

Developing socioemotional skills in secondary school: Short term impacts from a randomized experiment in Ceará, Brazil

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Abstract

We evaluate the impact of an innovative social and emotional curriculum for high school implemented in 36 schools of Ceara, randomly selected from a pool of 72 schools that voluntarily opt to participate (N=4438). We found significant positive effects for Emotional Resilience (+0,16 σ), Kindness (+0,14 σ) and Engagement with Others (+0,15 σ) as measured by the SENNA assessment (Primi et al, 2016), precisely the priority dimensions worked during the first year of the intervention. Effect sizes are in line with what is found for Positive Youth Development programs in the literature. Impacts are bigger for vulnerable individuals, such as those with previous records of grade repetition, boys and with low scores in cognitive tests. These results indicate that social and emotional skills are malleable during teenage, and can be manipulated in large scale by an intervention.

JEL classifications: I21, I25, J24

Keywords: Social and Emotional skills, secondary school, randomized control trial, Brazil

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I. Introduction

Secondary education in Latin America and the Caribbean (LAC) faces important challenges to ensure students stay enrolled in school and obtain a meaningful level of learning to meet the academic and professional challenges of the 21st century. First, despite significant progress achieved over the period 1990–2010, graduation rates remain low compared to developed countries, a large fraction of young students drops out from school before completing secondary school, and substantial gaps in educational outcomes in terms of gender, income quintiles, and regions within countries persist (Bassi, Busso and Muñoz, 2013). Second, students who do stay enrolled are not learning what they should according to international standards. The 8 Latin American countries that participated in the 2015 Program for International Student Assessment (PISA) are among the 14 lowest performers in mathematics out of 65, and many students do not reach basic levels of knowledge in math, science and reading (Bos, Vegas and Zoido, 2016).

In addition, empirical evidence suggests that there seems to be a disconnection between the skills demanded by the labor market -at least in the formal and competitive sectors- and those taught in school (Bassi, Busso, Urzúa and Vargas, 2012). In a survey conducted by the IDB in 2010, approximately 1,200 companies in Argentina, Chile and Brazil, more than 90% the entrepreneurs interviewed claim to have serious difficulties finding this type of abilities in high school graduates in the countries evaluated. In fact, they highlight that the skills demanded are changing and, today, socio-emotional skills are the most valued. Facing this urgent task, many countries are actively seeking ways to attract, retain and improve children's educational outcomes in secondary school, particularly in terms of socio-emotional skills. Indeed, although it is necessary to advance in research and discussions to reach a consensus on these issues, there is enough evidence to say that secondary school systems need to start developing these set of skills as they are essential for success of children and youth in and out of school (Heckman et al., 2006; Santos and Primi, 2014). Yet, until now very few initiatives have been implemented directly in schools and governments lack clear models on how the development of these skills can be integrated into the curriculum.

In this paper, we aim at identifying mechanisms through which schools can effectively develop socio-emotional skills of students and evaluate the effects that these skills can have on student motivation, retention and general academic performance. In order to do this, we estimate the short term impact of an innovative program, “Work, Research and Social Practices” (NTPPS in Portuguese) by implementing a randomized experiment. Generally speaking, NTPPS shares the same general characteristics of the Positive Youth Development (PYD) programs that have become popular in the US. In this program, all students in normal secondary schools in the State of Ceará, Brazil (Ensino Médio) receive training to develop personal, social and labor skills over the three years of this educational level. The program, developed by the Department of Education of Ceará (SEDUC-CE) in partnership with Instituto Aliança (IA), consists of a new curriculum component inducing innovative teaching practices in school, based on methodologies that highlight: (i) student involvement, (ii) interdisciplinarity, (iii) project-based learning, (iv) the use of research as a learning tool, and (v) preparation for the world of work. To carry out an impact

evaluation of NTPPS, the 72 schools that volunteered to implement the program in 2015 were randomly assigned to one of 2 groups: those who would participate in the program in 2015 (treatment group) and those who would not participate in the program but would serve as a control group. In the beginning of the academic year, a sample of 5,561 students from the 72 schools selected for the baseline analysis to receive 2 questionnaires: an instrument called SENNA (Social and Emotional or Non cognitive Nationwide Assessment), used to measure socio-emotional skills of students; and a second instrument designed to collect data on socio-economic characteristics of the students' households, the school life of students, including student perceptions of their teachers, and students' expectations about their post-secondary school future.

Our main research questions are the following: Does the program NTPPS have a measurable impact on the development of socio-emotional development of students at the end of the year 1? Do these effects vary depending on the characteristics of the students (socio-economic status, gender and ethnicity of students and geographic location)? Does the effect of the program on the socio-emotional development influence the performance of students in other areas such as Mathematics and Portuguese?

The results indicate that there is evidence of a positive impact of NTPPS on students' social-emotional characteristics, especially in self-efficacy in dimensions associated with intrapersonal and inter-personal behavior. The most significant impacts were in "Engagement with others" (0.15σ), "Kindness" (0.14σ) and "Emotional resilience" (0.16σ), the socioemotional impact was particularly high for students with a history of school repetition, Learning difficulties in Portuguese and boys. This result is particularly important given that this program had bigger effects of student that were "more vulnerable" and thus, had important effects on equity. No negative effect of NTPPS on student proficiency was observed. On the contrary, for students who already had some disapproval we observed a positive and significant impact of 6.79 points (0.14σ) in Mathematics.

It is interesting to note that the dimensions on which the program had effect have a great overlap with the contents prioritized in the first year of the NTPPS. In particular, the themes addressed in this period emphasize the individual's relationship with himself, with the school and the family, and the domains on which the program had the greatest impact are those related to interpersonal characteristics and emotional resilience.

To some extent, however, the estimated effects of the program in our paper can be considered as a lower bound given that even though randomization worked well according to data collected at baseline, in the follow-up data collection imbalanced attrition occurred. Indeed, a higher proportion of subjects in the control group with less favorable socioeconomic and learning characteristics drop out from high school, potentially increasing the average performance of students from this group relative to the treatment group. Yet, even in the data collected by the State Secretariat of Education of Ceará (SEDUC / CE) through the Permanent System of Evaluation of Basic Education of Ceará (SPAECE) were we found that attrition was lower more balanced, we still found significant effects of the program on the development of socioemotional skills.

The experience of Ceará can yield valuable lessons for other Brazilian states as well as other countries in the region. Indeed, as in other Latin American countries, the quality of primary education in Ceará measured by student learning outcomes has improved steadily over the last 10 years, but the State faces major challenges in terms of relevance and quality of its secondary school system: (i) high dropout rates (only 55.8% of youth aged 19 have completed high school); and (ii) low academic performance as measured by standardized tests, in Portuguese and Mathematics (only 24% and 9%, respectively, lower than the already poor national average of 29.2% and 10.3%). Yet, the State of Ceará has made significant efforts to improve the coverage, quality and relevance of secondary education in both regular and professional schools. For example, the State multiplied by four the supply of professional schools in a five-year period (from 25 schools in 2009 to 110 schools in 2015) and, initiated a partnership with Instituto Aliança to design innovative programs to provide training in personal, social, and job skills as well as in the use of information technology in secondary schools.

Our results also contribute to the international literature. According to a recent meta-analysis of interventions aiming at developing socioemotional skills by Duryea et al. (2017), there are no studies that explicitly find significant effects of secondary school interventions on extroversion and emotional stability, two areas that consistently display high returns and malleability before age 30. The NTPPS intervention had strong effects on both types of skills and can thus provide insights on how to develop such skills during adolescence.

This paper is organized as follows. Section II describes the program and the study design. In Section III, we describe the empirical strategy, the randomization and changes in composition due to attrition in the follow-up data collection. Section IV presents the main results and Section V provides some concluding remarks.

II. The program and study design

1. The program Núcleo de Trabalho, Pesquisa e Práticas Sociais (NTPPS)

The state of Ceará, through its secretariat of education (SEDUC/CE), is a unique case in the Brazilian Education landscape given that the performance of its education system has improved steadily over the last 10 years. Their model for improvement partly relies on what they call: *protagonismo estudantil*, or student leadership, that emphasizes the importance of developing student socio-emotional skills as a fundamental ingredient for taking full advantage of their educational opportunities. This model was primarily developed upon the conclusions of the Delors' report (UNESCO, 1996), which groups the goals of education into four *pillars*³, and shares important features with Positive Youth Development (PYD), Social and Emotional Learning (SEL) and Service Learning interventions.

³ Learning to know, learning to do, learning to be and learning to live together.

In order to promote student leadership and to induce schools to modernize their curricula, the Education Secretariat of Ceará (SEDUC), in partnership with the Instituto Aliança (IA), developed in 2012 an innovative program called *Núcleo de Trabalho, Pesquisa e Práticas Sociais* (NTPPS)⁴ -that means Work, Research and Social Practices. The main objective of this program is to provide high school students with training for the development of personal, social and work skills throughout the three years of high school offered directly into the curriculum.

The NTPPS consists of five hour lessons per week divided into three sessions (two sessions of 2 hours and one of 1-hour). The two longer sessions focus on building a life project, while the shorter session is dedicated to learning Information and Communication Technologies (ICT). The pedagogy is based on participatory methodologies that value students' opinions and experiences, and provides an association between disciplinary contents, real life experiences and practices.

Based on the structured material produced by Instituto Aliança, the sessions are organized in a dynamic group format, in which experiences and simulations of real life events are brought to the fore providing a process of discussion and critical reflection. The process culminates in the production of a report written in small groups summarizing the main conclusions of the case. At the same time, the room is divided into groups that choose a topic related to the predetermined thematic axes (see Table 1 below). In-depth research is then carried out by each group and presented at the end of the year in a final report. The 1 hour weekly session dedicated to ICT is used as a tool for the accomplishment of the group research.

The thematic axes that guide the group discussions and the research projects to be carried out by the students are predefined and follow an annual planning, as shown in Table 1. In the first year, the discussions are centered on the relationships between the individual, the school and the family; in the second year, the focus is on citizenship and the relationship between the individual and the community; and in the last year of high school the central concern is the relation of the individual to the world of work.

Table 1: The NTPPS program during the three years of high school (*Ensino Médio*)

Year 1	Year 2	Year 3
SCHOOL AND FAMILY	COMMUNITY	WORK AND SOCIETY
Life Project I- Personal	Life Project II - Integrating the Community	Life Project III - Academic and Productive Career
Project and Research	Project and Research	Project and Research
Personal Identity	Identity and Integration	Professional identity
Integration	Social Identity	Leadership and Teamwork

⁴ The NTPPS program is a reformulation of the Com Domínio Digital (CDD) program developed by IA and offered between the years of 2008 and 2012 in public schools of Ensino Medio of Ceará as an extracurricular activity to develop student's digital skills. Instituto Aliança (IA) received the Global Best Awards of the International Education Business Partnership Network (IPN), for its effort to scale up the program Com.Domínio Digital (CDD).

Family	Citizenship	The various dimensions of work
School	Youth Participation	Simulations of selective processes
Health and Life Valuation	Health and Sexuality	Financial education
Ethics at school and in the family	Ethics in Society	Ethics in the World of Work
Communication	Communication	Communication in the World of Work

Source: Santos (2016) using information available on <http://www.seduc.ce.gov.br/>

Introducing the NTPPS in a school requires important changes in the curriculum and thus, schools need to fulfill some basic conditions:

- i) The introduction of 4 hours of classes per week for the NTPPS (160 hours per year) in the curriculum for the realization of workshops, characterized by participatory pedagogy and project development, plus 1 hour for ICT;
- ii) Identification of teachers for the NTPPS based on an established profile (complete higher education degree, experience in classroom management among others).
- iii) Provision of time for NTPPS teachers to participate in continuous training;
- iv) Provision of a computer lab for internet research and preparation of presentations and reports;

As shown by requirements listed above, a crucial component of the program is the systematic training and monitoring of teachers provided by IA to ensure they feel comfortable with the materials and the teaching formats that are different from the one commonly used in class. In particular, IA provides the following materials and support: i) Systematized materials for Year 1, 2 and 3 for the teachers and the students; ii) 4 Teacher training sessions per year in addition to distance monitoring that include monitoring guide of the students, contents of lesson plans and research skills; iii) Follow-up visits to teachers, articulation and presentation of the Program for the School Community (frequency: 1 per month). The institute staff continuously monitors the progress of the intervention to ensure the quality of the implementation

2. Timeline and selection of schools

The evaluation of the effect of this program on socioemotional skills is based on the random assignment of public secondary schools under the responsibility of SEDUC-CE, in two groups: one that will receive the intervention (called the treatment group) and the other that will remain without the intervention (the control group). However, not all schools offering Secondary Education in the state of Ceará were eligible to participate in this study. The set of eligible schools was composed of those who: (a) offer regular high school (not professional education)⁵ or normal

⁵ This program was conceived to be implemented in two modalities: one focused on the regular schools (the NTPPS) and the other aimed at professional schools (or EEEPs). The program in EEEPs was implemented universally, but the

school (*magisterio*) and at least one class takes place in the morning or afternoon; (b) have not yet received the NTPPS (or his predecessor the CDD program) program in previous years; And (c) have information regarding the proficiency of students coming from the Permanent System of Evaluation of Basic Education of Ceará (SPAECE) for the years 2013, 2012 and 2011.

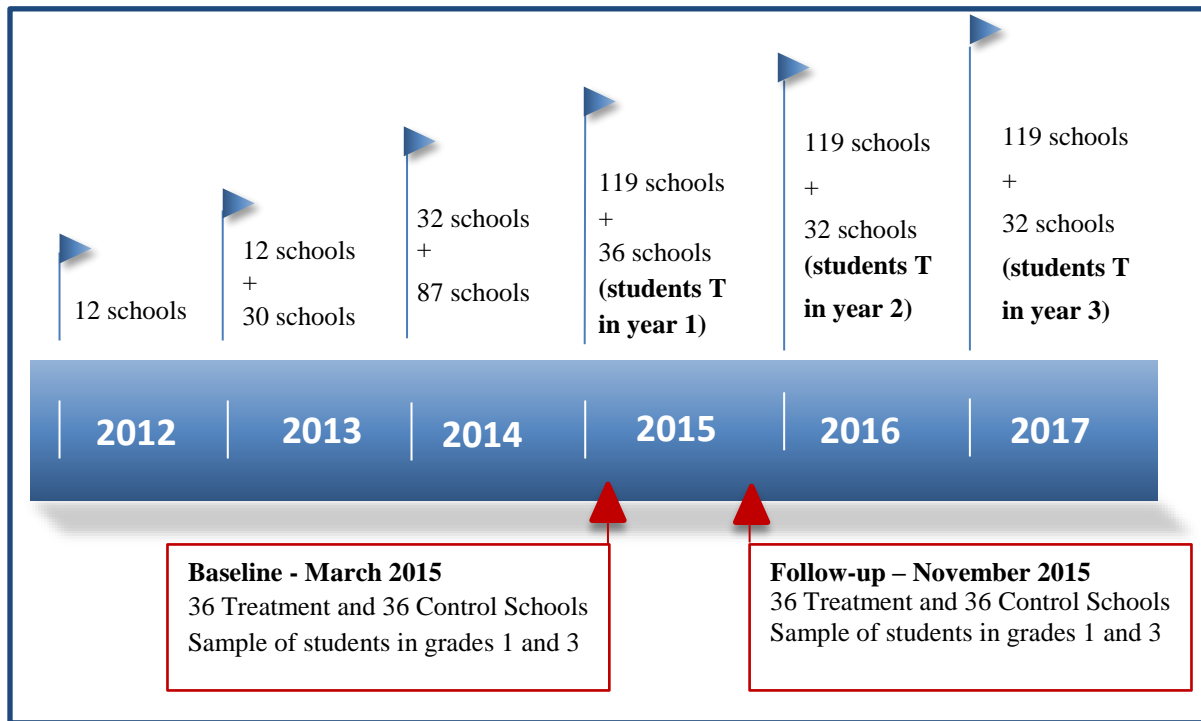
The latest information to which we had access to in 2013 indicated that Ceará had 636 schools offering high school, of which 492 would had either regular high school or teaching. Finally, we excluded from the sample three schools that do not had grades for the third year of high school in SPAECE, leaving us with 489 schools. Out of these 489 schools, 83 have received the NTPPS and 21 have received the CDD, which leaves us with a universe of 385 eligible schools⁶.

The timing of the impact evaluation with respect to the implementation of the NTPPS is the following. The program has been implemented progressively in regular schools in Ceara since 2012. For its 4th year of expansion in 2015, the SEDUC-CE made a state-wide call for volunteers and randomly allocate schools to treatment and control groups. The manifestation of interest occurred in two moments in time. First, a dissemination campaign targeting school directors was carried out in December 2014 by sending the call for volunteers via email and publishing it in the SEDUC webpage place. As a result, a total of 51 schools responded, of which 42 were eligible and grouped into 21 pairs (see explanation below). In the second phase, sensitization sessions were carried out by the SEDUC / CE team in collaboration with IA with regional coordinators in January 2015. After this second process, another 36 schools volunteered to receive the NTPPS, of which 30 were eligible for treatment. Following the same procedure as before, 15 additional pairs were formed. However, in two pairs the allocation to treatment did not occur randomly and two treatment schools did not adhere to treatment, according to additional data received from SEDUC-CE in early 2016. Thus, the impact assessment will be restricted to 32 pairs of high schools. Figure 1 below summarizes the timeline of the implementation of the NTPPS program and the different phases for data collection.

NTPPS was implemented gradually, yielding a unique opportunity to design an experimental impact evaluation. The IDB provided support for the implementation of the program in EEEPs in Ceará and for the evaluation of the results of the NTPPS through the operation BR-T1294.

⁶ The reason we disregard schools that have already received CDD in the past is to avoid any contamination in the estimated effect, since the two programs have similarities. Additionally, if these schools had CDD in the past and decided to discontinue CDD, they would likely not be willing to implement NTPPS if assigned to the treatment group.

Figure 1. Expansion of the NTPPS program in Ceara and data collection for the impact evaluation



Source: Own elaboration

Although the identification strategy is based on a randomization of schools between treatment and control groups, we can increase the accuracy of our estimates by pre-matching the schools that will participate in the study, and then randomize which school will implement the program within each pair. This procedure removes part of the unobserved variance and improves the ex post balance between the treatment and control groups in terms of the joint distribution of observables. Thus, in a sample of 72 eligible schools that declare interest in receiving NTPPS in 2015, we constructed 36 pairs of schools with the lowest Mahalanobis distance using the following characteristics: Portuguese and math proficiency for the cohort enrolled in 1st and 3rd year of high school, a variable indicating whether the school is located in Fortaleza, an indicator of whether the school participates in the Project called *Jovem do futuro*⁷, the student teacher ratio in the first year of high school and the total number of students enrolled in the school. Table 20 in the Appendix shows the final relationship of the pairs of schools that make up the final sample with the respective identification of treatment and control.

Finally, using the administrative records sent by SEDUC / CE, two 1st year classes from High School (HS) and half a 3rd year class from secondary school were randomly selected for each of

⁷ Jovem de Futuro is a School Management project launched in 2012 by the SEDUC-CE in partnership with the Unibanco Institute which provides participating schools with technical and financial support for a period of 3 years for High Schools. Schools receive training and technical advice to plan, execute, monitor and evaluate a proposal to improve their results, and R \$ 100 / student / year to finance the strategic actions foreseen in this plan.

the 72 schools involved in the evaluation. A total of 5561 students were selected, 4438 of the first year of HS and 1123 of the third year of HS. It is important to highlight that as explained earlier, the program was designed as a 3-year curriculum throughout high school. Given that the treatment schools started the implementation of the program in 2015, we only reach the cohort enrolled in the first year of HS. However, collecting information from the 3rd year MS students will allow to verify the total effect of the NTPPS program after the three years of implementation and therefore the total effect of the program in the future.

Additional information sent by SEDUC early in 2016 revealed that: (i) two schools dropped from the NTPPS shortly after joining and (ii) two other schools left the program in 2016 after one year of exposure to the program. These four schools are identified in Table 20 in the Appendix and will be considered when estimating the impact of the program.

3. *Expected results and outcome variables*

As mentioned before, NTPPS is an intervention closely related to PYD, SEL and Service Learning programs. Studies on PYD interventions (Durlak et al., 2011, Sklad et al, 2012) reveal that these programs typically succeed in improving feelings of self-confidence and self esteem, positive social behaviors and school bond, as well as academic achievement. They also reduce problem behaviors and drug use. In the most recent and broad meta-analysis (Taylor et al, 2017), the average effect size of SEL interventions was $0,14\sigma$ for conduct problems and $0,16\sigma$ for emotional distress, typical markers of emotional stability. They also find an important impact of $0,13\sigma$ for positive social behavior. These authors, as well as the ones in Durlak et al (2011), stress that four features seem to be present in successful SEL interventions, summarized in the acronym SAFE (Sequenced, Active, Focused and Explicit⁸), all of which present in NTPPS. They also report that most of the PYD interventions contain structured material and lessons, lasting between 30 and 45 minutes. Programs run by the school staff (such as NTPPS) also display higher impacts than those whose activities are conducted by external personnel (Durlak et al, 2011). Zins et al (2004) summarizes the proposed theory of change of PYD programs, which suggests that PYD interventions affect mainly Positive Social Behavior, Conduct Problems and Emotional Distress, through two mechanisms: social and emotional skill acquisition and improved attitudes about self, others and school. It is worth to notice that the first year of the NTPPS curriculum emphasizes precisely such attitudes, and as we will see further in this study, has its most visible impacts exactly on interpersonal dimensions (related to positive social behavior) and emotional resilience.

⁸ These meta-analyses, often conducted by researchers linked to CASEL, concluded that four characteristics are usually present in effective SEL interventions: They are (i) *Sequenced*: Connected and coordinated activities to foster skills development; (ii) *Active*: Active forms of learning to help students master new skills and attitudes; (iii) *Focused*: A component that emphasizes developing personal and social skills; and (iv) *Explicit*: Targeting specific social and emotional skills. All four aspects are present in NTPPS.

Finally, we need to define the outcome variables we will use to estimate the impact of the NTPPS program. We use 2 sets of indicators: social-emotional skills and school performance in Portuguese and Mathematics.

Socioemotional skills are measured using the instrument developed by Instituto Ayrton Senna called SENNA (Social and Emotional or Non-cognitive Nationwide Assessment; Primi et al 2016). With the aim of contributing to the measurement of socioemotional attributes in Brazil, the instrument was developed by researchers through an exploratory factorial analysis of items observed in international instruments. The original instrument is a self-report measure composed of 92 items that allow the evaluation of 6 psychological constructs: Self-management, Engagement with others, Emotional resilience, Internal control, Kindness and Openness to new experiences. The SENNA instrument was distributed to students at baseline and follow-up used to measure students' socioemotional skills. However, a different version of the SENNA scale was applied to the students between the baseline and the follow-up data collection. For the baseline, version 1.0 was used while for the follow-up we were able to use the newly developed SENNA 2.0 (162 items). The main difference between these two versions is that the SENNA 2.0 allows to disaggregate each of social-emotional domains into facets.

School performance in Portuguese and Mathematics is measured by State exam called the Permanent System of Evaluation of Basic Education of Ceará (SPAECE in Portuguese⁹). This evaluation applies performance tests and contextual questionnaires to all students in the public schools and municipal networks of the state. In this paper, we use the tests scores in Portuguese and Mathematics applied in 9th grade of basic Education as well as 1st and 3rd grade of High School. In addition, in 2015 a short questionnaire aimed at measuring socioemotional skills of student in the state was included, a short version of the SENNA 2.0. The questions included were from the same bank of items that originated the SENNA 2.0, and whose psychometric properties reveal that it can be grouped in the same five domains of personality, both in terms of identity and self-efficacy.

Besides the outcomes variables, we measured a series of variables aimed at capturing the socioeconomic background of the students, their relationship with the parents, their academic trajectory and perceptions about their future at the end of the HS and their teachers. The questions allowing to define these variables were included in the questionnaire along with the SENNA instrument both at baseline and follow-up data collection.

III. Empirical strategy and randomization

1. Empirical strategy

In this section, we describe the empirical framework used to estimate the impact of the NTPPS program. Since the assignment of treatment (receiving the NTPPS program) was random after pre-

⁹ Sistema Permanente de Avaliação da Educação Básica do Ceará (<http://www.spaece.caedufif.net/>).

matching the schools based on their observables characteristics we can estimate the average treatment effect on the schools that voluntarily adhered to the program, which formally can be expressed by the following equation:

$$D = E[Y_i|T_i = 1] - E[Y_i|T_i = 0] \quad (1)$$

Where Y_i is the result variable and T_i is the treatment indicator variable. Therefore, D is the average of the outcome variable in the treated group after treatment minus the average of the same variable, for the same group, but in the counterfactual situation, i.e. when not exposed to treatment.

To obtain the first element of the previous equation, we can resort to the data collected after the group received the treatment. However, measuring what would happen to the same group in the absence of treatment is more challenging, and in many social experiments, it cannot be observed. By randomizing exposure to treatment, the data collected from the control group can be used as a measure if this expected average given that the potential outcome of both groups becomes independent of the allocation to the treatment. Thus, we can denote that $E[Y_i(0)|T_i = 0] = E[Y_i(0)|T_i = 1]$ and therefore any problems arising from the auto-selection bias are solved. Thus, the treatment effect can be calculated by Ordinary Least Squares (OLS), that is,

$$Y_{is} = \alpha + \beta T_s + \varepsilon_{is} \quad (2)$$

Where ε_{is} captures both the observed and unobserved variables of individual i in school s . In this equation, β can capture the effect of the program, but if it is correlated with at least one unobserved variable, $E[\varepsilon_{is} | T_i] \neq 0$ will be a skew estimate. However, the randomization process ensures that $E[\varepsilon_{is} | T_i] = 0$ and, therefore,

$$E[Y_{is}|T_s = 1] - E[Y_{is}|T_s = 0] = (\alpha + \beta) - \alpha = \beta \quad (3)$$

where β would be the effect of the NTPPS program.

To improve the accuracy of the estimate of the treatment effect, we can add an indicator variable for each pair of schools in addition to using school clusters to correct the variance matrix of ε . This is necessary given that randomization occurred within each school pair, after they were pre-matched using their observable characteristics. Thus, the impact estimate β will be obtained using the following regression,

$$Y_{is} = \alpha + \beta T_i + \sum_{p=1}^N \beta_p w_p + \varepsilon_{is} \quad (4)$$

where w_p is an indicator variable for each of the school pairs and β would be the effect of the NTPPS program.

It is important to remember that, as shown in Table 20 in the Appendix, some school pairs did not meet the requirements for random assignment to treatment, others did not join the program and others implemented other programs during the same school year. In this sense, to only estimate the impact of NTPPS, we exclude these pairs from the impact evaluation in the initial analysis. As part of our robustness checks about the impact of the NTPPS, we run additional analysis using the complete set of schools.

2. Randomization

One of the main objectives of an impact evaluation is to ensure that any differences in outcomes between the treatment and control groups can be *causally* attributed to the fact that only one of the groups received treatment rather than other pre-existing differences. Although the random assignment guarantees statistical independence between the treatment and other pre-existing characteristics of the treatment and control groups, it is possible that, in small samples, systematic variations detected in these groups can explain differences observed later in the results. Ideally, we would like to have as much evidence as possible that the control and treatment groups were similar ex-ante, and therefore, that the allocation to treatment is the fundamental cause of outcome variations ex -post.

To verify the quality of the random allocation to treatment, we explore ex-ante differences between the students from the treatment and the control schools using the data collected at baseline. However, not all students were interviewed at baseline and, therefore, we do not have information about their socioeconomic characteristics or social-emotional abilities. As shown in Table 2, almost 16% of the students did not respond to the baseline questionnaire. These cases were equally distributed among schools that joined the NTPPS in 2015 and those not participating in the program.

Table 2: Students interviewed at baseline by school participation status

	Control	Treatment	Total
Not Interviewed	448 16,17%	463 16,59%	911 16,38%
Interviewed	2322 83,83%	2328 83,41%	4650 83,62%

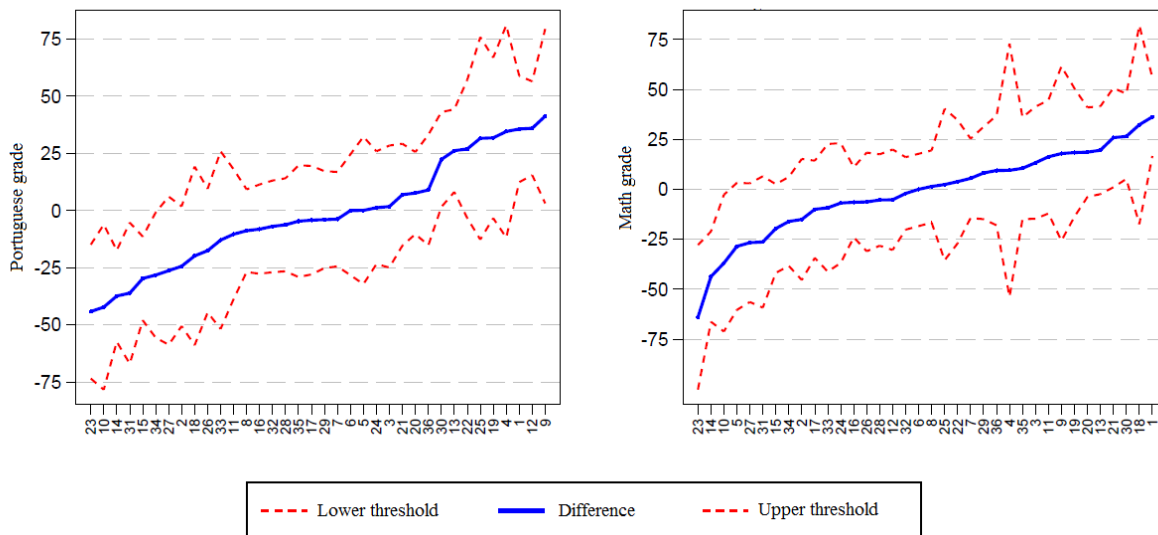
Source: Own elaboration

Since the randomization was done in pairs, it is important to note that both groups (the one that received the program and the one that did not receive it) display similar percentages of missing responses. In addition, we also verified that the percentage of students not interviewed was not concentrated in a specific school. In most schools the percentage of students interviewed was over 70%. In one of the schools in the control group, this percentage was approximately 55%, while in three schools, two in the control group and one in the treatment group, 100% of the students were interviewed. It can be inferred that the non-attendance of some students on the day of the baseline

data collection seems balanced between the control and in the treatment schools and thus, should not affect the comparison.

The following question is: how efficient was the process of random assignment to treatment by pre-matching schools *ex ante*? The answer can be obtained by verifying the existence of statistically significant differences in the observable characteristics of the students sampled at baseline. If the randomization was satisfactory, we should not observe large differences in the observable characteristics between both groups. Theoretically, the absence of differences in observable characteristics suggests that there should be no difference in unobservable characteristics. To perform this analysis, we compare each of the 36 pairs of schools with respect to four individual characteristics (race, sex, age and socioeconomic status), six socio-emotional abilities measured by the SENNA scale and the level of proficiency in Portuguese and mathematics (see Figures 2 and 3 below)¹⁰.

Figure 2: Difference between Treatment and Control group by school pair in student characteristics



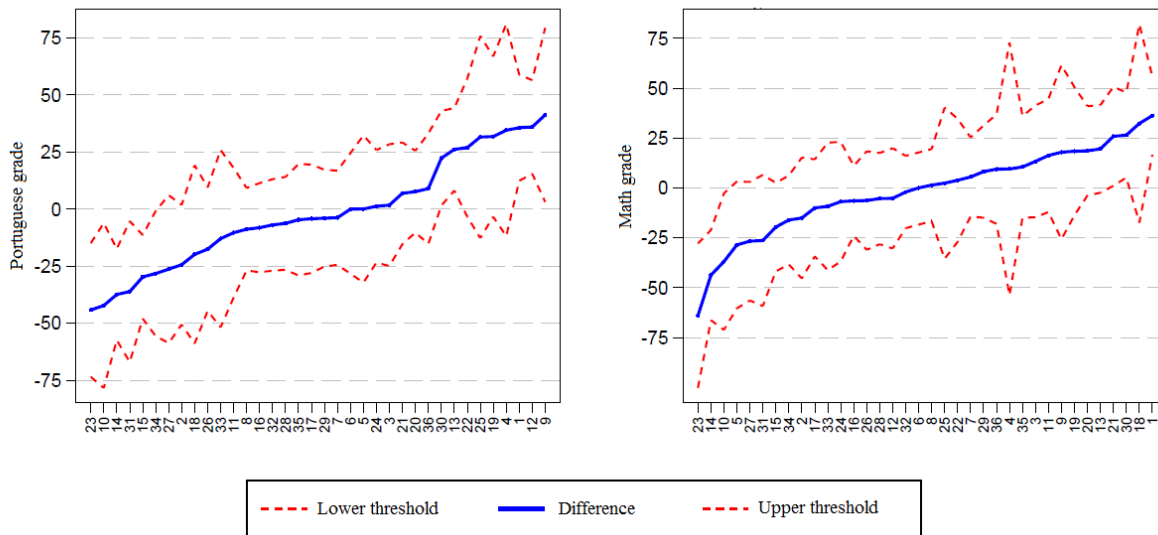
Source: Own elaboration

Figure 2 reveals that only a few pairs presented statistically significant differences between treatment schools and control schools, both for color / race, and for sex and age of students. With respect to the socioeconomic index, statistically significant differences were observed in about half of the pairs. However, just as there are pairs in which the difference indicates that the treated school has students with better socioeconomic conditions, there are control schools in which students are better at this indicator when compared to the students in the treated schools. Thus, on average, the two groups do not present statistically significant differences.

¹⁰ The ex-ante difference in the level of proficiency in Portuguese and Mathematics of our sample of students enrolled in the first year of high school was measured using their level of proficiency at SPAECE 2014 when our students were in 9th grade of Elementary School (Ensino Fundamental).

With data from the Permanent System of Evaluation of Basic Education of Ceará (SPAECE), we compared the academic performance of students in the control group and in the treatment group in the previous year to the data collection, that is 2014, during their last year of basic education. For these students, Figure 3 reveals that in most pairs of schools, there are no statistically significant differences between the two groups in neither Portuguese nor Mathematics. These results should be interpreted with caution, since about 1/3 of the 1st year students included in the sample were not identified in the SPAECE of 2014 when they were enrolled in 9th grade.¹¹ Students not found in the data base are (i) students who migrated from the private network to the public network, (iii) students whose records were altered or (iv) students who did not participate in SPAECE in 2014.

Figure 3: Average differences by school pairs between treatment and control in Portuguese and mathematics at SPAECE 2014



Source: Own elaboration

Lastly, we conclude this analysis with Table 3 that tests the average differences between treated and controls at baseline. The results show that, despite the existence of some statistically significant differences, the randomization was successful in creating balanced treatment and control groups. First, the treatment and control group do not have differences regarding the characteristics of the students and the family background (except for a small difference in age and previous grade failure). Second, the results show that students in the treatment and control group had similar average levels of proficiency, both in Portuguese and in mathematics. Finally, we observe no difference in five of the six socio-emotional dimensions assessed at Baseline (see also Figure 11 in the Appendix).

¹¹ As shown in Table 21 in the Appendix, the share of student not found in the SPAECE data base in 2014 is very similar in the treated group and the control group, approximately 34%. It can be inferred that the non-information about student academic performance is equally distributed in both groups.

Table 3: Difference between treated and controls in the characteristics observed at Baseline.

	Grade 1 of HS			Grade 3 of HS			Total		
	Treat.	Ctrl.	Dif.	Treat.	Ctrl.	Dif.	Treat.	Ctrl.	Dif.
Grade in Portuguese	237,19	237,26	-0,07				237,19	237,26	-0,07
Grade in Mathematics	239,25	240,91	-1,66				239,25	240,91	-1,66
Openness to new experiences	-0,07	-0,04	-0,03	0,08	0,16	-0,08	-0,03	0,01	-0,04
Kindness	-0,06	-0,03	-0,02	0,13	0,13	0,00	-0,01	0,01	-0,02
Self-management	-0,04	0,02	-0,06*	0,03	0,12	-0,09	-0,03	0,04	-0,07**
Engagement with others	-0,03	-0,04	0,01	0,08	0,12	-0,04	0,00	0,00	0,00
Internal Control	-0,01	-0,03	0,02	0,12	0,14	-0,02	0,02	0,01	0,01
Emotional resilience	-0,02	-0,01	-0,02	0,05	0,09	-0,05	-0,01	0,02	-0,02
Age	15,63	15,75	-0,12*	17,36	17,37	-0,01	16,03	16,14	-0,11*
Preschool attendance (%)	0,88	0,89	-0,01	0,87	0,91	-0,03	0,87	0,89	-0,02*
Failed grade (%)	0,43	0,40	0,03*	0,33	0,3	0,03	0,41	0,38	0,03**
White (%)	0,29	0,28	0,00	0,32	0,28	0,05	0,3	0,28	0,01
Boys (%)	0,51	0,53	-0,02	0,43	0,45	-0,02	0,49	0,51	-0,02
Recipient <i>Bolsa Família</i> (%)	1,61	1,63	-0,01	1,58	1,67	-0,09***	1,61	1,64	-0,03*

Note: Trat. = Treatment, Ctrl = Control e Dif. = Difference; *, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively

Source: Own elaboration

3. Composition effect

To estimate the impact of the NTPPS, two different data sources are used. The first one comes from the Follow-Up data collection after one year of intervention. The second comes from the SPAECE records of 2015. Each data base has advantages and disadvantages.

The Follow-Up data was collected in the last week of classes after the final exams and the battery of tests applied was significant: the full version of the SENNA v2.0 psychological instrument (17 facet constructs grouped in the five major domains of personality, Measured both at the level of identity and self-efficacy). As a result, we have a level of attrition of 30%. The SPAECE data on the other hand was collected a week before the Follow-Up and suffering less attrition (about 15%), but the main objective of students that day was to respond to a relatively exhaustive test of math and language. After the tests, students were asked to complete a short version of the SENNA 2.0 instrument, containing only measures of the five major personality domains at the levels of identity and self-efficacy. By combining the use of these two data sources, we enrich the analysis and have more flexibility to deal with possible attrition problems.

It is worth noting that the SPAECE data refers in principle to the universe of students enrolled in treatment and control schools, and not only to students who participated in the Baseline (as in the Follow-Up data). As the strategy for identifying the impact of the NTPPS intervention in this case involves the original randomization of schools into treatment and control groups, the causal

interpretation of the differences in outcome in the SPAECE data for the enrolled population is not impaired, with the benefit of the expansion of the sample size. For this reason, our analysis involving the SPAECE 2015 data is made primarily considering the universe of students enrolled in treatment and control schools, and not restricted to baseline participants only.

As described earlier, the Follow-Up data collection was carried out at the end of the year 2015. The sample of students to be interviewed was maintained, that is, 5561 students, of which 1123 were students in the 3rd year of High School and the rest were students from the 1st year. As can be seen in Table 4, 63.25% of the baseline interviewees were also interviewed in the Follow-Up. Note that in the treatment schools, 1371 students were interviewed, while in the control schools, 1570 students were interviewed.

Table 4: Students interviewed and not interviewed in the Follow-Up by type of school

	Treatment	Control	Total
<i>Follow-Up</i>	1371 29,48%	1570 33,76%	2941 63,25%
<i>Only Baseline</i>	957 20,58%	752 16,17%	1709 36,75%
Total	2328 50,06%	2322 49,94%	4650 100,00%

Source: Own elaboration

These 2941 students interviewed answered the following blocks of questions:

- I- Socioeconomic questionnaire
- II- Allocation of time, in which the student was asked about spending his time on activities related to work and leisure. From these answers, we defined an indicator of engagement with the studies that assumes the value 1 when the student dedicates at least 2 hours per day to the studies, and 0 otherwise.
- III- Academics, which has raised questions related to students' attitudes towards studies (Do your teachers usually list exercises or support material to study at home? Or Do you like to study Portuguese?).
- IV- SENNA 2.0, a questionnaire whose objective is to measure the level of social-emotional abilities.

Given that not all students in the Baseline were interviewed in the Follow-Up, we need to assess whether the students present in both data collections are representative of the group of students interviewed in the Baseline to rule any selection bias in our results. For the estimation of the impact of the intervention, the data used is the one collected at the end of the year (either in Follow-Up or in SPAECE2015), and therefore it is in this sample (and not in the Baseline) that we need to ensure that pre-existing differences between the treatment and control group do not explain any potential differences in outcome. Knowing that randomization worked well and that at the beginning of the exercise both groups were observationally equivalent is important, but insufficient to exclude the

possibility of contamination by confounding effects or changes in the composition of the group that could make our sample of students no longer representative. We focus on possible changes in student composition in the dimensions we will use as outcome variables, as well as selected dimensions of socioeconomic characteristics that may help us to interpret the results.¹²

Among the striking changes highlighted in Table 5, students with low achievement in Portuguese and mathematics and of students with lower levels of "Openness to new experiences" "Kindness" and "Internal Control" have a strong tendency to disappear from the database between our 2 points in time. These composition changes seem to affect only the control group and thus, could artificially inflate students' scores in these dimensions in the control group and underestimate the true effect of the intervention. Our calculations reveal that the inflation of results due to the change of composition in the control group vis-à-vis treatment is 11.2 points (0,22 σ) in Portuguese language. To get a better idea of the magnitude of this problem, a youngster is expected to learn on average almost 13.5 points per grade during elementary school. In mathematics and in "Internal control", this difference was around 9 points and 0.19 standard deviation, respectively.

Table 5: Composition effect at Follow-Up (1st year of High School)

	Treatment			Control			Composition Effect (A-B)
	<i>Follow Up</i>	<i>Only Baseline</i>	Diference (A)	<i>Follow Up</i>	<i>Only Baseline</i>	Diference (B)	
Portuguese	236,81	235,24	1,57	239,72	226,54	13,18***	-11,61***
Mathematics	238,61	237,33	1,28	242,32	233,91	8,41***	-7,13*
Openness to new experiences	-0,08	-0,08	-0,00	-0,02	-0,13	0,11**	-0,11
Kindness	-0,05	-0,07	0,02	-0,00	-0,10	0,10*	-0,07
Self-management	0,02	-0,10	0,12**	0,04	-0,03	0,06	0,06
Engagement with others	-0,05	-0,02	-0,03	-0,07	-0,01	-0,06	0,03
Emotional resilience	0,02	-0,07	0,09*	-0,01	-0,04	0,03	0,06
Internal Control	-0,02	-0,03	0,01	0,01	-0,19	0,20***	-0,19**
Age	15,40	15,85	-0,44***	15,49	16,22	-0,73***	0,29**
Preschool attendance (%)	0,89	0,87	0,01	0,89	0,89	0,00	0,01
Has repeated a grade (%)	0,39	0,48	-0,09***	0,35	0,49	-0,14***	0,05

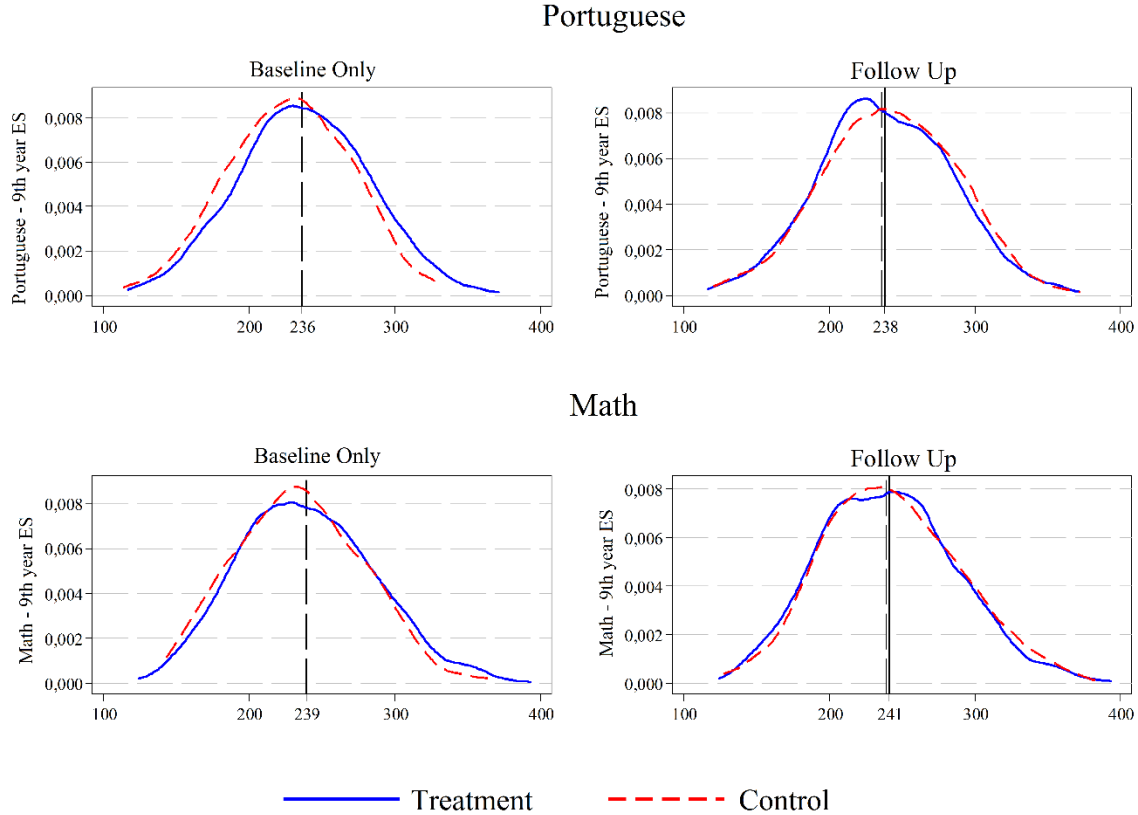
Note:*, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively. Source: Own elaboration.

Similarly, Figure 4 below shows the Portuguese average in SPAECE 2014 in the complete sample advanced 2 points in both disciplines only because of the attrition occurring predominantly in the lower tail of the distribution. In addition, it can be noted that the upper tails of the control group's grade distributions became denser in the Follow-Up compared to the Baseline distribution. In this graph, we separated the sample from the baseline between students who were found only in the first interview and students who were re-interviewed at the end of 2015 at the time of Follow-Up.

¹² In this analysis, we consider only the 32 pairs that so far followed the randomization criteria.

Our goal was to see if the students who participated in the follow-up remain similar in the treatment and control groups in terms of their pre-existing characteristics.

Figure 4: Distribution of the initial proficiency levels in Portuguese and mathematics by data collection



Note: The vertical dashed line represents the Portuguese average of the interviewees in the Baseline. The vertical line continues to represent the Portuguese average of the respondents in the Baseline and Follow-Up. Source: Own elaboration.

In the computation of the average effects of the treatment on the population of interest a , we are typically interested in the difference in means between the treatment and control students for relevant variables of outcome measured after some time from the beginning of the intervention, i.e. we are interested in the parameter:

$$\Delta(a) = E[y|T = 1; a] - E[y|T = 0; a] \quad (5)$$

Whenever attrition occurs, however, we were only able to calculate the respective means in the subgroup of our interest sample that remained in the study, i.e.:

$$\delta(a) = E[y|T = 1, P = 1; a] - E[y|T = 0, P = 1; a] \quad (6)$$

Where the random variable P indicates whether the individual from our initial sample remained in the study until the time when the variable y was measured. The difference between the parameter we want and what we can estimate is therefore:

$$\begin{aligned} \delta(a) - \Delta(a) = & Pr(P = 1|T = 1; a)[E[y|T = 1, P = 1; a] - E[y|T = 1, P = 0; a]] \\ & - Pr(P = 1|T = 0; a)[E[y|T = 0, P = 1; a] - E[y|T = 0, P = 0; a]] \end{aligned}$$

If the occurrence of attrition is independent of the other variables of interest in this exercise, we will have $f [y | T, P = 1; a] = f [y | T; a]$ and in this case $\Delta (a) = \delta(a)$. As seen in the attrition analysis, this does not appear to be the case. We also observed that the attrition rates are slightly higher in the treatment group, that is, $Pr (P = 1 | T = 1; a) > Pr (P = 1 | T = 0; a)$.

If the treatment effects were homogeneous, that is, if $\Delta (a) = \Delta$, and defining y_0 as the level of y before the beginning of treatment, we would have $E (y | T) = E (y_0 | T) + \Delta T$, causing

$$\begin{aligned} \delta(a) - \Delta(a) = & Pr(P = 1|T = 1; a)[E[y_0|T = 1, P = 1; a] - E[y_0|T = 1, P = 0; a]] \\ & - Pr(P = 1|T = 0; a)[E[y_0|T = 0, P = 1; a] - E[y_0|T = 0, P = 0; a]] \end{aligned}$$

In this scenario, it is possible to quantify the magnitude of the influence of friction on our estimation of the intervention impact if we have information about y_0 at the baseline. Table 6 seeks to precisely estimate $\theta (T) = E [y_0 | T, P = 1; a] - E [y_0 | T, P = 0; a]; T = 0,1$, and test for differences in this object Between the treatment and control groups, finding that $\theta (1) \leq \theta (0)$, leading to a tendency to underestimate the impact of the intervention.

Table 6: Composition effect Follow-Up (3rd year of high school)

	Treatment			Control			Composition Effect (A-B)
	<i>Follow Up</i>	<i>Only Baseline</i>	Difference (A)	<i>Follow Up</i>	<i>Only Baseline</i>	Difference (B)	
Openness to new experiences	0,06	0,12	-0,06	0,18	0,15	0,02	-0,09
Kindness	0,09	0,22	-0,13	0,11	0,13	-0,02	-0,11
Self-management	0,03	0,03	-0,00	0,18	0,02	0,16*	-0,16
Engagement with others	0,02	0,14	-0,11	0,15	0,05	0,09	-0,21
Emotional resilience	0,02	-0,05	0,07	0,06	0,18	-0,12	0,19
Internal Control	0,08	0,11	-0,03	0,12	0,14	-0,03	-0,00
Age	17,31	17,41	-0,10	17,10	17,82	-0,72***	0,62**
Preschool attendance (%)	0,86	0,90	-0,04	0,90	0,88	0,02	-0,06
Has repeated a grade (%)	0,32	0,34	-0,02	0,29	0,31	-0,02	-0,00

Note: *, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively
Source: Own elaboration.

Therefore, there are two plausible interpretations of the effects of the intervention. First, the numbers obtained through the comparison of averages from the Follow-Up can be seen as the lower limit of the true impact of the intervention. If these figures are positive and statistically significant, the composition effect will reinforce that the intervention had a positive impact. Secondly, when we observe that in the control group the loss of pupils in the lower-tail of the original talent distributions occurred more intensely, we can speculate that the NTPPS keeps pupils with more difficulty in school than who would have left the study (possibly because they left school) if they did not participate in the intervention. Both interpretations regarding the influence of friction on our conclusions are favorable to the occurrence of positive effects that the program possibly had and that our empirical exercise was not able to capture.

This observation also reinforces the suspicion that the main effects of the program are to retain in school those students most likely to abandon. To assess this assumption, we can compare the changes in composition that occurred in the 1st and 3rd year of high school. Given that the focus of the intervention in 2015 was on first year students, and that those enrolled in other series, at most, could have benefited indirectly, it can be expected that the change in the composition would affect first year students more than those in the third year. Table 6 is consistent with this interpretation, noting that, with the exception of the change in the more intense age profile in the control schools, there are no other differences that occur more significantly in the group of student in 3rd year of HS.

So far, our analysis suggests that, in a way, non-attendance occurred differently in the treatment school group and in the control schools in the Follow-Up. Both in Portuguese and in the measurement of internal control locus, we observe a composition effect of approximately 20% of a standard deviation. In this sense, we will use the data from SPAECE to verify if attrition occurred only when we use the Follow-Up data. The number of students who take the SPAECE assessment in Ceara is considerably high (this percentage was 86% in 2015).

Table 7: First-year students interviewed and not interviewed at SPAECE in 2015 by school condition

	Treatment	Control	Total
SPAECE	1530 43,23%	1506 42,55%	3036 85,79%
Only <i>Baseline</i>	249 7,04%	254 7,18%	503 14,21%
Total	1779 50,27%	1760 49,73%	3539 100%

Source: Own elaboration.

As shown in Table 7, only 503 first-year students sampled at baseline and interviewed in the Baseline did not conduct SPAECE assessments at the end of 2015. This implies that almost 86% of first-year of High School interviewed at Baseline also carried out the SPAECE. The percentage of students that were not found in SPAECE in 2015 was around 7%, both in schools belonging to the control group and in the treatment group. Table 8, below, presents the same analysis performed using the Follow-Up data. As observed, only 62.64% of the 1st year students were interviewed, and it is noticeable that the number of students not interviewed during this collection was higher in the schools of the treatment group.

Table 8: 1st-year students interviewed and not interviewed in Follow-Up by school condition

	Treatment	Control	Total
<i>Follow-Up</i>	1022 28,88%	1195 33,77%	2217 62,64%
Only <i>Baseline</i>	757 21,39%	565 15,96%	1322 37,36%
Total	1779 50,27%	1760 49,73%	3539 100%

Source: Own elaboration

Since student attendance at SPAECE was higher than attendance at Follow-Up (only 84 1st year students were interviewed at Follow-Up and did not attend SPAECE), it is better to perform a composition analysis using the SPAECE as well. Again, only using the 32 school pairs, we observe in Table 9 a strong composition effect in the treatment group and in the control group but in this case the effect was very similar in both groups.

Regarding the other characteristics, we observe that: (i) the age profile of the students changed in the two groups in an equivalent way, as did the proportion of those who repeated a year; (ii) with respect to the socioemotional domains, those students that did not take the SPAECE in the treatment schools are those with higher levels of "Engagement with others", whereas in the control schools, those not interviewed display lower levels of this social-emotional ability.

Table 9: Composition effect in SPAECE 2015 (1st year of High School)

	Treatment			Control			Composition Effect (A-B)
	<i>Follow Up</i>	Only <i>Baseline</i>	Difference (A)	<i>Follow Up</i>	Only <i>Baseline</i>	Difference (B)	
	Portuguese	237,78	220,01	17,78***	237,66	221,42	
Mathematics	239,73	221,64	18,09***	241,28	228,25	13,03***	5,06
Openness to new experiences	-0,07	-0,12	0,05	-0,03	-0,19	0,16**	-0,10
Kindness	-0,05	-0,08	0,03	-0,01	-0,18	0,17**	-0,14
Self-management	-0,00	-0,21	0,21***	0,05	-0,20	0,26***	-0,04
Engagement with others	-0,05	0,01	-0,06	-0,03	-0,16	0,13*	-0,19*
Emotional resilience	-0,01	-0,09	0,08	-0,00	-0,14	0,14*	-0,05
Internal Control	-0,01	-0,13	0,12*	-0,02	-0,28	0,26***	-0,14
Age	15,44	16,60	-1,16***	15,51	16,96	-1,45***	0,29
Preschool attendance (%)	0,88	0,90	-0,02	0,89	0,89	0,00	-0,02
Has repeated a grade (%)	0,39	0,64	-0,24***	0,36	0,61	-0,25***	0,00

Note: *, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively.

Source: Own elaboration.

Following our results, it seems that the Follow-Up data was, to a certain extent, hampered by the non-attendance of the students in the days of collection. Although it is a very rich data collection containing several measures of results for the evaluation of NTPPS, the results obtained using these data could be biased because of the selection effect just described. When comparing with the data from SPAECE in 2015, it seems that non-attendance at Follow-Up is not linked to a desirable effect of the program (retaining students with a higher propensity to drop out), but with the motivation to participate in the program. To a certain extent, the higher absenteeism of students from treatment schools on the day of Follow-Up is also consistent with a result that appears in some of the intervention impact estimates: that students in NTPPS schools perceive themselves as having lower levels of Self-management than those of control schools (note that in the literature missing school is considered as indicative of self-management).

Finally, since two databases are available to estimate the impacts of the intervention, it is important to briefly discuss the pros and cons of using each and the reasons that made us choose Follow-Up survey data as our primary source. In favor of the use of SPAECE 2015 data would be in principle the presence of lower rates of attrition and less evidence that attrition has greatly affected the similarity in the original compositions of student samples from treatment and control schools, which, can bias our estimates as discussed above. On the other hand, the socio-emotional measures

contained in SPAECE are significantly less rich than those obtained in Follow-Up (since only a short version of the Senna instrument was used), and there could be higher measurement errors in the Students' responses to this instrument, since the social-emotional questionnaire was applied at the end of two days of knowledge tests in Portuguese and Mathematics.

In fact, in the questions that were simultaneously applied in the short version of SENNA, during the SPAECE 2015, and a week later at Follow-Up, the correlation of the responses obtained is relatively low (0.5 on average, as seen in Table 22 in the Appendix), a fact consistent with the presence of measurement error. The day of the follow-up data collection took place when classes were over in most schools in the sample and students went to school only to attend our tests. It is possible that they were rested and even more motivated compared to the fatigue of the students when completing the SENNA during the SPAECE 2015, explaining the low correlation observed. Given that measurement errors can lead to attenuation biases in the estimated impacts, it is not clear that using the SPAECE 2015 would yield less biased results than using the Follow-Up data. Since the instruments applied in the Follow-Up are the ones included in the original design of the evaluation, we prioritize the analysis of the results obtained from the follow up database leaving to the appendix the numbers referring to the impacts obtained at the base of SPAECE 2015.

IV. Results

In this section we present the estimates of the short-term impact of the NTPPS program. The NTPPS was explicitly designed to strengthen youth leadership and to stimulate the social-emotional development of young people and their beliefs about their own potential. Thus, the first set of results we present are those related to impact of the program on the outcomes directly aligned with the objective of the program: socioemotional self-efficacy, as measured by the instrument SENNA 2.0, performance in the task of emotional intelligence of recognition of emotions, performance in planning tasks involving both cognitive and socioemotional characteristics, and professional and personal expectations. Then, we estimate the impact of the program on school performance indicators such as Mathematics and Language and the probability of staying in school. Analyzing this indirect effect of the program is crucial given during the implementation some teachers and principals were concerned about the fact that inserting the NTPPS in their curriculum came at the cost of reducing the hours of other disciplines, potentially reducing student academic performance.

At each stage of our research, we seek to estimate not only the average impact of the program on the beneficiaries, but also the possible existence of heterogeneous effects in individual characteristics. For example, one of our priors was that it could be easier to influence the socio-emotional development of young students who initially appeared to have significant deficits in these dimensions than those who already had high levels of these attributes because there was less room for improvement. Our design of the impact evaluation allows for measuring this given that we collected baseline estimates of socioemotional skills using the SENNA1.0 instrument and confirms that the greatest impacts of the NTPPS were concentrated among individuals with low

initial levels of their socioemotional characteristics. We also estimate the heterogeneity of the impact by gender, by the level of education of the mother, and by previous grade repetition. This could be useful to identify which student or family characteristics lead to lower social-emotional vulnerability at baseline: gender (either for biological or cultural reasons), lower maternal education, etc.

1. Impacts of NTPPS on social emotional skills

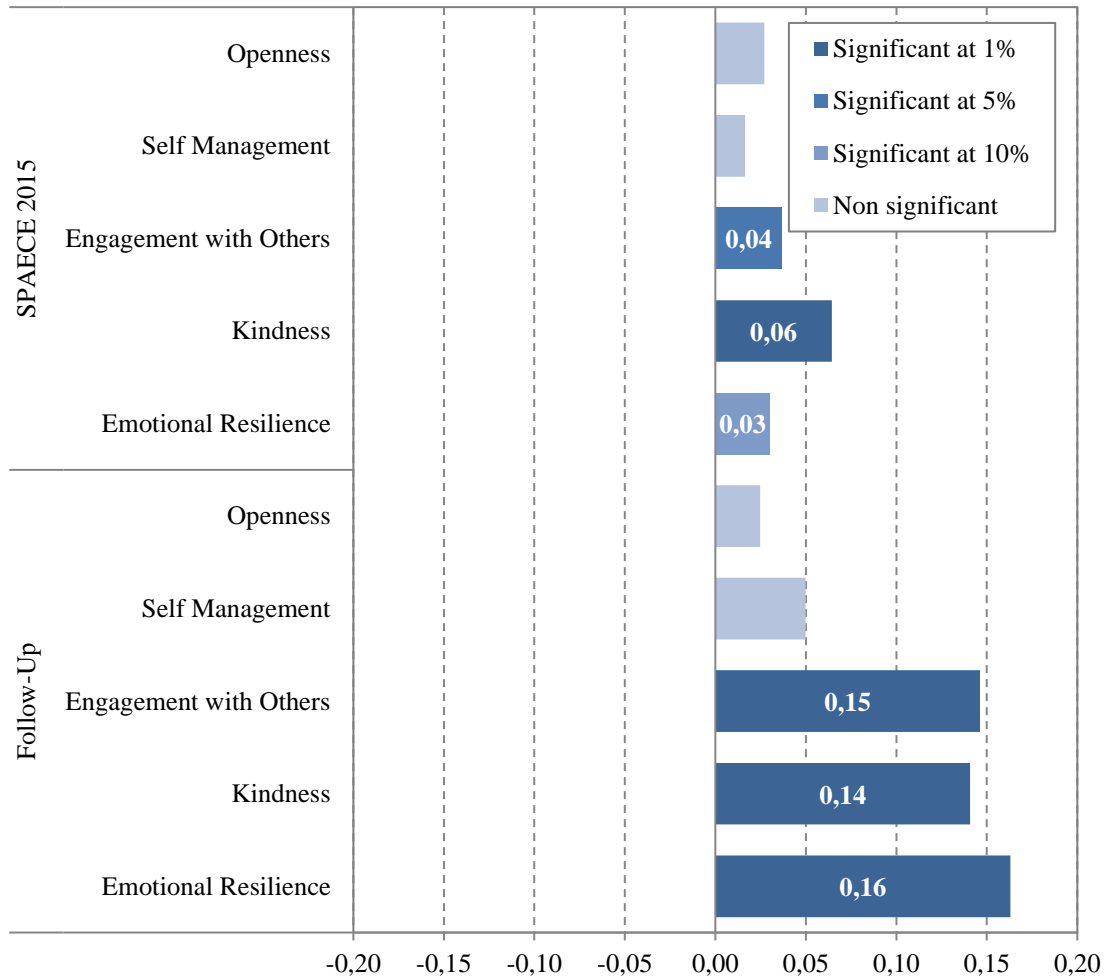
In this subsection, we estimate the impact of the intervention on the dimensions it was explicitly designed to modify, social and emotional skills. We estimate the impact of NTPPS using two distinct samples: i) the SPAECE 2015 where it is possible to estimate the impact of NTPPS by means of SENNA v2.0 short version in all the students who completed the SPAECE in 2015 in the sampled schools¹³; ii) the Follow-Up data where the SENNA v2.0 long version was applied and that allows to disaggregate the effect of socioemotional domains in their facets. Given that the results using the Follow-Up data do not always coincide with those obtained from SPAECE 2015 and that both have significant rates of attrition when compared to the baseline sample¹⁴, this last data set can be seen as a robustness check to investigate whether such differences come from the instruments applied or from possible disparities in the composition of the sample.

Figure 5 below reveals that, despite the limitations of each of the samples used to calculate the impact, the program seems to have a positive and significant impact on "Engagement with others" and "Kindness". If we consider only the students sampled in the Follow-Up, we observe an impact around 0.15 standard deviation (σ) in "Engagement with others", "Kindness" and "Emotional resilience". When we calculate the impact on all students enrolled in the 1st year of high school in the sampled schools, the impact on "Engagement with others" and "Kindness" remained statistically significant, but with a lower magnitude, 0.03σ and 0.06σ , respectively.

¹³ As the allocation of treatment in the 74 schools that volunteered to receive the program was random, the contrast between the average scores of NTPPS school students and the control group in the SPAECE 2015 sample can also be interpreted as average treatment effects.

¹⁴ Our previous analysis allowed to show that the treatment and control groups were similar *ex-ante*.

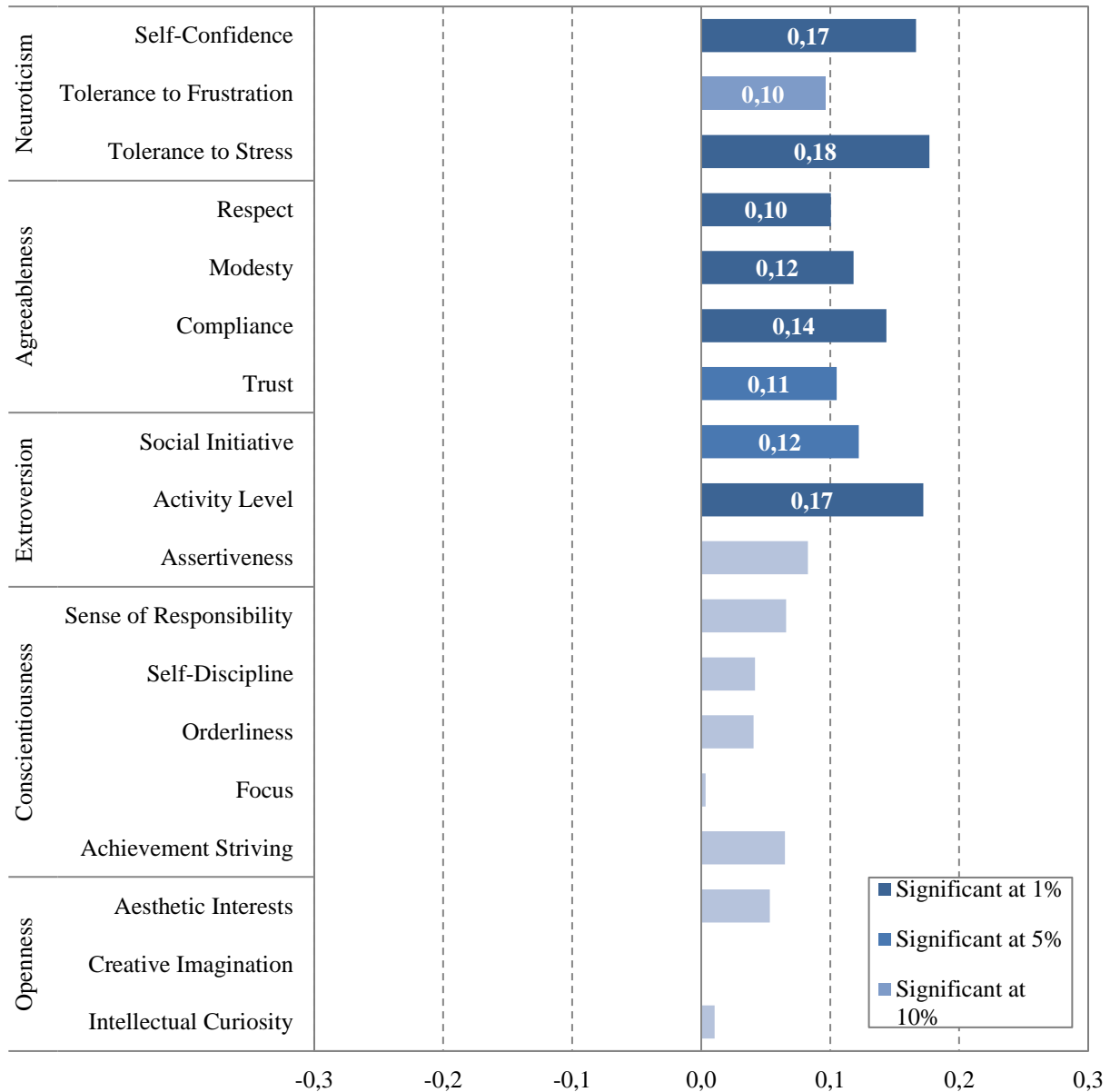
Figure 5: Impact of NTPPS on socioemotional domains



Source: Own elaboration

The data collected in the Follow-Up using the long version of the SENNA 2.0 allows us to disaggregate the social-emotional domains in their main facets and explore which one is influenced by the NTPPS program. As shown in Figure 6, the positive impact of NTPPS on "Engagement with others" was mainly related to the "Enthusiasm" (0.17 σ) and "Social Initiative" (0.12 σ) facets. The impact on "Kindness" occurred on the four facets of this domain, being the impact of greater magnitude on "Empathy". Finally, the impact on "Emotional resilience" occurred on "Self-Confidence" (0.17 σ) and "Tolerance to Stress" (0.17 σ) and a little less expressive in "Tolerance to Frustration", 10 σ).

Figure 6: Impact of NTPPS on socio-emotional facets



Note: Analysis performed only on the sample of students interviewed in Follow-Up.
Source: Own elaboration

Finally, we present the effects of the NTPPS program on the level of student interest on school activities, measured by two indicators about how much the student likes studying mathematics and Portuguese, and how much the students is committed to studying¹⁵. Given that this information was also collected at the baseline, we use an alternative methodology to evaluate the impact of the

¹⁵ As explained earlier, we define commitment with studying as a binary variable equal to 0 if the students declared he studies a maximum of 1 hour per day in school days and is equal to 1 if he declares studying 2 or more days.

intervention: differences-in-differences, restricting the analysis only to the students present in both data collection, Baseline and Follow-Up. The results, presented in Table 10, do not show statistically significant differences.

Table 10: Impact of the NTPPS Program on student interest in school activities

	<i>Baseline</i>		<i>Follow Up</i>		Impact
	Treat.	Ctrl.	Treat.	Ctrl.	
Engagement in studies	0,49	0,51	0,47	0,50	-0,01
Likes Portuguese	0,80	0,79	0,91	0,87	0,03
Likes math	0,54	0,55	0,71	0,70	0,03

Note: *, **, *** denotes statistically significant differences at 10%, 5% e 1%,

Source: Own elaboration

In summary, the NTPPS program had a short-term effect the biggest effect on intra-personal skills: Self-confidence, tolerance to stress or frustration, etc. This result is coherent with the curriculum of the program during the first year given that it is focused on developing a better understanding of themselves and their personal relations. It also had a significant effect on skills like empathy that are also developed during the first year by analyzing their relationship with the family and the school. It is important to measure if as the curriculum evolves through high school, other domains and facets related to organization skills, communication, etc. are modified as well.

2. *Heterogenous effects*

In Table 11, we show that the positive impact estimated above comes mostly from students with initial low level of that particular skills, i.e.: (i) those with a low level of "Openness to new experiences", we estimate an impact of receiving the NTPPS program of 0.22σ , 0.16σ and 0.26σ respectively in "Engagement with others", " Kindness " and " Emotional resilience "; (ii) for students with low or medium level in "Self-management" there are also significant impacts on "Engagement with others", "Kindness" and " Emotional resilience " (iii) for those with a low level of "Engagement with others " we find positive impacts on all socioemotional domains ranging from 0.17σ and 0.37σ ; (iv) students with a low level of "Kindness" had positive impacts ranging from 0.22σ to 0.28σ , except for "Openness to new experiences". Therefore, with some exceptions, the results of Table 11 demonstrate that the positive impact of NTPPS seems to be concentrated on students who had low level of social-emotional abilities *ex-ante* to the exposure to treatment, especially regarding the interpersonal domains (Engagement with others and Kindness).

Table 11: Impact of NTPPS on socioemotional domains according to socioemotional skill level measured ex-ante exposure to treatment

		Openness to new experiences	Self-management	Engagement with others	Kindness	Emotional resilience	
Level of socio-emotional development at baseline (SENNNA 1.0)	Openness to new experiences	Low	0,09	0,11	0,22***	0,16*	0,26***
		Medium	0	-0,02	-0,07	0,07	0,09
		High	-0,04	0,01	0,17**	0,11	0,09
	Self-management	Low	-0,02	0,08	0,15*	0,22**	0,21**
		Medium	0,07	0,12	0,13*	0,15**	0,19***
		High	-0,02	0	0,18**	0,06	0,11
	Engagement with others	Low	0,17**	0,22**	0,37***	0,31***	0,35***
		Medium	0,01	0,12	0,13	0,17**	0,23***
		High	-0,08	-0,16**	-0,01	0,02	-0,03
	Kindness	Low	0,07	0,22**	0,28***	0,28***	0,28***
		Medium	0,11	0,04	0,15*	0,07	0,19**
		High	-0,13*	-0,11	0,02	0,05	0,01
	Emotional resilience	Low	0,01	0,08	0,18**	0,13	0,18*
		Medium	-0,02	-0,05	0,11	0,09	0,06
		High	-0,05	0,03	0,08	0,12*	0,15*
Internal Control	Low	0,17	0,19	0,23**	0,28**	0,27**	
	Medium	-0,09	0,08	0,11**	0,06	0,15**	
	High	0,01	-0,04	0,12*	0,18***	0,13**	

Note: *, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively
Source: Own elaboration

Regarding the heterogeneous effects by observable characteristics of the students presented in Table 12, we see that: (i) in "Kindness" and "Emotional resilience", the positive impact was two times higher than the impact on girls; (ii) for students who failed a grade during their academic path the impact of the program on skills such as "Self-management", "Engagement with others" and "Kindness", the impact was of the order of 0.2 and the impact on "Emotional resilience" was two times higher than for students those who reached high school without having repeating a year; (iii) in relation to the mothers' schooling, we do not observe a differentiated impact between students whose mothers have a high level of schooling (full or complete) in relation to the others; (iv) impacts of the order of 0.15 σ were found for students with low performance in Portuguese in "Engagement with others", "Kindness" and "Emotional resilience", as well as relevant impacts in the five major domains for high performance students in math.

Table 12: Heterogeneous effects of the NTPPS on socioemotional domains

		Openness to new experiences	Self- management	Engagement with others	Kindness	Emotional resilience
Sex	Boy	0,07	0,08	0,17**	0,17**	0,24***
	Girl	-0,06	0,01	0,11**	0,09	0,08
Failed grade	Yes	0,12	0,18**	0,23***	0,26***	0,22***
	No	-0,04	0	0,12*	0,1*	0,14**
Mother level of schooling	Low	-0,1	0	0,09	0,12	0,03
	High	0,02	-0,04	0,1	0,1	0,18*
Performance in Portuguese	Low	0,02	0,06	0,16**	0,15***	0,15**
	High	0,01	-0,06	0,12	0,11	0,11
Performance in mathematics	Low	-0,06	-0,05	0,08	0,05	0,1*
	High	0,35***	0,25**	0,47***	0,46***	0,35***

Note: *, **, ** and *** denotes statistically significant differences at 10%, 5% e 1%, respectively.

Source: Own elaboration

3. School performance

In this subsection, we describe the main results of the estimated impact of the NTPPS program on academic performance. As described earlier, although the NTPPS aims at developing socioemotional skills and not proficiency in math or Portuguese, it is important to evaluate the indirect effect for several reasons. First, the NTPPS program requires “creating” an additional course in the curriculum for a total amount of 5 hours per week. In many schools, this adjustment was made at the expense of core course such as math and language, and thus, some school principals and teachers were worried about the effect this could have on learning in general. In addition, previous studies (Cunha et al, 2010) have found some level of complementarity between higher levels of socioemotional skills and academic learning.

Our baseline and follow-up data collection did not contained any measure of academic performance given that Ceara performs an annual state wide exams for all students enrolled in grades 9th to 12th called SPAECE. Using the 2015 SPAECE data for students in the 1st year of the High School (or 10th grade) and from the enrollment records for the 2016 school year, it is possible to verify the impact of the NTPPS on proficiency indicators. In Table 15 we see that on average, the NTPPS program did not have any positive or negative impact on the academic proficiency indicators, neither in the sample of students interviewed for impact evaluation of the NTPPS, nor when we analyze all students enrolled in the sampled schools.

Table 15: Impact of the NTPPS Program on Proficiency

	Mathematics	Portuguese
Students in the NTPPS sample	3,96 n = 3071	1,17 n = 3071
All Students enrolled	3,59 n = 8810	1,87 n = 8812

Note: *, **, and *** denotes statistically significant differences at 10%, 5% e 1%, respectively.
Source: Own elaboration

As in the previous section, we also analyze heterogeneous impacts using the sample of all students enrolled in the participating schools whenever possible. However, in the case of disaggregation by socioemotional skill level ex ante treatment exposure (collected in the Baseline), we will use only the sampled students given that this information is only available for the sampled students.

Table 16: Heterogeneous Impact of NTPPS on Proficiency

		Mathematics	Portuguese
Gender	Boy	3,17	1,71
	Girl	4,26	1,94
Repeated at least 1 grade	Yes	6,79***	4,16
	No	2,33	0,81
Mother's level of education	Low	2,96	-0,63
	High	5,88	4,39

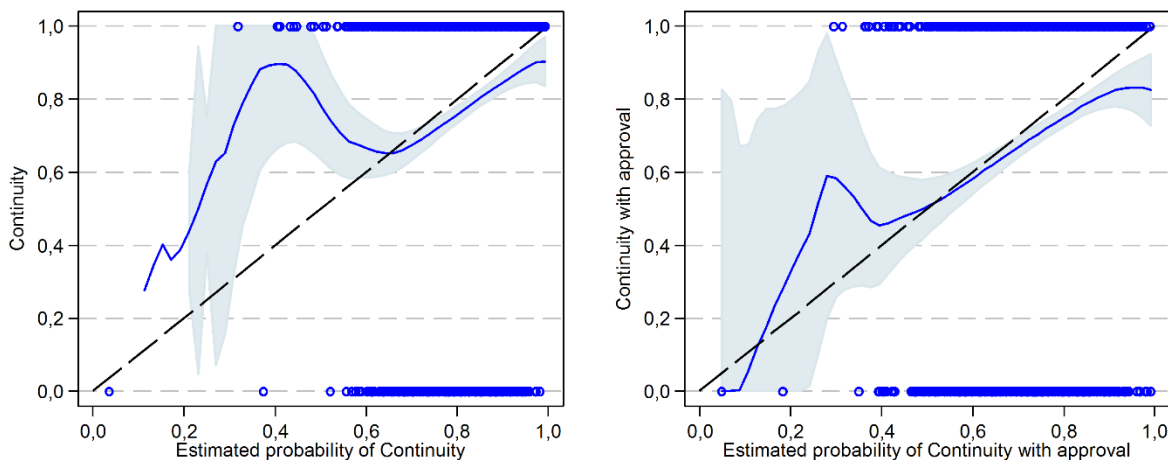
Note: *, **, and *** denotes statistically significant differences at 10%, 5% e 1%, respectively.
Source: Own elaboration

Following the results from Tables 15 and 16, we did not observe any evidence that the NTPPS had negative impacts neither in the complete sample nor in any subgroup analyzed. This is indicative that implementing the NTPPS program in the sampled schools did not have any deleterious effects on the level of student proficiency. If anything, we capture a positive and significant effect of 6.79 (about 0.14) on the program on students who had failed a grade prior to treatment on mathematics. In other words, not only the NTPPS did not had a negative effect, for some students it was beneficial for students with some degree of ex ante vulnerability to treatment, in line with previous results from the literature (Kraag et al, 2009; Hawkins et al, 1999).

Finally, we performed an additional exercise, in which we estimated the probability of the student staying in the same school based on their personal, family and social-emotional abilities using only data from the control group. We then contrasted this predicted probability with an indicator of whether the student stay enrolled in the same school the following year and whether he stayed enrolled and succeeded by means of a polynomial regression locally weighted by a kernel. The result of this procedure can be seen in Figure 10 below. Students who were less likely to stay enrolled and stay enrolled and approved the grade at their respective schools remained more

frequently. This result, even if it is descriptive, indicates that the NTPPS may have altered student retention school, especially for those who had a high probability of dropping out of school.

Figure 10: Relationship between the predicted and the observed value for staying enrolled and staying enrolled with approval in the same school



Note: The predicted value was made through a discrete choice model (probit) in which we considered characteristics of the students, characteristics of the family background and their social-emotional abilities. Source: Own elaboration

V. Conclusion

In order to promote student leadership and to induce schools to modernize their curricula, the Education Secretariat of Ceará (SEDUC), in partnership with the Instituto Aliança (IA) and the Inter-American Development Bank (IDB), developed an innovative program called *Núcleo de Trabalho, Pesquisa e Práticas Sociais* (NTPPS) in which high school students will receive training for the development of personal, social and work skills throughout the three years of high school. Beginning in 2012, the NTPPS consists of adapting to the context of regular secondary schools of the program Com.Domínio Digital, awarded with the Global Best Awards of the International Education Business Partnership Network (IPN) for the success in promoting youth protagonism and digital inclusion in Large scale.

In the expansion of the 2015 program, SEDUC / CE convened schools to show interest in receiving the intervention, receiving positive feedback from 72 schools that met the pre-established eligibility criteria for implementing the intervention. From these, we were able to choose 68 to first group in pairs according to the similarity of the schools in geographical, socioeconomic and management characteristics, randomizing in each pair one of the schools to receive the intervention (two schools of treatment abandoned the intervention early, so that our Main exercise ended up consisting of 32 school pairs).

At each school, 1st and 3rd grade students were selected to participate in the baseline at the beginning of 2015, and a new interview at the end of the same year. Analysis of baseline data show

that in fact the treatment and control groups had similar observable characteristics just before the implementation of the program. Over time, however, there was substantial attrition that produced a change in the original composition of the sample with socioeconomically vulnerable students with learning difficulties becoming underrepresented in the follow-up data of the Down-Up. In particular, we document that while there is a higher loss of subjects in the lower tail of abilities, this occurred with greater intensity in the control group (artificially increasing their average results).

Among the instruments included in the two moments, the priority was given to measures related to the dimensions that the program sought to modify intentionally, in particular the students' social-emotional development, their beliefs about their respective potentials, and their aspirations and life expectancies. Additionally, secondary data were added to the database to investigate the impact of the program on school performance measured by grades in standardized Mathematics and Language tests. In this respect, our a priori expectations were ambiguous. On the one hand, there is ample scientific evidence that school programs focused on socio-emotional development are effective in driving learning. On the other hand, critics point out that most of the schools that implemented the NTPPS had to reduce the didactic load of the other disciplines.

Regarding the estimated impact of the NTPPS, we found a positive and statistically significant impact on "Engagement with others" (0.15σ), "Kindness" (0.14σ) and "Emotional resilience" (0.16σ). This effect was mainly due to the following socio-emotional facets: enthusiasm, social initiative, empathy, trust, respect, modesty, respect, self-confidence, tolerance for frustration, and tolerance for stress. We have evidence that this impact was heterogeneous, mainly on male students and those who had experiences academic failure, precisely the group of students with higher dropout rates in high school and who suffer more with disinterest with the teaching in this phase. In addition, we have evidence that the impact in these three domains was mainly on those who had low level of socioemotional ability before exposure to treatment. Regarding school performance, we did not observe adverse effects of intervention on proficiency in Mathematics and Portuguese neither for the mean nor for any subgroup analyzed. It is important to emphasize, however, that students with a history of repetition presented acceleration of their learning, especially in mathematics ($+ 0,14\sigma$). These magnitudes are in line with what is found in the literature for constructs related to emotional resilience and interpersonal skills (Taylor et al, 2017; Sklad et al, 2012; Durlak et al, 2011). These meta-analyses also indicate that attrition acts as a downward moderator of such impacts, probably indicating that true impacts can be even bigger for NTPPS. The literature (Taylor et al, 2017) also points out that average impacts for high school are typically smaller than for earlier grades, which places NTPPS among the relatively successful interventions for this educational level.

Thus, in a country like Brazil, where there are high numbers of young people who do not complete basic education, dropping out of school, in general, during high school, curricular innovations, such as the NTPPS, are excellent candidates for decreasing dropout in high school.

It is important to emphasize that the results presented in this paper refer to an estimated short-term impact of the NTPPS, since the program is a reorganization of the curriculum of the High School and, therefore, lasts for three years. Taylor et al (2017) indicates, for instance, that long term impacts of PYD interventions tend to be bigger than short term ones, indicating that this type of intervention takes time to fully reveal its benefits. It should also be pointed out that, since receiving the NTPPS program in 2015 was randomized, maintaining this evaluation process and registering the students in the sample may be of great value in estimating long-term causal effects, including the students' 3rd year interviewed in the Baseline in a future comparison with the first class of 3rd year that was exposed to the NTPPS through the 3 years of high school.

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Appendix

Table 20: School pairs according to their condition in the impact evaluation of the NTPPS

Pair	Round	INEP Code	TREATMENT	Round	INEP code	CONTROL
1	1	23008814	EEM ANTÔNIO RAIMUNDO DE MELO	1	23029854	EEM PRUDÊNCIO DE PINHO
2	1	23265400	LICEU DE ACOPIARA DEPUTADO FRANCISCO ALVES SOBRINHO	1	23073039	COLÉGIO ESTADUAL LICEU DO CEARÁ
3	1	23219181	EEM MONSENHOR XIMENES	1	23083816	EEFM MIRIAN PORTO MOTA
4	1	23085347	EEFM GOVERNADOR GONZAGA MOTA	1	23087323	EEFM PROFESSORA MARIA JÚLIA FIALHO
5 ^a	1	23264721	EEFM JOÃO PAULO II	1	23157020	EEFM GETÚLIO VARGAS
6	1	23165430	EEFM PRESIDENTE GEISEL	1	23045493	EEM TABELIÃO JOSÉ RIBEIRO GUIMARÃES
7	1	23067918	EEFM PROFESSORA DIVA CABRAL	1	23068973	EEFM PARÓQUIA DA PAZ
8	1	23100133	EEM ABRAÃO BAQUIT	1	23254068	EEM MARIA CELESTE DE AZEVEDO
9	1	23246260	EEM DE AMARELAS (a denominar)	1	23225190	LICEU DE ARARENDÁ JOSÉ WILSON VERAS MOURÃO
10	1	23069171	EEFM SANTA LUZIA	1	23246324	EEM DE ARAPÁ (a denominar)
11	1	23014202	EEM DOUTOR JÚLIO DE CARVALHO	1	23234474	EEM ANTÔNIO REGINALDO MAGALHÃES ALMEIDA
12	1	23002115	EEM PROFESSORA MARIETA SANTOS	1	23157011	EEM GABRIEL BEZERRA DE MORAIS
13	1	23028068	COLÉGIO ESTADUAL OTACÍLIO MOTA	1	23217510	EEM MARIA VIEIRA DE PINHO
14	1	23165774	EEFM DONA MARIA AMÉLIA BEZERRA	1	23026596	EEM AUTON ARAGÃO
15	1	23057793	EEM ALMIR PINTO	1	23068078	EEFM MONSENHOR DOURADO
16	1	23038861	EEM RAIMUNDO NONATO RIBEIRO	1	23039027	EEFM FURTUNATO SEVERIANO DA COSTA
17	1	23252669	ZUMIRA AGASSIS EEM	1	23252545	MIGUEL CARNEIRO DA CUNHA EEM
18	2	23095075	EEM JÁDER DE FIGUEIREDO CORREIA	2	23062720	EEFM JOSÉ MARIA PONTES DA ROCHA
19	2	23065214	EEFM ANÍSIO TEIXEIRA	2	23158964	EEFM MONSENHOR VICENTE BEZERRA
20	2	23165197	EEFM DONA CLOTILDE SARAIVA	2	23545437	EEM PREFEITO JOSÉ MARIA MONTEIRO
21 ^a	2	23163020	EEFM JUVÊNCIO BARRETO	2	23127430	EEM MANUEL SÁTIR
22	2	23149434	EEM MONSENHOR HORÁCIO TEIXEIRA	2	23545534	EEM MARIA NEUSA ARAUJO MOURA
23	2	23245026	EEM MARIA DAS DORES CIDRÃO ALEXANDRINO	2	23163410	COLÉGIO ESTADUAL WILSON GONÇALVES
24	2	23122714	EEM FENELON RODRIGUES PINHEIRO	2	23115050	EEM EUCLIDES PINHEIRO DE ANDRADE
25	2	23104147	EEM DE AIUABA	2	23125586	EEM JOÃO BARBOSA LIMA
26	2	23132000	EEM MANUEL MATOSO FILHO	2	23008300	EEM CARMINHA VASCONCELOS
27	2	23021772	EEM JOSEFA BRAGA BARROSO	2	23061693	EEFM CORONEL OSVALDO STUDART
28	2	23165278	CERE ALMIRANTE ERNANI VITORINO ABOIM SILVA	2	23124121	EEM BARÃO DE ARACATI
29	2	23238828	EEM WILSON DIAS CABRAL	2	23159014	EEFM PADRE CÍCERO
30	2	23246634	EEM RAIMUNDO ADEJACYR CIDRÃO OLIVEIRA	2	23545550	EEM WALDERI MACHADO DE ALMEIDA
31	1	23068930	EEFM MATIAS BECK	1	23078561	EEFM WALDEMAR FALCÃO
32	2	23564016	EEM ANTONIA VIEIRA LIMA	2	23120878	EEM MARECHAL HUMBERTO DE ALENCAR CASTELO BRANCO

Pair	Round	INEP Code	TREATMENT	Round	INEP code	CONTROL
33 ^b	1	23071095	EEFM MARECHAL HUMBERTO DE ALENCAR CASTELO BRANCO	2	23072237	EEFM JOSÉ BEZERRA DE MENEZES
34 ^b	1	23078529	EEFM VISCONDE DO RIO BRANCO	2	23069511	EEFM ESTADO DO AMAZONAS
35 ^c	1	23013125	EEM FLÁVIO RIBEIRO LIMA	1	23069767	EEFM GENERAL EUDORO CORRÊA
36 ^c	1	23138106	EEM DEPUTADO JOAQUIM DE FIGUEIREDO CORREIA	1	23564431	EEM GERARDO MAGELLA MELLO MOURÃO

Notes: ^a are pairs in which the treatment school withdrew from the NTPPS in 2016; ^b They are the hybrid pairs, formed by a treatment school from the first wave and a control school from the second wave; ^c are pairs in which the treatment school did not adhere to the NTPPS in 2015 after the design of the experiment

Table 21: Percentage of 1st year high school students in 2015 not found in the data of the 9th year of Basic Education referring to SPAECE 2014

	Control	Treatment	Total
Not interviewed	237 17,79%	192 14,41%	429 32,21%
Interviewed	455 34,16%	448 33,63%	903 67,79%
Total	692 51,95%	640 48,05%	1332 100%

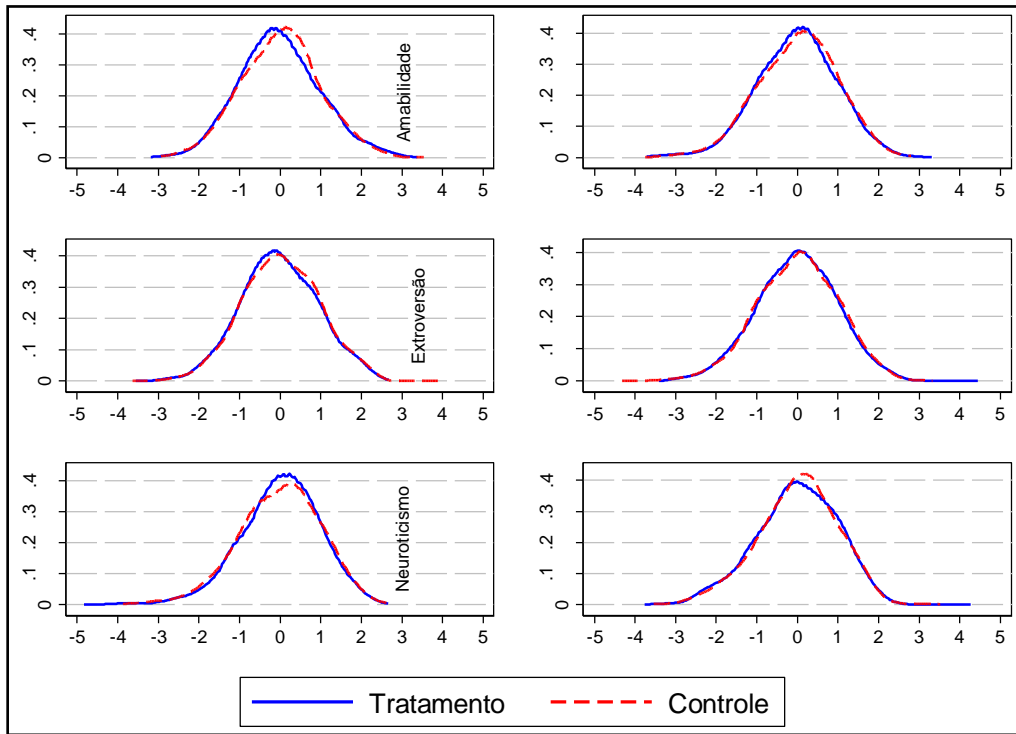
Source: Own elaboration

Table 22: Correlation between socioemotional domains calculated in the application of SENNA short in SPAECE 2015 and in the application of long SENNA in the *Follow-Up*

		Openness to new experiences	Self-management	Engagement with others	Kindness	Emotional resilience
Measures obtained in the <i>Follow Up</i>	Openness to new experiences	0,56	0,37	0,27	0,29	0,27
	Self-management	0,35	0,57	0,24	0,33	0,26
	Engagement with others	0,28	0,22	0,51	0,25	0,20
	Kindness	0,27	0,36	0,24	0,44	0,20
	Emotional resilience	0,22	0,19	0,14	0,15	0,46

Nota: São 22 itens comuns entre as duas aplicações, dentre os 57 que compõem a versão curta do Senna utilizada no SPAECE 2015.

Figure 11. Distribution of social-emotional skills in the control group and in the treatment group



Source: Own elaboration