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Empowering parents to improve education: Evidence from rural Mexico ☆

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ABSTRACT

We examine a very inexpensive program in Mexico that involves parents directly in the management of schools located in disadvantaged rural communities. The program, known as AGE, finances parent associations and motivates parental participation by involving them in the management of primary school grants. We find that AGE reduced grade failure by 7.4% and grade repetition by 5.5% in grades 1 through 3. However, while AGE was effective in poor communities, it had no effect in extremely poor communities.

1. Introduction

Improving school performance, especially in poor communities, remains a challenge facing most countries (Filmer et al., 2006). One policy being examined by many developing countries is school based-management (SBM), which decentralizes responsibility and decision-making powers to local school management committees (Barrera et al., 2009). SBM takes on many different forms, both in terms of who has the power to make decisions as well as the degree of decision-making. While some programs transfer authority to principals or teachers only, others mandate parental and community participation.[1] SBM devolves authority over one or more of the following: budget allocation, employment and remuneration of teachers and staff, curriculum development, textbook and educational material procurement, infrastructure improvement, school calendar, and monitoring and evaluation of teacher and student performance.

One of the primary reasons proponents support SBM is that decentralizing decision-making to the local level is thought to bring decision-making closer to the people so that their preferences can be better reflected in policy (Besley and Coate, 2003; Besley and Ghatak, 2003; Hanushek and Woessmann, 2007; Lockwood, 2002; Oates, 1972). The argument is that local decision-makers are better able to adapt the appropriate mix of inputs and education policies to local preferences, realities, and needs; and are more accountable to their constituencies. However, decentralized decision-making policies such as SBM may not improve school quality (Galiani et al., 2008) when parents lack the ability to make their voices heard, when local elites can capture public resources (Bardhan and Mookherjee, 2005, 2006), or when SBM groups are less technically able than higher levels of government to administer schools (Smith, 1985).

One implication of this debate is that SBM may lead to an increase in inequality. Since there is typically variation in the characteristics of local populations along many dimensions, one would expect a

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[1] Parental participation in SBM has long been popular in the United States, the United Kingdom, Australia and Canada, and is currently being implemented in a number of countries, including Hong Kong (China), El Salvador, Indonesia, Kenya, Mexico and Nepal.

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heterogeneous response to SBM. Specifically, in those areas with populations that have the ability and enough stature to voice and defend their preferences, SBM should improve the provision and benefits from public services. Conversely, SBM might not help in those areas with populations that lack the ability and stature to voice their preferences. Since these areas are likely to be poor, SBM may increase the inequality in school, thereby leaving the poor further behind.

In this paper, we empirically examine a program that includes parents in school management, albeit in a limited way. Parents, especially of younger children, are the principal clients of schools. They represent the interests of their children and, therefore, have the most to gain from better school performance. Participation in management committees provides parents a mechanism for them to assert their preferences over the school's operational decisions and policies, and make schools more accountable. Their participation allows them to directly monitor principal and teacher effort, as well as overall school performance, and provides a feedback mechanism for them to voice any concerns. Making schools directly accountable to their clients is the primary intervention to improve school quality recommended by the World Bank's 2004 *World Development Report* (World Bank, 2004).

Specifically, we study the impact of an effort to increase parental participation in school management in rural Mexico. In 1992, Mexico decentralized educational services from the federal to the state level. The federal government complemented school decentralization with the Compensatory Program, which was designed to equalize resources and educational standards across all schools with a focus on disadvantaged rural and indigenous schools. The program included a SBM component — the Support to School Management or AGE (*Apoyo a la Gestión Escolar*). AGE provides small monetary grants to parent associations that they can use to invest in infrastructure or in materials they deem important for their schools. Parents also receive training in the management of these funds and in participatory skills to increase their involvement in school activities. Through AGE, parents spend more time in the school and enjoy a more regular interaction and greater standing with school directors and teachers. As a result, they are better able to monitor school activities (such as teacher absenteeism and children attention in class) and to voice their opinions. AGE was the first program that gave parents any authority over school matters in Mexico.[2] By 2005, more than 46% of primary schools in Mexico had an AGE.

We examine the impact of the AGE on intermediate school quality indicators — grade failure, grade repetition and intra-year dropout rates. These measures are important as they are correlated with long term-academic achievement and early school dropout, with repeaters falling further behind their peers in the later years (Berlinski et al., 2008; Jimerson, 2001; Manacorda, 2012 and Marshall, 2003). We exploit the gradual phasing-in of the AGE intervention over time to identify difference-in-difference estimates of average treatment effects.

We find that AGE decreased the proportion of students failing by 5.4% and repeating a grade in the school by 4%. We also find larger impacts during the first three grades of primary school, where failure and repetition are also more frequent. For these grades, we observe a 7.4% decrease in grade failure and a 5.5% decrease in grade repetition. Finally, there appears to be no effect of AGE in the poorest communities in which parents may not have the ability to voice their preferences to schools.

This study contributes to a small literature on SBM in developing countries.[3] Several studies rely on cross-sectional variation, ex-post propensity score matching and exclusion restrictions – either using functional forms or weak instrumental variables – thus leaving their ability to establish causality open to question.[4] There are a few notable exceptions. Murnane et al. (2006) and Shapiro and Skoufias (2005) use difference-in-differences models to estimate the impact of Mexico's PEC on dropout, repetition and failure rates. Duflo et al. (2011) use experimental data to evaluate the effects of empowering local school committees to monitor and train teachers combined with contract teacher hiring in primary schools in Kenya. They show that combining class size reduction with improved incentives – by either hiring contract teachers (as opposed to civil servants) or increasing parental oversight – leads to significantly larger test scores.

The remainder of the paper is organized as follows. The next section describes the AGE intervention in greater detail and posits the pathways whereby AGE might affect parental participation using information from qualitative interviews. Section 3 describes the data used and our outcomes of interest. In Section 4 we discuss the identification strategy and present quantitative evidence of the effects of AGE on intermediate learning outcomes. A discussion of potential biases is provided in Section 5. Section 6 concludes.

2. The AGE program

AGE is part of a broader school reform designed to improve the supply and quality of education in schools in highly disadvantaged communities. The Compensatory Program consists of infrastructure improvement, provision of school equipment, provision of materials for students (notebooks, pens, etc.), pedagogical training, performance based monetary incentives for teachers, and AGE. However, not all of the sub-interventions were introduced at the same time and not all of the schools received all of the sub-interventions.

The Compensatory Program progressively expanded from more to less disadvantaged areas. Between 1992 and 1995, the program was introduced in the poorest municipalities of the poorest 23 states, as defined according to the 'marginality' index developed by the National Population Council or CONAPO (*Consejo Nacional de Población*). Coverage was extended to disadvantaged schools in the eight remaining Mexican states in 1998. These states have lower poverty rates and better educational outcomes than the states incorporated earlier. The worst performing schools in these states were targeted using an index based on CONAPO's community 'marginality' index, teacher–student ratios, the number of students per school, and repetition and failure rates.[5] Each state then decided which sub-interventions would be allocated to each school based on their budget and logistic capacity. In our analysis, we use data from schools incorporated starting in 1998.

AGE as a sub-intervention was first introduced in the 1996–97 school year. AGE finances and supports the schools' parent association. The monetary support varies from $500 to $700 per year depending on school size. The use of funds is restricted and subject to annual financial audits for a random sample of schools. Among other things, the parents are not allowed to spend money on wages and salaries for teachers. Most of the money goes to infrastructure improvements and small civil works. In return, parents must commit to greater involvement in school activities, participate in the infrastructure works, and attend training sessions delivered by state educational authorities. In these sessions, parents receive instruction in the management of the funds and in participatory skills to increase their involvement in the school. Parents also receive information on the school, on the role of the schools' parent association, on

[2] In 2001, the federal government launched a broader SBM intervention, the Quality Schools Program or PEC (*Programa Escuelas de Calidad*).

[3] Summers and Johnson (1996) review the evidence on the effects of SBM in the United States.

[4] See for example the works of Jiménez and Sawada (1999, 2003) on El Salvador's EDUCO; DiGropello and Marshall (2005) on the effects of the Honduras PROHECO program; King and Ozler (1998), King et al. (1999) and Parker (2005) on Nicaragua's Autonomous School program; or López-Calva and Espinosa (2006) on the impacts of AGE as well as the other Compensatory Program components on test scores.

[5] CONAFE (2000) provides specific details on the weighting of variables to construct this index.

their children's educational achievements, and advice on how to help their children learn.

While parent associations exist by law, they are rather dysfunctional and typically have little or no access to schools. AGE creates both a need and a right for parents to have access to schools to decide on the allocation of the grant, manage the funds (establish a feasible budget, record expenses, etc.), and participate in infrastructure works directly. Hence, the AGE represent the first time that parents are granted full access to the schools and are given certain – albeit limited – authority over school matters. We argue that this is likely to change parental attitudes toward schooling, attitudes of school directors and teachers toward parents, and overall improve school climate. Because parents now spend time in the school, they are better able to monitor school activities (teacher absenteeism, quality of the teaching, children's attention levels, etc.) and gather information about school performance. Parents are also better able to voice their opinion over general resource allocation and school policy.

In order to substantiate the plausibility of these arguments, we carried out a structured survey of school directors' perceptions in 115 randomly selected AGE schools in the states of Campeche, Guerrero, Michoacán, Sinaloa and Tamaulipas. The survey confirmed the perception that the AGE led to an increase in parental participation in school matters. In fact, *all* school principals believed that this was the case. When asked about the most important change induced by parental participation, all principals reported positive changes in at least one area: 40% reported increased parental concern about their children's academic performance; another 30% reported increased parental interest in the school overall; and a final 30% reported increased interaction between parents and teachers.

A majority of principals reported increases in parental interest in the work of teachers. More than 80%, for example, reported that parents complained if teachers were absent. Principals also expressed the view that AGE changed parental attitudes toward their children's performance in school, with 53% reporting that parents now helped their children with their homework and monitored that it was done more than before the introduction of AGE in the school. Another 42% of the principals reported that parents would now go more often to the school to follow up on their children's learning.

We also conducted a series of focus groups with parents in three AGE and three non-AGE schools in five communities in the Mexican state of Campeche.[6,7] In the focus groups, parents expressed the view that the AGE had helped generate and facilitate dialog between parents, teachers and school directors. Parents in AGE beneficiary schools were pleased with the fact that they were better able to meet with their child's teacher and to follow their child's progress more closely. They reported that teachers instructed them on how to improve their child's performance which, they believed, fostered their involvement in school and with their children's education. Parents also perceived that AGE had a positive impact on teacher effort. When asked what impacts they had noticed, parents commented on the fact that teachers stayed longer hours in schools to help students who were falling behind academically.

Overall, both parents and principals agreed that AGE increased parental participation in school, made parents more demanding in terms of attention to their children's learning needs and teacher effort, and increased parental involvement with homework. In the following section we test if, as a result, AGE improved intermediate schooling outcomes and provide an estimate of the size of the impact.

[6] See Patrinos (2006) for full details.

[7] These findings are in line with previous evidence in the state of Tabasco that AGE increased parental participation in school activities, improved parent–teacher relations, and reduced teacher absences (World Bank, 2000).

3. Data

We use data from a variety of sources, including administrative data from the Compensatory Program from 1991 to 2003 to identify which schools received the AGE and which received any of the other Compensatory Program interventions. Data on school performance and characteristics comes from the Mexican School Census (*Censo Escolar* or *Estadística 911*). We also use administrative data on other school interventions from the Secretariat of Public Education. Finally, we draw on the 1990 and 2000 Population Census and the 1995 mid-term census (*Conteo*) to construct socioeconomic locality indicators that will help us identify the evaluation sub-sample, as well as a community marginality index that the Government uses to classify communities by socio-economic status.

3.1. Analysis sample

As argued earlier, we exploit the geographic expansion of AGE over time to construct treatment and comparison groups. Our sample of analysis consists of non-indigenous primary schools in rural areas that did not enroll in the Compensatory Program – and hence did not have AGE – before school year 1998–99 and for which the targeting index is known.[8] We define the set of AGE treatment schools as the set of schools that first received AGE at the beginning of any school year between 1998–99 and 2001–02. Those that had not received AGE before school year 2002–03 constitute the comparison group. Hence we take school year 1997–98 as the baseline year.[9]

We limit the sample to schools that did not have AGE at all or those that once in the program received the AGE support continuously thereafter. Since, as we discuss later, we employ a difference in differences estimation strategy, we seek to avoid incorrectly interpreting changes in outcomes of treatment schools that received benefits intermittently as changes in outcomes of the comparison (reference) group. This implies dropping 13.2% of our estimation sample and 1.8% of treatment schools. While estimation results for the models presented below are robust to the inclusion of these schools in the analysis, the treatment and comparison schools in the unrestricted sample are less well balanced.

Our final sample consists of a balanced panel of 5028 rural non-indigenous primary schools that we observe continuously between 1995 and 2003. Of these, 40% become AGE beneficiaries over the evaluation period (school years 1998–99 to 2001–02) and hence constitute our treatment group.[10]

3.2. School performance measures

We measure school performance using the grade failure rate, grade repetition rate and intra-year dropout rate. Our unit of observation is the school-grade-year level. Specifically, we define the grade g failure rate in school year t as the proportion of students who failed grade g over the existing number of students enrolled in grade g at the end of the school year. The grade g repetition rate at t is defined as the proportion of students repeating grade g at the beginning of school year $t+1$ over the total enrolled in grade g at $t+1$. Finally, we compute the grade g intra-year dropout rate in school year t as 1 minus the ratio of existing

[8] This effectively limits the sample to rural non-indigenous primary schools because the vast majority of AGE beneficiary schools are in rural areas and because all indigenous schools were automatically incorporated when AGE first started in 1998 in these states.

[9] Because we only have AGE coverage data until 2003, we do not know whether schools in the comparison group received AGE at later dates.

[10] To allow comparison across outcomes, we restrict the sample to schools with complete information on all outcomes of interest, which we describe in the next sub-section. However, results are robust to the inclusion of schools with missing information for one or more of the outcomes. Moreover, we drop from the sample schools with values of the dependent variables in the top 0.5% of each distribution, as well as schools with extremely high numbers of students and teachers (top 0.5%).

students in grade *g* at the end of the school year *t* over the total enrolled in grade g at the beginning of school year *t*.[11]

Even if not as sensitive as test scores, these measures are important as they are correlated with long-term problems in terms of academic achievement. Repeating students tend to fall further behind their peers in later years, which in turn increases the risk of early school dropout (see for example, Berlinski et al., 2008; Jimerson, 2001; Manacorda, 2012 and Marshall, 2003).

By definition, grade failure and grade repetition measure very similar outcomes and thus provide a robustness test for each other. Nonetheless, there are at least four reasons that can explain differences in their values. First, they are constructed using measurements collected at different points in time. Second, repetition may sometimes be caused by family reasons. For example, household poverty may force a student to temporarily drop out of school. In many cases, the student is forced to repeat the last grade undertaken when she returns to school. Third, repetition may at times occur when students fail to pass external examinations, as opposed to internal school exams – though this is not a problem in Mexico. Lastly, the repetition rate is likely to be a more noisy measure of school performance than the failure rate as it can include repeating students that failed grade *g* in a different school.

In general terms, administrative data on failure, repetition and dropout in developing countries is less reliable than desired. There are concerns of possible misreporting in cases where these data are used to allocate resources or evaluate individual school performance and the reporting is poorly monitored by the education agencies (Shastry and Linden, 2008). There is less concern in this context. While the Mexican Government allocated these resources in part based on past performance, the timing was such that they used information from a period before schools knew about the program and then the Government never updated the targeting criteria with new data. Moreover, this process was made clear in the rules of operation. However, there are concerns that administrators may not put substantial effort into the accuracy of the reports, suggesting room for measurement error. This type of error tends to attenuate results, implying that our estimates are likely to be lower bound estimates of the effect of AGE on school performance.

3.3. Baseline characteristics

Table 1 shows summary statistics for the dependent variables and a few other school observable characteristics in 1997 (baseline) for AGE treatment and comparison schools. In 1997 treatment schools had slightly higher average failure and repetition rates, although lower intra-year dropout rates than did control schools. However, these averages mask some baseline differences across the grades. Treatment schools start out with lower grade failure rates than control schools in the early grades, but this pattern switches in the later grades. Treatment and control schools have the same repetition rates in grade 1, while treatment schools have higher repetition rates in the higher grades. Finally, treatment schools have lower dropout rates in the early grades, but this difference narrows in the older grades.

An interesting fact from Table 1 is that the failure and repetition rates, as well as the inter-year drop-out rate, are highest in the earlier grades and decline after that. In grades 1 and 2, the failure and repetition rates are almost 15%. They progressively decrease thereafter to values of 6 and 5% in grade 5 for failure and repetition, respectively. By grade 6, these rates are surprisingly low, at less than 1%. The proportion of dropout also decreases as students progress through primary school, although in a less dramatic fashion. Intra-year dropout rate attains its highest value in grade 1 and the lowest in grade 6.

One likely reason for the decline in these rates over the grades is selection; that is, poorly performing students either dropout or are held back to improve their performance. As a result, the quality-mix of students increases in higher grades due to selection. We also suspect that low repetition and failure rates in grade 6 might reflect a tendency to pass all students enrolled in the last grade of primary and have them graduate. Because the disproportionately low failure and repetition rates in grade 6 and because they may not be representative of the underlying (true) performance of sixth grade students, we exclude this grade from the analysis.

In addition, while treatment schools were smaller than comparison schools in terms of number of students, they had similar student-to-teacher ratios and class crowding indexes on average. On average, treatment schools have teachers with less education, as well as less teachers enrolled in *Carrera Magisterial*, a pay per performance teacher incentives scheme. Nonetheless, treatment schools did benefit more from other public educational interventions such as the conditional cash transfer program *Oportunidades*, and the other Compensatory Program sub-interventions such as the "school supplies" support and the "teacher training" support.

Finally, treatment schools tend to be in poor, but not the poorest communities as defined by the Government's marginality index.[12] This index is constructed using Census (or *Conteo*) information on community-aggregate household socio-economic information (proportion of households with electricity, drainage, piped water in the house, number of rooms, household size, etc.) and other locality information (population size, employment rates, illiteracy rates, etc.). The Government uses this index to classify communities into 5 categories of socio-economic status or marginality with values 1 (very low marginality or very high SES) to 5 (very high marginality or very low SES). AGE schools are more prevalent in medium to high marginality areas (marginality levels 3 and 4), but less present in the most disadvantaged communities (marginality level 5).

4. Did AGE reduce grade repetition, grade failure and dropout?

We estimate the effects of AGE on the three educational outcomes described above: the proportion of students that fail an exam, repeat a grade, or dropout of school.[13] In principle, we would like to compare school performance when schools have an AGE to the counterfactual — that is, quality for the same schools without an AGE at the same time. Since the counterfactual is never observed and we do not have a controlled randomized trial, we are forced to turn to quasi-experimental methods that mimic the counterfactual under reasonable conditions.

4.1. Identification and estimation

We use the phased rollout of the AGE intervention to identify treatment and comparison groups, with the treatment group being schools getting AGE early – between school years 1998–99 and 2001–02 – and the comparison group being those who got AGE later, starting in school year 2002–03. A major concern is that the late adopters could be different from the early adopters, and that

[11] We do not consider inter-year dropout as an additional school performance (quality) measure as we are not able to distinguish between school dropout and migration.

[12] The marginality information is available at the locality marginality level for 3307 schools, or about 66% of the schools in the sample. We replace missing values of the locality marginality index with the municipality average and account for the replacement in the regressions with a dummy. Note that a municipality is an administrative region larger than a community; that is to say, a group of communities.

[13] Since 1998, the National Standards (*Estándares Nacionales*) – later replaced by the Exams for Educational Quality and Achievement or EXCALE (*Exámenes para la Calidad y el Logro Educativos*) – collected test score data on a nation-wide representative sample of schools. Unfortunately, there is very little overlap between this sample and our sample. As a consequence, it is not possible to estimate robust effects of AGE on test scores on the sample and the evaluation period considered.

Table 1
Descriptive statistics by treatment status.

	AGE treatment schools ($N=2013$)		AGE comparison schools ($N=3015$)		t-stat
	Mean	SD	Mean	SD	
Dependent variables at baseline (1997)					
Failure rate grade 1	0.148	(0.118)	0.156	(0.108)	−2.298
Failure rate grade 2	0.144	(0.113)	0.144	(0.100)	0.008
Failure rate grade 3	0.113	(0.104)	0.108	(0.092)	1.816
Failure rate grade 4	0.090	(0.104)	0.084	(0.085)	2.125
Failure rate grade 5	0.064	(0.091)	0.057	(0.075)	2.702
Failure rate grade 6	0.009	(0.038)	0.007	(0.029)	1.970
Average failure rate (grades 1 to 6)	0.095	(0.056)	0.093	(0.048)	1.334
Average failure rate (grades 1 to 5)	0.112	(0.066)	0.110	(0.056)	1.143
Repetition rate grade 1	0.148	(0.122)	0.148	(0.109)	−0.117
Repetition rate grade 2	0.142	(0.115)	0.137	(0.101)	1.735
Repetition rate grade 3	0.105	(0.105)	0.098	(0.088)	2.431
Repetition rate grade 4	0.084	(0.101)	0.075	(0.081)	3.329
Repetition rate grade 5	0.053	(0.084)	0.047	(0.067)	2.650
Repetition rate grade 6	0.008	(0.035)	0.006	(0.025)	2.038
Average repetition rate (grades 1 to 6)	0.090	(0.054)	0.085	(0.044)	3.293
Average repetition rate (grades 1 to 5)	0.106	(0.064)	0.101	(0.052)	3.145
Intra-year dropout rate grade 1	0.051	(0.077)	0.061	(0.073)	−4.606
Intra-year dropout rate grade 2	0.035	(0.062)	0.042	(0.056)	−3.736
Intra-year dropout rate grade 3	0.034	(0.063)	0.039	(0.055)	−2.656
Intra-year dropout rate grade 4	0.033	(0.064)	0.038	(0.059)	−2.805
Intra-year dropout rate grade 5	0.034	(0.067)	0.037	(0.058)	−1.796
Intra-year dropout rate grade 6	0.027	(0.062)	0.024	(0.047)	1.796
Average intra-year dropout rate (grades 1 to 6)	0.036	(0.043)	0.040	(0.039)	−3.684
Average intra-year dropout rate (grades 1 to 5)	0.038	(0.046)	0.043	(0.042)	−4.546
School characteristics at baseline (1997)					
Total student enrollment	104.204	(69.338)	173.530	(114.255)	−26.750
Student-to-teacher ratio	26.452	(7.368)	27.171	(7.336)	−3.397
Class crowding index	24.614	(8.298)	26.314	(8.404)	−7.084
Proportion lower educated teachers (basic education teaching studies)	0.514	(0.349)	0.482	(0.307)	3.313
Proportion higher educated teachers (college education)	0.300	(0.329)	0.357	(0.311)	−6.105
Other interventions over treatment period (1998–2001)					
Proportion of teachers in *Carrera Magisterial*	0.502	(0.359)	0.558	(0.331)	−6.345
Proportion of *Oportunidades* students in the school	0.322	(0.213)	0.201	(0.218)	21.976
Other Compensatory Program sub-interventions over treatment period (1998–2001)					
Proportion of schools with school supplies support	0.414	(0.493)	0.023	(0.150)	43.631
Proportion of schools with teacher training support	0.186	(0.389)	0.012	(0.107)	26.699
Proportion of schools with infrastructure support	0.033	(0.180)	0.006	(0.077)	11.753
Proportion of schools with equipment support	0.010	(0.100)	0.003	(0.054)	5.820
Proportion of schools with teacher incentives support	0.005	(0.069)	0.000	(0.018)	4.942
Proportion of schools by marginality level (1997)					
Low marginality level (levels 1 and 2)	0.061	(0.240)	0.116	(0.321)	−7.770
Medium marginality level (level 3)	0.219	(0.413)	0.190	(0.392)	2.752
High marginality level (level 4)	0.353	(0.478)	0.286	(0.452)	5.669
Very high marginality level (level 5)	0.367	(0.482)	0.408	(0.491)	−3.293

AGE treatment schools are schools that receive the Apoyo a la Gestión Escolar (AGE) continuously starting in 1998 (or later) until 2001. Schools with extremely high values of the dependent variables, teachers and students (top 0.5% of each distribution by grade) have been dropped. Sample restricted to schools with complete information on all dependent variables. Locality marginality level as defined by CONAPO using 1995 Census (Conteo de Población) data.

these differences may be correlated with school performance. For example, Table 1 shows that the schools that received AGE early are, on average, located in slightly poorer rural areas (areas with marginality levels 3 and 4) than schools that received AGE later. In this case, the correlation between AGE and performance could be confounded with the wealth effect. Alternatively, it could be that schools with the strongest potential for improvement – schools with more engaged parents and motivated school staff – were incorporated at earlier stages. If so, our estimate of treatment would overestimate the true effect of the program.

In principle, many of the types of (unobservable) characteristics that may confound identification vary across schools, but are fixed over time. A common method of controlling for time invariant unobserved heterogeneity is to use panel data and estimate difference-in-differences models. We use this identification strategy, and hence, compare the change in outcomes in the treatment group to the change in outcomes in the comparison group. By comparing changes, we control for observed and unobserved time-invariant school characteristics as well as time-varying factors common to both comparison and treatment schools that might be simultaneously correlated with AGE and with indicators of performance. The change in the comparison group is an estimate of the true counterfactual — that is, what would have happened to the treatment group if there were no intervention. Another way to state this is that the change in outcomes in the treatment group controls for fixed characteristics and the change in outcomes in the comparison group controls for time-

varying factors that are common to both comparison and treatment schools.

Formally, we estimate the following regression specification of the difference-in-difference model for all $t = 1997–2001$:[14]

$$Y_{gst} = \alpha_s + \gamma_g + \eta_t + \xi_{lt} + \sum_t \pi_t trend_t * Ever\ AGE_s + \beta_1 AGE_{s,t-1} + \sum_{k=2}^{K} \beta_k X_{skt} + \bar{\varepsilon}_{gst} \quad (1)$$

where:

- Y_{gst} is the proportion of students in school s that fail, repeat or drop-out of grade g at the end of school year t;
- $AGE_{s,t-1} = 1$ if school s had an AGE immediately before the start of school year t (at $t-1$), and 0 otherwise;
- α_s are school fixed effects;
- γ_g are grade dummies;
- η_t are time dummies;
- ξ_{lt} are State (l) by year (t) fixed effects introduced to capture state specific aggregate time effects (state demographic trends, changes in state education policies, changes in state economic conditions, for example) that are correlated with schooling outcomes;
- $trend_t * EverAGE_s$ is a time trend specific to potential AGE treatment schools. It attempts to control for the possibility that the performance of AGE treatment and comparison schools may have secular trends over time. Note that $EverAGE_s$ is a dichotomous indicator equal to 1 if school s receives AGE for some or all of the treatment years (potential AGE treatment school).
- X_{skt} is a vector of time varying school characteristics that includes controls for the presence of other educational interventions coexisting in the school (see Section 4.2.4 for more details).[15]
- $\bar{\varepsilon}_{gst} = \frac{1}{N_{gst}} \sum_{i=1}^{N} \varepsilon_{igst}$ is the school average of individual error terms, which includes unobserved individual characteristics such as learning ability or disutility from studying. For the time being, we assume that unobservables are uncorrelated with the explanatory variables.

We estimate Eq. (1) using OLS and compute robust standard errors clustered at the school level to correct for heteroskedasticity (within grades in a school) and serial correlation (across grades in one school over time). The coefficient $\hat{\beta}_1$ is the difference-in-difference estimate of the effect of the presence of AGE in the school on the outcome of interest. The specification in Eq. (1) assumes that the AGE requires at least a full school year to be effective — namely, we regress outcome measures at the end of the school year (at t) as a function of having received AGE since at least right before the start of the school year (at $t-1$).

4.2. Results

Estimates of the effect of AGE on the measures of school performance are presented in Table 2. All estimated models include grade, school and state specific year fixed effects, and a treatment specific time trend. Each observation represents a school grade in a school year. There are a total of five grades – from grade 1 to grade 5 – and five school years, from school year 1997–98 (baseline year) to school year 2001–02.

4.2.1. Average treatment effects

For each dependent variable (reported in columns), the first column (Models A) in Table 2 provides the results for the base model specification in Eq. (1). The results show that AGE is associated with improved grade failure and repetition. Specifically, there is a significant 0.6 percentage point reduction in grade failure and a 0.4 percentage point reduction in grade repetition in AGE treatment schools. Given a mean baseline failure of 11% and a mean baseline repetition rate of 10%, these values imply a 5.5% decrease in the proportion of students failing a grade – averaged across grades 1 to 5 – in treatment schools and a 4% decrease in that of students repeating a grade. However, AGE seems to have no impact on the intra-year dropout rate.

As a matter of fact, the effect of AGE on intra-year dropout rates is not statistically significant in this or any of the specifications below. This is not too surprising given that enrolment and completion rates at the primary school level are very high in rural Mexico – at over 96% – hence leaving little scope for improvement.

4.2.2. Heterogeneity by grade

In a second specification, we interact the AGE dummy ($AGE_{s,t-1}$) with the grade dummies (γ_g) to investigate whether and to what extent there is heterogeneity in the impact of AGE across grades. The results, in Models B in Table 2, show that the effect of AGE on reducing grade failure and repetition is concentrated in the first three years of primary school, where the rates are higher. Specifically, we observe a significant 1 percentage point reduction, on average, in grades 1 to 3 in the failure rate and a 0.7 percentage point reduction in the grades 1 to 3 repetition rate. Given the average mean baseline failure and repetition rates for grades 1 to 3 in comparison schools reported in Table 1, these figures imply a 7.4% decrease in grade failure and a 5.5% decrease in grade repetition.[16] AGE does not have a statistically significant impact on outcomes in the later grades.

4.2.3. Length of exposure

We next investigate whether the effects of AGE are immediate or take time to affect outcomes. To do so, we disaggregate the AGE indicator variable by grade into two dummies: one for the first year on the program, and the second, for two or more years. The results reported in columns C of Table 2 show that the impact of AGE on the first three years of primary school is already achieved in the first year of benefits, and that impacts do not change with more years on the program. Indeed, we cannot statistically reject the hypothesis that the impact of AGE on outcomes in grades 1 to 3 is the same for schools that have received benefits for one year and for schools that have received benefits for more than one year (p-values of 0.52 for grade failure and 0.92 for grade repetition).

4.2.4. Other schooling programs

A major threat to the validity of our identification strategy is that there may have been other time varying changes that are correlated with the timing of the introduction of AGE and with school performance. While the inclusion of state specific time dummies captures changes in school policy and other environmental factors between states over time, there may have been other factors that changed within states over time that might be correlated both with the rollout of AGE within states and with school performance.

The most likely sources are other Government programs designed to improve school performance. In a final specification, reported in Models D in Table 2, we include explicit controls for the three other major demand-side and supply-side oriented educational interventions that were introduced around the same time as AGE. This addresses the concern of whether part of the observed effects are driven by other policies also directed at improving schooling quality and accessibility that are simultaneously operating in the school.

First, we control for the share of students whose families were beneficiaries of *Oportunidades*, Mexico's conditional cash transfer

[14] We take school year 1997–98 as the baseline year. Evaluation years are from 1998–99 to 2001–02.

[15] We have replaced missing values of these variables (less than 0.25% of the observations) with the municipality average during the school year (or the state average in its default). We have included indicator variables to account for the replacement.

[16] The test of equality of the AGE coefficients on grade 1 and grades 2 and 3 cannot be rejected for grade failure at the .05 significance level.

Table 2
Effect of AGE on school educational outcomes.

	Failure rate				Repetition rate				Intra-year dropout rate			
	Model A	Model B	Model C	Model D	Model A	Model B	Model C	Model D	Model A	Model B	Model C	Model D
AGE = 1	−0.006**				−0.004*				0.001			
	(0.002)				(0.002)				(0.002)			
AGE* ∗ Grades 1 and 2 and 3 = 1		−0.010**				−0.007**				0.000		
		(0.002)				(0.002)				(0.002)		
AGE* ∗ Grades 4 and 5 = 1		0.001				0.002				0.003		
		(0.002)				(0.002)				(0.002)		
AGE received during 1 year* ∗ Grades 1 and 2 and 3 = 1 (1)			−0.009**	−0.010**			−0.007**	−0.007**			0.000	0.000
			(0.002)	(0.002)			(0.002)	(0.002)			(0.002)	(0.002)
AGE received over 1 year* ∗ Grades 1 and 2 and 3–1 (2)			−0.011**	−0.011**			−0.007*	−0.007*			−0.000	−0.001
			(0.003)	(0.003)			(0.003)	(0.003)			(0.002)	(0.002)
AGE received during 1 year* ∗ Grades 4 and 5 = 1 (3)			−0.000	−0.000			0.001	0.001			0.003	0.003
			(0.002)	(0.002)			(0.002)	(0.002)			(0.002)	(0.002)
AGE received over 1 year* ∗ Grades 4 and 5 = 1 (4)			0.001	0.001			0.003	0.003			0.002	0.002
			(0.003)	(0.003)			(0.003)	(0.003)			(0.002)	(0.002)
Other interventions												
Proportion of *Oportunidades* students in the school				−0.007*				−0.005				−0.014**
				(0.003)				(0.003)				(0.002)
Proportion of teachers under *Carrera Magisterial*				−0.005**				−0.004*				0.000
				(0.002)				(0.002)				(0.002)
Other Compensatory Program Sub-interventions												
Infrastructure = 1				0.001				0.003				0.002
				(0.003)				(0.003)				(0.003)
Equipment = 1				0.005				0.003				0.002
				(0.006)				(0.006)				(0.005)
Incentives = 1				−0.000				0.006				0.010
				(0.009)				(0.007)				(0.011)
Student supplies = 1				−0.001				−0.002				−0.003
				(0.002)				(0.002)				(0.002)
Training = 1				0.002				0.003				0.004
				(0.002)				(0.002)				(0.002)
School fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grade dummies and year dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State by year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Treatment specific time trends	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Prob>F-stat (1) = (2)	–	–	0.52	0.53	–	–	0.92	0.92	–	–	0.72	0.75
Prob>F-stat (3) = (4)	–	–	0.93	0.93	–	–	0.66	0.68	–	–	0.26	0.33
Mean dependent variable in 1997 (baseline)	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.04	0.04	0.04	0.04

Number of schools: 5028; number of observations: 125700. Robust SE clustered at the school level in parentheses.
* Significant at 5%.
** Significant at 1%.

Table 3
Effects of AGE on school educational outcomes by locality marginality level.

		Failure rate		Repetition rate		Intra-year dropout rate	
AGE * marginality level 1 and 2 (low)* * Grades 1 and 2 and 3 = 1	(1)	−0.010*		−0.013**		0.001	
		(0.005)		(0.005)		(0.005)	
AGE * marginality level 3 (medium)* * Grades 1 and 2 and 3 = 1	(2)	−0.011**		−0.007*		0.003	
		(0.003)		(0.003)		(0.002)	
AGE * marginality level 4 (high)* * Grades 1 and 2 and 3 = 1	(3)	−0.013**		−0.010**		0.000	
		(0.003)		(0.003)		(0.002)	
AGE * marginality levels 1 to 4* * Grades 1 and 2 and 3 = 1	(4)		−0.012**		−0.009**		0.001
			(0.002)		(0.002)		(0.002)
AGE * marginality level 5 (very high)* * Grades 1 and 2 and 3 = 1	(5)	−0.006	−0.006	−0.004	−0.004	−0.001	−0.001
		(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
AGE * marginality levels 1 and 2 (low)* * Grades 4 and 5 = 1	(6)	0.010*		0.008		−0.001	
		(0.005)		(0.005)		(0.005)	
AGE * marginality level 3 (medium)* * Grades 4 and 5 = 1	(7)	0.005		0.006		0.002	
		(0.003)		(0.003)		(0.003)	
AGE * marginality level 4 (high)* * Grades 4 and 5 = 1	(8)	−0.002		−0.000		0.004	
		(0.003)		(0.003)		(0.002)	
AGE * marginality levels 1 to 4* * Grades 4 and 5 = 1	(9)		0.001		0.003		0.003
			(0.003)		(0.003)		(0.002)
AGE * marginality level 5 (very high)* * Grades 4 and 5 = 1	(10)	0.003	0.003	0.002	0.002	0.002	0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
School fixed effects		Y	Y	Y	Y	Y	Y
Grade dummies and year dummies		Y	Y	Y	Y	Y	Y
State by year fixed effects		Y	Y	Y	Y	Y	Y
Treatment specific time trends		Y	Y	Y	Y	Y	Y
Prob>F-stat (1) = (2) = (3)		0.87	–	0.47	–	0.68	–
Prob>F-stat (6) = (7) = (8)		0.02	–	0.10	–	0.54	–
Prob>F-stat (4) = (5)		–	0.06	–	0.10	–	0.18
Prob>F-stat (9) = (10)		–	0.69	–	0.82	–	0.82
Mean dependent variable in 1997 (baseline)		0.11	0.11	0.10	0.10	0.04	0.04

Number of schools: 4814; number of observations: 120350. Locality marginality level as defined by CONAPO using 1995 Census (Conteo de Población) data. Robust SE clustered at the school level in parentheses.
* Significant at 5%.
** Significant at 1%.

Table 4
Differences in pre-intervention trends (1995 to 1997) between intervened and non-intervened schools.

		Failure rate		Repetition rate		Dropout rate	
		Model A	Model B	Model A	Model B	Model A	Model B
Ever AGE * Year 1996 = 1	(1)	0.005*		0.002		0.002	
		(0.002)		(0.002)		(0.002)	
Ever AGE * Year 1997 = 1	(2)	0.001		−0.001		0.001	
		(0.003)		(0.003)		(0.002)	
Ever AGE * Year 1996* * Grades 1 and 2 and 3 = 1	(3)		0.004		0.001		0.000
			(0.003)		(0.003)		(0.002)
Ever AGE * Year 1996* * Grades 4 & 5 = 1	(4)		0.008**		0.004		0.004
			(0.003)		(0.003)		(0.002)
Ever AGE * Year 1997* * Grades 1 and 2 and 3 = 1	(5)		−0.003		−0.003		−0.001
			(0.003)		(0.003)		(0.002)
Ever AGE * Year 1997* * Grades 4 and 5 = 1	(6)		0.006		0.002		0.004
			(0.003)		(0.003)		(0.002)
School fixed effects		Y	Y	Y	Y	Y	Y
Grade dummies and year dummies		Y	Y	Y	Y	Y	Y
State by year fixed effects		Y	Y	Y	Y	Y	Y
Prob>F-stat joint significance (1) = (2) = 0		0.05	–	0.30	–	0.66	–
Prob>F-stat joint significance (3) to (6) = 0		–	0.00	–	0.11	–	0.00
Mean dependent variable		0.11	0.11	0.10	0.10	0.04	0.04

Number of schools: 5028; number of observations: 75420. Robust SE clustered at the school level in parentheses.
* Significant at 5%.
** Significant at 1%.

program. Cash transfers are disbursed conditional on school-aged children attending school and on household members engaging in a set of behaviors designed to improve health and nutrition. Second, we include the proportion of teachers under *Carrera Magisterial*, a voluntary pay per performance scheme targeted to all educators. Principals and teachers are eligible for permanent wage increases if they perform well in an assessment process based on their education and experience and on their school performance (student and teacher test scores).[17] Finally, we control for the presence of other (sporadic) interventions supported by the Compensatory Program in the school: provision of didactic supplies and school equipment, infrastructure building and maintenance, teacher training and performance based incentives to teachers.

The estimated effects of AGE on average repetition and failure are unaffected by controlling for the other school programs and remain positive and statistically significantly different from zero. We observe that both the proportion of teachers under *Carrera Magisterial* and the proportion of *Oportunidades* beneficiary students in the school is negatively associated with repetition and failure. The later effect might be due to the fact that the *Oportunidades* scholarships increase with the grade of enrolment, and are conditional on attendance as well as on not repeating more than twice a grade. *Oportunidades* may also impact learning outcomes through the improved nutrition and health practices it enforces (reduced morbidity). This is consistent with the growing literature that establishes strong positive effects of health on school performance (Bobonis et al., 2006; Miguel and Kremer, 2004). Lastly, the other Compensatory Program sub-interventions seem to have no impact.

4.2.5. Poverty

Finally, we investigate whether the effect of AGE is different in poorer versus less poor communities. The hypothesis is that parents in poorer communities may have less ability and stature to identify school problems and convince school directors and teachers to make productive changes. Here we interact AGE with CONAPO's 1995 marginality level aggregated at the locality level. As described earlier, this index takes values 1 (very low) to 5 (very high).

The results reported in Table 3 show that AGE had a significant effect on failure and repetition for grades 1 to 3 in schools located in communities with marginality levels 1–4, but had no impact in the poorest communities with a marginality level of 5. Hence, while AGE appears to be associated with an improvement in school performance in the less poor communities, it has no impact in extremely poor communities where parents are less likely to have the ability and/or stature to influence school performance.

5. Threats to identification

The use of difference-in-differences controls for observed and unobserved time-invariant school characteristics as well as time-varying factors common to both comparison and treatment schools that might be simultaneously correlated with AGE and with indicators of performance. The difference-in-difference estimator uses the change in the comparison group as an estimate of the true counterfactual — that is, what would have happened to the treatment group if there were no intervention. The key identifying assumption is that the change in the comparison group is an unbiased estimate of the counterfactual. However, there are a number of situations under which this assumption would not be true.

As discussed above, there may have been relevant policy or environmental changes that are different in the treatment areas than in comparison areas. We controlled for state level time series changes by including state-year fixed effects. And we also controlled explicitly for the other major school programs introduced around the same time as AGE.

However, there are two possibilities that we cannot completely rule out so far and therefore examine in this section. The first is that the treatment group has a different secular dynamic path than the comparison group; this is to say, the treatment group is just getting better (or worse) over time. We explicitly control for differential secular time trends by including a treatment specific time trend — namely, the year*potential AGE treatment variable. Note that this control assumes that the difference in secular trend is linear.

Second, it is possible that better students migrated to AGE schools after the introduction of AGE in order to obtain the higher quality schooling. Similarly, better teachers might have moved to AGE schools in order to take advantage of AGE benefits. In this case, the effect of AGE on school performance would be confounded with that of selective sorting. We test this hypothesis in this section as well.

Finally, there is a somewhat different issue related to the nature of parental involvement in school activities. While AGE may have facilitated more parental involvement, this involvement may not have resulted in

[17] See Skoufias (2005) for a review of impact evaluations on the *Oportunidades* program. McEwan and Santibáñez (2005) provide an evaluation of the *Carrera Magisterial* scheme.

Table 5
Intervening mechanisms.

	Total number of students in school	Student teacher ration	Proportion lower educated teachers	Proportion higher educated teachers	Numbers of students by grade	
	Model A	Model B	Model C	Model D	Model E1	Model E2
AGE = 1	0.645	0.112	0.010	−0.005	0.086	
	(0.450)	(0.185)	(0.010)	(0.009)	(0.075)	
AGE * Grades 1 and 2 and 3 = 1						−0.616**
						(0.087)
AGE * Grades 4 and 5 = 1						1.139**
						(0.091)
School fixed effects	Y	Y	Y	Y	Y	Y
Grade dummies and year dummies	Y	Y	Y	Y	Y	Y
State by year fixed effects	Y	Y	Y	Y	Y	Y
Treatment specific time trends	Y	Y	Y	Y	Y	Y
Number of observations	25140	25140	25140	25140	125700	125700
Number of schools	5028	5028	5028	5028	5028	5028
Mean dependent variable in 1997 (baseline)	145.77	26.88	0.49	0.33	25.12	25.12

Robust SE clustered at the school level in parentheses. 'Lower Educated Teachers' are teachers qualified to teach primary school at most, and 'Higher Educated Teachers' are those who possess a university degree or higher. Information at the grade level is only available on the number of students and on the number of students per class.
* Significant at 5%.
** Significant at 1%.

pressure to improve school quality. Rather, parents may just have exerted pressure for increasing the grades of failing students.

5.1. Testing for balance in pre-interventions trends

We start by testing the validity of the key identification assumption of difference-in-difference models: the equality in the evolution of the outcome variables prior to the intervention, also known as the balance in the pre-intervention trends. If the secular trends of the treatment and the comparison group were the same in the pre-intervention period (at t'), then it is likely that it would have been the same during the post-intervention period (at $t>t'$) without the intervention. In this case, the change in the comparison group would likely be a valid estimate of what would have been the change in outcomes in treatment schools if they had not had an AGE.

We thus estimate the following specification on pre-intervention data — that is, for all $t' = 1995–1997$:

$$Y_{gst'} = \alpha_s + \gamma_g + \xi_{lt'} + \sum_{t'} \phi_{t'} YR_{t'} + \sum_{t'} \delta_{t'} Ever\ AGE_s * YR_{t'} + u_{gst'} \qquad (2)$$

where as before,

- $Y_{gst'}$ is the value of the dependent variable of interest during the pre-intervention periods;
- α_s are school fixed effects;
- γ_g are grade dummies;
- $\xi_{lt'}$ are State specific time dummies, i.e. State (l) by year (t') fixed effects;
- $YR_{t'}$ are yearly dummy variables for all school years in the pre-intervention period;
- $EverAGE_s = 1$ if school s is a potential treatment school; this is to say, if s receives AGE for some or all of the treatment years ($t = 1998–2001$), and 0 otherwise;
- $u_{gst'}$ is a heteroskedastic disturbance that allows for correlation across grades and within schools over time.

In this specification, the test $\delta_{t'} = 0$ is equivalent to the test of the equality of the pre-intervention trends between treatment and comparison schools at each time t'.

Table 4 reports the test of the difference in pre-intervention trends for the outcomes of interest: grade failure, grade repetition and intra-year dropout. For each dependent variable, Models A correspond to the estimation of specification (2) and Models B further interact $EverAGE_s * YR_{t'}$ with grade dummies to test whether pre-intervention trends were equal across grades. All specifications include school, grade and year fixed effects, and state by year fixed effects.

Estimates in Table 4 show that there are no significant differences in pre-intervention trends between treatment and comparison schools in school-averaged (grades 1 to 5) grade repetition nor intra-year dropout (Models A), nor by grade (Models B). For grade failure, however, we observe a significant *positive* difference for treatment schools between school years 1995–96 and 1996–97 (Table 4, column 1) with respect to comparison schools. This suggests that, if anything, early beneficiary schools were experiencing worst dynamics (larger increases) in school-averaged grade failure than late beneficiaries prior to the introduction of AGE. As shown in the second column, such dynamics only affect grades 4 and 5 – for which the estimated treatment effect in the post period is non-significant (Table 2, columns 2 to 4). Hence, the inclusion of the treatment specific time trend is important for the interpretation of the fourth and fifth grade results as causal.

5.2. Changes in the distribution of students or teachers in the school

The error term $\bar{\varepsilon}_{gst}$ in Eq. (1) includes unobserved student characteristics, θ_{ist} = {skills, ability, motivation}, that we have so far assumed uncorrelated with the observed treatment variables. However, treatment might affect the skill mix of students enrolling in a school. For instance, AGE schools might attract higher skill or more motivated students whose parents have a higher preference for education. Alternatively, AGE might enable schools to retain less-skilled students who were not doing well academically and would otherwise have withdrawn. If these changes in total enrolment significantly alter the distribution of students' skills in the school, then treatment would be spuriously correlated with unobserved ability and the estimated effect biased.

Analogous reasoning would suggest that the presence of AGE in the school might affect the distribution of teachers and teacher skills. One could imagine, for example, that less motivated or less able teachers would try to avoid AGE schools, where their attendance and performance is likely to be monitored by parents more closely.

[18] Section 2 discusses the random sample of principals used and provides a summary of the main findings stemming from these interviews on parental involvement in the school as a result of AGE.

Although it is difficult to determine the direction of these biases, we can nonetheless test for their existence by examining changes in student enrolment, in the student teacher ratio, and in the proportion of 'lower educated' (less skilled) and 'higher educated' (more skilled) teachers in the school in response to AGE. By 'lower educated' teachers we mean less qualified teachers — namely teachers that are qualified to teach no more than at primary school; whereas 'higher educated' teachers refers to more qualified teachers, this is to say teachers that are qualified to teach secondary school and possess a university degree or higher. These account for 33% of the teachers in our sample. 49% of the teachers are qualified to teach primary school students only, and 2% of the teachers have a basic (primary or secondary) education degree.

In Table 5 we report coefficient estimates resulting from estimating Eq. (1) on total enrolment, the student–teacher ratio, the proportion of 'lower educated, teachers and the proportion of 'higher educated' teachers. Since we only have school aggregate information on the number of teachers, the student–teacher ratio and the proportion of qualified teachers, then regressions are estimated at the school level, rather than at the school-grade level. As results in Models A through D show, we find no effect of AGE on any of these variables. We therefore believe that changes in the distribution of student and/or teacher skills are unlikely to account for the observed effects in failure and repetition rates.

However, while there does not appear to be sorting between schools, there may be some reallocation of resources within schools. In Models E in Table 5, we report the results for an additional outcome that we observe at the grade level: the number of students in a grade. While there is no effect at the school level (Model E1), there is a small negative effect on the number of students in grades 1 through 3 and a small positive effect on the number of students in grades 4 and 5 (Model E2). This suggests that schools are adjusting their organizational structure in a way that is consistent with improvements in grades 1 through 3 and not in grades 4 and 5.

5.3. Student learning versus parental pressure

Finally, we examine whether the effects observed on schooling outcomes are indeed the result of teachers influencing results in response to increased parental pressure. While, we cannot test this hypothesis with the administrative data available, we did ask principals about this possibility in the May 2006 survey interviews.[18] More specifically, we asked principals about parents' reactions to the possibility of their children repeating a year or receiving a very poor grade. Less than 3% of principals reported that parents demanded that undeserving children were allowed to progress. According to principals, the vast majority of parents (97%) would accept that their children failed a grade or that they received a poor grade. Hence, although AGE makes parents more demanding in terms of teacher attendance and attention to children's learning needs, it does not seem to make them pressure teachers to change grades for undeserving students.

6. Conclusions

Mexico's AGE aims to empower parent associations to improve school quality. We have provided quantitative empirical evidence that AGE improved intermediate school outcomes, namely reducing primary school (averaged over grades 1 to 5) grade repetition and grade failure by 4 to 5.5%. Effects are larger – 7.4% decrease in grade failure and 5.5% decrease in grade repetition – during the first three grades of primary school, where failure and repetition are also more common. However, while these AGE effects are present in relatively poor communities, AGE has no impact in extremely poor communities. This suggests that AGE may serve to increase inequality in education by further leaving the extreme poor behind.

A limitation of the study is that we only have crude measures of school performance, rather than more sensitive measures such as test scores. Still, these results are important as grade failure and repetition are associated with long-term problems in terms of academic achievement. In particular, they are related to poorer test performance and a higher probability of subsequent dropout in later years (Berlinski et al., 2008; Jimerson, 2001; Manacorda, 2012 and Marshall, 2003). Moreover, grade repetition can exacerbate crowding in primary schools (increased class sizes), especially in the earliest grades, thus increasing the burden placed on teachers (Brophy, 2006). This may result in management problems and a lower quality education provided for all students.

Our results suggest that the pathways by which AGE improved performance were through increased parental participation in school matters, and improved relations and communication between parents and teachers. Parents in schools with AGE were more likely to observe and complain about teacher absence and poor teaching. They were also more likely to know when their child was not doing well and could take corrective action.

These results are consistent with theories laid out in the economics of identity and social exclusion (Akerlof and Kranton, 2000, 2005). This work postulates that one's identity enters the utility function of both the parent and the school director. Social exclusion occurs when both believe that the parent does not deserve the benefit. The AGE acts to change parental identity and gives them a seat at the table.

Indeed, the economics of identity may explain why the effect of AGE had no impact in schools located in extremely poor communities. In these communities parents may lack the ability and stature to voice and assert their preferences. The lack of a formal role for parents in the Argentine decentralization of schools may also explain why Galiani et al. (2008) found positive effects in wealthy communities, but no impact on schools in poorer communities.

Finally, the results have important policy implications. Empowering parents in SBM is likely to strengthen the positive effects of decentralization. However, while the quantitative effects of AGE are strong and consistent, they are modest. The relatively small size of the effects should not come as a surprise given that AGE is a very limited intervention. Interventions that greatly increase the power of parents could be considered and tested. In addition, programs to empower parents need to address issues of social exclusion in the extremely poor communities.

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