A great depression? Students' educational aspirations and investments in the aftermath of the Great Recession*

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Abstract

We study how economic downturns shape human capital accumulation by affecting adolescents' educational aspirations and subsequent academic outcomes. Using population-level data matched with administrative records, we construct an individual-level measure of exposure to local labor market conditions based on the share of school peers with unemployed parents. Greater exposure to adverse business cycle conditions negatively affects both students' aspirations to pursue tertiary education and subsequent high school final grade, college enrollment, dropout. Through a causal mediation analysis, we show that the aspirations channel explains a substantial part of the effect of the business cycle on later educational outcomes.

JEL Classification: I21, I23, J24, E32

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. . . there are many reasons why today we usually do not like studying any more [. . .]. Nowadays, I would add another reason, a very recent one, a very creeping one, always on the edge of becoming an alibi: the economic crisis. We do not want to study any more because there are no jobs, thus, why should we study if studying doesn't help us to reach anything? Everywhere this rigmarole.

Paola Mastrocola, *The rebel passion [La passione ribelle]*, Laterza 2017 (p. 101).

1 Introduction

Over the past two decades, most advanced economies have faced several periods of severe economic turmoil. One should first mention the Great Recession (2007-2009), the following Sovereign Debt crisis (which hit several European countries in 2010-11), but also the worldwide economic crisis caused by the COVID-19 pandemic, and the recent inflationary shocks. While there is a well-established literature on how macroeconomic conditions affect labor market trajectories and careers, the evidence on how they might also affect decisions to invest in human capital is more scarce and mainly concentrated on the contemporaneous choices of college students (Adamopoulou and Tanzi, 2017; Long, 2014). However, economic downturns may affect human capital accumulation well beyond those individuals who are directly called to make education or labor market choices during recessionary periods.

In this paper, in particular, we shed light on whether and how economic downturns might affect also those who at the time are still in education *via* a change in their *aspirations* about their future educational goals (what we label as *educational aspirations* following La Ferrara (2019)).[1] By observing a worsening of the economic conditions around them, students may reconsider their life goals and thus revise downwards also their educational aspirations; this may then translate into lower human capital investments and thus lower educational attainment and income in the long run (Ray, 2006; Genicot and Ray, 2017; Dalton et al., 2016; La Ferrara, 2019).

Crucially, aspirations are not shaped by economic conditions in society at large, but by those experienced within each student's *aspiration window*, that is, the social environment defined by their family, peers, and school (Ray, 2006). The key contribution of the paper is exactly to show for the first time this mechanism at work: How the observation of a worsening of the economic condition within one's student aspiration window translates into lower educational aspirations, and *via* lower aspirations, into a reduction of human capital accumulation.

[1] Aspirations are defined in the literature as individuals' incentives to invest and encompass their hopes or ambitions of achieving certain life goals (Genicot and Ray, 2017; La Ferrara, 2019) (see Section 4).

Our empirical analysis uses individual-level administrative data on educational aspirations – i.e., students' stated willingness to enroll in university – covering the universe of 10^{th}-grade students in Italian high schools across eight consecutive cohorts, and links them to a built-in proxy for local economic downturns, captured by the share of schoolmates with unemployed parents.[2] We then link these educational aspirations to a number of later-in-life educational outcomes, including high school completion, the final grade obtained upon high school graduation, university enrollment, and university dropout. The data used in the analysis are unique, as they merge population-level data provided by the Italian Education Authority (*Invalsi*) with administrative records from the National Students' Registries held by the Education and University Ministries. To the best of our knowledge, this is the first time that such a large administrative dataset linking educational aspirations to subsequent educational outcomes has been collected and analyzed.

For identification, we build on the literature on peer effects in schools pioneered by Hoxby (2000). Specifically, we exploit within-school, cohort-to-cohort variation in the share of peers with unemployed parents, while controlling for a rich set of time-varying individual-, class-, and school-level characteristics, as well as school-specific time trends.

We thus document two distinct, yet complementary, main findings, around which the paper is organized. First, educational aspirations are influenced by the perceptions of a worsening of the economic conditions, as proxied by an increase in the exposure to school peers with unemployed parents. We find that increasing exposure to peers with unemployed parents by 10 percentage points (p.p.) determines a decrease of about 0.6 p.p. in the probability of aspiring to enroll in tertiary education (about one percent decrease with respect to the average). The effect is economically meaningful and comparable in magnitude to other studies examining the effects of peers' parents' characteristics on students' outcomes (Cattan et al., 2025; Mertz et al., 2025). This first finding aligns with the theoretical predictions in Genicot and Ray (2017), who posit that the observation, within one's aspiration window, of a deterioration of the economic conditions translates into a corresponding reduction of the possible achievable outcomes, and hence into a reduction of the aspirations to achieve them.

Second, we document that exposure to peers with unemployed parents in grade 10 (i.e., at the time when aspirations are stated) negatively affects educational choices and effort measured three to four years later, namely the likelihood of completing high school and enrolling in university, as well as the likelihood of remaining enrolled beyond the freshman year. In line with the predictions of the theory of aspirations (Genicot and Ray, 2017), we thus show, in a reduced-form setting, that the perception of a deterioration in economic conditions has negative effects on medium-run measures of human capital

[2] In our setting, schoolmates and their families represent the aspiration window, that is, the subset of individuals who influence the formation of one's aspirations through social interactions (Ray, 2006; Genicot and Ray, 2017).

accumulation.

Having established these two reduced-form results, we then ask whether educational aspirations constitute a causal channel linking exposure to worsening economic conditions to subsequent educational outcomes. To address this question we resort to a causal mediation analysis (Celli, 2022; Huber, 2020), which allows us to quantify the extent to which the average treatment effect of exposure to worsening economic conditions on educational outcomes (as estimated in our reduced-form specification) can be explained by the aspiration channel (Nicoletti et al., 2023; Cattan et al., 2025).[3]

Implementing this decomposition requires identifying both the effect of exposure to worsening economic conditions and the effect of aspirations on subsequent educational outcomes. For the former, we continue to exploit the quasi-random variation in exposure to school peers with unemployed parents within schools and across cohorts. Identifying the latter, however, requires a separate source of exogenous variation (Chetty and Imai, 2025). We therefore conduct the mediation analysis within an IV framework, exploiting a random feature of the administration of the educational assessments and student questionnaires used in the analysis. Specifically, the random and unexpected presence of an external examiner in a subset of classes each school year provides a credible source of exogenous variation in students' aspirations.[4]

The mediation analysis shows that a substantial share of the effect of adverse business-cycle perceptions on later educational outcomes operates through the aspirations channel. In particular, aspirations account for about one third of the negative effect on the final high school grade and fully account for the effect on university enrollment decisions (i.e., we find evidence of complete mediation).[5] These findings provide some of the first micro-level causal evidence that exposure to adverse economic conditions can reduce subsequent human capital accumulation through its negative effect on aspirations, as predicted by the theory of Genicot and Ray (2017).

Importantly, our mediation framework also yields a causal estimate of the effect of aspirations themselves on medium-term educational outcomes, conditional on the peers' and peers' parents' characteristics included in the baseline analysis. We find this effect to be large and statistically significant. In doing so, we also contribute to the literature seeking to identify the causal effect of aspirations on subsequent educational outcomes (Rizzica, 2020).

[3] In the mediation analysis literature this is generally referred to as the natural indirect effect (NIE), as opposed to the natural direct effect (NDE) as the one caused, in our setting, by the exposure to business cycle on the educational outcomes, while keeping constant the aspirations channel. The NIE and the NDE sum to a so-called average total effect, which corresponds to the average treatment effect (ATE) (Imai et al., 2011; Heckman et al., 2013; Pearl, 2000).

[4] This instrumental variable has also been extensively used in the literature. See, for example, Bertoni et al. (2013); Lucifora and Tonello (2015); Bertoni et al. (2021).

[5] For university dropout, about eighty percent of the effect is explained by the aspirations channel, although the results are non-conclusive given the limited power of the first stage.

Our findings also have implications for policy. By showing that aspirations respond to adverse economic conditions and, in turn, causally affect subsequent educational outcomes, our analysis points to aspirations as a potentially important margin for early intervention. Policies aimed at sustaining students' aspirations may help mitigate the longer-term consequences of adverse economic conditions on human capital accumulation. Such interventions may be particularly valuable when targeted at young students, whose aspirations may be especially responsive both to changes in their economic environment and to corrective policy measures (Cunha et al., 2010). This is especially relevant in our setting, as we study students at a critical stage of their educational trajectories, close to the end of compulsory education, when they face consequential decisions about their educational future.

The paper proceeds as follows: in Section 2 we place our paper within the most closely related literature; Section 3 describes the institutional setting and the background; Section 4 describes the conceptual framework that will drive our empirical analysis; Section 5 describes the data used and provides descriptive evidence; Section 6 illustrates the reduced-form empirical strategy and discusses the main identifying assumptions, while Section 7 contains the the main reduced-form results and heterogeneity on the effects of the business cycle on aspirations and later educational outcomes. Section 8 contains the causal mediation analysis, where we seek to isolate the impact of adverse perceived business cycle conditions on later-in-life educational outcomes, as determined by a change in aspirations. Section 9 concludes and provides some policy implications.

2 Related literature and contribution

Compared to the existing literature, our work contributes to three main areas: first, the effects of cyclical macroeconomic conditions on human capital accumulation; second, the influence of individuals' aspirations on economic decision-making; third, the impact of school peers' parents' characteristics on educational choices. To the best of our knowledge, our empirical analysis is also the first to link such large-scale population-level data on students' aspirations to the educational decisions they subsequently make.

As to the first aspect, it has been shown that macroeconomic conditions affect *contemporaneous* educational choices (such as university enrollment, choice of college major, dropout). For example, Long (2014) shows that during the Great Recession in the United States, college attendance levels increased overall. Similarly, Adamopoulou and Tanzi (2017) show that the Great Recession decreased the probability of dropout during college.[6] We contribute to this strand of literature by providing evidence that macroeconomic

[6]Other papers document changes in the college major choice during recession times, pointing to a shift towards fields related to the industrial sectors less affected by the recession (Liu et al., 2019; Weinstein, 2017).

downturns can influence human capital accumulation to a larger extent by also affecting the aspirations, hence the *future* educational choices and effort, of adolescent students.[7]

Secondly, we speak to the growing literature on aspirations, and in particular those concerning education (Fruttero et al., 2024; Genicot and Ray, 2020; La Ferrara, 2019). We add to this literature in two distinct, yet complementary, ways. On the one hand, we contribute to the literature that looks at the potential determinants of aspirations. Only a few papers have investigated what factors can shape aspirations, and, specifically, educational aspirations. Concerning the specific relationship between economic conditions and aspirations, using the British 1958 NCDS cohort data that follow individuals for nearly 60 years since birth, Lekfuangfu and Odermatt (2022) show that aspirations are largely influenced by parents' socioeconomic status, by parents' own aspirations for their children, and by children's achievements. The geographical correlation between local labor market conditions and aspirations is never statistically significant, pointing to a limited or nihil impact of economic conditions in the local labor market on individual aspirations. Watson et al. (2025) use Canadian data collecting educational aspirations of youths and their parents' and show that the incidence of poverty is associated with both mothers and children reducing their aspirations about child's educational attainment. While in both studies the link between economic conditions and aspirations' formation is mainly correlative in nature, we provide sufficiently clean causal evidence focusing on more narrowly defined aspiration windows to isolate exogenous variation in individual exposure to economic downturns. In this respect, we are close to Iwo et al. (2024) who also manage to provide causal estimates of the impact of economic and social deprivations experienced following the 2004 tsunami in Indonesia on students' aspirations, finding that damage to the students' community depresses aspirations, but only in the short term.

On the other hand, we provide novel causal evidence on how such changes in aspirations translate into actual investments in education. To the best of our knowledge, only Rizzica (2020) provides a causal estimate of such a relation. She analyses a policy implemented in the UK aimed at raising the aspirations of pupils from low socioeconomic backgrounds to increase their participation in college education. The policy successfully raised the aspirations of the target students, but only for those from relatively less deprived households did participation in post-compulsory education increase. Other existing studies provide evidence of robust correlative relation between aspirations and educational outcomes (Favara, 2017; Ross, 2019; Guyon and Huillery, 2020). Our estimates contribute to this literature by showing how aspirations stated by ten graders directly and strongly affect educational outcomes three to four years later.

Finally, our work is related to a well-established literature on the effects of school

[7] A larger literature analyzed the effects of the business cycle on labor market outcomes, prevalently focusing on the short- and long-run labor market effects of graduating during a recession (see von Wachter (2020) for a review).

peers' composition on educational, labor market, and family outcomes. This literature was pioneered by the seminal contribution by Hoxby (2000), who demonstrated the fundamental importance of the peers' interactions based on gender and native status differences. Recent contributions have also shown that other salient characteristics of the peers might influence students' outcomes. Mertz et al. (2025) show that exposure to a higher share of female peers with entrepreneur parents encourages girls' entry and tenure into these occupations, thus narrowing the entrepreneurship gender gap. Cattan et al. (2025) show that exposure to school peers with elite-educated parents increases peers' enrollment in elite programs. Interestingly, and in line with our work, these two contributions have moved the attention from peers' to peers' parents' characteristics and still focus on high school as a crucial turning point in shaping future outcomes.[8] In turn, our analysis highlights a novel peer-based channel through which macroeconomic shocks transmit to long-run human capital formation.

3 Institutional setting and background

3.1 The Italian schooling system

The Italian schooling system consists of three different levels of education: five years of primary school (grades 1 to 5, ISCED level 1), three years of junior-high school (grades 6 to 8, ISCED level 2), and five years of high school (grades 9 to 13, ISCED level 3), to be chosen among three main tracks: academic, technical, and vocational.[9]

Compulsory education ends upon successful completion of at least grade 10.[10] Students are then free to drop out of the schooling system, though they are obliged to attend either a professional course or to start an apprenticeship contract, which should last until they reach age 18 and should be aimed at the acquisition of a three-year professional degree.[11] Those who decide to continue their education sit for a final examination to get their high

[8] There may also be a direct effect of parental job loss on children's educational outcomes. By focusing on peers' parents, while controlling for own parent employment status, we are able to isolate the effect that passes through a change in aspirations from that due to a negative shock to own family income. Moreover, the evidence in the existing literature (Carneiro et al., 2022; Drydakis, 2023) supports two key elements in our analysis: on the one hand, the focus on the years of adolescence as those powerfully shaping later-in-life outcomes; on the other hand, the attention to high school completion and university enrollment as potential outcomes.

[9] The academic track is designed for students who aim to attend university; the technical track allows students to acquire skills that are both theoretical and practical, letting them continue with tertiary education or look for a job (e.g. accountant, surveyor, technician); the vocational track, instead, focuses on endowing students with vocational skills, which are essential to find a job right after high school.

[10] Children enroll in the first grade of primary school the year they turn six, start junior-high school when they turn eleven, and enroll in the first grade of high school (grade 9) the year they turn fourteen. Students must also turn 16 before legally dropping out.

[11] Professional courses are organized on a regional level and are typically aimed at preparing for a low-skilled manual job (e.g., waiter, cook, hairdresser, beautician, etc.); with an apprenticeship contract, the youth starts her working path.

school diploma at the end of grade 13. The high school diploma is mandatory to access university and comes with a final grade expressed in points (from a minimum of 60 to pass to the maximum of 100 *cum laude*).[12]

In high school, students have several teachers, one for each subject, and are expected to gain knowledge on a wide range of skills. The subjects vary a lot depending on the path chosen, but always entail a core instruction in Italian language, math and English (as the main foreign language). Students at all grades and tracks follow formal classes along the whole school year (lasting from mid-September to mid-June) but also participate in programs of training and on-site eduction in firms or Institutions. Grade retention is possible if, based on teachers' marks and evaluations, the student does not attain the minimum level of skills required for the completion of each grade.[13]

3.2 The National Evaluation Program of Students' Achievement

The Italian Education Authority (*Invalsi*, from the Italian acronym)[14] started the National Evaluation Program of Students' Achievement (henceforth, NEPSA) in the school year 2009-10. The NEPSA has a yearly and census nature: every school year, all students in grades 2 and 5 (primary school), grade 6 (junior-high school), and grade 10 (high school) sit a reading and a math standardized test, typically between April and early May. In some grades and school years, students are also asked to fill in a *Student Questionnaire*, which provides additional information on students and families.

The Invalsi NEPSA is not a high-stakes test: the results of the evaluation have the purpose of assessing the school's performance and are not part of a proper school accountability system granting schools additional funding or rewards for teachers. Moreover, the test results are returned to the schools at an aggregate level so that neither the teachers nor the students have direct access to their individual-level scores or *Questionnaire*. The individual-level data are available for research purposes, correlated with basic individual-level characteristics (such as gender, age, non-native status, grade retention, class, and school anonymous identifiers). The *Questionnaire* can be linked to the standardized tests

[12]The final high school grade differs from the high school GPA commonly used in the U.S. education system. While the latter reflects students' average academic performance over the course of high school, the former is the final grade awarded upon completion of high school.The high school final grade is the sum of several components. A maximum of 40 points can be cumulated by the student depending on the academic performance at the end of grades 11, 12, and 13. Then, a maximum of 60 points can be gained in the formal tests at the end of grade 13 (20 points in each of the two written tests and 20 points in an oral test). These final tests are supervised by a commission composed of both teachers who taught the students in grade 13 and external teachers from other schools. In our empirical analysis 100 *cum laude* is coded as 101. Although potentially interesting, existing data do not allow the decomposition of the final high school grade into its components.

[13]The standardized tests performed under the Italian National Evaluation Program cannot be used to determine this choice (see the following subsection). The individual results for each student remain unknown to the same students and teachers.

[14]*Istituto Nazionale per la VALutazione del SIstema educativo.*

by means of an anonymous individual-level identifier, while the school identifier makes it possible to follow schools over the years.[15]

For the purpose of our study, we focus on the NEPSA of eight successive cohorts of 10^{th}-grade students, from school year 2010-11 to 2017-18, as in these years students were asked a question in the *Student Questionnaire* about their future educational aspirations (see Section 5 for details). In the mediation analysis (Section 8), we will also exploit a peculiar feature of the NEPSA that occurred in the school years used in the paper, that is a randomization in the invigilation procedure of the students while taking the tests and the questionnaire.

3.3 The Great Recession, the Sovereign Debt Crisis and the (slow) recovery

Our empirical analysis covers a period spanning from 2010 to 2018, a turbulent economic time in Italy, as in most Western countries, especially in Europe. These were the years which followed the Great Recession (2007-2009),[16] and the Eurozone faced an additional period of severe economic downturn known as the Sovereign Debt crisis. In July 2011 the Italian Public Bonds reached an interest rate of about 7%, inducing a huge increase in the cost of public financing (similarly to Spain, Ireland, Portugal and Greece). In November 2011, the spread with respect to the corresponding German bonds (the target of secure assets) reached 570 points, from an average of about 200 in the previous months. The crisis called for huge interventions from the European Central Bank, and the slow recovery only started in 2014 (Grande et al., 2013).

The crisis also had severe consequences in the real economy and, ultimately, in the labor market (von Wachter, 2020). Italy experienced the sharpest relative increase in unemployment among EU economies (Appendix Figure A.1). The unemployment rate peaked in 2014, and the Italian National Bureau of Statistics (Istat) recorded in those years the sharpest increase in the year-to-year variation in unemployment since the late 1970s (Appendix Figure A.2). The substantial variability in economic conditions during those years helps us to precisely identify the effects under study.

4 Conceptual framework

Understanding how aspirations are formed, how they can be influenced, and how they translate into effort and investment is crucial (Genicot and Ray, 2020). Aspirations,

[15] Other works have used information derived from these questionnaires: see, among others, Pagani et al. (2021); Di Liberto et al. (2023); De Benedetto and De Paola (2022).

[16] The Great Recession refers to the economic downturn from 2007 to 2009, which followed the bursting of the U.S. housing bubble and the global financial crisis. It was the most severe economic recession in the United States since the Great Depression of the 1930s.

i.e., where individuals want to get or what they want to achieve, are a key driver of their decisions to invest (Ray, 2006; Genicot and Ray, 2017; Appadurai, 2004).[17] In the context of education, students choose how much to invest in human capital accumulation in response to changes in their aspirations (La Ferrara, 2019). Educational investments are, in other words, the means for reaching a higher position in life. In principle, the higher your aspirations, the more you will exert effort to achieve them.

A central insight of the theories developed by Ray (2006) and Genicot and Ray (2017) is that aspirations are not formed in isolation, but are socially determined. Individuals set what to aim for based on the distribution of outcomes they observe in society – typically income, wealth, or social status – and on their own position within that distribution. Importantly, aspirations are not shaped by society as a whole, but by the subset of individuals who belong to one's cognitive world, that is, those perceived as sufficiently similar or attainable. This reference group is formally conceptualized by Ray (2006) as the *aspiration window*. In our setting, students' aspiration windows are represented by their school peers and their families.[18] Changes in the economic conditions experienced within this window can therefore alter students' perceptions of the outcomes they may attain and, in turn, their educational aspirations.

A less explored implication of the theory concerns how aspirations translate into subsequent investments (Genicot and Ray, 2020). In our setting, we observe students' educational aspirations in grade 10 and link them to educational investments undertaken in subsequent years, including high school completion and university enrollment.

A central aspect of the theory, however, is that individual investments respond to the gap between aspirations and one's initial status – the *aspiration gap* – rather than to the level of aspirations *per se*. Importantly, the relationship between the aspiration gap and investment is non-monotonic. For moderate aspiration gaps, higher aspirations encourage greater investment toward achieving them. Yet, when the gap becomes sufficiently large, further increases in aspirations may instead discourage investment, as the aspired outcomes may appear unattainable given one's initial status, thereby generating frustration.[19]

In turn, given the underlying theory of aspirations formation and how they affect investment decisions, we can derive two main testable implications for our setting:

(i) A recession observed within one's aspiration window lowers educational aspirations.

[17] Aspirations may well differ from what is rationally achievable, i.e., from *expectations*. In the data we use (see Section 5), based on the wording of the question and in line with the existing literature (Fruttero et al., 2024), we interpret students' answers as statements of their future educational aspirations.

[18] This is a very narrow definition of window; one expects that adopting a broader definition would generate milder results in terms of students' reactions.

[19] To illustrate the conceptual relationship between aspirations and investments, Appendix Figure A.3 reports the standard graphical representation of this non-monotonic relationship, based on Genicot and Ray (2020).

(*ii*) A decline in aspirations affects subsequent educational investment, but the direction of the effect is theoretically ambiguous. Because the relationship between the aspiration gap and investment is non-monotonic, lower aspirations may decrease, increase, or leave investment unchanged, depending on the position of the average student within the distribution of aspirations and thus the size of the initial aspiration gap.

Additionally, we are able to test some alternative mechanisms, which may coexist within this aspirational framework (Fruttero et al., 2024). Specifically, one may argue that investment in education may decrease because during a recession students revise downwards their *expected* returns to education (Morgan, 1998). If this were the case, the effect should be driven by the status of parents with higher education (relative to that of those without). Then, we may shape the aspiration window so as to also include insights from the theories of *role models* and test them empirically. In particular, we may suppose that girls are more impressed by what happens to mothers of peers and boys by what happens to fathers (Beaman et al., 2012; Olivetti et al., 2018; Mertz et al., 2025).

5 Data, variables and descriptive statistics

We link population-level individual data from the Invalsi NEPSA on students in grade 10, including information on their educational aspirations, to individual-level administrative records on high school completion and university enrollment. In this section, we describe the main data sources and variables used in the analysis and provide preliminary descriptive evidence.

5.1 Students' aspirations

The Invalsi NEPSA data for 10^{th} grade students in the school years (s.y.) from 2010-11 to 2017-18 include a question on students' educational aspirations. Specifically, in the *Students' Questionnaire*, administered to all students at the end of the standardized assessment tests in mathematics and Italian language, students are asked to state the highest level of education they would like to attain in the future. The question reads: *What is the highest educational qualification you would like to attain? A. None (I will study until the end of compulsory education); B. Three-year vocational qualification; C. High school diploma; D. University degree; E. Master's degree or PhD.*[20] Note that grade 10 is still part of compulsory schooling in Italy, so that 15-year-old students are required to remain

[20] In line with the extensive review of the empirical literature in Fruttero et al. (2024), we interpret this formulation as capturing students' educational aspirations rather than expectations. The latter would also incorporate considerations about potential constraints and the perceived attainability of the stated goal. The same interpretation is adopted by Di Liberto et al. (2023), who use this variable to study how school principals' managerial practices affect students' outcomes, including aspirations, and by Taylor and Rampino (2014), using data from the BHPS.

in education and take the NEPSA assessment, whether enrolled in an academic, technical, or vocational track. At the same time, they are approaching an important educational transition: within the following months, they can decide whether to continue along the formal education path or leave it to enter an apprenticeship or enroll in vocational training (see Section 3). This makes grade 10 a particularly relevant stage at which to observe students' educational aspirations.

Based on the question above, we create a dummy variable for whether the student aspires to pursue tertiary education or not (*Aspiration Tertiary, AT*).[21] Formally, for each student i in school s, cohort c, and year t, we define:[22]

$$AT_{isct} = \begin{cases} 1 & \text{if the student aims to} \\ & \text{enroll in university} \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

The NEPSA archives also contain individual-level information on several students' and families' characteristics, such as gender, age, grade retention, native or non-native status, parental education, and current employment. These are obtained from the *Students' Questionnaire* and from school administrative records and can be linked to the results of the standardized tests through an anonymous student identifier. Crucially for our analysis, the *Students' Questionnaire* reports the employment status of each student's parents at the time of the assessment. Building on the notion that schoolmates and their families constitute a salient component of students' aspiration windows (Genicot and Ray, 2017), we define our main explanatory variable, $UP_{sct}^{(-i)}$, as the share of student i's schoolmates in the same cohort who have at least one unemployed parent (excluding student i):

$$UP_{sct}^{(-i)} = \frac{\sum_{j \neq i} UnemployedParent_{sct}}{n_{sct} - 1} \tag{2}$$

where n_{sct} denotes the number of students in school s and cohort c. The variable $UP_{sct}^{(-i)}$ captures variations in the business cycle as perceived by the student, i.e., those concerning her closest peers. In later sections, we assess the robustness of our results to alternative definitions of this exposure measure (e.g., differentiating by unemployed parents' gender, educational title, or using wider or narrower reference groups).

Finally, the NEPSA archives provide anonymous school identifiers, which allow us to follow schools over time, and class identifiers, which allow us to account for class-level characteristics. Our final NEPSA sample comprises approximately 2.52 million students attending 5,200 schools.

[21] AT takes value 1 for options D and E and zero for options A, B, and C of the aforementioned question.

[22] Here and throughout the paper, a school cohort (c) refers to all 10^{th}-grade students enrolled in a given school in a given school year, while t denotes the calendar year.

5.2 High school completion and university enrollment

We link the Invalsi NEPSA records for 10^{th}-grade students in the school years 2011–12 to 2017–18 to the National Students' Registries using a longitudinal student identifier. The National Students' Registries are administrative archives maintained by the statistical offices of the Ministry of Education and the Ministry of University and cover the universe of students enrolled in Italian high schools and universities, respectively.[23]

We merged the individual-level records in the Invalsi NEPSA archive of grade 10 with information on the high school completion and on the final grade obtained upon high school graduation in grade 13 (i.e., the final high school grade), as contained in the National Students' Registry held by the Ministry of Education. We then track students who enroll in any (public or private) university in Italy as recorded in the National Students' Registry held by the Ministry of University.For those who enroll, we also construct an indicator for whether they drop out by the end of the freshman year.[24]

To ensure comparability across cohorts of high school graduates, we focus on students who enroll at university in the two academic years following their high school graduation.[25] Overall, we are able to track in the National Students' Registries 87 percent of the students observed in the Invalsi NEPSA archive containing the statements on aspirations in grade 10 (s.y. 2011-12 to 2017-18).

In our empirical analysis of post-grade 10 educational investments—following the aspirations expressed in grade 10—we thus focus on four main outcomes: the probability of completing high school (*High school completion*), the final grade at high school (*High school final grade*), the probability of enrolling at university (*University enrollment*), and the probability of dropping out during the first year of university (*University dropout*).[26]

Our analysis relies on two main samples. To study how students' aspirations respond to perceived changes in economic conditions, we use the full population of 10^{th}-grade students observed in the NEPSA archives across eight cohorts, from the 2010–11 to the 2017–18 school year, comprising approximately 2.52 million students. To study subsequent educational outcomes and the role of aspirations in shaping them, we instead use the matched NEPSA–National Students' Registries data. This sample comprises approx-

[23] We cannot link the first cohort of students, who attended grade 10 in the 2010–11 school year, because the longitudinal student identifier required for the linkage is not available in the Invalsi NEPSA archives for that year. In Appendix B, we assess the robustness of our main findings to alternative sample definitions, such as the exclusion of the first cohort.

[24] Dropout probability in the first year of the university is considered a good proxy of the academic success (Adamopoulou and Tanzi, 2017). Notably, it also allows for comparability across years and majors.

[25] On average, in the decade between the academic years 2011-12 and 2021-22, about 75 percent of those who enroll at university for the first time did it exactly in the two academic years following high school graduation (ANVUR, 2023).

[26] Each outcome is defined on the relevant sample. *High school completion* is defined for all grade-10 students in the matched NEPSA–National Students' Registries sample; *High school final grade* and *University enrollment* are defined for students who complete high school; and *University dropout* is defined for students who enroll in university.

imately 1.97 million students and covers the seven cohorts from 2011–12 to 2017–18.

We perform our empirical analysis on how aspirations are influenced by the perceptions of business cycle on the census of 10^{th} grade students from the eight cohorts of the school years from 2010-11 to 2017-18 (about 2,523,000 individuals), as derived from the NEPSA archives. Then, when we focus on the effects of aspirations on subsequent human capital investments, we will make use of the matched data NEPSA-National Students' Registries. In doing so, we are forced to use a subsample of the NEPSA archives (about 1.970.000 individuals) because the first cohort of tenth-grade students (school year 2010-11) cannot be matched to the National Students' Registries.

To the best of our knowledge, this is the first study to combine population-level data on students' educational aspirations covering multiple cohorts with administrative records on their subsequent educational trajectories. The scale and longitudinal nature of the resulting data allow us to follow students from aspirations stated in grade 10 to consequential educational outcomes several years later.

5.3 Descriptive statistics

In Table 1 we report the descriptive statistics of the variables used in the analysis. As an indirect way to check the consistency of the stated aspirations, Figure 1 tabulates AT according to some salient individual and family characteristics.

[Table 1 and Figure 1 about here]

On average, about 65 percent of the students desire to achieve a university education (*Aspiration Tertiary*). Aspirations to achieve tertiary education display a high variability within each subgroup: females' and natives' aspirations are, respectively, 17 and 11 percentage points (p.p.) higher than those of male and non-native peers; similarly, students from more affluent families display aspirations 25 p.p. higher. Not surprisingly, while 89 percent of the students in the academic track aspire to achieve a college education, this figure drops by almost a half (39 percent) for students in non-academic tracks.

[Figure 2 about here]

To visually illustrate the raw correlations underlying our analysis, Figure 2, panel (A), presents a binned scatter plot of *Aspiration Tertiary* against the share of school peers with at least one unemployed parent (UP, defined in equation 2), our proxy for changes in economic conditions as perceived through each student's aspiration window. The horizontal axis reports UP, while the vertical axis reports the average share of students aspiring to tertiary education within each bin of the UP distribution. Each point therefore represents the average educational aspirations of students facing a similar degree of exposure to peers with unemployed parents. The raw data reveal a clear negative and statistically

significant relationship: students exposed to a higher share of peers with at least one unemployed parent are, on average, less likely to aspire to tertiary education.

Turning to the subsequent educational outcomes, based on data from the National Students' Registries, approximately 90 percent of students complete high school, achieving an average high school final grade of 80 out of a maximum of 101 (see Table 1). Around 65 percent enroll in university within two academic years after graduating from high school. Among those who enroll, roughly 6.5 percent drop out without successfully completing their first year.

Figure 2, panels (B) to (E), shows the bins scatter-plots of each subsequent educational investment against UP. The raw data display a negative and statistically significant correlation between exposure to peers with unemployed parents and the probability of high school completion, the high school final grade, and the probability of college enrollment, while a positive correlation with university dropout. While Figure 2 only depicts raw correlations, in the following paragraph, we will describe in depth the empirical setup that we exploit in order to pin down the proper causal estimates.

6 Identification strategy

6.1 Baseline estimating equations

Aspirations and business cycle. Following the seminal paper by Hoxby (2000) and a well-established empirical literature, we exploit the (arguably) as-good-as-random within-school and across-cohorts variation in the share of school peers with at least one unemployed parent. We thus estimate the following baseline equation:

$$AT_{isct} = \alpha_1 + \beta_1 UP_{sct}^{(-i)} + \gamma_1 X_{isct} + \theta_1 S_{sct} + \lambda_s + \lambda_c + \lambda_{st} + \epsilon_{isct} \tag{3}$$

where: AT_{isct} is the aspiration for tertiary education stated in calendar year t by student i of cohort c in school s (as defined in eq. 1); $UP_{sct}^{(-i)}$ is the share of school peers with at least one unemployed parent (as defined in eq. 2). In our setting, school peers and their families constitute the aspiration window through which students may perceive changes in the business cycle (see Section 4); X_{isct} is a vector of student-level characteristics (including dummies for: student gender, first and second generation non-native status, grade retention, parents' tertiary education, own parents' unemployment status; student's achievement in the previous semester); S_{sct} is a vector of class- and school-level time-varying characteristics (such as: the shares of females, first and second generation non-natives, grade retained, class size, school size, cohort size).[27] λ_s, λ_c, and λ_{st} represent,

[27] See Table 1 for the complete list of the control variables. As for the cohort size, we follow Epple and Romano (2011) and add up to a third-degree polynomial, as peer composition may potentially be correlated with cohort size.

respectively, school and cohort fixed effects (FE), and school-specific time trends.

The estimation of equation 3 allows us to shed new light on the process of aspiration formation, and, in particular, on how changes in students' perceptions of the business cycle influence the development of their educational aspirations. Building on the conceptual framework proposed by Genicot and Ray (2017), we expect that experiencing a recession within one's aspiration window reduces educational aspirations (see testable implication (i) in Section 4).

Business cycle and later-in-life educational investments. In Section 7.2 we focus on the effects of business cycle fluctuations, as perceived from each student's aspiration window, on subsequent educational investments. We proceed in a reduced-form setting and estimate:

$$Y_{iscT} = \alpha_2 + \beta_2 UP_{sct}^{(-i)} + \gamma_2 X_{isct} + \theta_2 S_{sct} + \psi_2 UR_{rT} + \lambda_s + \lambda_c + \lambda_{st} + \epsilon_{iscT} \qquad (4)$$

which closely follows eq. 3 with two main differences. First, the outcome variables (Y_{iscT}) are the educational investments observed at least three years after the statement of the educational aspirations (at time T).[28] Second, following an established literature which links the educational choices with the contextual conditions of the business cycle (von Wachter, 2020), we include a control (UR_{rT}) for the unemployment rate observed in the region where the school is located (r) at the time of the educational choices (T).

The estimation of equation 4 allows us to assess whether exposure to worsening economic conditions during a critical stage of students' educational careers has persistent effects on subsequent educational investments. This analysis extends the existing literature on business-cycle fluctuations and human capital investment along two dimensions. First, we examine whether adverse economic conditions experienced in grade 10, even indirectly through students' social environment, affect educational choices and effort several years later. Second, rather than focusing on shocks directly experienced by students' own families, we study whether economic conditions observed through peers' families shape subsequent educational behavior. In this sense, our analysis highlights a peer-based channel through which business-cycle fluctuations may affect human capital accumulation within students' aspiration windows (Ray, 2006).

6.2 Identification assumptions

In equations 3 and 4, the parameters of interest (β_1 and β_2) are identified thanks to the (arguably) exogenous variation in the share of peers with unemployed parents across cohorts within school. School fixed effects control for time-invariant endogenous sorting into schools, while cohort fixed effects take into account year-to-year unobserved differ-

[28] Specifically, high school completion, high school final grade, and college enrollment are measured three years later (at $T = t + 3$), while college dropout is measured four years later (at $T = t + 4$).

ences across cohorts. School and cohort fixed effects thus solve the identification issues related to time-invariant students' sorting into schools, while the strategy fails to control for school-specific time trends that may alter both peer composition and the outcomes of interest (Lavy and Schlosser, 2011). We thus include in all specifications school-specific (linear, quadratic, or cubic) time trends (λ_{st}), which account for both time variant and school-specific unobserved factors correlated with both variations in exposure to peers with unemployed parents and the educational outcomes of students in the same school.[29] The extensive set of control variables included allows us to take into account observable time variant factors.

For the estimation of the effects on educational outcomes, we also control for the regional unemployment rate registered during the year of high school completion (effective for those who completed high school and potential for those who drop out) in order to rule out any possible short-run effect due to the business cycle.

In what follows, we present an extensive set of evidence corroborating our main identifying assumption, i.e., that after controlling for the set of control variables, fixed effects, and trends, the remaining variation in the variable $UP_{sct}^{(-i)}$ can be considered as good as random. On top of that, additional robustness and sensitivity checks, as well as alternative specifications, are discussed at length in Appendix B.

Evidence corroborating the identification assumptions. A first-order concern before delving into the validity of our empirical strategy is whether we have sufficient variation in the share of peers with unemployed parents once we remove school and cohort fixed effects. In Appendix Table A.1 we show that once we add school and cohort fixed effects, and school-specific (linear) time trends, we are still left with about 60 percent of unexplained residual variability, in line with existing studies exploiting a similar empirical variability and identification strategy (Olivetti et al., 2018; Mertz et al., 2025; Liu et al., 2016).

We can now test some main implications of the identification assumption recalled above (Lavy and Schlosser, 2011; Brenøe and Zölitz, 2020; Merlino et al., 2019). First, as a sort of balancing test, we can verify if variations in the proportion of students with an unemployed parent within a school are associated with observable individual-level characteristics. In Appendix Table A.2 we show the results of several regressions in which each pre-determined student characteristic is regressed on UP, after controlling for school and cohort fixed effects, and school-specific linear trends. As a matter of fact, we do not detect any systematic correlation: a few coefficients are statistically significant, though not in a systematic way across the specifications tested; moreover, all estimates are extremely close to zero.[30]

[29] We intend for the time trend the calendar year when each school year starts, i.e., from 2010 (or 2011, depending on the outcomes) to 2017.

[30] Appendix Table A.3 replicates, with comparable results, the same exercise on the sub-samples of the students who finished high school and on those who enrolled at university.

Second, we can graphically inspect the nature of the within-cohort-to-cohort variation exploited for identification purposes. In the spirit of Brenøe and Zölitz (2020) and Mertz et al. (2025), Appendix Figure A.5 plots the share of peers with unemployed parents (after removing school and cohort fixed effects). The assumption that variation in our exposure measure is as good as random (once we condition on school and cohort fixed effects) is supported by these deviations in the share of peers with unemployed parents, which mimic a normal distribution. Appendix Figure A.4, instead, plots UP for a random sample of 100 schools by school year (as in Carrell et al. (2018)). The random component of the variability is quite apparent in this graph. It can also be noticed some increase in the UP variable in the central years used in the analysis, when Italy reached its peaks of unemployment rate (see, for e.g., Appendix Figure A.1). This further corroborates the use of the UP variable as a good proxy for the actual unemployment rate.

Third, the identifying assumption would be violated if, for example, students with unemployed parents self-select into some specific schools based on some expectation of higher or lower proportions of peers sharing the same characteristic. In Appendix Table A.4, we thus show the results of simple OLS regressions of the own status of a student with an unemployed parent on the share of peers (excluding the student) with unemployed parents (i.e., our measure UP). However, as first noticed by Guryan et al. (2009), the simple correlation between each student's status of having an unemployed parent and the share of school-cohort peers with unemployed parents would mechanically deliver a spurious negative correlation, as each student peer group necessarily excludes the student itself (column 1 of Appendix Table A.4). We thus follow the correction procedure proposed by Guryan et al. (2009) and include in the regression the school-level leave-out mean of the proportion of peers with unemployed parents across cohorts within the school to account for the mechanical relationship between own status and peers' status. As expected, the negative estimated relationship turns positive once we account for this spurious correlation (Appendix Table A.4, columns 2-3), and it remains precisely estimated around zero in all remaining specifications. We finally notice that our estimates of this relationship return correlations which are, albeit significant in statistical terms, extremely small in magnitude and very precisely estimated around zero. Given the large sample size that we us we can be confident that these relations are indeed negligible in magnitude and not economically meaningful.

7 Reduced-form results

In this section, we present our reduced-form evidence on how changes in economic conditions perceived through students' aspiration windows affect both educational aspirations (Section 7.1) and subsequent educational investments (Section 7.2). We then discuss how these findings relate to the conceptual framework of Genicot and Ray (2017) and examine

relevant patterns of heterogeneity and potential alternative mechanisms.

7.1 Business cycle perceptions and aspirations

Baseline results. We estimate equation 3 using OLS regressions, with robust standard errors clustered at the school level. In Table 2 we present the main results for AT, where we progressively saturate the model by adding the FE, the control variables, and the linear, quadratic, or cubic school-specific trends.[31]

[Table 2]

The coefficient estimates for Aspiration Tertiary appear quite stable and always statistically significant across the various specifications. Concerning the magnitude of the estimated effects, we should notice that it decreases as long as we progressively saturate the model, while the functional form of the school-specific trend does not alter the point estimates substantially. In what follows, we focus on the specification in column 4 – the one with linear trends – as our baseline model.

We uncover a negative effect of the exposure to peers with unemployed parents on students' aspirations for tertiary education, thus confirming our testable prediction (i) (see Section 4). A 10 p.p. increase in exposure – approximately twice the mean of UP – reduces the probability of aspiring to tertiary education by 0.6 p.p., corresponding to about a one percent decrease relative to the sample mean.

The magnitude of the effect is economically meaningful. In particular, the estimated effect of a 10 p.p. increase in UP is comparable to the positive association between being female and aspiring to tertiary education in our baseline specification (see Appendix Table A.5). Gender has been shown to be an important predictor of educational aspirations, with female students typically reporting higher aspirations than their male counterparts (Lundberg, 2020; Favara, 2017) (see Appendix Table A.5). The estimated effect is smaller than that documented by Rizzica (2020), who finds that students' aspirations for tertiary education increased by 4.8 percentage points following exposure to a policy explicitly designed to foster educational aspirations. It is, however, reasonable to expect the effect of a targeted policy to be larger than the one estimated in our context, which operates through peer interactions. The magnitude of our effect is indeed very close to those reported in the literature when comparing our estimates with two relevant studies examining the influence of peers' parental characteristics on labor market and human capital decisions, namely Mertz et al. (2025) and Cattan et al. (2025).[32]

[31] For all outcome variables, Appendix Table A.5 provides the parameter estimates of the full list of control variables. The definition of all the control variables can be found in Table 1. Importantly, all the regressions include the dummy for the student's own parents unemployment status.

[32] Mertz et al. (2025) find that increasing by 10 p.p. the exposure to school peers whose parents are entrepreneurs increases by less than 0.1 p.p. the probability that the student became an entrepreneur by the age of 40. Cattan et al. (2025) document that an increase of 10 p.p. in the share of school peers

Heterogeneous effects and alternative channels. Building on the theoretical framework, we next explore several dimensions of heterogeneity in the response of educational aspirations to changes in economic conditions.

We first examine how the baseline effects vary when considering different proxies for students' relevant aspiration windows. In line with the theoretical model, wider aspiration windows, such as those associated with less socially connected individuals, are expected to lead to more muted responses to changes in the economic environment. We provide a narrower definition, i.e., based on the calculation of our measure $UP_{sct}^{(-i)}$ (eq. 2) on class rather than school peers, and a wider definition, i.e., based on the unemployment rate in the Local Labor Market (LLM) where the high school is located.[33] The results are in Table 3; their overall pattern confirms that definitions of a larger aspiration window tend to deliver smaller effects, while narrower definitions deliver stronger effects.[34] The latter result is in line with those in Lekfuangfu and Odermatt (2022).

[Table 3]

We next consider two alternative mechanisms that could contribute to explaining our findings on educational aspirations. First, students may lower their aspirations (and subsequent educational investments) during a recession because they revise downward their expected returns to education (Morgan, 1998). If this mechanism is at work, the response of aspirations should be particularly sensitive to the employment status of peers' highly educated parents, whose labor market outcomes may provide a more salient signal of the returns to higher education. However, results in Table 4 aspirations are mostly depressed by the observation of the unemployment status of lower-educated peers' parents, suggesting that changes in expected returns to higher education are unlikely to be the main mechanism.

[Table 4]

Second, we investigate whether our findings can be interpreted through the lens of gender-specific role models. Building on the literature on role-model effects (Beaman et al., 2012; Olivetti et al., 2018), we test whether students respond more strongly to changes in the employment status of peers' parents of the same gender – that is, whether girls respond more to the employment status of peers' mothers and boys to that of peers' fathers.[35] The results provide little support for this mechanism. Female and male students

whose parents have an elite education increases by 0.3 p.p the probability that a student enrolls in a tertiary education elite program.

[33] Italian LLMs are about 600, a smaller geographical entity as compared to the provinces (NUTS level 3), which broadly correspond to school districts.

[34] Standardizing the explanatory variables yields the same ordering of effects: the estimated effect is largest for class peers ($\hat{\beta}_1 = -0.0054$), smaller for school peers ($\hat{\beta}_1 = -0.0020$), and statistically indistinguishable from zero for the LLM unemployment rate.

[35] Recent research has identified aspirations as a potential driver of well-documented gender differences not only in academic performance and educational choices (Lundberg, 2020), but also in career trajectories, occupational patterns, and marital decisions (Inoue-Smith, 2014).

respond similarly to adverse economic conditions (Table 5, Panel A), and distinguishing between unemployment among peers' mothers and fathers reveals no systematic same-gender pattern (Panels B and C). Overall, we find no evidence that gender-specific role-model effects drive the response of students' aspirations.

[Table 5]

Robustness and sensitivity checks. We test the robustness of our main findings under several aspects. First, we provide a battery of sensitivity checks devoted to some possible variants of our baseline specification. In short, we show that the results do not depend on the measures of students' achievement used as control variable, nor on the inclusion of additional year-of-birth fixed effects or alternative measures to capture family wealth. Finally, we provide extensive evidence that measurement error in our main variable of interest does not alter the results. Appendix B is devoted to a detailed description of all these tests and results.

7.2 Business cycle perceptions and educational investments

Baseline results. We now turn to the reduced-form effects of business cycle perceptions in grade 10 on the four educational outcomes introduced in Section 5.2.[36] Table 6 presents the baseline results. As in the analysis of educational aspirations, we estimate equation 4 by OLS, clustering standard errors at the school level. Our preferred specification includes the full set of fixed effects and controls, as well as school-specific linear trends (column 4).

[Table 6]

We uncover detrimental effects of exposure to higher shares of school peers with unemployed parents in grade 10 on the later-in-life educational outcomes, in line with the idea that – on average – perceptions of worse economic conditions translate into lower effort in human capital accumulation. More in detail, we find that the effects on the probability of completing secondary education (Panel A) are negative, but noisily estimated in the whole population of students.[37] We observe a negative effect on high school final grade, whih decreases by about 2 points (corresponding to a reduction of 2.5 percent with respect to the average high school final grade in the sample; Panel B). The effect on the probability of university enrollment (Panel C) is again negative and statistically significant. In this

[36] While we consider these outcomes jointly as measures of educational investment, some more directly capture educational choices (e.g., high school completion and university enrollment), whereas others more closely reflect students' effort and persistence (e.g., the final high school grade and university dropout).

[37] As a matter of fact, obtaining the high school diploma is a necessary condition for university enrollment, and the vast majority of the students in our sample did obtain it (about 90 per cent). It thus seems somehow natural for high school students who aspire for tertiary education to reach the target of getting the high school diploma.

case, an increase of 10 p.p. in the share of peers with unemployed parents leads to a decrease of university enrollment of about 0.4 p.p.. Finally, we find that higher exposure to a negative business cycle in the moment of aspiration formation also translates into an increased probability of dropping out of college in the first academic year (about 0.3 p.p. for a 10 p.p. increase in exposure). All the estimated effects appear economically meaningful: they are about 2 times larger than the effect of being female in the same regressions (see Appendix Table A.5).

We perform the same robustness and specification checks as described in the previous section for the educational outcomes too. All the results can be found in Appendix B and largely confirm our baseline findings. In addition, we show that the baseline results on the effects of business cycle on aspirations (Section 7.1) hold in the slightly smaller sample of students for whom we could match the subsequent educational outcomes (see Section 5 and Appendix Table B.2).

Non-monotonic effects in educational investments. A key component of the theory of aspirations developed by Genicot and Ray (2017) is the notion of *frustration*. Aspirations must be sufficiently ambitious to encourage effort and investment, yet not so high relative to one's initial conditions as to become unattainable and ultimately demotivating. As discussed in Section 4, the effect of changes in aspirations on subsequent educational investment may therefore be non-monotonic, depending on the size of the initial aspiration gap.

While our full-sample estimates show that adverse economic conditions reduce educational investment on average, we next examine whether this effect varies across students in a way consistent with the non-monotonicity predicted by the theory. Specifically, we test in a reduced-form setting whether the effect of business cycle perceptions on subsequent educational investments differs with students' initial conditions and, hence, with their potential aspiration gaps. Evidence of such a pattern would provide suggestive evidence for the aspiration channel. We directly assess and quantify this channel through the causal mediation analysis in Section 8.

We distinguish individuals based on the plausible size of their aspiration gap, which is the distance between their current status and the aspirational target. This gap varies depending on the initial conditions individuals face, which we proxy using predetermined family characteristics that reflect their socioeconomic background. Specifically, we differentiate students by parental education (as previously discussed), by the occupational status of the father (blue-collar vs. white-collar jobs), and by the quality of home resources, such as access to a quiet study space, a computer, a desk, internet connection, a private room, and reference materials like encyclopedias. Since aspirations are uniformly defined as the pursuit of tertiary education, students from more disadvantaged backgrounds are likely to be further from this goal, and thus may experience a larger aspiration gap.

[Table 7]

The results of this heterogeneity analysis are presented in Table 7. We find evidence that students from more advantaged family backgrounds are negatively affected by an increased perception of adverse business cycle conditions, whereas those from less privileged backgrounds appear less affected, or not affected at all. This finding aligns with testable implication *(ii)* of the theory. Specifically, the larger the aspiration gap, as is likely the case for students from poorer families, the greater the likelihood that a negative shock to aspirations does not lead to a reduction in future educational investments. This is because these students are more likely to fall within the *frustration area* (see Appendix Figure A.3), where a decline in aspirations does not necessarily translate into lower effort or investment. In contrast, students from more affluent families, who plausibly face a smaller aspiration gap, are more likely to be in the *satisfaction area*, where aspirations are both high and attainable. For them, a negative external shock that lowers aspirations is more likely to result in a corresponding decline in educational investments.

8 The causal path from aspirations to educational investments

The empirical analysis so far has established two main reduced-form results. First, exposure to school peers with unemployed parents reduces students' educational aspirations (Section 7.1), consistent with the conceptual framework outlined in Section 4. Second, the same exposure has persistent adverse effects on subsequent educational outcomes, including the final high school grade, university enrollment, and university dropout (Section 7.2). We also documented heterogeneous effects consistent with the non-monotonic relationship between aspiration gaps and educational investment predicted by the theory. Taken together, these findings suggest that aspirations may constitute an important channel through which adverse economic conditions affect subsequent human capital accumulation.

In this section, we take a final step and investigate whether, and to what extent, aspirations constitute a causal channel linking exposure to adverse economic conditions to subsequent educational outcomes. To this end, we rely on the conceptual and empirical framework of causal mediation analysis (Celli, 2022; Huber, 2020; Heckman et al., 2013; Imai et al., 2011; Pearl, 2000), which serves two purposes. First, it allows us to decompose the average treatment effect of exposure to peers with unemployed parents on educational outcomes, estimated in the reduced-form analysis of Section 7.2, and quantify the share operating through the aspiration channel (Celli, 2022; Huber, 2020; Cattan et al., 2025). Second, the mediation framework allows us to identify the causal effect of aspirations themselves on medium-term educational outcomes, conditional on the peers' and peers'

parents' characteristics included in the baseline analysis. This latter result also contributes to the limited empirical literature seeking to identify the causal effect of aspirations on subsequent educational outcomes.[38]

8.1 Mediation analysis: Decomposition of the total average effect

Following the notation of Pearl (2000), Appendix Figure A.6 provides a Directed Acyclic Graph (DAG) representation of the causal relationships underlying our mediation analysis. The DAG formalizes the causal structure suggested by the theoretical framework (Ray, 2006; Genicot and Ray, 2017) and consistent with the reduced-form evidence presented so far. In our setting, the treatment is exposure to peers with unemployed parents (UP), students' educational aspirations (ASP) represent the mediator, and subsequent educational outcomes are denoted by Y. The effect of UP on Y operating through changes in ASP is the *mediator effect*, while the effect of UP on Y that does not operate through the mediator is the *direct effect*.[39] Our main object of interest is the mediator effect, which captures the extent to which aspirations mediate the effect of adverse economic conditions on subsequent educational outcomes.

The empirical setup of the causal mediation analysis translates the DAG (and the underlying nonparametric structural model) into the following linear structural equations model:

$$Y_{iscT} = \alpha_3 + \beta_3 UP_{sct}^{(-i)} + \delta_3 AT_{isct} + \gamma_3 X_{isct} + \theta_3 S_{sct} + \psi_3 UR_{rT} + \lambda_s + \lambda_c + \lambda_{st} + \epsilon_{iscT} \quad (5)$$

$$AT_{isct} = \alpha_4 + \beta_4 UP_{sct}^{(-i)} + \delta_4 Z_{sct} + \gamma_4 X_{isct} + \theta_4 S_{sct} + \lambda_s + \lambda_c + \lambda_{st} + \epsilon_{isct} \quad (6)$$

where: Y_{iscT} are the educational outcomes (i.e., high school completion and final grade, university enrollment and dropout) of student i of school-cohort c in school s, as observed in T (where: $T = t + 3$ or $T = t + 4$, depending on the outcome; see Section 7.2); AT_{isct} are the student's aspirations for tertiary education, as defined so far, while the other terms are defined according to eq. 4. Equation 5 thus represents the effect on educational outcomes of both the treatment and the mediator. Given that the mediator is likely to be endogenous in our setting, equation 6 represents the first-stage regression of aspirations on a randomly assigned instrumental variable (Z_{sct}), which we use for identification and discuss in the next subsection.

[38] To the best of our knowledge, Rizzica (2020) provides the closest causal evidence, estimating the effect of a policy aimed at raising students' aspirations on college enrollment in the U.K., while other studies primarily document robust conditional correlations between aspirations and subsequent educational outcomes (Fruttero et al., 2024; Favara, 2017; Guyon and Huillery, 2020).

[39] In the potential-outcomes formulation of causal mediation analysis, these components are commonly referred to as the natural indirect effect (NIE) and natural direct effect (NDE), respectively (Pearl, 2000; Nicoletti et al., 2023).

As we show in Appendix C, the joint estimate of eq. 5 and eq. 6 makes it possible to recover the causal parameters of interest. First, the casual estimate of δ_3 will deliver the effect of aspirations on later educational investments. Then, by multiplying β_4 from eq. 6 (i.e., the effect of peers with unemployed parents on aspirations) by δ_3 from eq. 5 (i.e., the effect of aspirations on later educational investments), we obtain a measure of the effects on educational investments of the exposure to school peers with unemployed parents through the aspirations channel, i.e., the estimate of the mediator effect. Moreover, by comparing this parameter with the baseline overall effect of school peers on later educational investments (i.e., β_2 in eq. 4) we are able to recover the relative importance of the aspiration channel in explaining our results (Celli, 2022; Cattan et al., 2025). Moreover, β_3 provides the estimate of the direct effect, i.e., the effect of school peers with unemployed parents on later educational investments, conditional on students' aspirations. We can think of this effect as the residual peer effect component, not driven by the aspirations channel.

8.2 Mediation analysis: Identification

The correct quantification of the mediator effect and of the direct effect necessitates identifying the parameters β_3 and δ_3. A simple OLS estimation of eq. 5 faces two main challenges that hamper causal identification. First, AT_{isct} is likely to be endogenous, as individual aspirations are correlated with unobserved individual factors that also affect educational outcomes. As a result, OLS estimates of δ_3 would be biased. Second, OLS estimates of β_3 would also be biased, given the new correlation introduced between AT_{isct} and $UP_{sct}^{(-i)}$ (which was absent in the reduced-form setting of eq. 4). A common approach to addressing mediator endogeneity in causal mediation analysis is to rely on an instrumental variable (IV) strategy (Celli, 2022; Nicoletti et al., 2023; Cattan et al., 2025). In our setting, this corresponds to finding an instrumental variable that only influences the student's aspirations at time t, without having effects on the subsequent educational outcomes, other than through the aspirations channel.

To construct such an instrument, we exploit a natural experiment embedded in the administration of the NEPSA assessments. Under standard testing procedures, students are supervised by school teachers and staff, who are responsible for administering the tests and ensuring compliance with the assessment protocol. In each NEPSA wave covered by our analysis, however, Invalsi randomly selected a representative sample of classes to be externally monitored. In these classes, an external examiner administered and proctored the assessment and ensured that all testing procedures were correctly followed. The externally monitored sample was used by Invalsi as a benchmark for assessing the quality and representativeness of the data collected from the full student population.

Importantly for our identification strategy, external monitoring was randomly as-

signed, and schools typically learned that they had been selected only a few days before the assessment. The randomization was conducted independently in each school year, irrespective of assignments in previous years, and could select one or more classes within the same school.[40]

We therefore define Z_{iskt} as an indicator equal to one if student i's class k, in school s and school year t, is randomly assigned to an external examiner. The examiner is present throughout the testing procedure and represents a random and unexpected change in the monitoring environment. In particular, external monitoring substantially limits opportunities for both student and teacher cheating during and after the assessment (Lucifora and Tonello, 2020).

The presence of an external examiner may, however, also affect students' stated educational aspirations in the short run. One plausible channel operates through students' perceived performance on the assessment. As shown in Appendix Table A.6, external monitoring lowers test scores, while leaving unaffected the predetermined teacher-assigned grades that we use throughout the analysis as a proxy for students' prior academic ability.[41] The presence of the examiner may therefore induce students to form a more pessimistic assessment of their own ability and, in turn, report lower educational aspirations. This immediate response is particularly plausible in our setting, as students complete the questionnaire containing the aspiration question immediately after taking the assessment, while the external examiner is still present. Importantly, students never observe their actual test scores, so any effect on their stated aspirations cannot be driven by direct information about their performance and must instead operate through their perception of the testing experience.

A second, related channel may operate through the testing environment itself. The presence of an unfamiliar external examiner may make the assessment environment more stressful or uncomfortable, potentially inducing students to report less ambitious educational aspirations. While our data do not allow us to distinguish empirically between these mechanisms, both provide plausible channels through which the randomly assigned external examiner can generate short-run variation in stated aspirations.

For the instrument to be valid, we also require that the presence of an external examiner during the grade-10 NEPSA assessment does not directly affect the educational outcomes observed three to four years later, other than through its effect on students'

[40] An extensive literature exploits this natural experiment; see, among others, Bertoni et al. (2013; 2021); Lucifora and Tonello (2015; 2020). These studies show that the presence of an external examiner affects test scores, social interactions, and teachers' behavior. The randomization was discontinued after the transition from paper-based to computer-based assessments, which began in school year 2019–20. It remains in place for elementary school students in grades 2 and 5, for whom assessments continue to be administered on paper.

[41] An extensive literature documents the negative effect of external monitoring on test scores, largely attributing it to the reduction in student and teacher cheating when an external examiner is present (Bertoni et al., 2013; Lucifora and Tonello, 2015; 2020; Bertoni et al., 2021).

aspirations. Existing evidence supports the plausibility of this exclusion restriction. In particular, Bertoni et al. (2021) studies the persistence of the effects of external monitoring on test scores and cheating behavior and finds that its effect on test scores vanishes within one year. Given the transitory nature of the monitoring shock, this evidence makes it unlikely that the presence of an external examiner in grade 10 directly affects educational outcomes realized several years later.

8.3 IV and mediation analysis results

Table 8 reports the results of the mediation analysis. Column (1) reports the first stage regression (eq. 6), column (4) the results of the IV regression; for comparison reasons, we also report the endogenous OLS regression in column (3) (i.e., eq. 5 estimated using an OLS and not the causal IV model), and the reduced-form OLS regression in column (2).[42]

[Table 8 about here]

As shown by the first-stage estimates, external monitoring has a negative and statistically significant effect on students' aspirations, consistent with the interpretation that the presence of an external examiner induces students to revise their aspirations downward, possibly through a more pessimistic perception of their own ability. The external monitoring depresses the aspiration for tertiary education by 0.8 p.p., determining a reduction of about 1.2 per cent with respect to the average probability of aspiring for tertiary education. As reasonable, the altering effect on aspirations due to the presence of the external inspector is small in magnitude, but still statistically significant: the Cragg-Donald Wald F statistic is about 19 for high school completion, final grade, and university enrollment (Stock and Yogo, 2005). The first-stage relationship is weak for the university dropout outcome, however, limiting the precision and interpretability of the corresponding IV estimates.[43]

The IV estimates indicate a large positive causal effect of students' aspirations for tertiary education on subsequent educational outcomes. In particular, aspiring to tertiary education approximately doubles both the probability of completing high school and that of enrolling in university. Aspirations also have a sizeable effect on educational effort: the final high school grade increases by about 12 points, corresponding to approximately 15 percent of the sample mean. These findings provide novel causal evidence on the role of educational aspirations in shaping medium-term educational outcomes. While the

[42] We report the baseline reduced-form OLS regression corresponding to the estimation of eq. 3 and reported in the main results of the paper in Table 6 because the inclusion of the external monitoring dummy slightly alters the baseline sample, due to some missing values in the original data (0.5 per cent).

[43] This plausibly depends on the smaller sample on which this outcome is measurable (i.e., those who have indeed enrolled at university).

magnitude of the IV estimates should be interpreted in light of the local nature of the identified effects, the results point to aspirations as an important driver of subsequent human capital investment.

Turning back to the mediation analysis, we obtain the mediator effect by multiplying β_4 from equation6 by δ_3 from equation 5. The resulting estimates are reported in Table 5. The mediator effect is negative for both the final high school grade and university enrollment. This follows naturally from our previous results: exposure to peers with unemployed parents reduces aspirations for tertiary education, while higher aspirations have a positive causal effect on subsequent educational outcomes.

The aspiration channel accounts for approximately one third of the total effect on the final high school grade. For university enrollment, instead, we find evidence of complete mediation (Bullock and Green, 2021), with the effect of exposure to peers with unemployed parents operating entirely through changes in aspirations. The aspiration channel therefore appears particularly important for the decision to enroll in university, whereas its contribution is smaller for the final high school grade, for which a larger share of the total effect operates through other channels captured by the direct effect.[44]

High school completion represents a different case. Since exposure to peers with unemployed parents has no detectable reduced-form effect on the probability of completing high school (column 2), there is no total effect to decompose into direct and indirect components (Bullock and Green, 2021). Aspirations nevertheless have a large positive causal effect on high school completion, as discussed above, but this effect does not represent a channel through which exposure to peers with unemployed parents affects this outcome.

As sensitivity checks, Appendix Figure A.7 shows that the first-stage estimates are similar across different subsamples of students. This evidence suggests that the instrument operates similarly across observable groups and alleviates concerns that the estimated effects are driven by a highly specific population of compliers. In addition, Appendix Figure A.8 shows that the estimated causal effect of aspirations on educational outcomes is broadly stable across student subsamples. This evidence supports the plausibility of the homogeneity condition required for causal mediation analysis within an IV framework (Huber, 2020; Cattan et al., 2025).

9 Concluding remarks

Aspirations are an important determinant of individuals' educational choices and investments in human capital (Genicot and Ray, 2017; La Ferrara, 2019). Understanding how they are formed, how they respond to changes in the economic environment, and how

[44]For university dropout, the mediator effect accounts for approximately 80 percent of the average total effect. This estimate should, however, be interpreted with caution given the weak first stage for this outcome.

they shape subsequent investments is therefore important for understanding the process of human capital accumulation (Fruttero et al., 2024).

In this paper, we study how exposure to deteriorating economic conditions within adolescents' aspiration windows affects both their contemporaneous educational aspirations and their subsequent educational outcomes. We focus on school peers and their families as a salient component of students' aspiration windows and exploit within-school, cohort-to-cohort variation in exposure to peers with unemployed parents. This setting allows us to study whether adverse economic conditions experienced through one's social environment shape what students aspire to achieve and, ultimately, their educational trajectories.

Our results provide three main insights. First, greater exposure to peers with unemployed parents reduces students' aspirations to pursue tertiary education. Consistent with the theory of Genicot and Ray (2017), aspirations respond to changes in the economic conditions observed within students' aspiration windows. The results also suggest that this process is not primarily driven by gender-role norms or by changes in the perceived economic returns to education.

Second, exposure to adverse economic conditions during grade 10 has persistent consequences for subsequent human capital accumulation. Students who are more exposed to peers with unemployed parents are less likely to complete high school and enroll in university, and more likely to drop out of university by the end of the freshman year. Moreover, consistent with the non-monotonic relationship between aspiration gaps and investment predicted by the theory, these effects vary with students' initial socioeconomic conditions. In particular, students from more disadvantaged backgrounds appear more likely to be in the frustration region, where aspiration gaps are sufficiently large that aspirations provide weaker incentives for additional educational investment.

Third, our causal mediation analysis shows that aspirations constitute an important channel through which exposure to adverse economic conditions affects subsequent educational outcomes. Aspirations explain a substantial share of the reduced-form effects on the final high school grade and university enrollment, with evidence of complete mediation for the latter. The analysis also provides a causal estimate of the effect of aspirations themselves on subsequent educational outcomes, which we find to be positive and economically meaningful. Taken together, these findings provide micro-level causal evidence that adverse economic conditions can affect human capital accumulation not only through their direct economic consequences, but also by changing the outcomes young individuals perceive as attainable.

Our findings have several implications for policy. Policies aimed at promoting human capital accumulation may benefit from explicitly considering students' aspirations as a margin of intervention.[45] Such interventions may be particularly valuable during eco-

[45]See Biroli et al. (2025) for an example of online tutoring aimed at strengthening students' soft skills and aspirations, among other outcomes, and Mahmud et al. (2025) for related experimental evidence in

nomic downturns, when adverse conditions in students' social environments can depress their educational aspirations. Their timing may also matter: interventions targeted at critical stages of educational careers – such as the end of compulsory schooling or the transition from high school to tertiary education – may help prevent temporary adverse conditions from generating persistent effects on educational trajectories. Moreover, focusing on the youngest is especially important as their aspirations (and subsequent choices) are more malleable by targeted policies. Finally, our evidence on heterogeneous aspiration gaps suggests that a one-size-fits-all approach may be ineffective. Students from more disadvantaged socioeconomic backgrounds may require stronger or differently designed interventions to prevent large aspiration gaps from generating frustration rather than motivation. Such interventions may help break the vicious cycle whereby socioeconomic disadvantage leads to lower aspirations and educational investment, thereby perpetuating disadvantage later in life – an aspiration-induced poverty trap (Ray, 2006; Dalton et al., 2016).

More broadly, our results highlight a previously underexplored channel through which economic downturns can have persistent effects on human capital formation. By shaping the economic conditions observed within young people's social environments, downturns can alter their aspirations and, through them, the educational investments that determine future opportunities. Policies that sustain aspirations at critical stages of adolescence may therefore help limit the propagation of temporary economic adversity into longer-lasting inequalities in human capital.

a developing-country setting.

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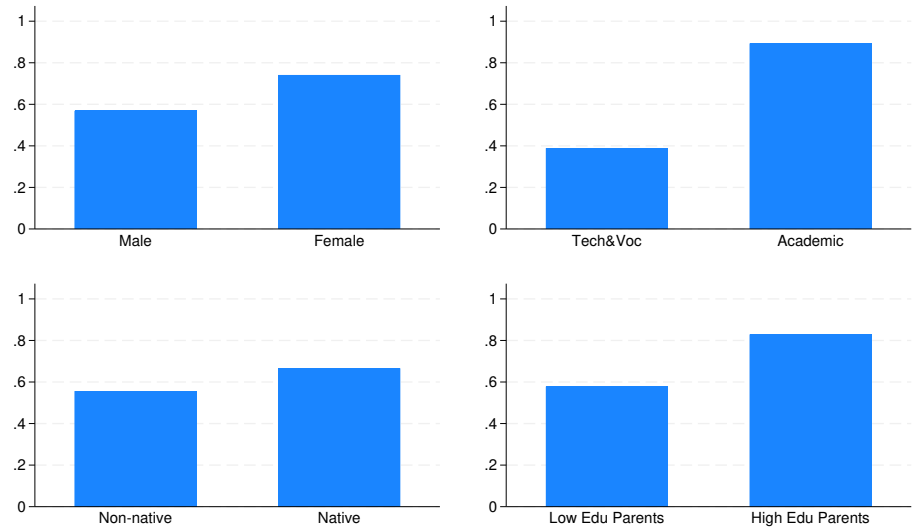
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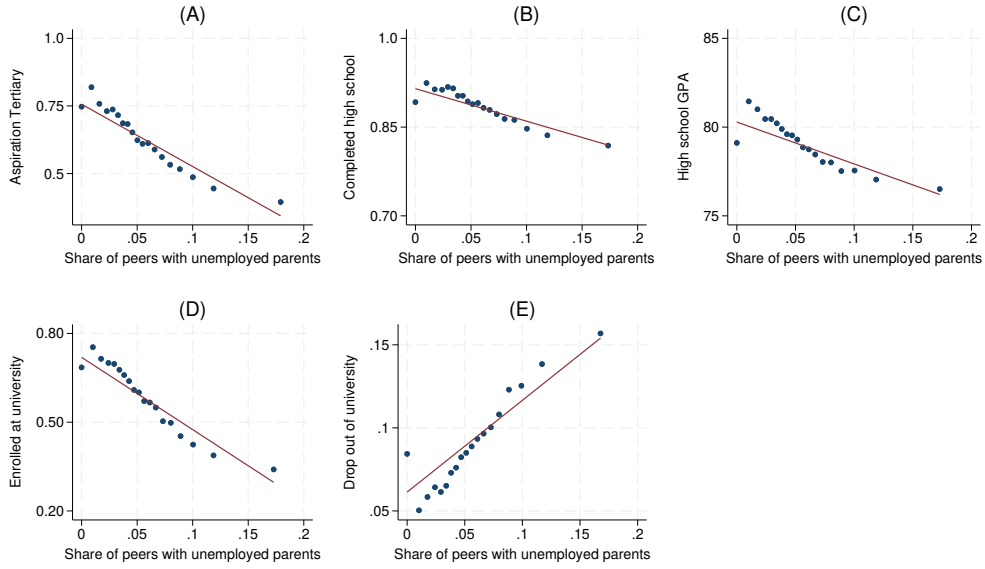
Figures

Figure 1
Students' aspirations by: gender, school type, native and non-native status, parents' education



Notes: the bars show the average of the variable aspiration tertiary by gender, school type (academic and non-academic schools), native and non-native status, parents' education (at least one parent with tertiary education or not). Academic schools cover 53% of the students in the sample. **Source**: own elaboration from Invalsi NEPSA, G10, s.y. 2010-11 to 2017-18.

Figure 2
The share of school peers with unemployed parents, students' aspirations, and subsequent educational outcomes



Notes: the graph shows binscatter plots (net of school and cohort fixed effects) of the relation between the share of school peers with unemployed parents and: aspiration tertiary (Panel A), educational outcomes (Panels B to E). The estimated slope coefficients (and SE) are, respectively, for the outcome variables in Panels A to E: -2.3(0.033), -0.5(0.018), -23.6(0.742), -2.4(0.038), 0.6(0.014). **Source**: own elaboration from Invalsi NEPSA, G10, s.y. 2010-11 to 2017-18.

Tables

Table 1
Descriptive statistics

	Sample:			
	Aspirations stated in G10		Subsequent educational outcomes	
Variable	Mean	SD	Mean	SD
Aspiration Tertiary	0.656	0.475	0.668	0.471
High school completion			0.896	0.306
High school final grade (†)			79.757	12.497
University enrollment (†)			0.651	0.477
University dropout(*)			0.062	0.242
Share of school peers with unemployed parents	0.053	0.034	0.054	0.033
Share of school peers with unemployed fathers	0.023	0.020	0.023	0.020
Share of school peers with unemployed mothers	0.036	0.026	0.036	0.026
Female	0.505	0.500	0.511	0.500
Non-native 1st. gen	0.045	0.208	0.040	0.196
Non-native 2nd. gen	0.047	0.211	0.046	0.209
Ahead of year	0.018	0.132	0.014	0.116
Repeating year	0.163	0.369	0.130	0.336
Teachers' mark in the first term	6.076	1.138	6.125	1.123
Missing teachers' mark in the first term (dummy)	0.003	0.058	0.003	0.058
Percentile class rank	0.505	0.297	0.504	0.300
At least one parent with tertiary education (dummy)	0.310	0.463	0.325	0.468
At least one unemployed parent	0.052	0.223	0.054	0.225
Unemployed father (dummy)	0.023	0.149	0.023	0.151
Unemployed mother (dummy)	0.035	0.185	0.036	0.186
Share of class peers with unemployed parents	0.053	0.066	0.054	0.069
Female class share	0.501	0.286	0.508	0.286
Ahead of year class share	0.017	0.049	0.014	0.041
Repeating year class share	0.171	0.170	0.133	0.150
Non-native 1st. gen class share	0.051	0.078	0.044	0.071
Non-native 2nd. gen class share	0.047	0.063	0.047	0.066
Class size (no. of students)	20.176	4.679	18.858	4.792
Monitored class (dummy)	0.100	0.300	0.096	0.295
Female school share	0.500	0.211	0.507	0.209
Ahead of year school share	0.017	0.039	0.014	0.032
Repeating year school share	0.174	0.134	0.135	0.112
Non-native 1st. gen school share	0.052	0.055	0.045	0.047
Non-native 2nd. gen school share	0.047	0.038	0.048	0.039
School size (no. of students)	171.564	76.281	161.538	72.866
Average class size in the school	19.241	3.663	17.740	3.793
Cohort size (no. of students)	174199	105000	154914	96189
Observations	2,523,308		1,966,146	

Notes: *Dependent variables definitions*: Aspiration Tertiary (1 if aims to enroll in university), High school completion (1 if successfully completed high school); High school final grade† (final grade at the high school diploma, integer $\in [60-101]$); University enrollment † (1 if enrolled at university the year following high school completion); $\dagger$ indicates that the two variables are available only for the subsample of those who completed high school (N=1,761,286); University dropout (1 if drop out from university the in the first year of enrollment); $*$ indicates that the variable is available only for the subsample of those enrolled at university (N=1,147,087). *Other variables definitions*: *Share of school peers with unemployed parents/fathers/mothers* is the share of school peers with at least one unemployed parent / with unemployed father / with unemployed mother (excluding the student itself); Female (1 if female), Non-native: 1st gen. (1 if first generation immigrant), Non-native: 2nd gen. (1 if second generation immigrant), Ahead of year (1 if the student has anticipated by one year the beginning of the primary school), Repeating year (1 if the student is grade retained), Teachers' grade in the first term (average teachers' grade in Italian language and math at the end of the first semester in grade 10), Missing teachers' grade in the first term (dummy) (1 if teachers' mark is missing in Italian language or math), Percentile class rank (percentile class rank of teachers' grade in the first term), at least one parent with tertiary education (1 if at least one parent has tertiary education), at least one unemployed (1 if at least one parent is unemployed), unemployed father or mother (1 if father or mother is unemployed); the same variables are used to obtain the corresponding shares within classes and schools; Monitored class (1 if the class has been assigned an external monitor during the NEPSA assessment by Invalsi): this is the variable used as instrument in the mediation analysis (see Section 8). **Source**: own elaborations from Invalsi NEPSA (G10, s.y. from 2010-11 to 2017-18) and National Students' Registries (s.y. from 2013-14 to 2020-21).

Table 2
Aspirations and business cycle perceptions: Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)
Share of school peers with unemployed parents	-0.1062***	-0.0895***	-0.0777***	-0.0557***	-0.0554***	-0.0570***
	(0.0191)	(0.0184)	(0.0177)	(0.0191)	(0.0191)	(0.0192)
R2	0.28	0.32	0.33	0.33	0.33	0.33
N.Obs.	2523308	2523308	2523308	2523308	2523308	2523308
School and Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level controls		Yes	Yes	Yes	Yes	Yes
Class and school level controls			Yes	Yes	Yes	Yes
Linear trends				Yes		
Quadratic trends					Yes	
Cubic trends						Yes

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. The specifications progressively include: school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear, quadratic or cubic school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA, G10, s.y. from 2010-11 to 2017-18.

Table 3
Aspirations and business cycle perceptions: Alterations of the aspiration window

	(1)	(2)	(3)
	Aspiration window:		
	baseline	narrower	wider
Share of school peers with unemployed parents	-0.0557***		
	(0.0191)		
Share of class peers with unemployed parents		-0.0818***	
		(0.0075)	
LLM unemployment rate			-0.0228
			(0.0175)
R2	0.33	0.33	0.33
N.Obs.	2523308	2523183	2296989
FE, controls and linear trends	Yes	Yes	Yes

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered: at school level for columns 1 and 2; at the LLM (Local Labor Market) level in column 3. The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA, and Istat, Labor Force Survey (2010-2018).

Table 4
Aspirations and business cycle perceptions: Heterogeneous effects based on the education of peers' unemployed parents

	(1)	(2)	(3)
Panel A: parents with or w/o secondary education			
Share of school peers with unemployed parents with at least HS Diploma	0.0299		0.0383
	(0.0495)		(0.0495)
Share of school peers with unemployed parents w/o HS Diploma		-0.0982***	-0.0987***
		(0.0216)	(0.0216)
R. squared	0.33	0.33	0.33
N.Obs.	2523308	2523308	2523308
Panel B: parents with or w/o tertiary education			
Share of school peers with unemployed parents with tertiary education	-0.0328		-0.0231
	(0.0257)		(0.0257)
Share of school peers with unemployed parents w/o tertiary education		-0.1296***	-0.1282***
		(0.0280)	(0.0281)
R. squared	0.33	0.33	0.33
N.Obs.	2523308	2523308	2523308
FE, controls and linear trends	Yes	Yes	Yes

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA.

Table 5
Aspirations and business cycle perceptions: Heterogeneous effects based on students' gender, mothers vs. fathers' unemployment status

	(1)	(2)	(3)
	All	Males	Females
Panel A			
Share of school peers with unemployed parents	-0.0557***	-0.0574**	-0.0527**
	(0.0191)	(0.0256)	(0.0240)
R2	0.33	0.33	0.31
N.Obs.	2523308	1248117	1275106
Panel B			
Share of school peers with unemployed fathers	-0.0803***	-0.0686*	-0.0962***
	(0.0295)	(0.0404)	(0.0351)
R2	0.33	0.33	0.31
N.Obs.	2468991	1221410	1247489
Panel C			
Share of school peers with unemployed mothers	-0.0700***	-0.0762**	-0.0550*
	(0.0226)	(0.0304)	(0.0288)
R2	0.33	0.33	0.31
N.Obs.	2516333	1244364	1271880
Mean (SD) of dep. variable:	0.656 (0.475)	0.568 (0.495)	0.741 (0.4384)
FE, controls and linear trends	Yes	Yes	Yes

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA.

Table 6
Business cycle perceptions and subsequent educational investments: Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. High school completion						
Share of school peers with unemployed parents	-0.0198	-0.0059	0.0005	-0.0101	-0.0201	-0.0283
	(0.0180)	(0.0178)	(0.0181)	(0.0190)	(0.0192)	(0.0193)
R2	0.09	0.20	0.19	0.20	0.20	0.20
N.Obs.	1966146	1966146	1963881	1963881	1963881	1963881
Panel B. High school final grade						
Share of school peers with unemployed parents	-1.7008***	-1.6267***	-1.6659***	-2.0386***	-2.1165***	-2.1770***
	(0.5695)	(0.6140)	(0.6072)	(0.6484)	(0.6543)	(0.6619)
R2	0.12	0.43	0.44	0.44	0.44	0.44
N.Obs.	1761279	1761279	1760960	1760960	1760960	1751983
Panel C. University enrollment						
Share of school peers with unemployed parents	-0.0727***	-0.0592***	-0.0437**	-0.0431**	-0.0409*	-0.0407*
	(0.0202)	(0.0203)	(0.0197)	(0.0216)	(0.0217)	(0.0218)
R2	0.25	0.30	0.31	0.31	0.31	0.31
N.Obs.	1761279	1761279	1760960	1760960	1760960	1760960
Panel D. University dropout						
Share of school peers with unemployed parents	0.0422***	0.0406***	0.0372***	0.0313*	0.0300*	0.0297*
	(0.0150)	(0.0149)	(0.0150)	(0.0169)	(0.0169)	(0.0168)
R2	0.04	0.05	0.05	0.06	0.06	0.06
N.Obs.	1116825	1116825	1116654	1116654	1116654	1116654
School and Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level controls		Yes	Yes	Yes	Yes	Yes
School-level and regional unempl. rate controls			Yes	Yes	Yes	Yes
Linear trends				Yes		
Quadratic trends					Yes	
Cubic trends						Yes

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. The specifications progressively include: school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear, quadratic or cubic school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Regional unemployment rate refers to the year of high school completion. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

Table 7
Business cycle perceptions and subsequent educational investments: Non-monotonic effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Low parents' edu	High parents' edu	Blue collar father	White collar father	Low item pos	High item pos.
Panel A. High school completion						
Share of school peers with unemployed parents	-0.0071	-0.0237	-0.0007	-0.0376*	-0.0021	-0.0163
	(0.0211)	(0.0255)	(0.0233)	(0.0225)	(0.0223)	(0.0223)
R2	0.21	0.19	0.21	0.20	0.22	0.19
N.Obs.	1325562	638275	950911	878904	964324	973121
Mean (SD) of dep. variable:	0.883 (0.321)	0.923 (0.266)	0.880 (0.325)	0.921 (0.269)	0.880 (0.325)	0.914 (0.280)
Panel B. High school final grade						
Share of school peers with unemployed parents	-1.6313**	-3.2085***	-1.6505**	-2.5863***	-1.9083**	-2.3531***
	(0.7137)	(0.9503)	(0.7767)	(0.8115)	(0.7503)	(0.7926)
R2	0.42	0.48	0.42	0.47	0.43	0.46
N.Obs.	1171475	589421	837383	810002	848963	890141
Mean (SD) of dep. variable:	78.872 (12.346)	81.544 (12.601)	78.856 (12.337)	80.930 (12.579)	79.450 (12.485)	80.171 (12.497)
Panel C. University enrollment						
Share of school peers with unemployed parents	-0.0327	-0.0806**	-0.0170	-0.0595**	-0.0346	-0.0573**
	(0.0250)	(0.0332)	(0.0285)	(0.0288)	(0.0275)	(0.0281)
R2	0.30	0.25	0.30	0.29	0.32	0.30
N.Obs.	1171475	589421	837383	810002	848963	890141
Mean (SD) of dep. variable:	0.566 (0.496)	0.771 (0.420)	0.564 (0.460)	0.723 (0.447)	0.592 (0.491)	0.680 (0.466)
Panel D. University dropout						
Share of school peers with unemployed parents	0.0271	0.0306	0.0384	0.0256	0.0168	0.0525**
	(0.0220)	(0.0238)	(0.0251)	(0.0216)	(0.0249)	(0.0213)
R2	0.07	0.07	0.07	0.07	0.07	0.07
N.Obs.	662201	454308	471572	585120	501443	604711
Mean (SD) of dep. variable:	0.071 (0.257)	0.0490 (0.216)	0.070 (0.254)	0.054 (0.227)	0.065 (0.246)	0.060 (0.24)

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends, regional unemployment the year of high school completion. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. *Low parents' edu* is equal to one if none of the parents has a university degree; *high parents' edu* is equal to one if at least one parent has a university degree; *white collar father* is equal to one if the employed father is a manager, a member of the arts or professions, an office worker or a school teacher; *blue collar father* is equal to one if the employed father is self-employed or blue collar; *low item possession (pos.)* is equal to one if the student has not access to at least one of the following items: a quiet study space, a computer, a desk, an internet connection, a private room, reference materials such as encyclopedias; *high item possession (pos.)* is equal to one if the student has access to all the mentioned items. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

Table 8
Mediation analysis: Results

	(1)	(2)	(3)	(4)
	First stage	Reduced form	OLS	IV
	Aspiration Tertiary	**High school completion**		
Monitored class	-0.0077***			
	(0.0017)			
Share of school peers with unemployed parents	-0.0588***	-0.0062	-0.0036	0.0502
	(0.0213)	(0.0192)	(0.0192)	(0.0309)
Aspiration Tertiary			0.0426***	0.9496***
			(0.0007)	(0.2369)
F statistic				20.26
Mediator effect				-0.056
N.Obs.	1952769	1952769	1952769	1952769
	Aspiration Tertiary	**High school final grade**		
Monitored class	-0.0077***			
	(0.0017)			
Share of school peers with unemployed parents	-0.0588***	-2.0112***	-1.8946***	-1.3016*
	(0.0225)	(0.6564)	(0.6489)	(0.7284)
Aspiration Tertiary			1.9681***	11.9709**
			(0.0253)	(5.2517)
F statistic				19.24
Mediator effect				-0.704
N.Obs.	1751959	1751959	1751959	1751959
	Aspiration Tertiary	**University enrollment**		
Monitored class	-0.0077***			
	(0.0017)			
Share of school peers with unemployed parents	-0.0588***	-0.0477**	-0.0340*	0.0162
	(0.0225)	(0.0219)	(0.0206)	(0.0293)
Aspiration Tertiary			0.2313***	1.0788***
			(0.0017)	(0.2255)
F statistic				19.24
Mediator effect				-0.063
N.Obs.	1751959	1751959	1751959	1751959
	Aspiration Tertiary	**University dropout**		
Monitored class	-0.0016			
	(0.0015)			
Share of school peers with unemployed parents	-0.0716***	0.0315*	0.0295*	0.0053
	(0.0252)	(0.0170)	(0.0170)	(0.0490)
Aspiration Tertiary			-0.0277***	-0.3652
			(0.0009)	(0.6304)
F statistic				1.12
Mediator effect				0.026
N.Obs.	1112793	1112793	1112793	1112793

Notes: the table reports coefficients and standard errors (SE) from OLS and 2SLS regressions with robust SE clustered at school level. The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. The instrumental variable is for specification in col.4 the dummy indicating a monitored class. Cragg-Donald Wald F statistic reported. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

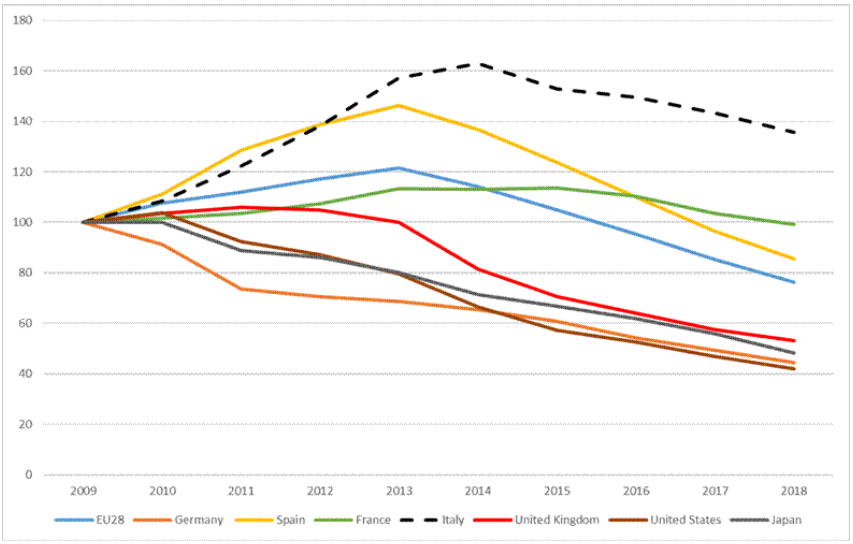
Online Appendix to:

A great depression?
Students' educational aspirations and investments in the aftermath of the Great Recession

Eleonora Porreca, Lucia Rizzica, Marco Tonello

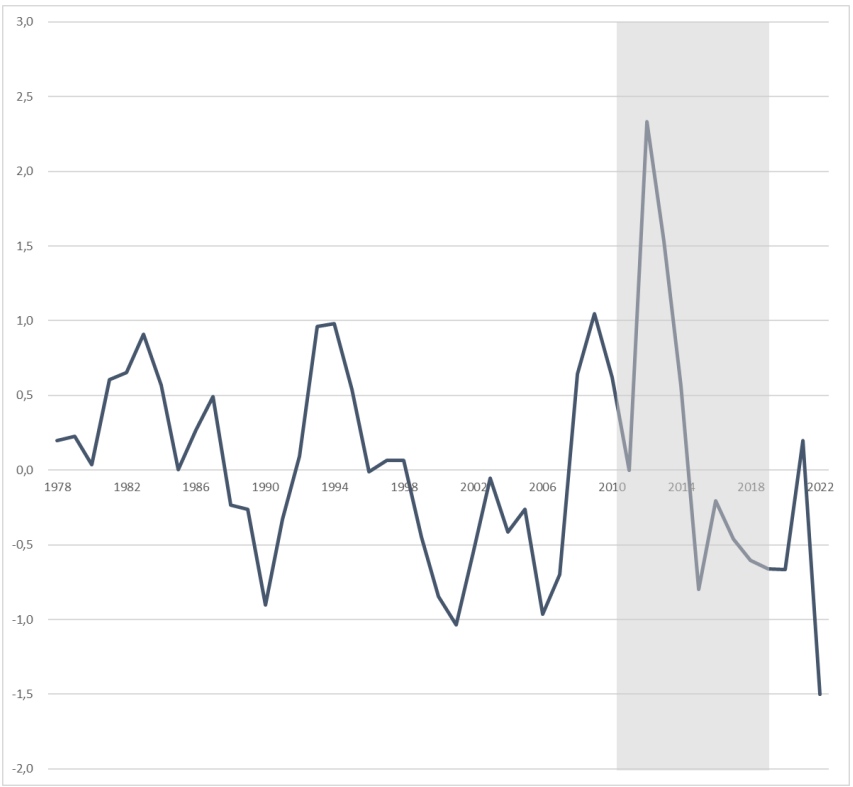
A Appendix: Additional Figures and Tables

Figure A.1
Unemployment rate in selected EU countries and UK (2009=100)



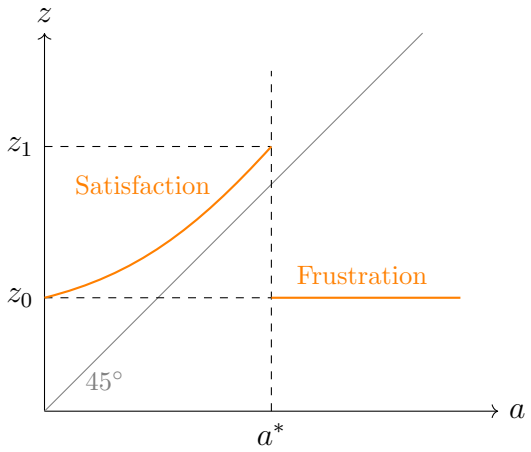
Notes: the figure shows the unemployment rate between 2009 and 2018 (2009=100) in selected EU countries, UK, and EU28 average. **Source**: own elaboration from data from Eurostat.

Figure A.2
Percentage change in yearly unemployment rate in Italy (1978−2022)



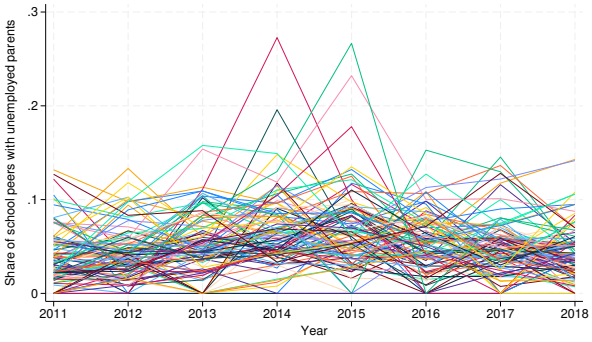
Notes: the figure shows the percentage change in yearly unemployment rate in Italy over the period 1978−2022. The gray area visually identifies the period when students' aspirations were stated. **Source**: own elaboration from data from Italian National Bureau of Statistics.

Figure A.3
The non-monotonic relation between aspirations and subsequent investments: a visual representation



Notes: the figure shows the easiest possible representation of the non-monotonic relation between aspirations (a) and the subsequent investments (z); a^* determines the aspiration level at which the individual passes from the satisfaction to the frustration area. **Source**: elaboration from Genicot and Ray (2020).

Figure A.4
Average share of school peers with unemployed parents by school and cohort



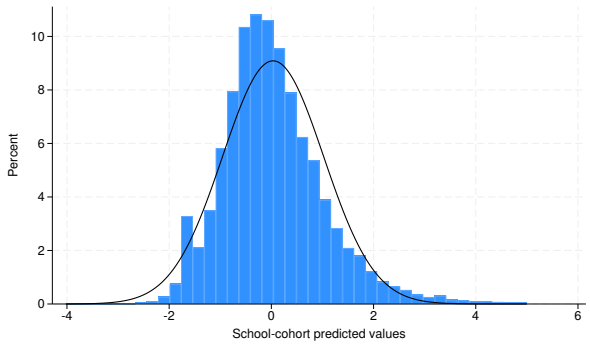
Notes: each line represents the average share of school peers with unemployed parents by school and cohort. For simplicity, five schools are randomly selected for each of the 20 Italian regions. **Source**: own elaboration from Invalsi NEPSA, G10, s.y. 2010-11 to 2017-18.

Table A.1
Residual variation

Variation in the share of school peers with unemployed parents	Mean	SD
Raw variable	0.0528	0.0334
Residuals after removing FE and Linear Trend	0.0000	0.0194

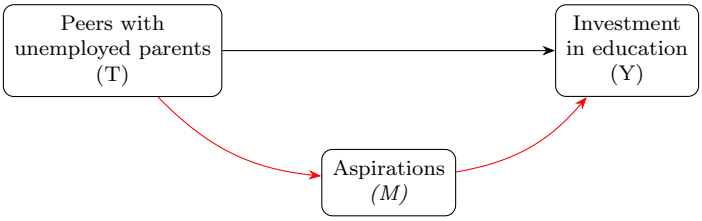
Notes: Robust SE clustered at school level; significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations from Invalsi NEPSA.

Figure A.5
Cohort-to-cohort variation in share of school peers with unemployed parents within schools



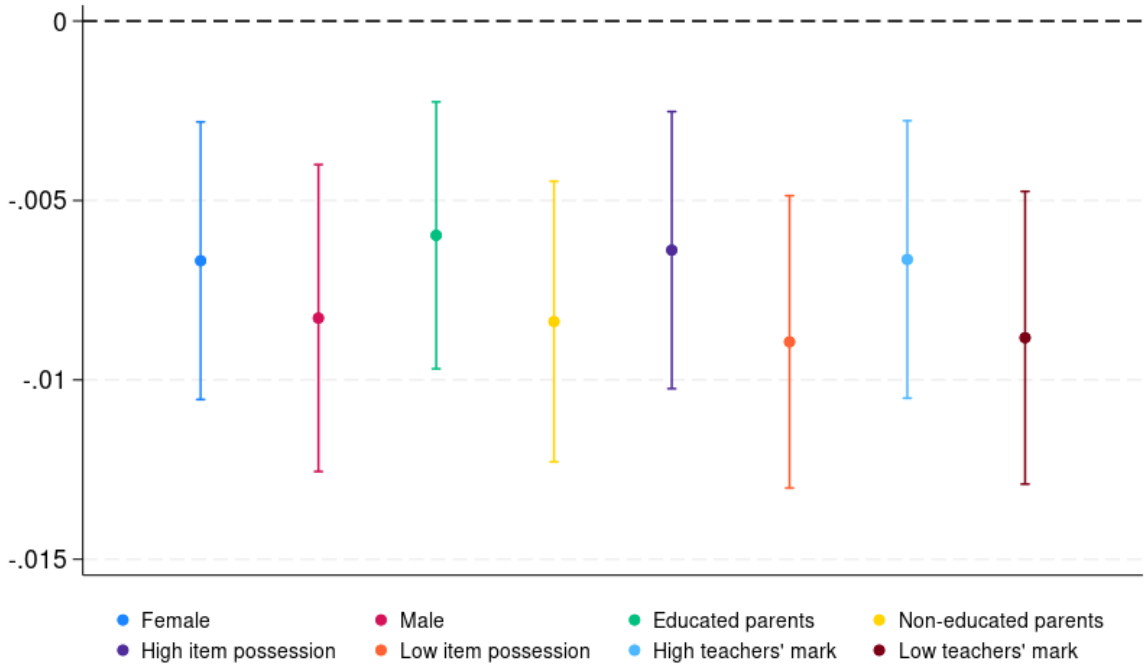
Notes: the histogram shows the predicted share of school peers with unemployed parents from a regression of the share of peers with unemployed parents on school and cohort fixed effects and linear trends; robust SE clustered at school level; the black line represents the normal distribution. **Source**: own elaboration from Invalsi NEPSA.

Figure A.6
Directed acyclic graph (DAG) illustrating the underlying Nonparametric Structural Equation Model.



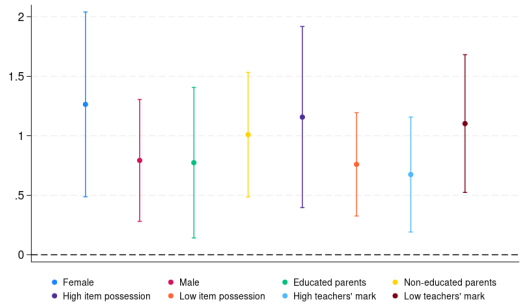
Notes: the figure shows the causal pathway from exposure to adverse business cycle conditions, as proxied by peers' parents' unemployment status, i.e., UP our treatment variable (T), to later-in-life educational outcomes (Y), through its effects on students' aspirations (the mediator variable, M) (Pearl, 2000).

Figure A.7
IV - First stage: Effect of monitored class on aspirations for tertiary education

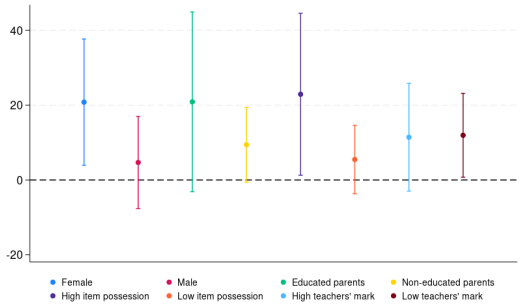


Notes: the figures show the effect of the IV-first stage, i.e. the effect of monitored class on aspiration from OLS regressions with robust SE, on different subsamples. Educated parents, High item possession are defined according to Table 7; High teachers mark indicates students with average teachers mark higher than the median in the sample. **Source**: own elaboration from Invalsi NEPSA and National Students' Registers.

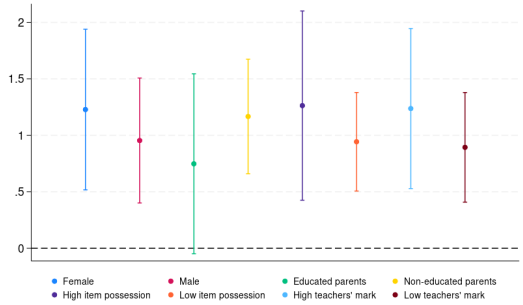
Figure A.8
IV estimates across subsamples



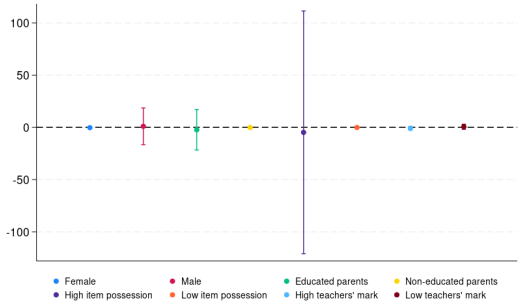
(a) High school completion



(b) High school final grade



(c) University enrollment



(d) University dropout

Notes: the figures show the IV estimates on educational outcomes across different subsamples. **Source**: own elaboration from Invalsi NEPSA and National Students' Registers.

Table A.2
Balancing test: observable students' characteristics

	(1)	(2)	(3)	(4)
	Dep. Var.: $UP_{sct}^{(-i)}$			
Female	0.0000	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0001)	(0.0000)	(0.0000)
R2	0.58	0.66	0.67	0.67
First generation immigrant	0.0004***	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.58	0.66	0.67	0.67
Second generation immigrant	-0.0000	-0.0001	-0.0001	-0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.58	0.66	0.67	0.67
Ahead year	-0.0003	0.0000	0.0002	0.0003**
	(0.0002)	(0.0001)	(0.0001)	(0.0001)
R2	0.58	0.66	0.67	0.67
Repeating year	0.0002***	0.0001***	0.0001**	0.0001**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.58	0.66	0.67	0.67
First term grade	-0.0000	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R2	0.58	0.66	0.67	0.67
Parents with univ. degree	-0.0001**	-0.0000	-0.0000	-0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R2	0.58	0.66	0.67	0.67
N.Obs.	2523308	2523308	2523308	2523308
School and Cohort FE	Yes	Yes	Yes	Yes
Linear trends		Yes		
Quadratic trends			Yes	
Cubic trends				Yes

Notes: OLS regressions with robust SE clustered at school level; each cell represents the coefficient of the correlation between the share of school peers with unemployed parents ($UP_{sct}^{(-i)}$) and the observable characteristic reported in each row. **Source**: own elaborations from Invalsi NEPSA.

Table A.3
Balancing test on sub-samples: observable students' characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.: $UP_{sct}^{(-i)}$	Completed high school subsample				Enrolled at university subsample			
Female	0.0000	-0.0000	-0.0000	-0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000))	(0.0000)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
First generation immigrant	0.0003***	0.0001	0.0000	0.0000	0.0003**	0.0001	0.0001	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
Second generation immigrant	-0.0000	-0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
Ahead year	-0.0008***	-0.0002	-0.0002	-0.0001	-0.0008***	-0.0003*	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
Repeating year	0.0001	-0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
First term grade	-0.0001	0.0000	-0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
Parents with univ. degree	-0.0001**	-0.0000	-0.0000	-0.0000	-0.0002***	-0.0001*	-0.0001*	-0.0001*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R2	0.57	0.66	0.67	0.67	0.54	0.64	0.64	0.64
N.Obs.	1752302	1752302	1752302	1752302	1112986	1112986	1112986	1112986
School and Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear trends		Yes				Yes		
Quadratic trends			Yes				Yes	
Cubic trends				Yes				Yes

Notes: OLS regressions with robust SE clustered at school level; each cell represents the coefficient of the correlation between the share of school peers with an unemployed parents ($UP_{sct}^{(-i)}$) and the observable characteristic reported in each row. **Source**: own elaborations from Invalsi NEPSA.

Table A.4
Balancing test: student's status with unemployed parent and share of peers with unemployed parents

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: $UP_{sct}^{(-i)}$					
At least one parent unemployed	-0.0008***	0.0010***	0.0009***	-0.0005***	-0.0006**	-0.0006**
	(0.0001)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
R2	0.58	0.58	0.58	0.67	0.67	0.67
N.Obs.	2523308	2523308	2523308	2523308	2523308	2523308
School and Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Guryan et al. (2009) correction		Yes	Yes	Yes	Yes	Yes
Controls			Yes	Yes	Yes	Yes
Linear trends				Yes		
Quadratic trends					Yes	
Cubic trends						Yes

Notes: OLS regressions with robust SE clustered at school level; each cell represents the coefficient of the correlation between the share of school peers with an unemployed parents ($UP_{sct}^{(-i)}$) and the parents' occupational status of the $i-th$ student. **Source**: own elaborations from Invalsi NEPSA.

Table A.5
Baseline results on aspiration tertiary and subsequent educational outcomes with full controls list

	(1)	(2)	(3)	(4)	(5)
	Aspiration tertiary	High school completion	High school final grade	University enrollment	University dropout
Share of school peers with unemployed parents	-0.0557***	-0.0101	-2.039***	-0.0431**	0.0313*
	(0.0191)	(0.0190)	(0.648)	(0.0216)	(0.0169)
At least one unemployed parent	-0.0204***	-0.0159***	-0.287***	-0.0233***	0.00737***
	(0.0013)	(0.0011)	(0.0340)	(0.0015)	(0.0012)
Female	0.0516***	0.0112***	1.151***	0.0210***	-0.0175***
	(0.0008)	(0.0006)	(0.0238)	(0.0010)	(0.0006)
First generation immigrant	0.0376***	-0.0322***	-0.223***	-0.00466**	0.00175
	(0.0016)	(0.0017)	(0.0474)	(0.0022)	(0.0019)
Second generation immigrant	0.0319***	-0.0404***	-0.547***	-0.00340	0.00483***
	(0.0017)	(0.0014)	(0.0394)	(0.0019)	(0.0014)
Ahead year	0.0006	-0.0063***	0.936***	0.0239***	-0.0063***
	(0.0017)	(0.0013)	(0.0586)	(0.0024)	(0.0018)
Repeating year	-0.0436***	-0.198***	-2.252***	-0.0793***	0.0314***
	(0.0011)	(0.0014)	(0.0314)	(0.0015)	(0.0015)
At least one parent with tertiary education	0.1128***	0.0082***	0.805***	0.0695***	-0.0081***
	(0.0016)	(0.0005)	(0.0187)	(0.0013)	(0.0005)
Teachers' mark in the first term	0.0502***	0.0330***	3.422***	0.0667***	-0.0149***
	(0.0013)	(0.0009)	(0.0776)	(0.0018)	(0.0006)
Missing teachers' mark in the first term	0.0035	-0.0273***	0.0436	-0.0063	0.001
	(0.0060)	(0.0064)	(0.276)	(0.0085)	(0.0056)
Percentile class rank	0.0503***	0.0832***	11.88***	0.0626***	-0.0226***
	(0.0042)	(0.0031)	(0.225)	(0.0056)	(0.0020)
Female class share	0.0976***	0.0191***	1.836***	0.0649***	-0.0080***
	(0.0051)	(0.0020)	(0.0839)	(0.0057)	(0.0017)
Non-native 1st gen. class share	-0.1111***	-0.0574***	-0.933***	-0.0816***	0.0117*
	(0.0116)	(0.0075)	(0.215)	(0.0124)	(0.0065)
Non-native 2nd gen. class share	-0.1061***	0.0045	-1.127***	-0.0876***	0.0120**
	(0.0108)	(0.0057)	(0.205)	(0.0104)	(0.0053)
Ahead of year class share	0.1404***	0.0031	4.166***	0.190***	-0.0579***
	(0.0143)	(0.0093)	(0.439)	(0.0181)	(0.0091)
Repeating year class share	-0.3360***	-0.123***	-5.023***	-0.415***	0.0839***
	(0.0091)	(0.0063)	(0.157)	(0.0106)	(0.0046)
Female school share	-0.0324***	-0.0064	0.250	-0.0122	-0.0030
	(0.0089)	(0.0096)	(0.288)	(0.0107)	(0.0069)
Non-native 1st gen. school share	0.1330***	-0.0432*	2.053***	0.0920***	-0.0875***
	(0.0225)	(0.0225)	(0.743)	(0.0289)	(0.0208)
Non-native 2nd gen. school share	0.0876***	0.0529**	1.939***	0.0847***	-0.0363**
	(0.0218)	(0.0217)	(0.707)	(0.0256)	(0.0183)
Ahead of year school share	-0.0738***	-0.224***	-5.360***	-0.112***	0.0080
	(0.0253)	(0.0337)	(1.042)	(0.0347)	(0.0216)
Repeating year school share	0.2349***	0.0541***	2.292***	0.229***	-0.0158
	(0.0137)	(0.0157)	(0.453)	(0.0177)	(0.0134)
Average class size in the school	-0.0020***	0.0000	-0.0261***	-0.00327***	0.0000
	(0.0003)	(0.0003)	(0.0099)	(0.0003)	(0.0002)
School size (No. of students, log)	0.0372	0.0560	0.577	0.0181	0.109*
	(0.0716)	(0.0713)	(2.628)	(0.0966)	(0.0607)
Regional unemployment rate		-0.0321***	-0.209***	0.0264***	-0.0113***
		(0.0010)	(0.0263)	(0.001)	(0.0007)
Constant	1.8694***	1.597***	55.97***	1.602***	-0.0701
	(0.3772)	(0.2080)	(5.882)	(0.250)	(0.155)
R2	0.33	0.2	0.44	0.31	0.06
N.Obs.	2,523,308	1,963,881	1,760,960	1,760,960	1,116,654
School and Cohort FE	Yes	Yes	Yes	Yes	Yes
Linear trends	Yes	Yes	Yes	Yes	Yes

Notes: OLS regressions with robust SE clustered at school level. School and cohort FE indicate the inclusion of the full set of school and cohort fixed effects, and school-specific linear trend; for the definitions of the control variables included see Table 1. The unemployment rate is taken form the Italian Labor Force Survey (Italian Bureau of Statistics), at the regional level in the year of high school graduation. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

Table A.6
The effect of monitoring on contextual and pre-determined achievement measures

	(1)	(2)
	Invalsi score	Teachers' mark in the first semester
Monitored school	-0.8054***	-0.0048
	(0.0830)	(0.0049)
R^2	0.53	0.19
N. Obs.	1,952,685	1,952,685

Notes: the table reports coefficients and standard errors (SE) from OLS regressions with robust SE clustered at school level. Both the Invalsi score and the teachers' mark are an average between the Italian language and math tests. The Invalsi score ranges from 0 to 100 (mean and sd in the sample are, repsctively, 57.17 and 57.17). The specifications include school and cohort fixed effects (FE), individual-level controls, class and school level controls, and linear school-specific trends. For the list and detailed definitions of all control variables included, see Table 1 and Appendix Table A.5. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

B Appendix: Robustness and sensitivity checks

In this Appendix, we provide extensive checks of the robustness of our reduced-form results under two main dimensions. First, we provide a battery of sensitivity checks devoted to some possible variants of our baseline specification, mainly concerning the control variables or the samples used. Second, we test for the possible effects induced by measurement error in our main variable of interest.

B.1 Specification checks

Winsorized sample. We repeat our estimates on a sample in which the main variable of interest (UP) is winsorized at the first and ninety-ninth percentiles.[46] In so doing, we check that our estimates are not driven by some extreme values in the distribution of the variable UP. The results reported in Appendix Table B.1 (col. 1) are not significantly different from our baseline.

Students' achievement measures. An important control variable in our empirical specification is the achievement level measured in the semester before the statement of the aspirations. Indeed, Lekfuangfu and Odermatt (2022) show that achievement is a strong correlate of students' aspirations, so that we arguably would like to clean out our estimated effect from this possible omitted variable by including a good proxy for the students' competencies.

In our baseline specification, we use the average grade given by teachers in the two main subjects, i.e., Italian language and math, at the end of the first semester of grade 10. Importantly, this measure embeds two desirable elements: first, it reflects a predetermined level of achievement with respect to the moment when aspirations are stated; second, it is sufficiently close in time to the moment of the aspiration statement.[47] However, two caveats are in order. First, in the spirit of keeping as many observations as possible, when only one grade was available in the data (either the Italian language or the math one), we simply took that one and added a dummy variable that indicates the students for whom we only have one of the two grades (0.3 percent of observations in the sample).[48] Second, we also add an ordinal achievement measure, namely the percentile rank of the students in her class, to account for relative differences in students' perceived ability with respect to her own peers (Murphy and Weinhardt, 2020; Pagani et al., 2021).[49]

[46] Experimentation with trimmed samples or different percentiles for winsorization does not show remarkable differences.

[47] Teachers' grades at the end of the first semester are given to the students usually by January, while aspirations are stated in the following months of April to early May.

[48] Our results are largely unaffected when excluding these individuals.

[49] This is particularly important in our context given that teachers' grades are not standardized assessments, and thus they might also reflect both teachers' personal evaluations (also with reference to the other class peers), and students' non-observable traits (like diligence, class behavior, general attitude, etc.).

Table B.1
Sensitivity and robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Aspiration Tertiary							
Share of school peers with unemployed parents	-0.0522***	-0.0194	-0.0571***	-0.0559***	-0.0606***	-0.0559***	-0.0479**
	(0.0193)	(0.0191)	(0.0191)	(0.0191)	(0.0204)	(0.0191)	(0.0188)
R2	0.33	0.34	0.33	0.33	0.33	0.33	0.34
N.Obs.	2523308	2522633	2522660	2523308	2296989	2523308	2455682
Panel B. High school completion							
Share of school peers with unemployed parents	-0.0162	-0.0081	-0.0011	-0.0074	-0.0086	-0.0094	-0.0108
	(0.0203)	(0.0190)	(0.0190)	(0.0192)	(0.0204)	(0.0190)	(0.0190)
R2	0.20	0.19	0.21	0.19	0.20	0.20	0.20
N.Obs.	1963881	1963797	1963858	1939278	1754549	1963562	1937409
Panel C. High school final grade							
Share of school peers with unemployed parents	-2.2296***	-1.6061**	-2.0038***	-2.0142***	-2.5359***	-2.0548***	-2.2335***
	(0.6872)	(0.6245)	(0.6479)	(0.6524)	(0.6893)	(0.6490)	(0.6535)
R2	0.44	0.47	0.44	0.44	0.44	0.44	0.44
N.Obs.	1760960	1760894	1760949	1742118	1575953	1760679	1739080
Panel D. University enrollment							
Share of school peers with unemployed parents	-0.0419**	-0.0239	-0.0416*	-0.0420*	-0.0414*	-0.0438**	-0.0450**
	(0.0227)	(0.0221)	(0.0216)	(0.0217)	(0.0225)	(0.0216)	(0.0216)
R2	0.31	0.32	0.31	0.31	0.31	0.31	0.31
N.Obs.	1760960	1760894	1760949	1742118	1568247	1760679	1739080
Panel E. University dropout							
Share of school peers with unemployed parents	0.0279	0.0284*	0.0313*	0.0315*	0.0400**	0.0329*	0.0343**
	(0.0173)	(0.0168)	(0.0169)	(0.0171)	(0.0184)	(0.0169)	(0.0170)
R2	0.06	0.06	0.06	0.06	0.06	0.06	0.06
N.Obs.	1116654	1116601	1116645	1104385	1007175	1116511	1106242
Specification:							
(i) Winsorized sample	Yes						
(ii) Achievement measure		Yes					
(iii)Year of birth FE			Yes				
(iv) Regional UR				Yes			
(v) LLM UR					Yes		
(vi) Regional income						Yes	
(vii) High home possessions							Yes

Notes: OLS regressions with robust SE clustered at the school level. Specifications: (i) the variable UP is winsorized at the 1 and 99 percentiles; (ii) the Invalsi test score in grade 10 is used as achievement measure; (iii) year of birth fixed effects are added; (iv), (v) and (vi) add, respectively, the regional and local labor market unemployment rate of 35-65 years-old individuals, the regional average yearly household net income; (vii) adds the high home possession dummy variable: equal to one if the student has access to all considered items (a quiet study space, a computer, a desk, an internet connection, a private room, and reference materials such as encyclopedias) at student, class and school levels. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

As a sensitivity check, we use the Invalsi NEPSA standardized test scores in grade 10 (as opposed to teachers' grades) as an alternative measure of students' achievement available in the data. The advantage in making use of test scores lies mainly in their standardized nature, while the drawback is that they are contemporaneous to the statement of the aspirations. As for the measure based on teachers' grades, we take the average score in the tests for Italian language and math, and, when one of the two is lacking, we simply take the available one and add a dummy variable to control for this. The results reported in column 2 of Appendix Table B.1 are in line with our baselines.

Year of birth fixed effects. In our baseline specification, we control for cohort fixed effects and dummies for the student being grade retained, which, taken together, implicitly control for the student belonging to the birth cohort of those who had a regular progression across grades or for belonging to other birth cohorts. Alternatively, we could also add a cohort of birth fixed effects, as in our sample of eight subsequent school years, we observe 13 different birth cohorts. The results reported in column 3 of Appendix Table B.1 do not significantly differ from the baseline.

Family wealth. The period under examination is characterized not only by a substantial increase in the unemployment rate but also by a pronounced decline in average household income and wealth.[50] Such a contraction in wealth could also have exerted a discouraging effect on students' educational aspirations and outcomes. While precise household-level wealth data are unavailable, we account for this limitation by including in all the specifications as a proxy for family wealth the parents' educational level, both for each student and for her school peers. In this check, we further augment the baseline specification by including two additional proxy measures: first, the average regional household income from EU-SILC data for Italy; second, a quality indicator of home resources at the student level based on the availability of a quiet study space, a computer, a desk, an internet connection, a private room, and reference materials like encyclopedias. These and other items are generally used in education surveys to obtain a measure of the student's family socio-economic and cultural status (ESCS indicator).[51] We thus test the sensitivity of our results to the inclusion of an indicator of high family possessions, both at the student, class and school level. In doing so, we not only clean out our results from possible omitted variable bias at the individual level linked to the components of family wealth not already captured by parents' education, but also we control for the average time-variant family wealth in each school and classroom. The estimates reported in columns 6 and 7 of the Appendix Table B.1 remain largely consistent with the baseline.

B.2 Measurement error

A peculiar case of measurement error (ME, henceforth) might arise in the case of estimation of peer effects. It derives from the simultaneous inclusion of both own and peers' average characteristics (i.e., the parent unemployment status in our case) in the estimated model, when these variables are measured with some error. Previous literature has shown that this peculiar type of ME would lead to attenuation bias in the estimated peer effects coefficient in case the variability exploited can be considered as good as random, while it would lead to overestimation of the peer effects parameter in case of non-random assignment (Angrist, 2014; Feld and Zölitz, 2017).

In line with the existing literature, we provide two tests for the plausible effects of ME in our estimates. One possible way is to add the regression variables, which may be correlated with the ME, and observe the changes in the estimated coefficient. We thus augment our baseline equations with a measure of unemployment rate at the regional and

[50] See for e.g., EU-SILC estimates for Italy (https://www.istat.it/wp-content/uploads/2024/10/INCOME-AND-LIVING-CONDITIONS-2023.pdf, accessed on February 4 2026).

[51] Notably, questions on the possession of these items have been chosen to be included in the INVALSI NEPSA *Students' Questionnaire* as they can be safely considered as pre-determined with respect to any student's outcome surveyed, and to follow pre-existing international best practices in the OECD PISA and IEA TIMSS surveys (Campodifiori et al., 2010).

Local Labor Market (LLM) levels.[52] These are measured in the four quarters preceding the students' stating of aspirations (i.e., reasonably when the unemployment status of the parent is disclosed in the Invalsi data) from the Labor Force Survey provided by the Italian Bureau of Statistics (Istat). Results reported in in columns 4 and 5 of Appendix Table B.1 are very similar to our baselines.

As a further robustness check, following Merlino et al. (2019) and Feld and Zölitz (2017), we gradually introduce measurement error into our explanatory variable of interest and analyze whether the relative estimated coefficient tends to zero as evidence of as-good-as-random variation and whether any potential ME would possibly downward bias our results rather than exacerbate them. We thus generate a dummy variable equal to one with probability equal to the predicted share of peers with unemployed parents estimated by a regression on the unemployment status of parents, year, and school FE. Then, a new share of peers with unemployed parents is generated, which is equal to the observed one with a probability of 99 percent and to a random value with a 1 percent chance. This step is repeated for different levels of error. Aspirations and the other outcomes are eventually regressed on the newly generated share of peers with unemployed parents, measured with different levels of error. The entire process is estimated 1000 times. Appendix Figure B.1 shows that the average coefficients of all dependent variables tend to zero as more ME is introduced in the explanatory variable of interest. This corroborates the hypothesis that the variability we are exploiting is as good as random and that, if anything, we are not overestimating the peer effects.

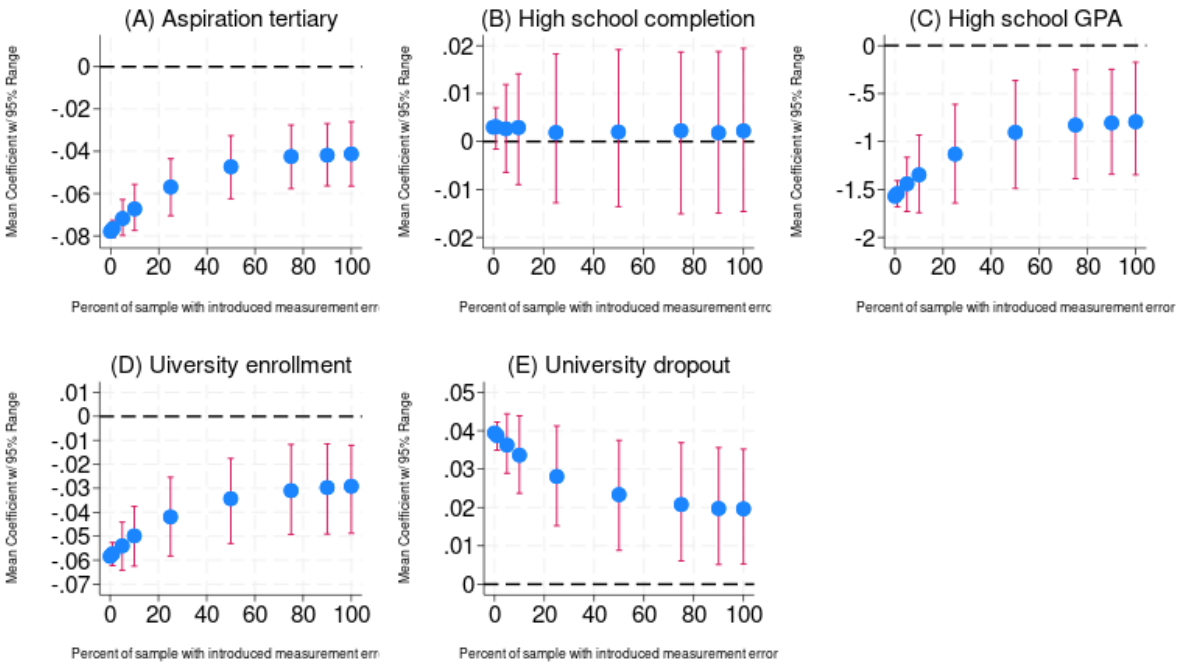
B.3 Consistency of the results on aspirations across samples

As explained in Section 5, the estimations on subsequent educational outcomes are performed on a slightly smaller sample with respect to the one for the results on aspirations formation. The difference in the sample size comes from two main reasons. First, with the linkage to the National Students' Registries, we lose the first cohort of students (i.e., school year 2010-11). Second, we cannot merge about 13 percent of students because of errors in the individual-level anonymous identifier (either in the Invalsi NEPSA or in the National Registries).[53] As a check of consistency, we repeat the estimations on the aspiration tertiary (Subsection 7.1) on the same smaller sample used for the estimates on the subsequent educational outcomes (Subsection 7.2). The results are reported in Appendix Table B.2 and are in line with the baseline reported in Table 2.

[52] In Italy, there are 20 regions (NUTS 2) and about 600 LLMs.

[53] The two datasets used are completely anonymized and independent, so that we cannot recover which observations in the Invalsi NEPSA data are not matched to the school registries. However, a comparison of the key summary statistics across the two datasets (Table 1) shows that the subpopulation with matched educational outcomes closely mirrors the characteristics of the full sample.

Figure B.1
Measurement error: simulation exercise



Notes: the figures show the sensitivity of the effect of the share of school peers with unemployed parents on the outcome variables (aspiration tertiary (A), completed high school (B), high school final grade (C), enrolled at university (D), university dropout (E)) to measurement error in this share. The Y-axis shows the average coefficient from 1,000 regressions: before each regression, for a share of the sample, the unemployed parents dummy variable is replaced with a random value. The X-axis shows the share of the sample. **Source**: own elaboration from Invalsi NEPSA and National Students' Registers.

Table B.2
Estimates of the effects on aspiration formation on the educational outcomes sample

	(1)	(2)	(3)	(4)	(5)	(6)
Share of school peers with unemployed parents	-0.0925***	-0.0789***	-0.0701***	-0.0521**	-0.0513**	-0.0514**
	(0.0199)	(0.0196)	(0.0189)	(0.0210)	(0.0210)	(0.0210)
R2	0.27	0.31	0.32	0.33	0.33	0.33
N.Obs.	1966146	1966146	1966146	1966146	1966146	1966146
School and Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level controls		Yes	Yes	Yes	Yes	Yes
Class and school level controls			Yes	Yes	Yes	Yes
Linear trends				Yes		
Quadratic trends					Yes	
Cubic trends						Yes

Notes: OLS regressions with robust SE clustered at school level; mean (SD) of asp. tertiary: 0.669 (0.470). The table reports the baseline estimation for aspiration tertiary formation (as in Table 2 on the sub-sample given by the merge with subsequent educational outcomes which excludes the older cohort of students. Significance levels: * p<0.1, ** p<0.05, *** p<0.01. **Source**: own elaborations from Invalsi NEPSA and National Students' Registries.

C Appendix: Mediation analysis parameters decomposition

In this Appendix we follow Nicoletti et al. (2023) and Imai et al. (2011) and formally demonstrate how the causal identification of the parameters in equations 5 and 6 allows us to retrieve the mediator effect.

Based on equations 5 and 6, we can rewrite the average total effect, i.e., the average effect of increasing a student's exposure to peers with unemployed parents from, say, $\tilde{UP}_0$ to $\tilde{UP}_1$, on later educational outcomes (Y) (Nicoletti et al., 2023; Pearl, 2000; Imai et al., 2011; Heckman et al., 2013) as:

$$E(Y_{\tilde{UP}_0} - Y_{\tilde{UP}_1}) = E(Y_{\tilde{UP}_1, AT_{\tilde{UP}_1}} - Y_{\tilde{UP}_0, AT_{\tilde{UP}_0}}) \tag{C.1}$$

where $Y_{\tilde{UP}_k}$ and $AT_{\tilde{UP}_k}$, with $k = (0, 1)$, represent, respectively, the outcome and the mediator when the treatment (UP) is set at pre- and post-treatment levels $\tilde{UP}_0$ and $\tilde{UP}_1$. This average total effect corresponds to the classical notion of Average Treatment Effect (ATE) and it represents the mean change in outcomes when exposure changes from $\tilde{UP}_0$ to $\tilde{UP}_1$, which in turn depresses aspirations from $AT_{\tilde{UP}_0}$ to $AT_{\tilde{UP}_1}$. It can be decomposed into the two following additive effects:

(i) the direct effect of exposure to peers of unemployed parents:

$$E(Y_{\tilde{UP}_1, AT_{\tilde{UP}_0}} - Y_{\tilde{UP}_0, AT_{\tilde{UP}_0}}) \tag{C.2}$$

i.e., the effect of increasing exposure, while keeping constant the effect of the mediator;

(ii) the mediator effect of exposure to peers with unemployed parents through aspirations:

$$E(Y_{\tilde{UP}_0, AT_{\tilde{UP}_1}} - Y_{\tilde{UP}_0, AT_{\tilde{UP}_0}}) \tag{C.3}$$

i.e., the effect mediated by the change in aspirations from $AT_{\tilde{UP}_0}$ to $AT_{\tilde{UP}_1}$, while keeping exposure at $\tilde{UP}_0$, which is the target of our decomposition analysis.

To see how by means of the structural parameters in eq. 5 and eq. 6 it is possible to provide an estimate of the mediator and direct effect, we rewrite expressions C.2 and C.3 by substituting the corresponding expressions taken from eq. 5 and eq. 6, and fixing the treatment variable and the mediator at the corresponding values ($\tilde{UP}_0$ and $\tilde{UP}_1$). We thus obtain the following expressions for the direct and the mediator effects, respectively:

$$E(Y_{\tilde{UP}_1, AT_{\tilde{UP}_0}} - Y_{\tilde{UP}_0, AT_{\tilde{UP}_0}}) = (\tilde{UP}_1 - \tilde{UP}_0)\beta_3 \tag{C.4}$$

$$E(Y_{\tilde{UP}_0, AT_{\tilde{UP}_1}} - Y_{\tilde{UP}_0, AT_{\tilde{UP}_0}}) = (\tilde{UP}_1 - \tilde{UP}_0)\beta_4\delta_3 \tag{C.5}$$