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# Can Non-Cognitive Skills Programs Improve Achievement?

## Quasi-Experimental Evidence from EPIS\*

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### Abstract

Do investments in soft skills pay off in terms of student achievement? This paper evaluates a large private-sector program in this area, EPIS, based on individual and small-group sessions of mediators that seek to improve the non-cognitive skills (e.g. motivation, self-esteem, conscientiousness) of selected students. Our quasi-experimental evidence is drawn from rich longitudinal student data and the different timings of the roll-out of the program, within and across schools. The results highlight the potential of targeted, small-group, non-cognitive interventions, as we find that the EPIS program reduced grade retention by at least 10 percentage points and did so in a cost-effective manner.

*Keywords:* Student achievement, Non-cognitive skills, Matched School-Student Data.

*JEL Codes:* I20, J08.

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# 1 Introduction

Investment in human capital through schooling is widely regarded as a critical avenue towards higher levels of economic wellbeing (Krueger & Lindahl 2001, Heckman & Carneiro 2003, Hanushek et al. 2015). However, substantial skill gaps are still observed not only across but also within countries. Moreover, such skill gaps correlate strongly with children's socio-economic or minority status and impair intergenerational mobility and the promotion of equal opportunities (Black & Devereux 2011).

Governments have responded to these challenges through a number of programs that seek to enhance the schooling achievement of disadvantaged pupils. Most of these programs involve some form of remedial education, where students that perform poorly receive extra tuition, revision sessions, computer-aided learning, etc. However, the causal effects of many of these programs have been shown to be small (Machin et al. 2004), mixed (Jacob & Lefgren 2004, Taylor 2014) or insignificant (Leuven et al. 2007). In some other cases, the effects are relatively sizeable (Lavy & Schlosser 2005, Dobbie & Fryer 2011, Cortes et al. 2015) but still may not be as cost effective as alternatives based on more systemic changes to the education system (e.g. teacher incentives). Similar mixed findings have been obtained for the case of developing countries (Glewwe & Kremer 2006, Banerjee et al. 2007).

While most remedial programs focus on cognitive skills (e.g. revising class room material), economists are also devoting attention to potential of the non-cognitive dimensions of children and youngsters (Heckman & Rubinstein 2001, Heckman et al. 2006). Such non-cognitive traits involve 'softer' aspects of one's personality that may be equally important in shaping one's success at school and in the labour market: motivation, discipline, tenacity, self-esteem, self-control, confidence, patience, etc. In this context, school interventions based on non-cognitive skills may be more effective than the more traditional remedial programs. Indeed, as argued by Heckman & Kautz (2012), 'soft skills causally produce success in life' and 'programs that enhance soft skills have an important place in an effective portfolio of public policies'. The timing of these interventions may also matter, as the relative payoff of investments in hard and soft skills tends to tilt towards the latter with age (Heckman & Cunha 2007), despite their substitutability and complementarity.

This paper sheds empirical light on these issues as one of the first to describe and present empirical evidence about the effects of a large soft-skills programme for adolescents (see Kautz

et al. (2015) for a description of the existing literature). We consider the case of EPIS, an original program that seeks to improve achievement and reduce retention and early school leaving of lower-secondary students by strengthening their non-cognitive skills. This program, in operation in a large number of public schools in Portugal since 2007, is funded by private firms and run by a not-for-profit organisation. On top of the emphasis placed on non-cognitive skills, EPIS is original due to its rigorous screening of all the more than 15,000 students across 85 schools that participated in the program over the period covered here. Such screening ensures that the resources invested by the program - mostly the staff (mediators) time, typically devoted to 20-minute small-group or one-to-one sessions with students, every two weeks during term time - are spent exclusively on the youngsters that are likely to need the intervention the most. Indeed, although many education programs have been shown to have small or insignificant effects, ‘inputs specifically targeted to helping weaker students may be effective’, in particular ‘if they address specific unmet needs in the school’ (Banerjee et al. 2007).

However, such screening raises obvious issues in terms of the identification of the causal effects of the intervention. We address such concerns by drawing on different features of EPIS: particularly rich longitudinal data on all students (treated and non-treated) - which also allow us to present a number of interesting results about the determinants of student achievement (Lazear 2003, Rivkin et al. 2005, Aaronson et al. 2007, Lavy 2009, Martins & Walker 2006); and differences in the roll-out of the program across and within schools. We also consider the case of a number of schools for which the same detailed information on student characteristics was also collected but were not treated in the first two years of the program.

Our evidence indicates that, unlike many remedial programs, EPIS had a significant effect in improving the achievement levels of treated students, despite the its relatively light intensity (generally two twenty-minute meetings per month). According to our findings, based on a range of complementary methods, including fixed effects and difference-in-difference matching models, the probability that a student fails 25% or more of their modules (our main measure of achievement) falls by at least 10 percentage points (and as much as 30 percentage points in some specifications). However, we also find that the effects of the program on specific academic subjects that may be more intensive in cognitive skills (e.g. maths) tend to be smaller, even if still significant. This latter result may highlight the limitations of an approach based almost

entirely on non-cognitive skills; it may also reconcile our results with those of the only other large and recent case-study of non-cognitive skills for adolescents we are aware of (Holmlund & Silva 2014), which find insignificant results. In any case, the effects of the EPIS program on retention appear to be highly positive from a cost-benefit perspective.

The structure of the paper is as follows: Section 2 describes the main characteristics of the program studied in the paper and its institutional context; Section 3 presents the matched school-student panel data set used in this paper; Section 4 describes the main results; Section 5 presents quasi-experimental findings from a subset of schools; and Section 6 presents a number of extensions and robustness analyses. Finally, Section 7 concludes.

## 2 The EPIS program

The main goals of the EPIS program are to reduce early school leaving and to promote student achievement. These are important policy goals in many countries, including in Portugal, where at the time when the program was introduced, 2007, 39.1% of 18-24 year olds had at most a lower secondary school degree (while also not enrolled in any form of training). Moreover, retention rates in public schools at the time were of about 15% in each of the three years of the lower secondary cycle.

The goals of program are pursued through an original intervention in that EPIS aims to strengthen the non-cognitive skills of students - in striking opposition to a more standard remedial approach, based on cognitive skills. As mentioned before, there is growing awareness about the potential effects of such non-cognitive skills - motivation, discipline, tenacity, self-esteem, self-control, confidence, patience, etc - in terms of different socio-economic outcomes (Heckman & Rubinstein 2001, Heckman et al. 2006) but also some evidence indicating that programs based on these skills may not improve student achievement (Holmlund & Silva 2014).

From a more practical perspective, one important dimension of the EPIS program ('Mediators for school success') is its adoption of a targeted approach. Specifically, EPIS spends considerable effort in identifying the 7th- and 8th-grade pupils (typically 13-15 year-olds) most at risk of failing their year and/or dropping out.<sup>1</sup> This process involves at least two rounds of

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<sup>1</sup>In a nutshell, the Portuguese pre-university education system is composed of four cycles: lower primary (grades 1-4), upper primary (5-6), lower secondary (7-9) and upper secondary (10-12). In the latter three cycles, students can be retained (ie not progress to the following grade) in all grades if they do not pass a

screening, first when students are interviewed individually by EPIS staff, and second through a number of meetings of EPIS staff (mediators) with teachers, headteachers and parents for further information. A detailed questionnaire is applied to each student, which leads to the assignment of the student to one of three different levels of students' likelihood of low achievement and potential dropping out. Students that in the highest dropout probability group are then assigned to the program (on average about one third of all 7th and 8th grade students in each school). Students that are in the intermediate group are referred to their teachers for further monitoring. The remaining group of students are left out by the program, except that their grades are also recorded, up to their graduation (9th grade) or when they leave school.

Once the students' parents agree on the participation of their children (which approximately 95% do), then a specific set of interventions is assigned to each student. These methods will depend on the individual non-cognitive, behavioral or other issues that are flagged during the screening process. The intervention will therefore implement one or more different approaches, namely individual techniques (motivational discussions, self-control, problem-solving techniques), and group techniques (study methods, social competences training, management of criticism, anxiety self-control). The meetings, typically two per month, tended to last for a period of one and a half years.

These one-on-one or small-group interventions are implemented by EPIS staff (mediators) that work full-time in the program and are based permanently at the participating schools. Many such staff are young graduates in psychology or education sciences; in the case of three school districts, the program is delivered by tenured teachers that have reduced teaching duties on account of demographic or other reasons. EPIS staff also seek to keep in frequent contact with the relatives and teachers of the participant students and, in some cases, their local councils, to monitor the progress of each intervention pupil as closely as possible. EPIS staff not only meet their students individually or in very small groups but they also do so on a relatively frequent basis (e.g., every two weeks). During the first meetings, staff and students agree on goals with respect to each student's future performance. Meetings typically do not overlap with classes, in particular in the core subjects. This rules out negative effects on class attendance and also minimizes any stigma that may otherwise occur.

Furthermore, the program places emphasis on a stable mediator-student relationship, as that can strengthen the effect of the treatment. Over the period studied here, there are 65  

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minimum number of subjects. Children start lower primary in the civil year of their sixth birthday.

EPIS staff working in schools and each mediator holds a portfolio of a total of 50 to 100 students, typically in one school only. All mediators also take part in several training sessions before they are allocated to schools and during the program.<sup>2</sup>

On an administrative level, the program is run by a private, not-for-profit organisation of the same name (EPIS stands for ‘Entrepreneurs for Social Inclusion’). Its funding comes from approximately 100 large companies based in Portugal, each paying an annual contribution of 20,000 euros as an act of corporate social responsibility. (A small share of these funds are spent on additional, related initiatives, including a program for management skills for headteachers and the promotion of entrepreneurial skills in students.) In addition, a scientific council formed by academic experts in education, psychology and economics helped in the design of the program, also meeting twice per year to offer comments and suggestions to senior EPIS staff.<sup>3</sup>

The Ministry of Education and the local councils where the interventions are taking place also offer additional, generally non-financial, support, namely in terms of facilities at schools, coordination with headteachers, and mediators (the latter only in a small number of cases). EPIS also received the public endorsement of the Portuguese head of state, while several newspapers and TV stations agreed to advertise the program on a *pro bono* basis, to raise the public awareness and profile of the program, thus facilitating its implementation in schools, in terms of greater support by teachers, parents and students.<sup>4</sup>

The program was implemented from the 2007/08 school year in all the lower-secondary schools in ten different local councils (‘concelhos’) across the country, resulting in a total of 85 schools and over 15,000 7th and 8th grade students. These correspond to almost 10% of all 7th and 8th grade students in the entire country. Although this is already a sizable coverage, the program can be scaled up relatively quickly, as the set-up investments have already been made and variable costs stem mostly from the wage bill for staff based at schools.

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<sup>2</sup>See Pereira et al. (2008) for detailed information about the program, in particular the psychological contents of the interventions conducted in one-to-one or small-group meetings.

<sup>3</sup>The author of this paper has been an unpaid member of this scientific council since its inception, in 2006, and its president since 2014.

<sup>4</sup>See <http://www.epis.pt> (in Portuguese) for more detail about the program and its initiatives, including links to YouTube statements from students that participated in the program and contact details to access the data set used in this paper.

### 3 Data

The EPIS program adopted a sophisticated IT system that keeps detailed and longitudinal records of students. In particular, there are individual records about all students from each school that takes part in the program, including those that are not assigned to the treatment group, provided they are enrolled in the 7th or 8th grade in the 2007/08 school year. Most information, including the students' grades, is recorded at the term frequency, corresponding to the three terms per school year: September to December, January to March, and April to June. The data include several demographic variables about each student, such as gender and age, and different profile characteristics, in particular those perceived to be proxies of socio-economic or psychological issues that may affect progression. Interviews with teachers result in additional information from previous school years of each student, including earlier spells of retention.

All information is longitudinal, which creates a matched multilevel panel, covering the student, the class (group of students that take the modules together during each school year), the EPIS staff and the school, with unique and time-invariant identifiers for each unit in each one of those four levels. Crucially, the EPIS data also include information about the timings of the treatment for each treatment-group participant.

#### 3.1 Descriptive statistics

As mentioned above, the program began in 2007/08 with 7th and 8th grade students. In 2008/09 the first cohort of students were still under analysis and/or treatment but they then spanned the 7th grade (students retained), 8th grade (students that progressed from the 7th grade and students retained in the 8th grade) and the 9th grade (students that progressed from the 8th grade). Finally, in the last school year considered in the analysis, 2009/10, most students correspond to those enrolled in the 7th grade in the first year of the program, which will be attending the 9th grade in most cases. While the 2007/08 and 2008/09 data concern three terms (1st, 2nd and 3rd), the 2009/10 data used here concerns only the 1st term, creating a total of seven terms.

Given its richness, the data can be described in different ways. Table 1 focuses on student-quarter pooled data, of which there are a total of 93,901 observations, corresponding to a



total of 15,307 different students.<sup>5</sup> The mean age is 14.5 and 49.7% are girls. 4.5% are enrolled in vocational programs ('CEF'). 30.8% of the observations concern students that are (eventually) treated by the program (i.e. observations either before or during treatment of treated students), while 4.8% of the observations concern students that begin their treatment in that quarter. 18.7% student-quarter observations correspond to treated students observed once their treatment has already started.

Importantly, we find that 31.6% of the student-term observations correspond to cases of three or more failed modules (or 25% or more of all 12 modules). These cases would typically lead to a retention if that number of failed modules arises in the 3rd term. Grades range from 1 to 5, in which 1 and 2 correspond to a fail.<sup>6</sup> 12% of all student-term observations fail 50% or more of the 12 modules. Finally, there is a very large percentage of fails in Maths, over 40%, and a smaller but still large percentage of fails in Portuguese, 27.3%. Information on the other ten modules is not available on a module-by-module basis.

By contrast, Table 2 concerns cross-sectional data from all students as observed in a specific time period. We select the second quarter (i.e. January-March of the 2007/08 school year) as the program had not started in most schools at this stage. Average age is 13.9 and 49.9% of students are girls. 4,548 students out of 15,307 are subject to treatment and, on average, such treatment begins in quarter 3.5. 33.7% of students failed 25% or more of their modules in that quarter. Average class size is 22.9 while average school size (7th and 8th grades only) is 251 students. The average month number of the interview that led to the start of the intervention was 7.8 (in which 1 is January 2008, 12 is December 2008 and so on), and the average month when the specific intervention plan was put in practice was 12.9 (i.e. January 2009).

The previous tables pool data from treated and non-treated students. Table 3 presents descriptive statistics separately for each group, again referring to the second term of the 2007/08 school year. We find that non-treated students are younger than treated students (13.7 vs 14.4 years of age), slightly more likely to be female (51% vs 46%) and exhibit much

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<sup>5</sup>Students from the five schools that were not treated in the first two years of the program are excluded from this descriptive analysis and most regression results. We will return to these schools in Section 5, as they can be of interest also for identification purposes.

<sup>6</sup>The curriculum in the 3rd cycle includes: two languages (Portuguese and a foreign language - typically English), two social sciences (typically history and geography), maths, physics/chemistry and natural sciences, visual arts, technology/ICT, physical education, ICT, and moral/religious education and non-disciplinary areas, in a total of 12 modules. See European Commission (2007) for more details on the Portuguese education system and its lower secondary level.

better achievement levels (19.4% fail 25% or more modules compared to 67.4% in the case of treated students). Similarly large gaps in performance are documented for alternative measures of achievement, including fails in maths and Portuguese.

Another dimension of interest concerns the ten school districts where the EPIS program is active. Table 4 presents descriptive statistics about some of the main dimensions of interest of the program on a district-by-district basis. This table makes clear the considerable heterogeneity across districts in terms of the sizes and numbers of schools and also the numbers of students. The latter variable ranges from 109 students in only one school (Aljezur district) to 3,423 students in 17 schools (Matosinhos). The percentage of interventions also varies considerably, from 16.7% (Setúbal) to 56.9% (Aljezur). However, the interventions' timings are less dispersed as they are in all cases occurring between the third and fifth quarters, except in one instance - Paredes, the first school district where EPIS was implemented - when the average quarter falls between the second and third quarters. Differences in gender and age across school districts are very small, while achievement levels (overall retention and fails in maths or Portuguese) vary reasonably, more or less proportionately to the percentage of interventions.

Finally, we present a number of graphs that report additional descriptive statistics. For instance, Figure 1 describes the number of students and their fail rates for which data are available in each term of each grade and school year. This figure makes clear an interesting, so far undocumented pattern in the evolution of grades across the three terms of a school year: grades tend to be much lower (i.e. more cases in which there are 25% or more fails) in the first and second terms when compared to the third and final term (also a decisive term, from a retention perspective). This pattern may be regarded as surprising as the third term grade is also supposed to reflect the overall performance of the student not only over that term but also during the previous two terms. Furthermore, similar findings are documented for the specific cases of maths and Portuguese - Figure 2.

Figure 3 describes the number of interventions by quarter and the average school year and age of the students that are involved in each intervention timing. As indicated before, most interventions start in the third and fourth quarters (ie April to June 2008 and September to December 2008). In the first case, students' school year ranges between the 7th and 8th, while in the second case their grade ranges between the 8th and 9th. Similarly, in the first

case their average age is 14 while in the second case it is already 14.5.

## 4 Results

We estimate the main effects of the introduction of the EPIS program from student achievement equations, in the context of a linear probability model framework. Specifically, we consider an equation in which the dependent variable is equal to one if the student fails (i.e. fails 25% or more of her modules in a given quarter):

$$y_{it} = \beta_1 EPIS_{i,t}^* + X'_{it}\beta_2 + \alpha_i + \tau_t + u_{it}. \quad (1)$$

This specification draws on a definition of the EPIS variable which is equal to one from the moment the program is introduced. This allows one to compare the mean achievement levels before and after the student is exposed to the program.  $X$  is a vector of time-varying control variables, including age dummies, a dummy variable for retention status and a dummy variable indicating the type of program (one if vocational). Finally,  $\alpha_i$  is a student fixed effect and  $\tau_t$  is a comprehensive time fixed effect (a dummy variable for each academic year/term/school year combination). This very detailed set of time effects may be useful given the evidence reported in Section 3 of marked time effects, in particular a steep decline in fails from the first and second terms to the third term.<sup>7</sup> The sample includes all students from the participating schools, as described in Section 3.

Table 5 presents the results. We find in Panel A that, except naturally in the case that excludes student fixed effects (column A), EPIS status decreases the probability of failing. The magnitude of the effects is again very similar to the results documented in our benchmark specification. Moreover, the results are again particularly robust to the addition of vocational program and retention status controls. For instance, the EPIS effect moves from -9.1 percentage points in the specification B of Panel A to -9.3 in the same specification but with the additional two control variables (plus age dummies).

At least part of these results could be driven by the selection of students into treatment, a hallmark of the program. Indeed, there are still important elements of time-varying het-

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<sup>7</sup>There is also evidence that upper secondary school national exam marks fluctuated considerably over some of the years we cover here (Martins 2009). Some of those fluctuations may also have occurred at the lower secondary level and our detailed time effects should take them into account.

erogeneity that may need to be acknowledged, as they could correlate with treatment status. This may matter despite the fact that we already control for time-invariant (observed and unobserved) heterogeneity. For instance, some students will have been retained in a given year and therefore will be resiting the same modules in the following year, which is likely to facilitate their progression (students that are retained have to resit all modules, even those they have passed in their first sit). If such students started their participation in the EPIS program at the same time as they are repeating a year and this were not controlled for, then one may mistakenly attribute to the program an effect that could instead be driven by the repetition of the year. In particular, if resiting a year facilitates progression, then our estimates of the EPIS effect on retention would be biased downward.

We therefore control for an additional set of variables: a set of age dummies, a dummy variable (Vocational) equal to one if the student is attending a vocational course (CEF), typically only available for students aged 15 and above (who will therefore typically be repeating a grade), and a dummy variable (Retention) equal to one if the student is resitting the same school year as in the year before. The results are remarkably similar to those of the streamlined specification, except in the case of the specification without student fixed effects: in this case, the control variables appear to be extensive enough to capture much of the student heterogeneity to the extent that the results are very similar to those of the remaining columns that also include student fixed effects. The fact that the time-varying controls make such little difference to the estimates of the EPIS effects is reassuring in terms of the assumption of random treatment conditional on time-invariant differences made in difference-in-differences panel data methods.

The results on the control variables are also interesting in themselves, as they are determinants of achievement at the school level (Lazear 2001). For instance, we find that students taking the more vocational-oriented programs are less likely to fail. It is unclear if this is due to the selection of (older) students into these programs or a causal effect of the vocational programs themselves. For instance, the reduced fail rate may be driven by a better match between the syllabus and the students interests and/or easier requirements to pass. Furthermore, the resit variable is generally not significant, indicating that students that are repeating a year are not less likely to be retained again than if they are taking that year for the first time.

Overall, these results indicate that the EPIS program has a negative effect upon the probability of retention (or, more generally, of failing modules), of about 9 to 10 percentage points. Putting that number in context by considering the average retention level across all student-observations, in the second quarter of the 2007/08 school year, 67.4% (see Table 3), the effect amounts to approximately at least one sixth of the mean level. If the benchmark figure was the retention levels in the last quarter, the relative magnitude of the effect would be even higher. On the other hand, the effects upon very low achievers (with 50% or more fails) are smaller, pointing to the potential limitations of the non-cognitive approach to address the most extreme cases of poor student achievement.

#### 4.1 Alternative specification

Given the evidence of seasonal effects in Section 3.1, we also estimate equations based on three-term differences (i.e.  $\Delta y_{it} = y_{i,t} - y_{i,t-3}$ ) of the 25%-or-more-fails dichotomous variable ( $y_{it}$ , which typically entails grade retention when it occurs in the third and last term of the school year), as follows:

$$\Delta y_{it} = \beta_1 EPIS_{it} + X'_{it} \beta_2 + \alpha_i + \tau_t + u_{it}. \quad (2)$$

In most specifications,  $\Delta y_{it}$  is a variable referring to student  $i$  in term  $t$  that takes value one if the student failed three or more modules (out of a total of 12 modules) in term  $t$  but not in term  $t - 3$ . If the student does not change her status (i.e. failing three or more modules in both  $t$  and  $t - 3$  or not failing three or more modules in both  $t$  and  $t - 3$ ), the value of the dependent variable is zero. Finally, if the student improves from failing three or more modules (out of a total of 12 modules) in term  $t - 3$  but not doing so in term  $t$ , then the dependent variable will take value minus one. Moreover,  $EPIS_{it}$  is a dummy variable equal to one if student  $i$  begins her EPIS intervention in period  $t$  (and zero otherwise).

Now turning to the results, panel A of Table 6 considers a streamlined version of equation 2 which excludes all control variables except for the time and student fixed effects. The magnitude of the effects is again very similar to the results documented in our benchmark specification. The first result (column A) also excludes student fixed effects and finds that, in a pooled cross-section analysis, students subject to the EPIS program are 9.2 percentage points less likely to fail than other students. This result is robust to the inclusion of student

fixed effects on top of the time effects mentioned above as the EPIS coefficient again exhibits a large and statistically significant magnitude: -9.3 percentage points (column B).

These two results indicate that the EPIS program has an important effect in terms of reducing retention - or, more precisely, in terms of reducing quarterly grades that involve 25% or more fails. Moreover, when considering actual retention (a dependent variable defined as before but which considers the difference in the actual decision regarding progression in the case of term 3), the effect increases, to -10.5%. The difference between the two estimates suggests that the EPIS program has additional effects on top of the reduction in the number of failed modules that prompted the discretion awarded to teachers to decide on the retention of borderline cases. For instance, EPIS students may have exhibited progress in behavioural domains that can be taken into account by teachers. On the other hand, the EPIS effect appears to be weaker in terms of reducing the prevalence of more extreme cases of retention, namely when students fail 50% or more of their modules in a term. In this case, the coefficient falls to -4.3 percentage points (column D), although it remains highly significant.

As in our benchmark results, Panel B of Table 6 presents the results of the same specification adopted above (in Panel A) but now including several time-varying control variables. As before, we find that most EPIS coefficients from specifications with control variables prove to be quite close to the result in the counterpart specification without such controls, although generally smaller. For instance, in the case of column B, panel B presents a coefficient of -9.0 percentage points (significant at the 0.1% level), which compares with -9.3 percentage points in panel A.

## 4.2 Cumulative effects?

Given the relatively large magnitude of the effect documented above, we turn next to the question of its timing. In particular, we want to know if the effect arises soon after the start of the intervention on each student or if the effect is instead a more gradual, perhaps monotonously increasing phenomenon and becomes significant only some time after the intervention began. This analysis may also help in clarifying the scope for Hawthorne effects (Levitt & List 2009), when individuals change their behaviour because they are subject to some form of monitoring, not necessarily because of the treatment itself. For instance, a case in which the EPIS effects occur immediately but then do not grow over time (or alternatively fall over time) would be

far more consistent with Hawthorne effects than a situation in which the immediate effects are small or zero while the longer-term effects are larger.

We consider the empirical merits of this alternative interpretation by adapting equation 2 and extending the range of indicators of the start of treatment:

$$\Delta y_{it} = \beta_1^a EPIS_{i,t} + \beta_2^a EPIS_{i,t-1} + \beta_3^a EPIS_{i,t-2} + X'_{it} \beta_4^a + \alpha_i^a + \tau_t^a + u_{it}^a. \quad (3)$$

All variables take the same meaning as before; while  $EPIS_{i,t-1}$  is a dummy variable equal to one if the student joined the program in the previous quarter and  $EPIS_{i,t-2}$  is a dummy variable equal to one if the student joined the program two quarters before. This set up allows one to estimate any cumulative effects from the reform - they will arise if the effects of treatments that take place less recently are stronger than those that take place more recently.<sup>8</sup>

Table 7 presents the results. We find that most specifications indicate stronger, negative effects when the intervention started earlier in terms of the comparison in achievement. For instance, column B indicates that the effect from an intervention that started two quarters before is -36.9 percentage points, while that effect drops to -16.1 and -12.3 percentage points when the intervention started one quarter before or in the same quarter, respectively. All coefficients are statistically significant at the 0.1% level.

## 5 Quasi-experimental evidence

An evaluation exercise of this type must pay attention to the profile of the outcome of interest over time, in particular just before the intervention begins. The well-known Ashenfelter's dip (Ashenfelter 1978, Heckman & Smith 1999) highlights the potential effect of selection in undermining before-after comparisons. In our case, it could be that pupils enrolled into the program are those that are experiencing particularly poor grades due to transitory shocks (e.g. parental job loss or divorce). Once the shocks disappear, the students' grades would resume their earlier average values and their probability of retention would consequently also fall. However, this hypothesis would mean one may regard the improvement in grades subsequent to the shock as the effect of the program when in fact it was due (at least in part)

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<sup>8</sup>The evaluation analysis conducted by EPIS staff follows a similar set up, although not distinguishing between different quarters of introduction of the program, and finds an increase in the probability of approval (non-retention) of 13.7 percentage points. Other differences with respect to the approach adopted here concern the control for retention status and other time-varying variables and for time fixed effects.

to a regression to the mean phenomenon.

Here we examine this hypothesis in more detail drawing on a natural experiment related to the staggered introduction of EPIS across schools. In particular, in a specific district (Amadora) only part of those schools were intervened in the first two years of the program - recall the statistics reported in Table 4 and discussed in Section 3.1. This happened because it was not possible to obtain enough EPIS staff to implement the program in all schools due to timing and planning constraints. It was then decided to focus on schools whose students tended to have lower achievement levels. However, detailed data on student achievement and background was obtained from all schools in the district, including those where the intervention was delayed.

We draw on this event to estimate a difference-in-difference matching (DDM) model. In the first stage, we assemble a matched sample of treated students, from schools that participated in the program (i.e. treated students in ‘treated’ schools) and comparable students from schools that did not participate in the program. In order to ensure that the two samples are as comparable as possible, we focus on students based in other schools in the same district or in a neighbouring district (Odivelas).<sup>9</sup> In the second stage, we use that matched sample to estimate the effects of the program. In other words, we use students from non-treated schools that are (very) similar to treated students from treated schools as counterfactuals to estimate the effect of the EPIS program.

Tables 8 and 9 report the results from the matching exercise, based on the estimation of a propensity score and the imposition of a common support between the two samples. The quality and very long list of matching variables, over different time periods, allows one to argue that the scope for unobserved heterogeneity across the two samples to drive the results is limited. Moreover, the test of the equality of the means of each variable across the two samples is not rejected in all cases, which is evidence of the quality of the matching.

Finally, when estimating the effects using the new sample, we found results that are consistent with the main findings from the full sample of treated schools - see Table 10. Panel A (based on current term effects as in Panel B of Table 6 and equation 1) indicates coefficients that are always negative, in three cases significantly so (at least at the 5% level), and of similar magnitudes than in the main sample, even if nearer the lower bound. Moreover, when also

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<sup>9</sup>As expected, matching the two samples proved less satisfactory when considering the full sample of treated schools but the qualitative results - available upon request - are unchanged.



considering the effects from the introduction of the program in the previous quarter or the quarter before, the point estimates of those earlier quarters tend to increase considerably (in absolute value), as in the equivalent results based on the full sample. Although the precision of these estimates falls in some specifications, this can be attributed to the smaller sample sizes.<sup>10</sup>

Overall, we take these estimates to support a causal interpretation of the main results in this paper. Students that enter the EPIS program exhibit significant declines in their fail rates. The results are robust to the comparison of students subject to the program’s interventions with very similar students but that are not involved in the program at the same time because their schools only joined EPIS later.

## 6 Extensions

### 6.1 Additional robustness tests

To test the robustness of the results to other data sources, we conducted a simple difference-in-differences analysis based on national exams data. These exams are compulsory for 9th grade students, provided they are not retained (see Martins (2009) for more details on the data used and the structure of the examinations). Our goal is to assess the extent to which school-level grades and number of exams are affected by the EPIS program.

We find evidence of a decline in the national exam marks and an increase in the number of exams. However, point estimates are not always very precise (results available upon request), which we explain taking into account the relative small number of students involved in EPIS that reached the national exam level. In this case, the results are consistent with the main findings in the paper, in that the reduction of fails and retention would increase the number of students entitled to sit the national exams. Moreover, to the extent that these marginal students are below the mean achievement levels in their schools, the school-level results would fall, as they do in the data.

In another analysis, we consider two additional dependent variables: the students’ achievement in maths and in Portuguese. The dependent variable in this case is the three-term difference in a dummy variable equal to one if the student fails maths (or Portuguese). The results

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<sup>10</sup>The results presented here are based on nearest neighbourhood matching but are robust to alternative matching algorithms and different matching variables, including extended versions that nc(available upon request).

(available upon request) suggest that the effects of these two specific modules are smaller than in the more encompassing cases of across-the-board fails considered before. These effects can be explained by the possibly different nature of maths and Portuguese, namely in terms of their greater intensity in cognitive skills.

Finally, we check whether the main results differ depending on the students' gender. The results (available upon request) indicate that the EPIS effects are present in the two cases. However, the program appears to be somewhat stronger in the case of girls. For instance, when considering the dependent variable based on 25% or more fails, the effect of EPIS for boys is -7.5 percentage points while the effect for girls is -10.7 percentage points.

## 6.2 Cost-benefit analysis

Here we offer a simple back-of-the-envelope cost-benefit analysis of the program. We consider the (wage) cost of each EPIS staff (approximately 25,000 euros per year), the main variable cost of the program, and then multiply it by the total number of mediators (65 over the period covered).<sup>11</sup> We then divide that product by the number of non-retained students that are estimated to have been able to progress as a consequence of the program intervention (10% to 30% of 5,000). This results in a cost of approximately 1,000 to 3,250 euros per student that otherwise would have failed her year.

These figures can be compared with estimates of the public cost of one year of schooling, which can be estimated at around 3,000 euros per year (e.g. if the Education Ministry paid tuition fees charged by private schools, as it does when there are no public schools available in a specific region). In this case, the program would be - in the worst possible case - just about cost effective. However, when taking into account any other gains for the students that are not retained (such as future labour market returns), not to mention its positive externalities (including upon the non-eligible students (Holmlund & Silva 2014)), the program moves decidedly into the cost effective range. The same would apply the longer lasting are the program effects, for instance if achievement effects can also be observed in the upper secondary school.

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<sup>11</sup>As noted above, some of these mediators are teachers paid by the Ministry of Education under permanent contracts but with low teaching loads. These teachers therefore can be regarded as sunk costs to some extent.

## 7 Conclusions

The substantial dispersion of schooling levels in workforces around the world and the evidence of significant private, public and social returns, especially at low levels of education, have prompted governments to launch a number of programs that promote academic achievement, in particular of disadvantaged pupils. Most of these programs involve some form of remedial education, where students that perform poorly receive extra tuition targeted at cognitive skills. However, at the same time that the causal effects of many of these programs have been shown to be small at best, there is increasing awareness of the potentially major role of non-cognitive dimensions (motivation, discipline, self-esteem, etc) in pupil achievement (Heckman & Rubinstein 2001, Heckman et al. 2006, Kautz et al. 2015).

This paper addresses the potential of interventions that focus on non-cognitive skills by presenting empirical evidence about the effects of an original, large program in this area. EPIS seeks to improve achievement and reduce retention and early school leaving by strengthening students' non-cognitive skills. Over the period covered in the study, the program targeted 15,000 lower-secondary students in 85 Portuguese state schools. EPIS is original also due to its screening of all the students in the participating schools, ensuring that the resources invested by the program - mostly the staff time, typically devoted to small-group or one-on-one sessions - are only spent on students that are likely to need the intervention the most.

We explore the rich longitudinal data on all students (treated and non-treated) collected by EPIS and the differences in the roll-out of the program across and within schools to identify the effects of the program upon student achievement. We also exploit the fact that, for a subgroup of schools, the intervention stage of the program was deferred due to operational constraints, even if data and diagnostics were collected normally. Our evidence indicates that, unlike many remedial programs, EPIS had a significantly positive effect in terms of improving the achievement levels of treated students. The probability that a student is retained falls by at least 10 percentage points. This effect increases to up to 30 percentage points when considering cumulative effects. Moreover, our results also indicate that the program is cost effective.

Overall, our study supports the view that 'programs that enhance soft skills have an important place in an effective portfolio of public policies' Heckman & Kautz (2012). However, design, implementation and monitoring aspects will matter too, as similar non-cognitive skills

programs have not in all cases improved student achievement, especially in the case of adolescents (Holmlund & Silva 2014). Specific features that may be particularly important include the focused nature of the intervention, following a detailed screening process, the individual or small group nature of the interventions, and a regular collection of outcome variables, including in terms of individual student achievement.

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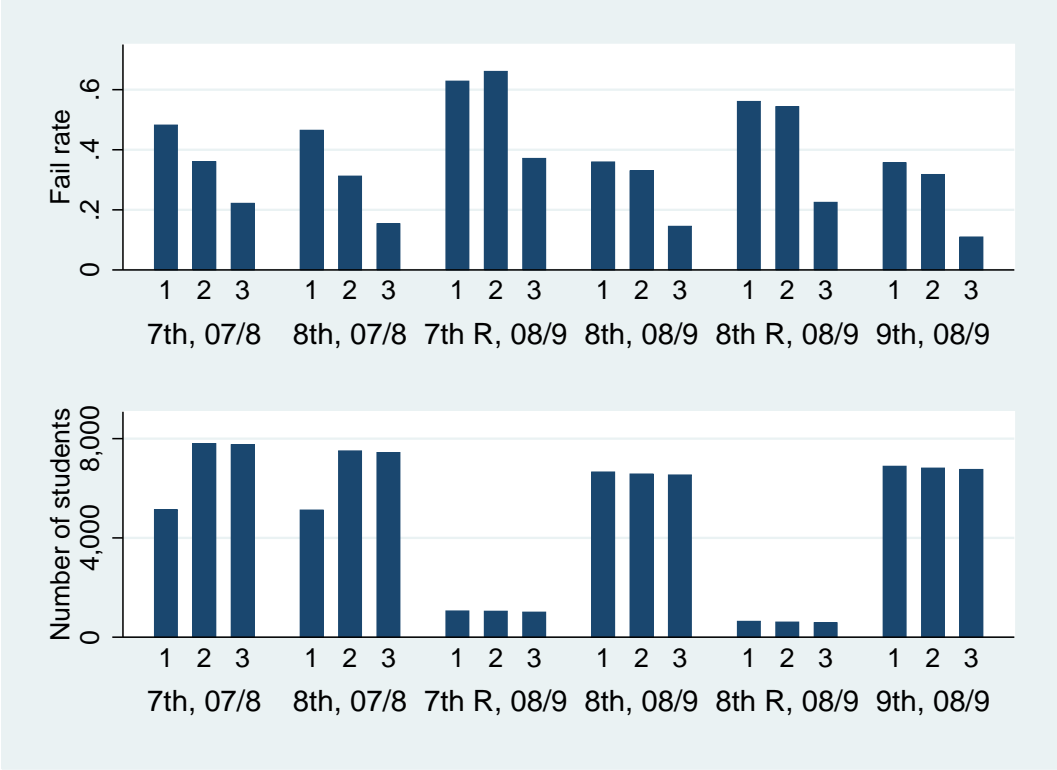
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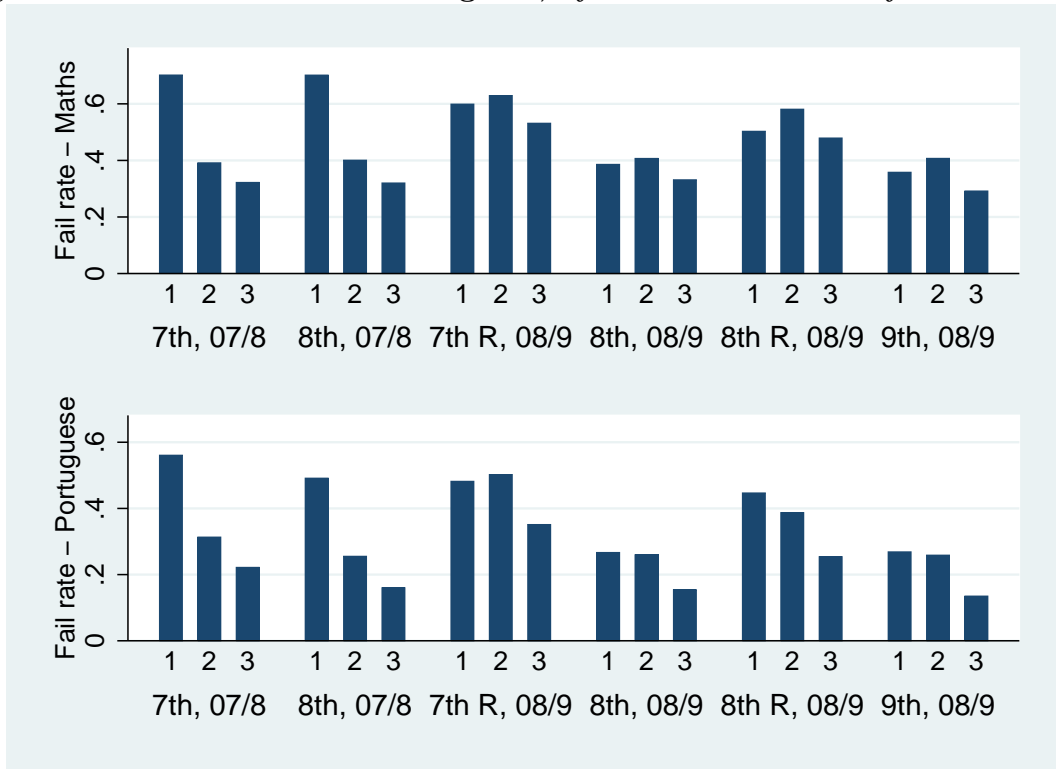
# Figures

Figure 1: Fail rate and number of students, by academic and civil years and term



**Notes:** '7th, 07/8' concerns students enrolled in the 7th grade in the school year 2007/2008; '8th, 07/8' concerns students enrolled in the 8th grade in the school year 2007/2008; '7th R, 08/9' concerns students enrolled in the 7th grade in the school year 2008/2009 that are repeating the grade; and so on. '1', '2', and '3' concerns the term (quarter): the first term runs from September to December, the second term from January to March and the third term from April to June.

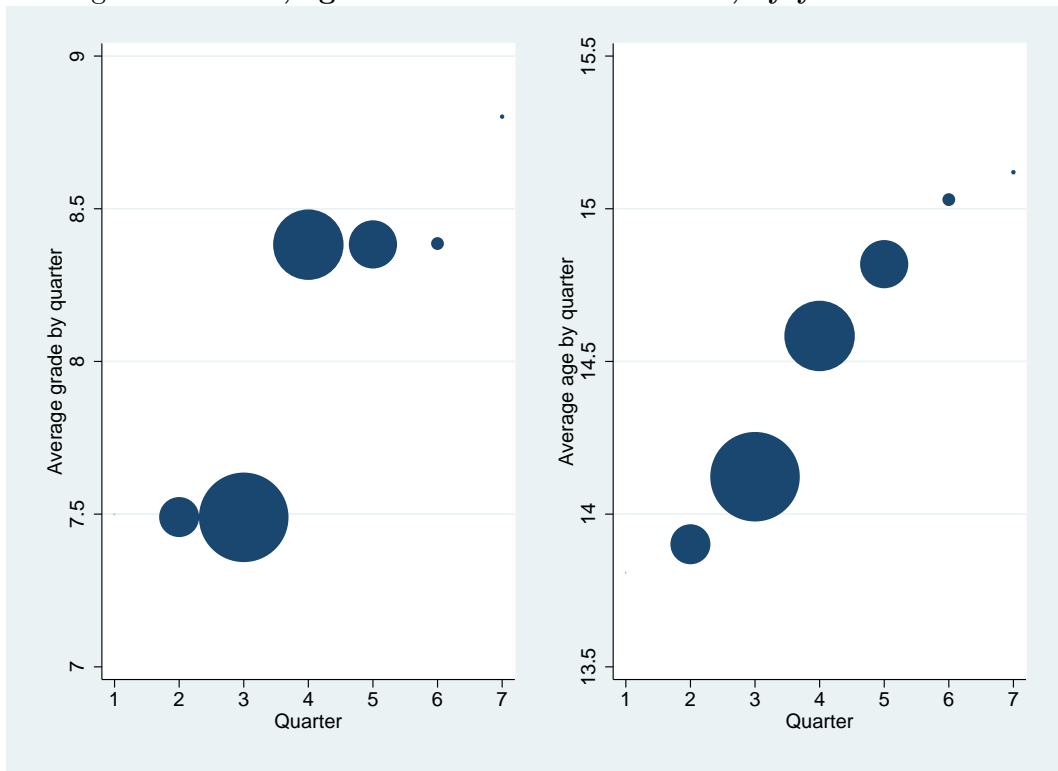
Figure 2: Fails in Maths and Portuguese, by academic and civil years and term



**Notes:** 'Fail rates' refer to a result of 1 or 2 (out of 5) in a term. Only if the student obtains a result of 1 or 2 in the third term will the student fail the module. See notes to Table 1 for more details.



Figure 3: Grade, age and interventions started, by year and term



**Notes:** The size of each circle indicates the number of students in each category. Quarter 1 corresponds to the first term of the 2007/08 academic year; quarter 2 corresponds to the second term of the 2007/08 academic year; and so on until quarter 7 (first term of the 2009/10 academic year). See notes to Table 1 for more details.

## Tables

Table 1: **Descriptive statistics, pooled student-quarter data**

Variable	Mean	Std. Dev.	N
Age	14.463	1.17	92085
Female	0.497	0.5	93901
EPIS	0.187	0.39	93901
Program participant	0.308	0.462	93901
EPIS-quarter	0.048	0.213	93901
Failed 25% or more modules	0.316	0.465	93901
Failed 50% or more modules	0.12	0.325	93901
Retained	0.303	0.46	93901
Failed Maths	0.405	0.491	90941
Failed Portuguese	0.273	0.446	91008
Vocational	0.045	0.208	93901
Quarter	3.916	1.83	93901
Civil year	8.032	0.735	93901
School year	7.651	0.63	93901

**Notes:** EPIS is a dummy variable equal to one when treatment is ongoing for that student (ie 0 in the quarters when the treatment has not started and 1 when the treatment had started; students that are never treated have all quarters as 0). Program participant is a dummy variable equal to one if student is (eventually) subject to treatment. EPIS-quarter is a dummy variable equal to one only in the quarter when treatment begins for that student. Vocational is a dummy variable equal to one if student enrolled in technical program. Quarter is a specific term-year combination (1 in the first term of the 2007/08 academic year, 2 in the second term of the 2007/08 academic year, and so on up to 7 in the first term of the 2009/10 academic year).

Table 2: Descriptive statistics, pooled student data

Variable	Mean	Std. Dev.	N
Age	13.902	1.124	15170
Female	0.499	0.5	15307
Quarter intervention began	3.506	0.871	4548
Program participant	0.297	0.457	15307
Failed 25% or more	0.337	0.473	15307
Failed 50% or more	0.131	0.337	15307
Retained	0.337	0.473	15307
Failed Maths	0.396	0.489	15307
Failed Portuguese	0.285	0.451	15307
Vocational	0.033	0.178	15307
Signalled	0.033	0.18	15307
Retentions	1.388	0.733	13862
Punctuality	0.917	0.277	11726
Parental permission	0.948	0.222	14672
Students per class	22.892	4.207	15307
Students per school	251.161	85.989	15307
Date student interview	7.817	3.745	4551
Date intervention plan	12.947	1.97	4074
Zooming - student	0.638	1.099	15307
School year	7.49	0.5	15307

**Notes:** The results concern the second quarter (January-March) of the 2007/08 school year. ‘Signalled’ is a dummy variable equal to 1 if the student has special needs or psychological problems diagnosed previously. ‘Retentions’ is a dummy variable equal to 1 if the student was retained at least once in the previous three years. ‘Punctuality’ is a dummy variable equal to 1 if the teacher responsible for the student’s class states that the student is punctual. ‘Parental permission’ is a dummy variable equal to 1 if the student’s parent agreed that the student participated in the program. ‘Students per class’ measures the number of pupils in the same class as the student. ‘Students per school’ measures the number of pupils in the same school as the student and that are monitored by EPIS. ‘Date student interview’ and ‘Date intervention plan’ is measured in months from 1 (January 2008; eg 13 is January 2009); ‘Date intervention plan’ indicates when EPIS staff determined the specific program that would apply to the student. ‘Zooming - student’ is a dummy variable equal to one if the student was subject to a second wave of screening. See notes to Table 1 for information on the remaining variables.

Table 3: Descriptive statistics, pooled student data

Variable	Treated students			Non-treated students		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Age	14.449	1.17	4501	13.671	1.019	10669
Female	0.464	0.499	4551	0.514	0.5	10756
Quarter intervention began	3.506	0.871	4548			0
Program participant	1	0	4551	0	0	10756
Failed 25% or more	0.674	0.469	4551	0.194	0.396	10756
Failed 50% or more	0.297	0.457	4551	0.061	0.239	10756
Retained	1.812	0.897	4551	1.182	0.527	9311
Failed Maths	0.674	0.469	4551	0.279	0.448	10756
Failed Portuguese	0.523	0.5	4551	0.184	0.388	10756
Vocational	0.048	0.214	4551	0.026	0.16	10756
Signalled	0.068	0.251	4551	0.019	0.136	10756
Punctuality	0.824	0.381	3927	0.963	0.189	7799
Parental permission	1	0.021	4549	0.925	0.264	10123
Students per class	22.316	4.600	4551	23.136	4.004	10756
Students per school	241.656	83.883	4551	255.183	86.555	10756
Date student interview	7.817	3.745	4551			0
Date intervention plan	12.946	1.969	4072			0
Zooming - student	2.144	0.911	4551	0	0	10756
Proximity assignment	0.975	0.155	4551	0.025	0.156	10756
Screening - student	2.578	0.635	4551	1.206	0.453	9311
Screening - family	1.113	0.423	4551	1.003	0.076	9311
Screening - graffar	1.39	0.52	4551	1.08	0.277	9311
Screening - school	1.449	0.539	4551	1.182	0.403	9311
School year	7.495	0.5	4551	7.489	0.5	10756

**Notes:** The results concern the second quarter (January-March) of the 2007/08 school year. ‘Proximity assignment’ is a dummy variable equal to 1 if assigned to enter the program. See notes to Table 1 for information on the remaining variables.

Table 4: Descriptive statistics, by school district

School District	No. students	Interventions			Female	Age	Retained	Failed		No. Schools	No. Staff	No. Classes
		%	Quarter	Female				Age	Maths			
Aljezur	109	0.569	3.016	0.440	14.291	0.319	0.319	0.297	0.297	1	1	5
Amadora	1585	0.339	4.577	0.509	14.559	0.326	0.326	0.400	0.302	8	10	77
Amadora (control)	1647	0	NA	0.476	14.492	0.221	0.221	0.297	0.237	6	5	74
Matosinhos	3423	0.238	3.258	0.485	14.067	0.201	0.201	0.301	0.169	17	10	165
Odivelas	2851	0.336	3.453	0.483	14.372	0.187	0.187	0.321	0.226	13	10	132
Paredes	2287	0.275	2.379	0.499	14.066	0.189	0.189	0.345	0.224	9	8	99
Resende	224	0.496	3.838	0.473	14.471	0.278	0.278	0.333	0.167	1	2	11
Santarém	966	0.176	4.106	0.488	14.054	0.117	0.117	0.232	0.121	6	7	45
Setúbal	2722	0.167	4.499	0.492	14.284	0.128	0.128	0.302	0.136	10	9	117
Tavira	504	0.313	3.139	0.508	14.326	0.179	0.179	0.324	0.235	2	3	23
V. F. Xira	2484	0.285	3.330	0.507	14.155	0.161	0.161	0.306	0.145	10	7	116

**Notes:** All statistics refer to a snapshot in the third quarter of 2007/08. ‘Amadora (control)’ denotes the set of schools that serve as an additional control group (where the interventions started much later); ‘Amadora’ denotes the set of schools in that school district where the interventions started at approximately the same time as in the other school districts. ‘Interventions’ is the percentage of students that are treated. See notes to Table 1 for information on the remaining variables.

Table 5: **Effects of EPIS: Main results**

	A	B	C	D
Dependent variables:	25% or more fails	25% or more fails	Retention	50% or more fails
Panel A				
EPIS (*)	.300 (.007)***	-.091 (.007)***	-.099 (.008)***	-.040 (.006)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	93807	93807	93807	93807
$R^2$	.126	.591	.574	.494
Panel B				
EPIS (*)	-.094 (.009)***	-.093 (.007)***	-.101 (.008)***	-.042 (.006)***
Vocational	-.207 (.016)***	-.466 (.026)***	-.462 (.025)***	-.275 (.021)***
Retention	-.066 (.014)***	-.004 (.021)	-.002 (.020)	.005 (.019)
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	91991	91991	91991	91991
$R^2$	.262	.6	.583	.5

**Notes:** The dependent variables are now measured in levels, not in differences as in Table 6.  $EPIS_t$  is a dummy variable equal to one if the program started for that student in that term and in all terms after that. All specifications include detailed time dummy variables (one for each school year/civil year/term combination). The EPIS dummy variable is one only from the term when the programme started for that student. Age dummies are included in all columns. Vocational is a dummy variable equal to one if the student is enrolled in professional degrees (CEF). Retention is a dummy equal to one if the student is resitting a grade. Each observation corresponds to a student/academic year/term combination. Standard errors allow for clustering at the class level. Significance levels: \*: 0.05; \*\*: 0.01; \*\*\*: 0.001.

Table 6: **Effects of EPIS on fails and retention: Alternative specification**

	A	B	C	D
Dependent variables:	$\Delta Fail$ (25% or more)	$\Delta Fail$ (25% or more)	Retention	$\Delta Fail$ (50% or more)
Panel A				
EPIS	-.092 (.015)***	-.093 (.017)***	-.105 (.017)***	-.043 (.015)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	45924	45924	45924	45924
$R^2$	.061	.465	.469	.469
Panel B				
EPIS	-.046 (.015)***	-.090 (.018)***	-.101 (.018)***	-.037 (.016)**
Vocational	-.323 (.029)***	-.407 (.068)***	-.399 (.064)***	-.283 (.053)***
Retention	-.563 (.016)***	-.657 (.043)***	-.692 (.042)***	-.452 (.034)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	45069	45069	45069	45069
$R^2$	.149	.484	.489	.484

**Notes:** The dependent variables are, alternatively: the three-term change in a dummy variable equal to one if the student has 25% or more failed modules in the term, which will typically lead to retention if in the third and final term (columns A and B); the three-term change in a dummy variable equal to one if the student has 25% or more failed modules in terms A or B and retained in the third term (column C); or the three-term change in a dummy variable equal to one if the student has 50% or more failed modules (column D). See notes to Table 5 for more details. Significance levels: \*: 0.05; \*\*: 0.01; \*\*\*: 0.001.

Table 7: **Effects of EPIS: Differences over time**

	A	B	C	D
Dependent variables:	$\Delta Fail$ (25% or more)	$\Delta Fail$ (25% or more)	Retention	$\Delta Fail$ (50% or more)
$EPIS_{t-2}$	-.149 (.092)	-.369 (.104)***	-.376 (.104)***	-.297 (.110)***
$EPIS_{t-1}$	-.072 (.027)***	-.161 (.039)***	-.185 (.036)***	-.117 (.033)***
EPIS	-.053 (.016)***	-.123 (.019)***	-.139 (.019)***	-.062 (.017)***
Vocational	-.324 (.029)***	-.401 (.069)***	-.392 (.064)***	-.279 (.053)***
Retention	-.563 (.016)***	-.657 (.043)***	-.692 (.042)***	-.452 (.034)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	45069	45069	45069	45069
$R^2$	.149	.485	.491	.485

**Notes:** See notes to Table 6. The dependent variables are the same as in Table 6.  $EPIS_t$  is a dummy variable equal to one if the program started for that student in that term.  $EPIS_{t-2}$  ( $EPIS_{t-1}$ ) is a dummy variable equal to one one (two) term(s) before the term when the program started for that given student. Significance levels: \*: 0.05; \*\*: 0.01; \*\*\*: 0.001.



Table 8: **Quality of matching between students in treated and non-treated schools**

Variable	Sample	Treatment group	Control group	p-value
		Mean	Mean	
25%-50% fails (1st term)	Unmatched	0.42869	0.34606	0.003
	Matched	0.42869	0.42965	0.962
50%+ fails (1st term)	Unmatched	0.44473	0.56802	0
	Matched	0.44473	0.4305	0.485
25%-50% fails (2nd term)	Unmatched	0.39156	0.34368	0.083
	Matched	0.39156	0.3631	0.153
50%+ fails (2nd term)	Unmatched	0.34768	0.44391	0
	Matched	0.34768	0.34709	0.976
25%-50% fails (Interaction 1st and 2nd terms)	Unmatched	0.21941	0.179	0.08
	Matched	0.21941	0.20556	0.41
50%+ fails (Interaction 1st and 2nd terms)	Unmatched	0.26498	0.37232	0
	Matched	0.26498	0.24853	0.359
Fail in Maths	Unmatched	0.83544	0.82339	0.571
	Matched	0.83544	0.84246	0.642
Fail in Portuguese	Unmatched	0.72405	0.68258	0.107
	Matched	0.72405	0.71946	0.803
Fail in Maths and Portuguese (interaction)	Unmatched	0.56371	0.50835	0.05
	Matched	0.56371	0.56276	0.963
Previous retentions	Unmatched	1.816	1.79	0.599
	Matched	1.816	1.8349	0.599
Female	Unmatched	0.47848	0.43675	0.141
	Matched	0.47848	0.46504	0.512
Year	Unmatched	7.4641	7.4869	0.423
	Matched	7.4641	7.4423	0.285
Age	Unmatched	14.264	14.428	0.019
	Matched	14.264	14.305	0.414
$Age^2/10$	Unmatched	20.495	20.975	0.018
	Matched	20.495	20.612	0.42

Table 9: **Quality of matching between students in treated and non-treated schools (cont.)**

Variable	Sample	Treatment group Mean	Control group Mean	p-value
(50%+ fails (1st term))*Age	Unmatched	6.274	8.1311	0
	Matched	6.274	6.0758	0.493
(50%+ fails (2nd term))*Age	Unmatched	4.932	6.3758	0
	Matched	4.932	4.8857	0.868
Psychological or other problems	Unmatched	0.10549	0.05489	0.002
	Matched	0.10549	0.11542	0.441
Parents schooling	Unmatched	3.5325	3.5418	0.828
	Matched	3.5325	3.5366	0.894
Parents job type	Unmatched	4.2262	4.284	0.14
	Matched	4.2262	4.2367	0.722
Parents income level	Unmatched	3.3181	3.4821	0
	Matched	3.3181	3.2906	0.333
Graffar group	Unmatched	1.4878	1.4988	0.722
	Matched	1.4878	1.4718	0.47
Screening group (student)	Unmatched	2.6996	2.7685	0.02
	Matched	2.6996	2.6967	0.896
Screening group (family)	Unmatched	1.1266	1.0835	0.078
	Matched	1.1266	1.134	0.697
Screening group (school)	Unmatched	1.4734	1.4081	0.038
	Matched	1.4734	1.4861	0.592
Class size	Unmatched	22.247	24.007	0
	Matched	22.247	22.324	0.709

Table 10: **Effects of EPIS: DDM results**

	A	B	C	D
Dependent variables:	$\Delta Fail$ (25% or more)	$\Delta Fail$ (25% or more)	Retention	$\Delta Fail$ (50% or more)
Panel A				
EPIS	-.044 (.027)	-.050 (.031)*	-.064 (.031)**	-.076 (.030)**
Vocational	-.264 (.053)***	-.422 (.131)***	-.415 (.135)***	-.186 (.112)*
Retention	-.468 (.032)***	-.592 (.072)***	-.636 (.072)***	-.460 (.072)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	4835	4835	4835	4835
$R^2$	.176	.485	.503	.517
Panel B				
$EPIS_{t-2}$	.0002 (.105)	-.084 (.136)	-.141 (.122)	-.309 (.156)**
$EPIS_{t-1}$	-.061 (.040)	-.025 (.064)	-.078 (.058)	-.145 (.056)***
EPIS	-.055 (.030)*	-.059 (.036)	-.089 (.036)**	-.122 (.034)***
Vocational	-.262 (.053)***	-.419 (.132)***	-.409 (.137)***	-.174 (.115)
Retention	-.469 (.032)***	-.593 (.072)***	-.638 (.071)***	-.465 (.072)***
Student FE		X	X	X
Time FE	X	X	X	X
Obs.	4835	4835	4835	4835
$R^2$	.176	.485	.503	.519

**Notes:** See notes to Table 6. The dependent variables are the same as in Table 6.  $EPIS_t$  is a dummy variable equal to one if the program started for that student in that term.  $EPIS_{t-2}$  ( $EPIS_{t-1}$ ) is a dummy variable equal to one one (two) term(s) before the term when the program started for that given student. Significance levels: \*: 0.05; \*\*: 0.01; \*\*\*: 0.001.