students entering the system because of the reduction in the price of schooling might not be prepared for school and may thus be unable to fully take advantage of new educational opportunities. In addition, they may be entering poorly performing schools. Through increasing schooling opportunities and school quality in the highly marginalized areas where OPORTUNIDADES operates, CONAFE’s compensatory intervention might help solve, at least partly, schooling deficiencies and satisfy the needs of an increasing demand for schooling. Therefore, there are reasons to believe that the marginal effects of each program might be larger in the schools where they coexist.

This paper uses existing data on CONAFE and OPORTUNIDADES to test the existence of synergies between supply- and demand-side interventions in this unique situation. Taking advantage of the considerable overlap over the population both programs are attending, we will estimate the impact of both CONAFE and OPORTUNIDADES on failure, repetition and drop out rates. In particular, we will focus on the impact of those interventions applied from 1998 until 2001 which correspond to the PIARE-8 and Phase I of the PAREIB compensatory programs, and to the starting years of the OPORTUNIDADES intervention. The gradual phasing in of both programs over time allows estimation and identification of the difference-in-difference (triple differences) estimates of the individual (joint) impacts of either (both) programs. Given the design of the CONAFE-supported intervention, targeted at schools in marginalized areas with very poor educational performance, the methodological challenge relies in finding a comparable set of schools that can be used as a valid control group. We will use schools incorporated at later stages of either intervention (from 2002 onwards) as controls and estimate a school fixed effects model to identify impacts. Additionally, we will control for other co-existing educational programs aimed at altering either supply- or demand-related school factors, and will in particular focus on the interaction between CONAFE and OPORTUNIDADES supported interventions. Moreover, we will not only analyze the CONAFE intervention as a whole but we will also separately study the different components for which there is enough data variation; namely,

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4 Section 3 contains a detailed description of the different stages of implementation of both the CONAFE and OPORTUNIDADES interventions.
teacher training, provision of school supplies, and monetary support to parent and teacher associations to be spent on school management (AGEs).

Results show larger effects of demand-oriented interventions on failure and repetition. OPORTUNIDADES scholarship is conditional on school enrollment and on not repeating more than twice a grade. This last requirement might be one of the reasons behind the observed effects. Another mechanism through which OPORTUNIDADES might impact learning outcomes are the improved nutrition and better health practices the program enforces. CONAFE’s positive impact on school quality disappears once we control for the intensity of OPORTUNIDADES treatment (ratio of OPORTUNIDADES beneficiaries to total students in the school) in the estimation. Interestingly enough, if we break up the CONAFE intervention in its different components, the effect of empowering parents’ associations (AGEs) on educational outcomes persists even after controlling for OPORTUNIDADES. This gives suggestive evidence that supply-oriented interventions should be redirected towards decentralizing school management and decision-making to the local level rather than focusing in centralized input provision. Finally, we find no robust evidence of joint effects. We surmise such finding as an inability of the econometric specification to capture super-additive effects given the data available rather than as evidence of no synergies between the two interventions.

The remainder of the paper is organized as follows. Section 2 reviews previous research on international education policies. Section 3 describes the Mexican educational context and provides institutional background on the compensatory programs and the OPORTUNIDADES program. Section 4 discusses the data and develops the identification strategy used in detail. Results and a discussion of potential biases are provided in section 5. Section 6 concludes.

2 International Evidence on Education Interventions

Despite the fact that the positive correlation between economic growth, poverty reduction and education is widely recognized, there is little consensus amongst researchers upon which policy initiatives can most effectively enhance the quantity and quality of schooling.

Hanushek (2003) summarizes econometric evidence from 89 publications in the US up to the mid-1990s that contain 386 separate educational production function estimates. The author shows that in only 14 percent of the studies did the pupil-teacher ratio have a positive significant effect on student performance; teacher’s education in 9 percent; teacher’s salary in 20 percent (and
insignificant in 73 percent of the cases); and facilities in 9 percent of the cases, amongst others policies. Despite the very little evidence that providing higher teacher wages or greater overall spending will lead to improved student performance, he states that “eager to improve quality and unable to do it directly, government policy typically moves to what is thought to be the next best thing – providing added resources to school” (Hanushek 2003: F66). Nonetheless, in the case of developing countries, the author acknowledges a stronger (albeit still poor, in his opinion) support for the effect of schooling input policies on schooling outputs. Hanushek (1995) performed a similar exercise and reviewed the evidence from 96 studies in developing countries. In the developing context, the pupil-teacher ratio showed positive and significant effects (on student performance) in 27 percent of the studies, teacher’s education in 55 percent; teacher’s experience in 35 percent; teacher’s salary in 31 percent of the studies and facilities in 65 percent of them. The author surmises the larger effects in developing countries as supporting evidence to the natural presumption that the importance of resources is likely to vary with its level.

Glewwe and Kremer (2006) suggest that the mixed evidence brought up by Hanushek (1995) should not be taken as conclusive of no systematic relationship between schooling inputs and student performance but rather as a failure to fully identify effects given the data available and/or the methodology employed: “[.] Drawing any definite conclusions from these data is difficult without knowing more precisely what the estimated parameters represent (including whether they are structural production function or reduced form relationships) and what biases may be present in the estimates” (Glewwe and Kremer 2006: pp. 30). In their paper, the authors exhaustively review the empirical evidence on the determinants of learning and the impacts of several policy interventions on both school quality and quantity from the mid-1990s onwards. Two main lessons are to be drawn from their literature review: (i) there is mixed evidence on the effect of different type of school inputs on school participation and learning and (ii) newer approaches to investigating the determinants of student achievement, such as natural experiments and randomized evaluations, give more reliable evidence than standard retrospective evaluation on non-experimental data.

In general lines, the authors classify the vast empirical literature generated during the last decade on impacting educational outcomes as follows: ⁵ (i) evidence coming from policies that consisted primarily of direct changes in educational inputs available in the classroom such as

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⁵ It is beyond the scope of this paper to re-summarize the existing literature. We will instead refer the reader to Glewwe and Kremer (2006).
textbooks (Glewwe et al. 1998), flipcharts (Glewwe et al. 2004) and other physical supplies; repairing and/or building new schools (Drèze and Kingdon 2001; Duflo 2001); or lowering student-teacher ratios (Case and Deaton 1999); (ii) evidence on incentives to attend school given reductions in the cost of education (Schultz 2004) or provision of subsidized meals (Drèze and Kingdon 2001; Vermeersch and Kremer 2004); (iii) evidence from school-based health programs (Miguel and Kremer 2004; Bobonis et al. 2004); (iv) evidence from more fundamental institutional arrangements and reforms: teacher incentives (Lavy 2002; Glewwe et al. 2003), school-based management programs (Jimenez and Sawada 1999), vouchers and school-choice programs (Angrist et al. 2002).

The studies reviewed provide mixed evidence on the extent to which school participation and student academic achievement respond to school quality (input provision, school improvements, etc.). Glewwe et al. (1998) find no effects of randomly providing textbooks on school participation and limited effects on test scores; similarly, Glewwe et al. (2004) find no effect on student learning of the random provision of flip-charts with instructional material. On the other hand, Glewwe et al. (1994) retrospective study in Ghana reports increases in reading and math test scores of around 2 standard deviations after repairing (leaking) classrooms. Introduction of blackboards were found to have effects of similar magnitudes, while adding libraries had smaller effects. Drèze and Kingdon (2001) study in India and Schultz (2004) Mexican study suggest school participation to be fairly responsive to incentives (reductions in the cost of schooling). School health programs also appear as a cost-effective way of increasing the quantity of schooling. The scarce evidence existing on teacher incentives is compatible with the belief that performance incentives cause teachers to teach more to the test (Lavy 2002; Glewwe et al. 2004). Regarding local decentralization of schooling, despite the fact that many observers advocate local communities arguably have the best knowledge about the needs of their children, stronger incentives to monitor teachers and principals, and a comparative advantage in conducting the monitoring, empirical evidence on their impact is almost non-existent. The evaluation of the EDUCO program in El Salvador (Jimenez and Sawada 1999), despite certain identification flaws, is one exception. Under the program, school committees are responsible for teacher hiring and firing, monitoring and equipping and maintaining the school. The authors find a large expansion of education in poor rural areas and reductions in student absenteeism as a result of the intervention. No effects on student achievement were found.
3 The Mexican Context and the Interventions

3.1 Education in Mexico

Mexico ranks as the tenth largest economy in the world and the largest in Latin America. However, Mexico’s education indicators are significantly poorer. The average educational attainment of the Mexican population aged 15 and over is a disappointing 7.2 years, as compared with 7.6 in Chile, Uruguay and Peru; 8.8 in Argentina; and 10 to 12 years for other, more advanced OECD countries. Despite the high enrollment rates for primary education, net enrollment in secondary education is only 58 percent (75 percent in Chile and 79 percent in Argentina). About 52 percent of the adult population in Mexico lacks the minimum basic skills and knowledge required for Mexico to remain a competitive economy (World Bank 2003). However, evidence on returns to education in Mexico indicates that education is a good investment for increasing productivity, particularly for those with lower skill levels (Patrinos and Metzger 2004). Thus, further investments in education will lead to reductions in inequality.

Not surprisingly, in the last decade Mexico has undertaken a large educational reform that began in 1992 with the decentralization of educational services from the federal to the state level, the “National Agreement for the Modernization of Basic Education.” A number of initiatives at the central and state levels were implemented. Reform measures included: (i) a far-reaching curricular reform that fully reorganized the content and materials for basic education; (ii) a federal government effort to provide better and diversified teaching and learning materials at the primary school level: free textbooks, special texts for teachers, large classroom libraries in most schools, and textbooks in indigenous students’ native language. CONAFE was the agency in charge of implementing the provision; (iii) the introduction of information and communication technology in both primary and secondary schools through the use of satellite systems, technology-based teacher-in service training and new computers in schools; (iv) the establishment in 1993 of Carrera Magisterial, a voluntary pay per performance scheme targeted to all educators to stop teacher absenteeism and turnover; (v) legally supported advancement of parental participation in schools; and (vi) the development and establishment of innovative demand- and supply-side interventions to promote rural (and later urban) education. Amongst others, these initiatives included: OPORTUNIDADES in 1997; a program to attend the educational deficiencies faced by the children of migrant agricultural laborers (Programa de Educación Primaria para Niñas y Niños Migrantes, PRONIM); and the creation of the Quality Schools Program (Programa Escuelas de Calidad, PEC) in 2001, a school-based management initiative.
Overall, in 2004, 44 percent of social development expenditures were devoted to education, which represents a 7.1% of GNP (compared to the 6.2% in 2000).

As a result of these efforts, Mexico has made substantial progress in expanding access to primary and secondary education, especially in rural areas and for the poor. The junior high school completion rate, for example, has increased from 55 percent in 1994 to 67 percent in 2002. In rural areas, the net enrollment rate has increased from just 25 percent to 48 percent during the same period of time. Primary education completion rates are very high in all areas and practically universal overall. Moreover, 95 percent of primary school graduates enrolled in junior high in the school year 2003-04. However, investments in secondary education are still low, especially given Mexico’s income level; and more worryingly, primary education is not imparting functional literacy to its graduates (Schmelkes 1997). The consequences of low quality schooling include failure, grade repetition and low learning achievement.

Several international achievement tests show that the quality of education is extremely low indeed. In 1995 Mexico participated in the Trends in International Mathematics and Science Study (TIMSS). Available data shows that student achievement in the Latin American countries participating lags far behind Indonesia, Korea, Hong Kong and Singapore. These poor results are confirmed by Mexico’s participation in the OECD’s first Program for International Student Assessment (PISA) in 2000. PISA provides a measure of reading, mathematics and science achievement for a nationally representative sample, comparable across countries. PISA’s assessment focuses on young people’s ability to apply their knowledge and skills to real-life problems and situations, rather than on how much curriculum-based knowledge they possess. Students from Mexico and other Latin American countries were among the worst performers. Moreover, results from PISA 2003 don’t show any improvement.

Another body of research has focused on the evaluation of some of the specific interventions the Mexican government undertook as part of the educational reform. Evidence is mixed on the effects of teacher training and salary incentives. López-Acevedo (2004) uses 1997 standardized test score data from the Encuesta de Evaluación de Educación Primaria (EEEP) to study the impact of teacher’s enrollment in the Carrera Magisterial. The author finds a positive

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6 Mexico is not lagging significantly behind other Latin American countries – with the exception of Cuba – as data from the UNESCO’s Latin American Laboratory for Educational Quality Assessment, (Laboratorio Latino-Americano de Evaluación de la Calidad de la Educación, OREAL 1998) shows.
effect on 5th grade learning after correcting for teacher selection into the scheme with standard methods. Nevertheless, identification is not clear and the estimated effects, larger for public rural schools, are likely to suffer from serious biases. McEwan and Santibañez (2004) exploit the incentive scheme design and apply differences-in-differences to 1999-2001 Carrera Magisterial administrative data. Using as a counterfactual principals around the promotion cut-off score but with “exogenous” lower (state specific) probabilities of promotion, they find no robust evidence that stronger incentives lead to improved school performance (higher test scores). An IDB report on telesecundaria schools finds they were effective in eliminating the math performance gap with respect to non-telesecundaria students. Effects on increased Spanish performance while modest were also significant (Castro, Wolff and García 2001). Most studies, however, especially more recent ones, find that telesecundarias do not perform very well (see, for example, World Bank 2005). Finally, several studies have also evaluated the effects of the compensatory programs and the OPORTUNIDADES interventions from different perspectives. To our knowledge, however, no study has studied them jointly so far. We summarize these pieces of evidence in the following two sub-sections, after describing each intervention in greater detail.

Despite some incipient improvements, the generally poor results in terms of education quality might be partly explained because the Mexican system continues to be highly centralized at the state level. The Ministry of Education in each state and the teachers’ union mostly control teacher assignments, the curriculum on what is to be taught and the nationally provided materials to be used. There is an overemphasis on memorization and rote learning, and very few resources to implement extracurricular programs or even meet teachers outside of school hours given that in most cases the morning, afternoon and evening shifts are held in one building.

3.2 Mexico’s Compensatory Education Programs

In the early 1990s the National Council of Education Promotion (CONAFE), a division of the Mexican Secretariat of Public Education (SEP), started to implement the Compensatory Programs on behalf of SEP. The Compensatory Education Programs7 aim to increase and improve the supply and quality of education in schools with the lowest educational performance levels in highly disadvantaged communities. They channel extra monetary and in-kind resources

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7 CONAFE also operates a community education program that leads instruction in highly isolated areas with very few children in school age. Given the difficulties in finding teachers willing to teach in these communities, the government allocates “instructors” that have just finished high school to teach in exchange of a grant to continue their studies to tertiary education. Since we only examine the CONAFE-implemented Compensatory Programs, subsequent mention of CONAFE will exclusively refer to the Compensatory Programs, unless otherwise noted.
to the state governments in the poorest areas in order to reach the most disadvantaged students and reduce schooling inequalities. It now serves about four million students in preschool and primary education, and about 300,000 students in *telesecundaria* education, in 44,165 marginalized rural and urban areas (29,534 schools) in all 31 states in Mexico.

Since its beginning, CONAFE has received substantial funding from international agencies to help finance the program. The World Bank’s Basic Education Development Loan (PAREIB, 1998-2006) provides a nominal total of $625 million to support the intervention. Previously, the World Bank had already operated several similar loans between 1991 and 1998 and the Inter-American Development Bank had operated the PIARE intervention (1995-2000). These loans provided a nominal total of nearly two billion dollars between 1991 and 2003. CONAFE’s real costs, despite having grown in the last decade, now cost just over $50 per student per year on average, an extremely low cost compared to a typical cost of $527 per *telesecundaria* student and $477 per general middle school student (Shapiro and Trevino (2004)).

### 3.2.1 Evolution of CONAFE’s Compensatory Programs: Targeting and Phasing In

Since their start in 1991, the Compensatory Programs have substantially evolved and expanded their coverage, both to new geographical areas and to new school levels. In its origins, compensatory education was the key element the Government used to reduce inequality in the education system by channeling more resources to the poorest states. Thus, from 1991-1996, the Program to Abate Educational Lag (*Programa para Abatir el Rezago Educativo*, PARE) operated exclusively in the four states (Oaxaca, Guerrero, Chiapas and Hidalgo) with the highest incidence of poverty. All indigenous and general primary schools in rural localities (less than 2,500 inhabitants) in these states were targeted and progressively incorporated into the program. In 1993, the Program to Abate Basic Education Lag (*Programa para Abatir el Rezago en Educación Básica*, PAREB) included all general and indigenous primary schools in the poorest and educationally worst performing municipalities in the next ten poorest states: Campeche,

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8 Costs are expressed in 2002 $US, using an exchange rate of 9.74 Mexican pesos to $1.
9 CONAFE first used the marginality index constructed by the National Institute of Statistics, Geography and Information Technology (*Instituto Nacional de Estadística, Geografía e Informática*, INEGI). In subsequent program stages, CONAFE used the National Council Population’s (*Consejo Nacional de Población*, CONAPO) marginality index for targeting purposes that is constructed using the principal components method. The variables that make up the index include: literacy rate; percent of dwellings with running water, drainage, and electricity; average occupants per room; percent of dwellings with a dirt floor; and percent of labor force working in the agriculture sector.
10 The education criteria used for selection of municipalities to be attended under the PAREB was the ratio of students completing primary school on time, also called the “terminal efficiency ratio.”
Durango, Guanajuato, Jalisco, Michoacán, Puebla, San Luis Potosí, Tabasco, Veracruz and Yucatán. On that same year, started the Project for the Development of Initial Education (Proyecto para el Desarrollo de la Educación Inicial, PRODEI) to support initial education in the 14 states attended by PAREB. The PRODEI intervention aimed to improve life conditions of 0 to 4 year olds, develop their physical, cognitive and emotional abilities and strengthen parents-children relationships through the distribution of education materials and the introduction of training sessions for parents and educators.

In 1995 the Integrated Program to Abate Educational Lag (Programa Integral para Abatir el Rezago Educativo, PIARE) started operating in order to consolidate and expand the actions enhanced by both initial and basic education compensatory programs. It extended coverage to all indigenous primary schools and general primary schools with first year repetition rates above the state average in the next nine poorest states according to CONAPO’s marginality index (Colima, Chihuahua, México, Nayarit, Querétaro, Quintana Roo, Sinaloa, Sonora y Zacatecas). It also incorporated some additional actions directed to improve CONAFE’s preschool services and rural community education, and to provide literacy teaching beneficiary children’s parents. In 1998, the PIARE was extended to the eight remaining Mexican states (Aguascalientes, Baja California, Baja California Sur, Coahuila, Morelos, Nuevo León, Tamaulipas and Tlaxcala) under what was internally called the PIARE-8. Worst performing schools in the PIARE-8 states were selected according to a targeting index constructed on the basis of: (i) CONAPO’s community marginality index; (ii) teacher-student ratios; (iii) the number of students per school; and (iv) educational outcomes. All general primary schools falling in the third and fourth quartiles of the targeting index were selected as beneficiary schools. As in previous stages, all indigenous primary schools were automatically attended.

Finally, in 1998 and in order to integrate all previous Compensatory Programs and to provide integrated and continuous educational support to all children ages 0 to 14, the Program to Abate Educational Lag in Initial and Basic Education (Programa para Abatir el Rezago Educativo en Educación Inicial y Básica, PAREIB) was established. PAREIB targets for the first time pre-schools, general and technical junior high schools, and \textit{telesecundarias}\textsuperscript{11} enrolling the most disadvantaged students in the country. It also extended its coverage to marginalized semi-

\textsuperscript{11} \textit{Telesecundaria} schools are junior high schools in which a single teacher coordinates and facilitates all subjects in schools in remote communities that receive recorded lectures from Mexico City using a national satellite television system. CONAFE only provides infrastructure support to \textit{telesecundaria} schools.
General primary schools were targeted using the same criteria applied to target PIARE-8 schools. These were also extended to pre-school and junior high schools. Schools offering any form of indigenous or community education was automatically targeted. The PAREIB is the only Compensatory Education Program currently functioning.

3.2.2 Components/Interventions

CONAFE’s compensatory programs do not operate schools, but rather give extra support to all indigenous schools, and targeted primary and secondary schools. By design, the interventions and supports given have varied across school types and along the different program phases. Moreover, the final decision to allocate resources depends on the state government and is based on the school needs and on the availability of resources in each state. As a consequence, there is a substantial variation in the type, number and timing of interventions each attended school receives.

In the school year 1996-97, under the PIARE, the number of interventions was reorganized and reduced to the following: (i) improvement of existing and/or building new school infrastructure and facilities (classrooms, workshop areas, labs, latrines, etc.); (ii) provision of updated audiovisual technology (computers, sound system, TVs, etc.) and equipment (desks, bookcases, etc.) to the school; (iii) provision of learning and other didactic materials for each student (notebooks, pens, pencils, etc.); (iv) professional development and administrative and pedagogical training to all educational staff; (v) performance based monetary incentives to teachers (monitored by parents) and principals in multiple grade schools and in schools with more than six teachers, to reduce the high teacher turnover and absenteeism; (vi) monetary support to school supervisors and improvement of monitoring methods; (vii) institutional strengthening, updating of the informational systems and evaluation planning; and (viii) support to school management (Apoyo a la Gestión Escolar, AGEs) which implies the provision of grants to parents and leaders to be spent on the educational purpose of their choosing, but limited to small civil works and infrastructure improvements, and training to guide them on their spending (Capacitación para el Apoyo a la Gestión Escolar, CAPAGEs). In indigenous schools, CONAFE additionally supports the development of curricula, didactic materials and textbooks for bilingual education, and the development of intercultural education. For telesecundaria education,

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12 Section 4.2 further details the targeting methodology applied to select beneficiary schools.
13 CONAFE is also in charge of the distribution of this package to all OPORTUNIDADES students.
14 Multiple grade schools (multigrado) are schools were one or more grades are taught simultaneously in one same room.
CONAFE is supposed to provide audiovisual materials and infrastructure improvements to all schools. In practice, CONAFE has provided one computer to each of the telesecundaria schools that have so far been supported.

3.2.3 Existing Evidence on CONAFE’s Impact

The evaluation of CONAFE’s Compensatory Program is a competency of the DGE (General Evaluation Direction), a division of the Secretariat of Public Education (SEP) primarily devoted to the evaluation of SEP programs. Results from previous evaluations show a significant impact of CONAFE in lowering the probability that school average repetition rates increase between 1998-99 and 2001-02 in rural primary schools (Benemérita Universidad Autónoma de Puebla (2004)). This cross-sectional study selects a control group from all non-intervened schools, applying the 2002-03 targeting criteria to 1998-99 data. It also finds larger reductions in boys’ repetition rates than girls’.

There has also been a body of external evaluations conducted by the World Bank and other financing institutions. López Acevedo (1999) compares CONAFE (PARE)-supported schools between the school years 1992-93 and 1994-95 with comparable schools in the state of Michoacán that received no CONAFE support during that time. The author found that CONAFE significantly increased Spanish test scores of indigenous (in particular) and other rural students, helping treated students overcome the disadvantaged situation they were in initially. The evaluation concluded that, if implemented correctly, the PARE program could cause indigenous student performance increases of 45 percent to 90 percent, and rural school performance increases of 19 percent to 38 percent. A complementary evaluation by Paqueo and López-Acevedo (2003) studied the differential effects of CONAFE’s PARE intervention on sixth grade Spanish test scores between the poorest and the least poor children in indigenous and rural schools. The authors found that the poorest students in rural areas benefited less from the intervention than the not so poor students. In the sample of indigenous schools the increases in learning outcomes for the poorest students were not statistically significant. These findings raise the question of whether the very poor are able to fully take advantage of the new opportunities made available from school quality improvements or whether their ability is compromised by malnutrition and lack of brain stimulation at early life stages.

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15 They also used comparable students in the non-intervened state of Michoacán as the control group.
More recently, Shapiro and Moreno (2004) conducted an impact evaluation of the PAREIB intervention on Spanish and math test scores at both the primary and junior-high school levels. The authors use propensity score matching techniques on student background data to find valid comparison students. They find that CONAFE is more effective in improving primary school math learning and junior-high school Spanish learning. CONAFE also seems to lower primary school repetition and failure rates. The authors conclude that while CONAFE seems to improve short term educational outcomes the improvement varies by subject of instruction and the demographics of the student taught.

3.3 OPORTUNIDADES

The Mexican Government initiated OPORTUNIDADES (originally called PROGRESA) in 1997. The program was designed to alleviate the immediate needs of poverty and break its intergenerational transmission by inducing parents to invest in the human capital of children. Cash transfers from OPORTUNIDADES are given to the female head of the household, and are conditional on children attending school and family members obtaining sufficient preventive medical care. OPORTUNIDADES is the largest conditional cash transfer program of its kind. It distributed approximately $3 billion to some 5 million beneficiary households in 2004 in both rural and urban areas. The OPORTUNIDADES model has become very popular throughout Latin America and several countries, such as Argentina, Colombia, Honduras, Jamaica and Nicaragua have adopted similar programs.

The cash transfers come every two months in two forms. The first is a transfer conditional on family members obtaining preventive medical care and is intended for families to spend on more and better nutrition. The second type of transfer comes in the form of educational scholarships and is given to each child less than 18 enrolled between the third grade of primary and the third (last) grade of junior high school, conditional on the child attending a minimum number of school days and not repeating a grade more than twice. Starting in 2000, high school scholarships are also granted to all beneficiaries younger than 21 years and enrolled in school.\textsuperscript{16} The educational stipend increases with the grade of the child and is higher for girls than boys during junior high and high school. Beneficiary children also receive money for school supplies once a year, which CONAFE delivers. There is an upper limit in the total transfer amount received per household.

\textsuperscript{16} Scholarships for beneficiaries in upper-secondary school can be received by the youth themselves.
While the program was first introduced in rural areas and specifically granted educational cash transfers to primary and junior high school students, it expanded into urban areas and covered high school students starting in 2001. This study focuses on the effect it might have had on rural primary schools.

3.3.1 National Coverage: Targeting and Program Phasing In

When OPORTUNIDADES was first rolled out in rural areas starting in 1997, program eligibility was determined in two stages (Skoufias et al. 2005). First, the program identified underserved or marginalized communities using a specially constructed “marginality index” based on data from the 1990 Population Census and the 1995 Conteo (small census). Then, OPORTUNIDADES identified low-income households within those communities by using a proxy means test. In order to construct the index, OPORTUNIDADES conducted a socio-economic survey, the Encuesta de Características Socioeconómicas de los Hogares (ENCASEH). Using these data, households in each eligible (marginal) community were classified as eligible for treatment (“poor”) or ineligible (“non-poor”). The original classification scheme designated approximately 52 percent of households as eligible.17

All eligible households living in treatment localities were offered OPORTUNIDADES and almost all (90 percent) enrolled in the program. Once enrolled, households received benefits for a three-year period conditional on meeting the health care and schooling requirements. New households were not able to enroll until the next certification period which began in 2000. This prevented household migration into the communities for OPORTUNIDADES benefits. About 1 percent of households were denied the cash transfer for non-compliance.

For logistical and financial reasons, the program could not cover all eligible households at once. Rather than purposely depriving households of program benefits, OPORTUNIDADES was phased-in over time starting with 6,344 rural localities (300,705 families) in 1997. In 1998, the program was greatly expanded reaching 40,711 rural localities (1,930,032 families) in all but one state. Beneficiary families in urban areas were incorporated starting in 2001, once 65 percent of eligible rural and 40 percent of eligible semi-urban households had already been incorporated. By 2002, 59 percent of the OPORTUNIDADES beneficiary students were enrolled in primary

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17 Later the Government decided that a subset of the “non-poor” households had been unduly excluded from the program, and re-classified households in a process referred to as “densification.” This process added another 21 percent of households to the program (Skoufias et al. 2005).
school, 31 percent were enrolled in junior high school and only 10 percent of them were enrolled in high school. Given that 73 percent of beneficiary families were in rural areas, versus 14 percent in semi-urban and 13 percent in urban areas; in 2002, the majority of beneficiary students were enrolled in rural schools.

3.3.2 The Randomized Experiment

One of the remarkable aspects of OPORTUNIDADES was the desire of the Government to conduct a rigorous evaluation of the program impact. For this reason and due to budgetary and logistical constraints, the government randomized 506 localities deemed eligible in seven states into treatment (60 percent) and control (40 percent) groups. Eligible households in treatment communities began receiving benefits in April 1998, while eligible households in control communities were not incorporated until November 1999. A baseline survey was performed in October 1997 and six follow-up surveys were taken at approximately 6 month intervals. There was an additional follow up survey in November 2003. Many studies on OPORTUNIDADES take advantage of these data. However, there were not enough (non-) OPORTUNIDADES and (non)-CONAFE schools in each cell as would be required for identification in the evaluation sample. For this reason, we will use data on CONAFE and OPORTUNIDADES coverage at the national level.

3.3.3 Existing Evidence on OPORTUNIDADES’ Impact on Education

OPORTUNIDADES has been extensively evaluated by academic collaborators, outside researchers and OPORTUNIDADES staff. The existing impact evaluation on school enrollment and performance mainly uses panel data at the individual (student) level coming from the randomized (rural) sample. It consistently finds significant increases in the enrollment of children, especially girls, at the secondary school level (Parker and Skoufias 2001; Schultz 2004). Behrman et al. (2005) apply a Markov schooling transition model to the experimental data and assess that the program effectively reduces drop-out rates and facilitates progression through grades, particularly during the transition from primary to secondary school. Simulation estimates also find that if children were to participate in the program between the ages of 6 to 14, they would have an average of 0.6 years of extra schooling. Moreover, there would be an increase of 19 percent in the percentage of children attending junior high school.\(^\text{18}\) Coady and Parker (2004)

\(^{18}\) Dubois et al. (2004) find a negative effect in the probability of progressing to a higher grade in junior high school. The authors attribute such finding to the fact eligibility for the educational stipend ends after completion of junior high school.
perform a cost-effectiveness analysis of building junior high schools against the alternative of providing OPORTUNIDADES scholarships to junior high students and find that a demand-side intervention like OPORTUNIDADES is more cost effective (the cost incurred in generating one extra year of schooling is lower) than increasing access through building schools.

Nonetheless, there is no consistent evidence of increases in primary school enrollment rates. This might be possibly explained by the already high pre-intervention enrollment rates, around 90 percent. Nor has OPORTUNIDADES had an impact on the time children spend in school or on assigned homework (Skoufias 2005). Additionally, Behrman et al. (2000) show no significant improvements on students’ achievement after receiving benefits for one and a half school years. The authors attribute the lack of results to data limitations and the short time horizon. Parker et al. (2005) evaluate the long term program impacts (after five and half year of exposure) using difference-in-difference matching comparisons between the original treatments and a new comparison group introduced in 2003. They continue to find positive impacts on grades of schooling attained (around one extra year of schooling for boys and girls ages 9 to 12) but no significant effects on achievement tests. Overall, these results point to the need to address quality issues while expanding access through scholarships.

To our knowledge there is so far a single study that looks at the effects of OPORTUNIDADES on education at the national level.19 Parker (2003) uses OPORTUNIDADES administrative data on program coverage and SEP data on educational outcomes and school characteristics to estimate double difference estimates of the impact of OPORTUNIDADES on enrollment in primary, junior high and high schools in both rural and urban areas over time (from school year 1995-96 until 2001-02). In line with previous research, the author finds significant increases in enrollment to junior high and high school but no effect at the primary school level. These increases are higher for girls than for boys and are higher in rural areas compared to urban and semi-urban areas. Thus, OPORTUNIDADES seems to effectively have an impact on school continuation and the number of education years attained as the short term estimates on the randomized sample predicted. Moreover, the study also shows preliminary evidence on positive effects (i.e., reductions) on drop-out and failure rates for primary school girls.

19 Barham (2005) uses data on the OPORTUNIDADES national coverage to study the impact of the program on child mortality at the municipality level. The study exploits the different dimensions of variation of the OP treatment across municipalities to identify effects. We will partly follow the methodology applied therein and thank the author for useful suggestions.
4 Estimation and Identification

Our objective is to estimate the impacts of increased school quality and capacity (CONAFE intervention) and student targeted school subsidies (OPORTUNIDADES’ scholarships) on intermediate indicators of student performance and school quality, namely failure, repetition and (intra-year) drop out rates\textsuperscript{20}. We specifically focus on the joint impact of CONAFE and OPORTUNIDADES between 1998 and 2001. These years correspond to stages PIARE-8 and PAREIB (Phase I) of the CONAFE intervention, and to the early years of the OPORTUNIDADES program. Section 4.1 lays out the econometric specification; section 4.2 describes the data; in section 4.3, we validate identification.

4.1 Econometric Specification

Let us model the probability that student $i$ in school $s$ at time $t$ attains educational outcome $Y_{ist}$ as a function of: (i) the presence $C_{s,t-1}=1$ of CONAFE support in the school in the previous year; and (ii) benefiting from the OPORTUNIDADES scholarship, $OP_{s,t-1}=1$; given the vector of $j$ individual characteristics, $I_{isjt}$, such as the student’s family background and her ability and skills, and the $k$-th vector of school characteristics, including school quality, $X_{skt}$. More formally,

$$pr(Y_{ist} = Y) = f(C_{s,t-1}, OP_{s,t-1}; I_{isjt}, X_{skt})$$

We consider three different educational outcomes: the probability that the student fails an exam ($F_{ist}=1$), repeats a grade ($R_{ist}=1$) or drops out of school $i$ during the school year $t$ ($D_{ist}=D$). Unfortunately, we do not have individual (student) measures of performance but rather school aggregate measures. Thus, aggregating the student individual probabilities at the school level and normalizing by the number of students in each school, equation (1) re-writes:

$$pr(\bar{Y}_{st}) = f(C_{s,t-1}, OPRatio_{s,t-1}; \bar{I}_{st}, X_{skt})$$

Let $N_{st}$ be the total number of students in school $s$ at time $t$, and $B_{st} \leq N_{st}$ the total number of OPORTUNIDADES’ beneficiaries in the school. Therefore, $\bar{Y}_{st} = \frac{1}{N_{st}} \sum_{i=1}^{N_{st}} Y_{ist}$, represents the school averaged failure rate, repetition rate or drop out rate at $t$; and $OPRatio_{s,t-1} = \frac{1}{N_{st}} \sum_{i=1}^{N_{st}} OP_{i,s,t-1}$, is the ratio of OPORTUNIDADES’ beneficiaries to total students in the school; i.e., a measure of the

\textsuperscript{20} Ideally, we would like to use test score data as a more direct measure of student performance. However, the standardized assessments (Estándares Nacionales) were done on a sample basis representative of all schools (from all geographical and social strata) in Mexico, leaving us with insufficient power to perform the analysis on test score data.
intensity of the OPORTUNIDADES treatment in the school. Analogously, \( T_{oj} = \frac{1}{N_o} \sum_{j=1}^{N_o} I_{oj} \) is the vector of the \( j \) school-averaged student characteristics.

Following from (2) and assuming a linear relationship, we estimate the following equation for all \( t \) in the evaluation period, \( t = 1998-2001 \):\(^{21}\)

\[
Y_{st} = \alpha_s + \eta_t + \sum_{j} \pi_{jt, trend} \cdot CT_{jt} + \sum_{j} \pi_{jt, trend} \cdot OPT_{jt} + \sum_{j} \pi_{jt, trend} \cdot CT_{jt} \cdot OPT_{jt} + \sum_{k=1}^{k=1} \phi_k X_{skt} + \epsilon_{st} \]

where \( \alpha_s \) and \( \eta_t \) are school and time fixed effects. \( \epsilon_{st} \) are state specific time dummies aimed to capture state specific aggregate time effects correlated with schooling outcomes (demographic trends or changes in government). We include separate time trends for potential CONAFE-treatment only schools, potential OPORTUNIDADES-treatment only schools, and both CONAFE and OPORTUNIDADES potential treatment schools to control for the different evolutions treatment and control schools might have experienced over time. \( X_{skt} \) is the vector of time varying school characteristics.\(^ {22}\) It includes: the school student-to-teacher ratio, the average number of students per class (crowding index) and the proportion of teachers under Carrera Magisterial.\(^ {23}\) We compute robust standard errors clustered at the school level to correct for heteroskedasticity and serial correlation. Because of the inclusion of school fixed effects, all time invariant school observed and

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\(^{21}\) We take \( t = 1997 \) as the baseline year. Evaluation years are from school year 1998-99 to 2001-02.

\(^{22}\) Missing values for school regressors have been replaced by the time specific municipality (or state, if the value was still missing) average. Indicator variables have been included to account for the replacement. The School Census 911 also collects data on the number of classrooms, desks, habilitated workshop and lab areas, etc. Unfortunately, these variables didn’t vary enough over time to be included as additional controls.

\(^{23}\) Despite the (lack of) evidence of teacher and principal incentives on student performance in the Mexican context (McEwan and Santibañez 2004), Carrera Magisterial might be a potential determinant of intermediate educational outcomes worth controlling for. We chose to include the proportion of teachers participating per school rather than a participation indicator since participation in the program (albeit voluntary) is almost universal.

\(^{24}\) The interventions might alter the number of kids enrolling in school. If as a consequence the distribution of students’ skills changes in treatment schools (with respect to control schools), then the program impact estimates are likely to be biased. We will explore the existence of this bias in section 5.3.2. Note that given we do not observe student characteristics in the data the characteristics of the average student in the school \( T_{oj} \) are also included in the error term.
unobserved characteristics that could be correlated with both school outcomes and program placement are controlled for.

Depending on the specification, $C_{s,t-1}$ will either be a dummy equal to one if the school receives CONAFE support, or a continuous variable reflecting the number of periods the school has received CONAFE supports continuously. Similarly, in certain specifications the OPORTUNIDADES treatment variable, $OPRatio_{s,t-1}$ (a measure of intensity), will be replaced by a dummy equal to one if 25 percent or more of the students in the school are OPORTUNIDADES beneficiaries. In either case, $\hat{\beta}_1$ and $\hat{\beta}_2$ are the difference-in-difference estimated lagged effects of the presence of CONAFE and (intensity of) OPORTUNIDADES in the school. In particular, they measure changes in school-averaged student performance trends between early intervened schools (treatments) and latter intervened schools (controls). The coefficient on the interaction, $\hat{\beta}_3$, is intended to capture the existence of super-additive effects resulting from both interventions. Notice that we are assuming that both the CONAFE and OPORTUNIDADES supports require some time to be effective. Thus, we take educational outcomes at the end of the school year (at $t$) and run them as a function of the presence in the school of either one or both interventions for, at least, the entire school year; this is to say, starting at $t-1$.

As previously noted, the CONAFE intervention is composed of several different interventions. Not all of them might have the same impact, if any, on educational outcomes. To the extent that there is heterogeneity on the impact of each intervention and enough variation in the number of schools that receive each individual support over time, treating CONAFE as a homogenous package might be misleading. Therefore, in further specifications we will decompose the CONAFE treatment variable in (3), $C_{s,t-1}$, into the three interventions for which we have enough data points over time: monetary support to parents and leaders for school management (AGEs), provision of school and student supplies, and teacher training. In these cases we will control for the reception of other (sporadic) CONAFE supported interventions, namely improvement of existing or building of new facilities, provision of equipment (desks, bookcases, typewriters, etc.) and performance based incentives to teachers.

### 4.2 Data Sources and Sample Sizes

To identify CONAFE and OPORTUNIDADES beneficiary schools we use administrative data on CONAFE coverage from 1991 to 2003 and on OPORTUNIDADES coverage from 1997
to 2003. We use data from the Mexican School Census (*Censo Escolar* 911), an annual listing of background and outcome data for all schools in Mexico to measure failure and repetition. We combine all school data sources at the school level thanks to a unique school identifier code. We also take advantage of the Mexico’s 1990 and 2000 Population Census and the 1995 Conteo to construct socioeconomic locality indicators that will help identify the evaluation sub-sample. This data is combined with the school level data using locality identifier codes.  

This study focuses on the joint impact of CONAFE and OPORTUNIDADES from 1998 to 2001. Therefore, we define the set of CONAFE and/or OPORTUNIDADES treatment schools as the set of schools that started receiving either (or both) intervention(s) between 1998 and 2001, and received it continuously ever since. The comparison group consists of those schools that started receiving CONAFE’s compensatory support and OPORTUNIDADES beneficiary students from 2002 onwards. In some cases and because we only have coverage data until 2003 some of the schools considered might not yet have received treatment. Ideally, this group of control schools would only differ from the group of treatment schools in their treatment status. However, given CONAFE’s phasing-in criteria (CONAFE targeted indigenous schools, and schools in poorer and higher marginalized areas first), this is unlikely to be the case (particularly, if indigenous areas are systematically different from non-indigenous (Ramirez 2006). In order to achieve well-balanced (comparable) samples, we restrict our study to the balanced panel of 5,383 rural non-indigenous primary schools observed continuously between 1995 and 2003. Out of these, 39.55 percent are CONAFE treatment, 83.28 percent are OPORTUNIDADES treatment, and 35.52 percent receive both interventions. For all these schools we know the value of the targeting index computed by CONAFE in 2000. 4,132 of them fall in the third and fourth quartile of the distribution of such index (see Tables 1A and 2B).

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25 For a non-negligible number of localities, locality and municipality codes as registered in the Population Census have changed over time. This prevents following these localities through time. To construct locality level indicators, we take the 2000 Census as the reference year and keep only those localities whose identifying codes have remained the same.

26 Note that while CONAFE’s compensatory support is given to the school, OPORTUNIDADES’ scholarships are given to eligible students. The current analysis is done at the school level. Thus, from here on we will refer to an OPORTUNIDADES (treatment) school as that school with, at least, one OPORTUNIDADES beneficiary student.

27 To allow comparison across outcomes, we analysis sample is restricted to those schools with non-missing observations for any of the dependent variables studied. Results are robust to the inclusion/exclusion of schools with mission information for one or more of the outcomes.

28 Schools with extremely high numbers of students and/or teachers (top 0.5 percent of each distribution) have been dropped out of the sample. The 510 schools that showed a larger number of OPORTUNIDADES beneficiaries than reported students have also been dropped.
The 2000 targeting index was constructed by CONAFE as a tool to select worse performing schools in less marginalized states to be intervened during the PAREIB. It used 2000 Census data on localities and School Census data for the school year 1999-00 on school characteristics (student density, student teacher ratio, etc.) and educational outcomes (failure, repetition and school drop out). The targeting rule applied implied that (i) all rural schools in highly marginalized areas and (ii) all schools falling in the third and fourth quartiles of the targeting index in less marginalized areas, would be selected as CONAFE beneficiaries starting in 2001. As in previous stages of the program, all indigenous primary schools were automatically attended. We basically exploit the index as a way of testing for balance between the constructed treatment and control groups of schools: schools with similar targeting indexes are likely to have similar values of the variables used in its construction. Hence, they are likely to be in similar environments and have similar educational outcomes. Figure 1 shows that the index distributions for treatment and control schools overlap over the entire support.  

Table 2 shows the descriptive statistics for a few school observable characteristics and for the dependent variables in 1997 (baseline). Schools in the sample have, on average, 149 students, 7 classes and between 5 and 6 teachers. OPORTUNIDADES and CONAFE treatment schools have the lowest number of students and teachers on average (94 students and almost 4 teachers). The schools that serve as pure controls, i.e., those that start receiving benefits as of 2002, are clearly larger with 251 students and 8 teachers on average. They also show significantly lower failure and grade repetition rates albeit drop out rates slightly above the average intra year drop out rate for all schools. This might reflect a larger mobility and school turnover in larger towns. Schools in all groups present similar student-to-teacher ratios and class-crowding indexes (students per class).

4.3 Sources of Variation and Balance in Pre-Intervention Trends

We rely on the phasing in of schools into either intervention over space and time to generate sufficient variation in the treatment variables to achieve identification. Tables 3A and 3B

29 See CONAFE (2000) for more details on the weighting of variables and construction of the targeting index. A previous index that used 1995 Census data and 1995-96 School Census data was constructed to target PIARE-8 schools. Unfortunately, we could only find data on this index for urban schools.

30 At first, it might seem surprising the fact that the distribution of treatment schools (targeted at earlier stages because of larger index values; i.e., lower efficiency levels) is more to the left than the distribution of control schools. Recall nonetheless, that this index was computed when most treatment schools had already been under treatment for a year or two, and therefore had had time to improve their educational outcomes with respect to control schools.
show the number of schools that started receiving CONAFE support and/or OPORTUNIDADES beneficiaries by school year. Figure 2 plots the proportion of schools in each treatment group (no treatment, CONAFE treatment only, OPORTUNIDADES treatment only, or both treatments) in each of the years evaluated (1998-2001). Logically, as OPORTUNIDADES starts being phased in 1998 less schools are CONAFE treatments only and the bulk of “both treatment” schools increases. Additional variation comes from the increase in the intensity of treatment within a school; i.e., the number of OPORTUNIDADES beneficiary students in the school $B_s$ that we assume increases as new localities are incorporated into the program.\footnote{The ratio of OPORTUNIDADES beneficiaries to total students could increase or decrease over time depending on the relative frequencies of potential beneficiaries in the community to children effectively enrolling in third grade for the first time (“new coming” beneficiaries) versus children effectively graduating from primary (“exiting” beneficiaries). A school level FE regression assesses it increases over time.} Variation in the timing of first receiving the different CONAFE interventions (AGEs, school supplies and teacher training) also allows independent identification of each intervention (see Figure 3).

However, the existence of a control group (the group of schools receiving benefits from 2002 onwards, in our case) does not imply its validity. Given the non-experimental nature of our data schools with the strongest (weakest) potential for improvement might have been incorporated at earlier stages. Then, our estimates would be overestimating (underestimating) the true program effects. Unbiased identification of the difference-in-difference estimates in this setting heavily hinges on the fact that post-intervention trends between intervened and non-intervened schools would have been identical in the absence of the intervention:

$$E[Y_t - Y_{t-1} | T = 0] = E[Y_{0t} - Y_{0,t-1} | T = 0]$$

(4)

Such an assumption is impossible to test as the counterfactual is never observed. We can nonetheless test whether pre-intervention trends of the educational outcomes under study were similar between the treatment group and the proposed control group. If pre-intervention trends (at $t' < t$) for the outcome measures were not significantly different between treatment and control schools, there is no reason to believe they would be significantly different in the post intervention periods ($t$) were the interventions not in place. Thus the identifying assumption re-writes:

$$E[Y_{1t} - Y_{1,t-1} | T = 0] = E[Y_{0t} - Y_{0,t-1} | T = 0]$$

(4')

We test the validity of (4') for the proposed treatment and control groups by running the following equation on pre-intervention data; i.e., $\forall \ t' = 1995-1997$: 

$$31$$
\[
Y_{st'} = \alpha_s + \sum_{t'} \gamma_{t'} YR_{t'} + \sum_{t'} \delta_{1t'} CT_s * YR_{t'} + \sum_{t'} \delta_{2t'} OPT_s * YR_{t'} + \sum_{t'} \delta_{3t'} CT_s * OPT_s * YR_{t'} + u_{st'}
\]

where \(CT_s\) and \(OPT_s\) are dichotomous variables equal to 1 if the school \(s\) is a potential treatment school; this is to say, if \(s\) will receive CONAFE support \((CT_s = 1)\) or OPORTUNIDADES beneficiary students \((OPT_s = 1)\) for some (or all) of the treatment years \((t = 1998-2001)\). \(YR_{t'}\) are year dummy variables \(\forall t' = 1995-1997\) (pre-intervention years). As before, \(\alpha_s\) are school fixed effects, and \(u_{st'}\) is a heteroskedastic disturbance that allows for correlation within schools over time. If the \(\gamma_{t'}\)’s are not significantly different from zero, then the pre-intervention trends for CONAFE treatment schools \((\gamma_{1t'})\), OPORTUNIDADES treatment schools \((\gamma_{2t'})\) and both treatment schools \((\gamma_{3t'})\) are not significantly different from those of control schools. Tables 4, 5 and 6 report results for failure, grade repetition and intra-year drop out rates pre-intervention trends for the entire sub-sample of schools (“All”) and for schools in the third and forth quartile of the targeting index distribution (“Q34”). Models 1B and 2B include state-time trends as additional controls. Models 2A and 2B disentangle the CONAFE treatment dummy \((CT_s)\) into the 3 different CONAFE interventions under study: AGEs, supply provision and teacher training, to assess the equality in pre-intervention trends for schools receiving each of the interventions.

Let’s focus on the set of regressions under the “Heterogeneous CONAFE Treatment” label for the time being. Overall, Models 1A and 1B for both the “All” and “Q34” sub-samples show no significant differences in pre-intervention trends in failure rates (Table 4), grade repetition rates (Table 5) and drop out rates (Table 6) between control schools and the different treatment schools defined. Nonetheless, potential CONAFE beneficiary schools do present an almost significant larger reduction in failure rates and a significant smaller reduction in drop out rates than pure control schools during the school year 1997-98. Schools that will potentially receive both CONAFE and OPORTUNIDADES treatments present the opposite effects.

By type of CONAFE intervention received, Models 2A and 2B show that AGEs treatment schools have significantly lower failure and grade repetition rates than control schools during the school year 1997-98 (and school year 1996-97 for grade repetition) for both the “All” and “Q34” sub-samples. The interaction with OPORTUNIDADES for these schools is positive and significant. On the other hand, school supplies treatment schools have significantly higher grade repetition rates than control schools during school year 1997-98, the interaction with

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32 “Heterogeneous” CONAFE treatment schools are schools that receive either one of the following CONAFE provided supports: AGEs, supplies and/or teacher training, during the treatment years; as opposed to “homogenous” CONAFE treatment schools which receive all of the above mentioned supports.
portunidades treatment being negative and significant. No significant differences in drop out pre-intervention trends are observed when we decompose CONAFE treatment by intervention (Table 6).

One can also test the equality in pre-intervention trends between schools that entered the program in different years. In this case, the equation to estimate on pre-intervention data is:

\[
Y_{st'} = \alpha_s + \sum_{t'} \gamma_{t'} YR_{t'} + \sum_{t'} \sum_j \lambda_{1t} CIN_{sj} \times YR_{t'} + \sum_{t'} \sum_j \lambda_{2t} OPIN_{sj} \times YR_{t'} +
\]

\[
+ \sum_{t'} \sum_j \lambda_{3t} CIN_{sj} \times OPIN_{sj} \times YR_{t'} + \nu_{st'}
\]  

(6)

where \(CIN_{sj}\) and \(OPIN_{sj}\) are two sets of dummies that take on the value 1 if the school \(s\) was phased in CONAFE and OPORTUNIDADES, respectively, on year \(j=1998-2001\). The coefficients on the interaction with the year dummies, the \(\lambda_{1t}, \lambda_{2t}\)'s, capture differences in pre-intervention trends for schools entering either or both programs in different years. Results for the sub-samples of “All” and “Q34” schools are reported in Tables 7 and 8. Table 7 shows results on the CONAFE package dummy; in Table 8 different sets of dummies account for the year schools start receiving each of the different CONAFE supports. Schools that start to receive CONAFE benefits in the school year 2001-02 show significantly lower drop out rates during school year 1996-97 (Table 7). By type of CONAFE intervention received, results show that schools receiving teacher training support for the first time in 2000-01 (and 1998-99) show larger failure (and drop out) rates in years 1996-97 (and 1997-98). This would imply and underestimate of the treatment effect for this group. There are some other almost significant differences we do not discuss here as they are barely significant and follow no consistent pattern.

Although pre-intervention trends look well-balanced overall, results by intervention suggest that endogenous program placement bias might come into play. Indeed, better performing schools in school year 1996-97 seem to be getting the AGEs support earlier (i.e., before 2002). If these schools have more motivated teachers and students living in families where education is perceived as a priority, and we plausibly assume these characteristics to be positively correlated with the outcomes, then estimates on the AGEs treatment are likely to overestimate the true impact. We informally tackle this issue by working with the sub-sample of schools that receive a “homogenous CONAFE treatment”. Under such definition a school is a CONAFE treatment school if it receives, at least, all the three supports we are concerned about, AGES and supplies and teacher training, between 1998 and 2000. If schools receiving all supports are better performing schools with a larger potential for improvement, then estimates on this sub-sample of
schools should be larger. The comparison between the two set of estimates will help set limits on the endogenous program placement bias, if existing.\textsuperscript{33}

Within the restricted sample of schools receiving the “homogeneous” CONAFE treatment, pre-intervention trends between treatment and control schools are balanced (see Table 6). Table 8, however, shows that schools that start receiving school supplies and OPORTUNIDADES treatments or teacher training and OPORTUNIDADES in school year 2000-01 present significantly different pre-intervention trends in all of the different outcomes measured during school year 1996-97 and 1997-98. Given the relatively low number of schools starting to receive these benefits during the school year 2000-01 (see Figure 3), these differences might be driven by a few outlier schools. In light of these results, treatment and control schools seem to have been experiencing similar evolutions in their educational outcomes before the interventions. They are therefore likely to have had similar patterns in their absence.

Identification also relies in the inclusion of school fixed effects that control for biases due to differences in time-invariant variables across schools. In addition, the state-time dummies are meant to capture state-specific aggregate time effects that might be correlated with schooling outcomes: changes in demographic trends in the state that might affect enrollment; or changes in the state government characteristics, for example, shifts in tastes and priorities about education that might alter the allocation of resources. Treatment specific time trends are included to capture the different evolutions of the various treatment and control schools might have experienced over time. In the same spirit, we also use as many school varying characteristics we are able to construct as controls. Although there are not many, it seems plausible to assume that schools do not change substantially in the span of 5 years. The estimate of the treatment effect will be unbiased as long as there are no unobserved time-varying characteristics or trends correlated with the treatment variables. We discuss potential biases in Section 5.3.

\textsuperscript{33} Alternatively we could control for the program phase-in rule as a way of minimizing the potential for endogenous program placement. The many deficiencies associated with it dissuade us from doing so. First, the targeting rule is computed at one point in time. We could construct a time-varying targeting index applying the formula to different years. However, we would need to generate time variation to some variables by extrapolation which might add measurement errors to the data. Second and more importantly, the targeting rule for primary schools is not unique. According to CONAFE, schools that were to be phased in under earlier stages (PAREB, PIARE) will continue to respond to the criteria associated with those stages, even if they start receiving benefits at later years. Since we are unable to perfectly assign -given the data available, the correct rule to each school, we chose not to control for specific targeting rule. In any case, the targeting rule does not determine when schools receive a particular CONAFE intervention.
5 Results on Failure, Repetition and Drop Out Rates

5.1 Graphical Evidence

Given the multiplicity of interventions that might be in place in one same school, although not necessarily simultaneously, and the variation in the intensity of the different treatments over time, it is difficult to show each of the individual (by intervention) treatment effects plus the joint treatment effect graphically. Even so, graphs can provide suggestive evidence. Figures 4, 5 and 6 present the evolution of failure, grade repetition and intra-year drop out rates over time. For each set of graphs, the first row plots the mean of the dependent variable at the end of each school year for the “All” and “Q34” sub-samples of CONAFE (“heterogeneous”) treatment and CONAFE control schools. Similarly, charts in the second row plot mean failure, repetition and drop out rates, respectively, for OPORTUNIDADES treatment and OPORTUNIDADES control schools. The vertical line at 1997 marks the beginning of the intervention period.34

As the descriptive statistics showed (Table 2), failure and grade repetition rates are higher for the group of treated schools. Intra-year drop out rates, however, are lower amongst treatment schools all the way through. From school year 2000-01 on failure and repetition rates for CONAFE treatment schools fall below those of CONAFE control schools. Although the difference is not significant it shows some trend towards minimizing the gap between compensated and non-compensated schools.35 In fact, this tendency towards convergence in failure and repetition is common to all graphs; either because of the larger drop in failure and grade repetition rates CONAFE treated schools experience, or because of the more moderate increase in failure and repetition rates in OPORTUNIDADES treated schools. Pre-intervention trends are rather parallel which graphically supports the validity of the identification strategy.36

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34 The intervention period starts in 1998. However, by construction failure and repetition are measured at the end of the school year. Thus, the average failure plotted in \( t = 1998 \) corresponds to the average failure at the end of the school year 1998-99, once the program has already been in place for an entire school year had it started at the beginning of the school year. Hence, the vertical line separating pre- and post-intervention trends is drawn at \( t - 1 = 1997 \) to graphically depict the school year difference we allow for the intervention to be effective.

35 To avoid overloading the graph with too many lines, confidence intervals are not depicted.

36 Since we cannot capture all the different treatment dimensions, the evidence depicted in these graphs is only partial and has to be seen accordingly. Treated schools are not necessarily CONAFE-treated only or OPORTUNIDADES-treated only. Although many receive both treatments simultaneously, the graphs here are “dissecting” each treatment independently, thus not accounting for the potential interaction effects. These graphs do not take into consideration the differences in phase-in timing across schools either.
5.2 Average Treatment Effects

Tables 9, 10 and 11 present estimates of the treatment effects in (3) for failure, grade repletion and intra-year drop out rates. The first eight columns in each table show the estimates on “All” schools; the second eight columns replicate the exercise on the “Q34” sub-sample. Whereas in Panel A, the CONAFE intervention is treated as a package, the set of regressions in Panel B disentangle the CONAFE treatment dummy \((CT)\) into the 3 different CONAFE interventions under study: AGEs, supply provision and teacher training. In all cases, we start estimating a modified version of equation (3) where each intervention is estimated separately. We also allow for different versions of the treatment variable. All results in these tables refer to the “heterogeneous” CONAFE treatment variable.

Results consistently show a significant effect of OPORTUNIDADES in reducing failure, grade repetition and drop out, regardless of the measure of the intensity of OPORTUNIDADES used and whether the CONAFE intervention is controlled for. On the other hand, when measured as a whole, the CONAFE intervention does not seem to have much of an effect on the outcomes measured. The only effects observer are a reduction on drop out rates at the 10 percent (Panels A, Table 11, Models 5 and 6) given CONAFE treatment; and significantly larger reductions in failure rates for schools that have been under the CONAFE scheme for longer (Panels A, Table 9, Models 2). Note that the effect tends to disappear as we control for the OPORTUNIDADES intervention (Panels A, Table 9, Models 7).

Such pattern changes when we break down the CONAFE treatment into the three main interventions it is composed by. Panels B of Tables 9, 10 and 11 show that, were it significant alone, the AGEs effect is likely to persist even after the introduction of OPORTUNIDADES. The number of periods the school receives school supplies also help reduce failure and repetition, and the effect persists even after controlling for OPORTUNIDADES, which could potentially be read as it takes time for quality inputs to take effect. Conflictingly, the larger the number of periods teachers in the school receive training, the larger is the increase in failure and repetition rates although only for schools receiving CONAFE only. This finding might be driven by a few outlier schools as: (i) there are very few schools receiving teacher training and no OPORTUNIDADES, and (ii) for schools that receive both OPORTUNIDADES and teacher training the interaction is negative and significant.
In general the interaction effects are not significant leading to a rejection of complementarities between interventions. One remarkable exception is the increase (!) in dropout rates in schools receiving CONAFE supports and OPORTUNIDADES students (Table 11, Panel A).

5.3 Potential Biases

5.3.1 Endogenous Program Placement Bias

Biases due to program placement might arise if the state authority decides to allocate programs in certain schools non-randomly in response to budgetary or other political considerations. There is enough variation in the time schools first receive different benefits in the data to raise such concern. Moreover, it is common practice amongst state governments to assign benefits to more marginalized schools given resource constraints. In this case, our estimates would be downward biased. We argue that the inclusion of state specific trends capture state specific aggregate time effects (shifts in tastes, changes in the allocation of resources) thus minimizing the potential for such bias.

It could also be that program placement responds to some specific characteristics of the school correlated with school performance. If we are willing to assume these characteristics to be time invariant, then the inclusion of school fixed effects in the analysis would correct for the bias. To examine this issue further we replicate the analysis on the sub-sample of schools receiving a “homogeneous” treatment effect, this is the sub-sample of schools receiving AGEs and supplies and teacher training between 1998 and 2001. Thus, the comparison group is now composed by “pure” control schools, in the sense that schools in the control group do not receive any of these supports until 2002 or after. Because the control group is now “clean” of any intervention, one would expect larger effects of treatment on this restricted sample of schools; and even more so, if one were to argue that better performing schools with higher potential to improve their students’ performance are fully treated first, then the estimated average treatment effects should be larger for this restricted sample of schools. Indeed, results in tables 12 and 13 show that estimates on the AGEs and the school supplies coefficients are around twice the size of those found on the unrestricted sub-sample (tables 9 and 10), which is suggestive of better schools being intervened first. This raises the natural concern that the identified effect on AGEs may disappear over time as worse performing schools (less motivated, etc.) join the program. Probably in anticipation of such a pattern CONAFE already started introducing, since 2003, a new support called CAPAGEs.
(Capacitación para el Apoyo a la Gestión Escolar) aimed at providing guidance on the administration of the monetary resources provided by the AGEs support.

**AGEs: A Qualitative Assessment**

How strong are the AGEs in reality and how well can we ascribe the positive benefits documented so strongly here? In an attempt to further justify the importance of AGEs, qualitative work was undertaken, consisting of discussions with parents, teachers and school directors of beneficiary and non-beneficiary schools in the Mexican state of Campeche (see Annex 1). The qualitative assessment was instructive. Through discussions with the school community, but mostly with parents, it became apparent just what the main benefits of the AGEs are. In terms of economic and financial benefits, parents argued that the AGEs financial support helped to reduce the household burden associated with sending their children to school. The implication was that with the AGEs their children’s school attendance increases and their school work improves. They also argued that the AGEs help improve school maintenance (which is one of the main goals) and that there are more school supplies. In other words, the AGEs allow parents to buy materials and improve school infrastructure. The connection to the positive results reported here could be that AGEs help create a better learning environment, thus improving outcomes, which in turn induces higher school attendance. In addition, there were arguments that the AGEs help motivate the teacher.

Another set of arguments from the parents focused on participation and other social aspects. That is, parents expressed the view that the AGEs helped generate significantly higher levels of school participation and communication – both among parents, and with teachers and school directors. In other words, the AGEs helped catalyze parental organizations, make them more formal and allowing them to function better. There was also the aspect that the AGEs improve school climate. This is believed to further foster parental involvement in the school, as well as at home with their children’s school work. Many parents believe that the AGEs put pressure on school directors and teachers to help their children. Moreover, the AGEs, it is believed, may help reduce absenteeism among teachers.

Both sets of arguments are plausible explanations for how AGEs improve schooling outcomes. However, reduced household financial burden is also a product of OPORTUNIDADES, which operates in most schools were compensatory education is present. Therefore, there is probably more weight behind participation as the answer, especially as it
improves relations between parents and teachers, and improves the school climate. There may also be less teacher absenteeism as a result of these better relations, social pressure and economic incentives for teacher and directors to benefit from the AGEs resources. However, independent data on teacher absences is not available in Mexico.

5.3.2 Changes in the Distribution of Students in the School

The error term in $\varepsilon_{st}$ in (3) includes unobserved student characteristics ($\theta_{ist} =$ skills, ability, motivation) that have so far been assumed uncorrelated with the observed treatment variables. However, treatment might affect the individual decision of enrolling in school, thus changing the total number of students attending school. Assume, for instance, that through equipping schools, training teachers and providing more inputs, CONAFE-supported schools attract higher skill students. Alternatively, through reducing the opportunity cost of schooling, OPORTUNIDADES might be attracting lower skill (or less motivated) students with an opportunity cost of schooling large enough to not attend school without the subsidy. In either situation, if changes in total enrollment significantly alter the distribution of student’s skills in the school, then treatment is correlated with unobserved ability and so the estimated average treatment effect is likely to be biased. In other words, if the interventions affect the individual probability of enrolling in school, $N_{st} = f(C_{st-1}, OP_{st-1})$ and the skills of the marginal student attracted are different from the average pre-intervention distribution of skills in the school, $\theta_{ist} \neq \theta_{st} = \frac{1}{N_{st}} \sum_{i=1}^{N} \theta_{ist}$, then changes in the school aggregate failure or repetition rate might not only come from changes in existing students’ individual performance (changes in the numerator) but also from changes in the distribution of students, which is affected by the total number of students (changes in the denominator). In other words, now $\text{pr}(\overline{Y}_{st}) = f(C_{s,t-1}, OP_{st-1}, \theta_{ist}, N_{ir}(C_{s,t-1}, OP_{s,t-1}); \overline{X}_{jt}, X_{st})$. If better students are attracted, our estimates of the treatment effect are upward biased; contrarily, if worse performing students are now enrolling in school, our estimates are likely to be downward biased.

Although it is difficult to determine the direction of the bias, we can at least test for its existence by examining changes in enrollment in response to treatment. Figure 7 plots total enrollment over time for the different treatments (CONAFE and OPORTUNIDADES) and sub-samples studied (“All” and “Q34”). As it can be observed, enrollment remains rather constant through time. We test for the existence of enrollment effects more formally by re-running
equation (3) on total enrollment, after checking for the equality in pre-intervention trends. Table 15 shows results on the pre-intervention trends. For the sample of “heterogeneous” CONAFE treatment schools, total enrollment trends are well-balanced between treatment and controls once we introduce the state-specific time dummies that are very likely controlling for changes in state demographic trends over time. Unfortunately, under the restricted definition of “homogeneous” CONAFE treatment, CONAFE schools present reductions in the total number of students of the order of 5 to 10 students less than control schools before the intervention. These larger reductions are significant at the 5 percent and are not wiped out after the introduction of the various controls. Given that the post intervention estimated effects are likely to be biased for the “homogeneous” CONAFE treatment sample, we will focus on results on the heterogeneous sample, which pass the equality of intervention trends identifying assumption.

Overall, results in Table 16 show that CONAFE is not significantly affecting total enrollment in the schools it is intervening. Contrarily, estimates show faster reductions (a little over 1 student more) in the number of students enrolled in schools with a concentration of OPORTUNIDADES students over the 25% of the total school population. Thus, more OPORTUNIDADES students in the school seem to be related to larger reductions in the total number of students enrolled; phenomena that could be read as a crowding out effect. In any case, the size of the effect of around one student difference is small enough to consider the potential for bias negligible. We therefore consider that the composition of students and consequently student’s skills in the school are unlikely to have been modified as a result of the different interventions.

5.3.3 Spillover Effects

The OPORTUNIDADES treatment effect might be overestimated because of the impossibility to exclude non-beneficiary students from the school. If there are positive spillovers between OPORTUNIDADES beneficiary and non-beneficiary students, then school aggregate reductions in failure and repetition rates respond to both the treatment effect on the treated (beneficiary) students but also to the spillover effects on their peers.

37 We slightly modify equation (3’) and replace the OPORTUNIDADES ratio variable (dependent on total enrollment) by two different indicator variables, depending on the specification, that take on the value of 1 if there is at least one OPORTUNIDADES student in the school or if more than 25% of the students are beneficiaries.
Spillover effects could also exist across schools in the same locality or geographical area. The most likely channel through which this could happen are changes in the individual enrollment decision. Students might be more attracted by improved CONAFE supported schools where supplies are freely provided. Although plausible, we do not consider this factor a major concern: first, because there is not much room left for choice of the school in the rural marginalized areas studied here where access to a school is not necessarily guaranteed; second, as we have proved in the previous section, there are no changes in total enrollment between treated and non-treated schools.

6 Conclusions

Supply-side interventions attempt to improve the infrastructure in order to improve the quality of education. Demand-side interventions attempt to provide incentives for poor parents to keep their children in school longer and engage in other activities bolstering human capital accumulation. We find larger effects from OPORTUNIDADES on schooling outcomes. Part of this may be due to the conditionality effect, another part due to the nutritional component of the program. Although OPORTUNIDADES is conditional on attendance, it does have some performance components. For example, students that repeat the same grade more than twice lose eligibility as beneficiaries. Furthermore, the subsidy (beca) increases as the student progresses to higher grades. It is noteworthy that the larger effects of OPORTUNIDADES are on dropout rates. Therefore, OPORTUNIDADES is good at keeping students in school. Part of the OPORTUNIDADES effect on grade repetition and failure could also be explained through changes in attendance. Perhaps OPORTUNIDADES beneficiaries now attend more school (or attend school for more hours), and therefore learn more just because they spend more hours in school.

Compensatory education as a package appears to have no impact once one controls for OPORTUNIDADES. However, if we break up the compensatory intervention into its multiple components, (monetary) empowering parent associations (AGEs) seems to have a substantial effect in improving outcomes. This could be evidence of the positive effects of decentralizing education to the lower levels (education in Mexico already decentralized to the state level, which may be to high a level of decentralization), and an argument for deeper or local decentralization.
It is interesting that this evaluation did not find evidence of joint effects. This should not be interpreted as evidence that there are no synergies between compensatory education and OPORTUNIDADES, but rather as the inability to capture super-additive effects.

Giving more inputs to schools does not seem to have the desired or expected effect. Otherwise the other components of the compensatory program are simply equalizing learning opportunities. That is, the compensatory program was designed in order to achieve a sort of minimum standards for schools in very disadvantaged areas. Also, and very importantly, the other inputs may have more impact on learning outcomes, something we were not able to evaluate because of the unavailability of data. A rather technical explanation could be that it is complicated to econometrically capture the effect of certain inputs (for example, the effect of a chair on test scores).

Moreover, as it has been pointed out in the literature, the socioeconomic, cultural and family backgrounds exert a very strong influence in the perception and (good) use of education. Results found go along these lines. That is, increasing the demand for education by either reducing its cost (OPORTUNIDADES scholarship) or by involving parents in the school decision-making process (AGEs support) seem to have a larger effect on children’s learning.

The AGEs are a very cost effective intervention. While the unit cost of the compensatory education program overall is $50, the AGEs are a much less costly component. Parents at each participating school receive between $500 and $700 a year depending on school size. There are over 45,000 schools and over 4.5 million students participating in the AGEs. The total cost of the AGE school grants is about $26 million a year; for 4.4 million students this comes to $5.86 per student annually. Oportunidades, which is also very effective and has other important benefits, pays students at the primary school level between $100 and $200 depending on which school grade they attend.

Mexico’s AGE substantially improve schooling outcomes. The strong and significant effects persist even after controlling for Oportunidades, suggesting that decentralizing decisions over education to local levels can have positive impacts on outcomes. Also, given the low cost of AGEs, pouring more resources into schools may not be necessary to improve outcomes if parental participation exists and is strong. The results suggest that it may be wise to increase
decision-making power to local levels and schools; and increase parental participation at schools. All this will improve the school climate.
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