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Nudging women towards pursuing their university careers

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Abstract

This study explores the impact of light-touch interventions on the academic outcomes of female scholarship recipients. In a randomized trial involving nearly 2000 students at the University of Bologna, we delivered a targeted message highlighting how higher education can reduce the gender gap in the labour market, and boost employment prospects. The nudge increased the likelihood of meeting scholarship requirements by nearly 5 percentage points, alongside significant gains in passing exams with higher credit values, and a reduction in failed exams in the medium term, with no short-term effects. Notably, there was an improvement in grades during the July/August exam period, reflecting a shift towards prioritizing quality over quantity in academic efforts, even though grades were not part of the requirements for maintaining scholarships. Treated students exhibited enhanced academic focus and more strategic study habits, without increasing overall exam load. These findings highlight the potential of cost-effective informational nudges to drive meaningful changes for women facing financial and informational barriers, providing valuable insights for policies designed to support female students. The results emphasize the importance of well-timed informational interventions in helping women to make informed decisions about their education, ultimately enhancing their academic success and long-term economic prospects.

KEYWORDS

female students, higher education, information experiment, scholarships, student performance.

JEL CLASSIFICATION

C93; D63; D91; I24; J16

1 | INTRODUCTION

Gender inequality remains a persistent challenge in labour markets globally, carrying significant implications for social mobility and economic growth (Bertocchi and Bozzano 2020) with women continuing to suffer systemic barriers in the workplace, including persistent pay gaps, under-representation in high-paying fields, and limited access to leadership roles (Humphries *et al.* 2024; Avent-Holt and Tomaskovic-Devey 2023).

Education plays a crucial role in empowering women and girls by providing access to different career paths and economic opportunities (Blau and Kahn 2017; Duflo 2012), hence effectively reducing inequality. In Italy, recent findings from the Italian National Statistics Institute (ISTAT) highlight a robust connection between educational attainment and improved employment prospects for women (ISTAT 2020). As educational levels rise, the employment gap between men and women significantly narrows from 31.7 percentage points for those with lower secondary education, to 20.2 percentage points for high school graduates, and to 8.2 percentage points for university graduates.

Building on these insights, our study explores a crucial question: can providing targeted information about the effects of higher education on lowering the gender gap in employment prospects encourage female students to increase their effort and excel in their studies? We test whether increasing the salience of these aspects will motivate female students to dedicate themselves to their studies, thereby raising the likelihood of completing their education.

This is particularly important for female scholarship recipients who encounter significant financial challenges. Public scholarships are not only means-tested but also require students to meet strict academic performance standards. Consequently, these students must consistently fulfil their university requirements to keep their financial aid. For many low-income students, losing this support places their opportunities to continue their education at risk. In this high-stakes environment, where every academic decision is linked to financial stability, the need for timely and strategic interventions becomes increasingly relevant over time.

Our randomized control trial, conducted in February 2022 with the support of the Emilia-Romagna Public Authority for the Right to Higher Education (ER.GO), focused on nearly 2000 female scholarship recipients at the University of Bologna. Building on the previously discussed considerations, the intervention emphasized the critical importance of completing their studies and illustrated how this could significantly contribute to reducing the gender gap in the labour market. In contrast, the control group received no additional information. This experimental design presents a unique opportunity to evaluate the effectiveness of targeted informational nudges in a context where academic performance is closely tied to financial stability. Unlike previous studies in the USA that typically targeted broader populations or specific fields like economics (Li 2018; Porter and Serra 2019), our research concentrates on a demographic that is both socioeconomically disadvantaged and confronted with distinct structural challenges within the Italian higher education system.[1]

The results from our experiment underscore the significant impact of targeted informational interventions on the academic behaviours of female students. Our findings show that students who received the intervention were 5 percentage points more likely to meet the requirements for scholarship renewal compared to their peers, clearly demonstrating the effectiveness of the nudge in aligning academic efforts with financial incentives. Additionally, the intervention led to a 2.1 percentage point increase in the likelihood of passing more challenging exams, indicating a positive shift towards engaging with tougher coursework. This effect was particularly pronounced during the pre-summer exam session in May and June, where the probability of passing these demanding exams increased by 3.3 percentage points. This trend continued into the subsequent summer exam period in July and August, during which treated students experienced a notable decrease in failed exams, reducing the number of failures by a small but significant margin (0.036).

Furthermore, this positive impact extended to their grades during the summer session, reflecting improvements in both the quantity and quality of their academic performance.

These findings could indicate that targeted information can encourage students not only to take on more challenging academic endeavours, but also to achieve superior outcomes, ultimately enhancing both their immediate and long-term academic trajectories. This underscores the advantages of a light-touch intervention such as the one that we propose.

The structure of the paper is as follows. Section 2 provides an overview of relevant literature that complements our study. Section 3 discusses the mechanisms underlying the type of informational nudge administered, while Section 4 outlines the institutional context in which the experiment takes place. The experimental design is detailed in Section 5, followed by a description of the data and estimation methods in Section 6. Section 7 presents the main findings of the analysis. Finally, Section 8 offers concluding remarks and suggests potential directions for future research.

2 | RELATED LITERATURE

The idea of nudging in behavioural economics was introduced by Thaler and Sunstein (2008) as a way of guiding people into acting in their own and ultimately in the community's best interests through small changes in the environment. A nudge alters decision-making without changing the economic incentive, while maintaining the freedom to choose. Applications of these techniques are well established in the area of healthy food replacement (Kroese *et al.* 2016; Dayan and Bar-Hillel 2011), increased tax compliance (Antinyan and Asatryan 2024) and pro-environmental behaviour (Grilli and Curtis 2021). In recent years, there has been a significant increase in research on informational nudges and their effects on educational and labour market outcomes, particularly regarding gender disparities. In the field of education, these low-cost and small-scale interventions have gained increasing interest to overcome several decision-making biases, as well as other behavioural or structural barriers that can prevent students from succeeding in academia. However, findings in this area have been mixed, especially for women in fields such as economics and STEM, revealing the complexities at play. In this section, we will examine key contributions, showcasing both the strengths and weaknesses of existing studies, and positioning our research within this broader context.

Bayer *et al.* (2019) explore whether a straightforward nudge can enhance diversity in undergraduate economics courses. Conducted at several liberal arts colleges across the USA, their experiment involved sending targeted emails to female students and under-represented minorities, highlighting the benefits of studying economics. The results showed a noticeable increase in enrolment among these groups, particularly among first-generation students. This research is crucial as it illustrates how timely and low-cost nudges can shape educational decisions by raising awareness of opportunities that students might not have considered otherwise. Similarly, Pugatch and Schroeder (2021, 2024) further explore the effectiveness of nudging interventions in public universities, focusing on how to encourage students to major in economics while taking gender differences into account. In their 2021 study, Pugatch and Schroeder (2021) analyse the gender composition of economics graduates, and find that while informational nudges successfully spark interest among male students, their impact on female students is less pronounced. This indicates that women may require different types of interventions or that additional factors beyond simple nudges play a role in shaping their educational and career decisions. Pugatch and Schroeder (2024) build on this by targeting socioeconomic diversity, revealing that nudges can improve diversity among economics students, although the effects on female students remain less significant compared to their male counterparts.

In that sense, targeted information treatments have the potential of promoting inclusivity, but their effects could vary across demographic groups. Brodnax (2024) exposes college freshmen to stereotypical imagery, neutral imagery or counter-stereotypical imagery in technology, and find that while their intervention increases women's participation in technology education, on the other hand it also widens the gender gap due to an even stronger response from male students. However, the gap is smallest in the group with counter-stereotypical imagery. Similarly, Li (2018) shows that framing information about a major in terms of its social impact increases the likelihood of women selecting it. This highlights the importance of how information is presented and which aspects are emphasized to target specific groups, while also considering potential unintended consequences.

Our study differs from previous contributions in some ways. First, the US context in which these experiments were conducted involves a distinct set of educational and socioeconomic dynamics, particularly regarding college decision-making processes and financial aid availability. These studies focus on broad student populations at the university, where informational barriers and social stereotypes may discourage women and minority students from entering fields such as economics. Our research centres on female scholarship recipients in Italy who face unique challenges that extend beyond informational barriers. The students in our sample are already enrolled in university and are primarily focused on maintaining their scholarships, which are tied to academic performance. This adds a level of financial pressure that is not as pronounced in studies focusing on course enrolment. By targeting students who are financially constrained and already pursuing higher education, our intervention addresses an immediate and pressing concern: securing the financial support necessary to continue their studies.

Another critical distinction lies in the nature of the informational content delivered through the nudges. While much of the existing literature highlights the potential academic and career benefits of fields such as economics, our intervention is uniquely tailored to the local labour market conditions in Italy, focusing on how higher education can actively reduce the gender gap in employment opportunities. By framing the message in this way, we directly address the financial and career incentives that resonate most with our target population.

Addressing information barriers is therefore key to unlocking educational persistence and sustaining academic progress. Studies by Bleemer and Zafar (2018) and Peter *et al.* (2021) explore how providing information on the returns to education influences decisions, particularly during the transition from high school to college. These works highlight the importance of tackling information asymmetries early in the decision-making process. While their focus is primarily on younger students, our research complements these insights by targeting college students who are already working to maintain their scholarships and stay on track for graduation. By delivering information tailored to these specific challenges, our intervention fills an important gap in the literature, particularly regarding persistence among financially vulnerable students. Halim *et al.* (2022) provide additional insights into gender differences in course selection and major choices through randomized interventions. Their results highlight how role models and targeted information can shape female students' decisions. Although our study does not involve role models directly, it uniquely addresses information gaps within the Italian context, offering a fresh perspective on how targeted interventions can be effective even in settings with limited direct interaction.

Public scholarships are usually linked to both financial need and academic performance. This creates a landscape where students feel a deep responsibility to stay on track, knowing that losing this economic support could endanger their academic career. Our study taps into this context, delivering nudges that do not just inform but actively reinforce students' immediate academic and financial priorities.

Building on the importance of the learning environment, Bayer *et al.* (2020) examine how factors such as belonging, relevance and growth mindset shape the persistence of diverse students in economics. Their findings underscore the necessity for a supportive educational environment

that fosters a sense of belonging. Our intervention aligns with this perspective by offering clear, context-sensitive information that addresses directly female students' concerns, helping them to make informed decisions about their academic futures.

Highlighting the crucial role of information in student outcomes—especially when it is thoughtfully designed to inspire—retention becomes an important measure of success. Recent studies have looked into innovative methods for teaching economics and boosting student engagement. Benjamin *et al.* (2020) and Bowles and Carlin (2020) point out that traditional teaching techniques often fall short in engaging students who might otherwise find the discipline appealing. They explore various teaching strategies aimed at making economic principles more accessible to a diverse range of students, including those less inclined to major in economics. Their findings indicate that these innovative approaches can help to break down barriers for under-represented groups. We add to this conversation by demonstrating that targeted informational interventions can achieve similar outcomes, especially when tailored to address specific structural challenges. Our intervention aligns with this perspective by delivering information that is directly relevant to students' immediate concerns, such as securing financial aid and grasping the long-term benefits of completing their degree.

3 | MECHANISMS BEHIND THE IMPACT OF INFORMATIONAL NUDGES

This section explores how informational nudges can impact female scholarship recipients at the University of Bologna. A variety of factors influences the decisions of students to start or continue their academic career, including the information they have access to and their perceptions of the value of education. Research shows that informational nudges that engage these aspects can significantly affect educational outcomes (Damgaard and Nielsen 2018). In particular, targeted interventions can result in meaningful behavioural changes, especially when they address specific information gaps and help to overcome motivational barriers (Lavecchia *et al.* 2016). Hoxby and Turner (2013), for example, show that providing information on the returns to a college degree positively influenced enrolment decisions, particularly among low-income and first-generation students.

According to the human capital theory (Becker 1964), students usually pursue higher education because of clear incentives, such as better job prospects, higher salaries and greater job security. Ideally, these incentives should be enough to keep students motivated and help them to complete their studies. However, research in behavioural economics shows that even these well-known incentives often fall short in driving action unless they are relevant at critical decision points (Oreopoulos *et al.* 2017). Our intervention takes advantage of this insight by emphasizing the substantial benefits of higher education, particularly in addressing the gender gap—a persistent issue in labour economics (Blau and Kahn 2017).

The purpose of our analysis is to close the information gaps that cause female students to lose sight of the long-term value of higher education. Research highlights that many students face challenges in making informed decisions, often due to a lack of understanding about the true returns on their educational investments or an incomplete grasp of how their academic choices will impact their futures (Bettinger *et al.* 2012). This underlines the need for clearer information about the long-term rewards of education, as it can help students to remain engaged and committed to their studies.

Identity and self-perception play a crucial role in shaping educational choices, as explored by Akerlof and Kranton (2002), who emphasize how students' sense of belonging and alignment with social roles can influence their academic and career paths. For female students, the expectations of a society associated with gender stereotypes can create significant barriers that deter full participation in higher education. By directly challenging these stereotypes and

delivering clear, positive messages about future career opportunities, targeted interventions can help to remove these obstacles and improve educational outcomes. Given that women often face unique challenges in the labour market, such as wage discrimination and limited advancement opportunities, our informational nudges aim to highlight how a college degree can help them to overcome these hurdles. The idea is that by making female students acutely aware of the direct connection between their education and more equal employment outlooks, they will be more motivated to persist in their studies and meet the requirements to maintain their scholarships. This approach aligns with existing literature that shows how targeted messaging can be particularly effective when it addresses the specific concerns and motivations of the intended audience.

Our experimental design focuses on female scholarship recipients who are already enrolled in college but are dealing with significant financial and academic pressures. We hypothesize that these students, at a crucial point in their educational journey, will be especially open to information that underscores the tangible benefits of completing their degrees (Goldin 2014). By framing the message around labour market outcomes—specifically, how higher education can help to reduce the gender gap—we draw attention to the immediate and long-term incentives that should already motivate students but may not be fully recognized. This approach is supported by the behavioural economics literature, which emphasizes that even small nudges can have a significant impact if they are delivered at the right moment and resonate with the target audience (Drexler *et al.* 2014).

Moreover, recent research by Castleman and Page (2015) demonstrates that personalized nudges, such as text messages or reminders, can effectively guide students through important decision-making processes, such as enrolling in college and persisting in their studies. The success of these interventions hinges on their ability to provide timely information, reduce procrastination, and assist students in navigating complex choices. This aligns perfectly with our study, where our information was strategically timed to precede exam periods and scholarship renewal deadlines, ensuring that it reached students when their academic performance and future plans were most pressing. Appendix A offers a detailed exploration of the underlying mechanisms that informed our selection of both quantitative and qualitative variables related to student performance.

4 | INSTITUTIONAL SETTING

4.1 | Public scholarships

The Italian financial aid system is deeply rooted in its constitutional principles, particularly Articles 3 and 34, which emphasize the removal of economic barriers and guarantee educational opportunities for all deserving individuals, irrespective of financial circumstances. At the heart of this system is the Right to Education (*Diritto allo Studio*), which primarily offers scholarships to students from low-income backgrounds. While lower levels of education are either free or heavily subsidized, financial aid becomes crucial at the tertiary level, where access to scholarships is determined by socioeconomic conditions and regulated by both national and regional guidelines. It is structured around a system of public scholarships that are not only income-based, but also strictly linked to academic performance. This arrangement places considerable pressure on low-income students to maintain high academic standards. For female students in Italy, the pressure can be intense as they often juggle multiple responsibilities, such as family obligations and work, alongside their studies. These challenges can exacerbate the pressure to maintain scholarships, especially in environments where they may also encounter gender biases. Appendix B offers a detailed overview of the Italian financial aid system for higher education, with a focus on public scholarships awarded based on both economic need and academic merit. It also outlines

the structure of tertiary education in Italy, including the credit system, exam schedules, and the relationship between performance-based financial aid and academic progress.

4.2 | ER.GO

The Regional Authority for the Right to Education in Emilia-Romagna is a cornerstone in promoting equitable access to higher education across the region. Its role extends far beyond administering scholarships, as ER.GO provides a comprehensive range of services that support students throughout their academic journey, particularly those from low-income backgrounds or living away from home. In addition to managing financial aid based on merit and financial need, ER.GO is responsible for student housing, meal plans, and essential counselling and advisory services. The organization allocates thousands of affordable housing units, runs dining facilities offering substantial discounts to scholarship recipients, and provides resources to address academic, financial and personal challenges. Furthermore, ER.GO is committed to enhancing student wellbeing through initiatives focused on mental health, career counselling, and support for students with disabilities. This comprehensive mission aligns with broader objectives of fostering social mobility and reducing educational disparities, ensuring that talented students can both access and succeed in higher education.

4.3 | Challenges for scholarship recipients

University retention in Italy is a pressing issue characterized by financial, social and informational barriers. Retention is closely tied to academic performance, which is directly linked to students' ability to maintain their scholarships. This scenario creates a unique environment where financial stability, educational success and future labour market prospects are tightly interconnected (ISTAT 2020). Recent reports, including those by the OECD, highlight that dropout rates remain a critical issue in Italy, particularly among students from disadvantaged backgrounds (OECD 2023).

Female scholarship recipients are especially vulnerable, as they must not only sustain high academic performance, but also navigate societal expectations and structural inequalities that can compound the pressures that they face (OECD 2017). These challenges are further magnified in southern Europe, where financial and structural barriers are particularly pronounced. In this context, timely and accurate information becomes a crucial tool for overcoming these obstacles.

4.4 | Addressing gender barriers to retention

In our study, indeed, the focus on female students is particularly important because of the unique economic hardships and societal pressures that they face (Osservatorio CPI 2023). While some research suggests that male students are more likely to drop out in various contexts, the circumstances surrounding female scholarship recipients in Italy are more demanding. These women must overcome both financial barriers and societal expectations that may discourage them from fully investing in higher education. The complexities facing female students in this context are well documented. Research by the European Commission reveals that these barriers are exacerbated by a lack of access to role models and gender-sensitive guidance factors that play a crucial role in sustaining women's engagement and persistence in education (European Commission 2023).

Without targeted support, female students are left to confront societal biases and structural inequalities on their own, which can lead to increased vulnerability to dropout.[2] The need for precise and targeted informational interventions is therefore paramount, especially when it

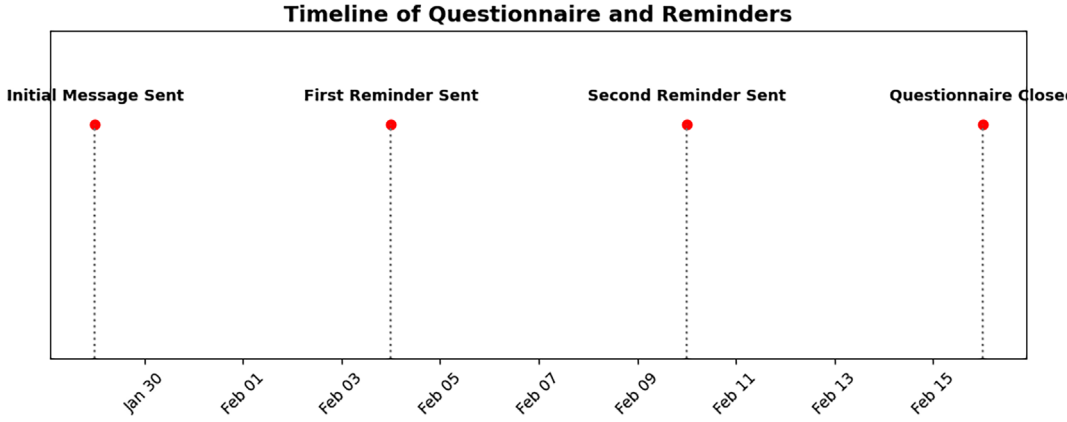

FIGURE 1 Timeline of the experiment. *Notes*: The graph shows the key points in our outreach: the initial message, two reminders, and the final closing date.

comes to addressing the financial and social constraints that often lead to academic attrition. Our intervention seeks to make these barriers more visible while offering clear, evidence-based information about the long-term benefits of completing their education, such as improved labour market outcomes and greater financial independence. By delivering this information at strategic moments—when academic and financial pressures are most acute—we aim to equip these students with the resources and encouragement necessary to persist in their studies. Appendix C provides a comprehensive overview of the gender gap and dropout rates within the Italian higher education landscape.

5 | RESEARCH DESIGN

5.1 | Experimental design

The experiment was conducted according to the timeline illustrated in Figure 1. On 29 January 2022, students were invited to participate in a questionnaire designed to assess their personal circumstances, the services tied to their scholarship, and the broader support provided by ER.GO. The invitation was delivered through two primary channels, email and text message.[3] These communications were sent directly by ER.GO using its established notification systems, prompting students to log into their personal accounts on the ER.GO platform—a secure portal regularly used for scholarship updates, academic tracking, and official communications, known as the *dossier-utente*.[4] Given that ER.GO routinely uses these channels throughout the academic year for essential updates regarding scholarships and deadlines, the communication felt both familiar and trustworthy to students.[5]

Once logged in to their ER.GO accounts, students received a notification directing them to complete a *Qualtrics XM* questionnaire designed by our research team. The survey, which focused on gathering information about students' socioeconomic backgrounds and service needs, concluded with a randomized informational nudge provided to those randomly assigned to the treatment group. Integrating the nudge into the existing workflow ensured that it felt like a natural and seamless part of the student's completion of the questionnaire. Strategically placed at the end of the questionnaire, the nudge was designed to flow naturally as an extension of the survey process. The content of the nudge emphasized the critical role that higher education plays in narrowing gender gaps in labour market outcomes, reinforcing its relevance

to the students' academic and professional goals, as discussed in the mechanisms outlined in Section 3.

To maximize participation and reduce potential response bias, we implemented a carefully timed reminder strategy. The first reminder was sent approximately four days after the initial invitation, between the night of 3 February and the early hours of 5 February 2022. Due to technological constraints, these reminders were delivered in batches of 500 invitations. The timing was deliberately chosen to allow students time to consider the initial message while offering a subtle prompt for those who had not yet responded. The second reminder was sent between the night of 9 February and the early hours of 11 February, using the same procedure. This follow-up aimed to reinforce the importance of completing the questionnaire before the deadline, while maintaining a respectful engagement rhythm. Spacing the reminders about six days apart helped to keep students engaged without overwhelming them. Data collection concluded on 16 February, giving students a two-week window to complete the survey at their convenience.[6]

5.2 | Alma Mater Studiorum, University of Bologna

The University of Bologna (hereafter, Unibo) is Italy's second largest public university, boasting an average enrolment of over 90,000 students and 3000 faculty members.[7] While the survey included students from across the Emilia-Romagna region, this study specifically focuses on scholarship recipients from Unibo. This focus is motivated by the availability of detailed, mergeable data exclusive to Unibo students.

Our analysis focuses on 6670 female scholarship recipients from 2022 who were enrolled in three-year, master's or single-cycle degree programmes, excluding those outside the designated time frame. This subgroup accounts for 61.15% of the total population, while male students on the same courses total 4238.[8] Initially, 2481 female students engaged with our outreach by clicking the link to our Qualtrics questionnaire, which they accessed through their personal *dossier utente* accounts. However, our final sample consisted of 1737 students who completed the full questionnaire and progressed to the randomization phase, allowing us to assign them to either the treatment or control groups.[9] The reduction from 2481 to 1737 participants occurred primarily because some students opted out or did not complete the questionnaire before the final randomization stage. We also excluded a small subset (fewer than 90 students) who did not provide the required consent at the beginning of the survey, in accordance with data privacy regulations. Additionally, we opted not to include the few students (71) who had never taken an exam during their academic careers, even though they answered the questionnaire.[10]

Ultimately, about 50% of the participants in the treatment group received an informational nudge emphasizing the importance of education in reducing the gender gap, while the control group did not receive any additional information. As shown in Table A4 in Appendix D, there were no significant differences in observable characteristics between the two groups. This balance is essential for the validity of our analysis.

6 | EMPIRICAL ANALYSIS

To evaluate the treatment effects, we merged the questionnaire responses with comprehensive administrative records for female students enrolled at Unibo who obtained a scholarship in the 2022 academic year. Our analysis centres on the period from 29 January 2022 to 10 August 2022, which we have also divided into four distinct subperiods aligned with the exam calendar in the second part of the analysis. The first period covers the end of January and February; the second spans March and April; the third includes May and June; and the fourth extends from July to the first ten days of August. We concentrate on the 10 August deadline because it represents the final date

for meeting the academic requirements necessary to confirm scholarship eligibility. Appendix B offers a detailed overview of the scholarship renewal process, highlighting how requirements vary across undergraduate or postgraduate programmes and year levels. Table A2 outlines all possible combinations of credit requirements and deadlines. Additionally, Appendix F presents an extended analysis covering the entire calendar year to December 2022, incorporating two additional subperiods: late August to October, and November to December, as seen in Tables A7 and A8.

Our final dataset includes comprehensive administrative records of the academic performance of female students, with daily information on grades, exams, credits earned, academic programme, department, relevant campus, and whether the student is enrolled in an undergraduate, postgraduate or single-cycle programme. The dataset also contains individual demographic and socioeconomic details, such as gender, place and date of birth, and city of residence, along with responses to the questionnaire related to family background, crucial for understanding each student's starting socioeconomic conditions.

The dataset was constructed by linking questionnaire responses with administrative records from Unibo using encrypted unique identifiers for each student. We focused our sample on female scholarship recipients who completed the questionnaire and, as a result, were part of the randomization process discussed earlier. From this refined sample, we developed a dataset centred on the key outcomes relevant to our analysis. The primary unit of analysis is the student and their academic performance over specified periods.

We examine the number of credits earned by each student per semester, as well as the likelihood of meeting the requirements for retaining their scholarship. For a comprehensive overview of how credits and exams are interconnected, see Appendix B. As for grades and exams worth more than five credits, we use the number of passed exams as the unit of reference. Any grade below 18 is not recorded, and the exam is classified as a *failed* exam. Therefore our analysis accounts for the distribution of student grades, the number of failed exams, and the probability of successfully retaining scholarship eligibility.

6.1 | Empirical strategy

To evaluate the impact of our intervention over the entire period, we estimate the treatment effect on some key outcomes using the specification

$$Y_i = \alpha + \beta\ Info_i + \varepsilon_i, \tag{1}$$

where Y_i represents the outcome variable for student i, while $Info_i$ is an indicator variable that equals 1 if the student is in the treatment group, and 0 otherwise. The error term ε_i captures the robust error. The coefficient of interest, β, measures the average difference in outcomes between students who received the informational intervention (treatment group) and those who did not (control group). A positive and statistically significant β would indicate that the intervention had a favourable impact on the outcome variable, suggesting that the targeted information effectively influenced student behaviour in the intended direction.

This straightforward specification enables us to directly assess the causal effect of the informational nudge on academic performance, persistence, and other relevant outcomes. We also take into account potential sources of variation that could influence our estimates. Our primary analysis utilizes heteroscedasticity-robust standard errors to ensure the validity of our inferences. Additionally, we conducted a robustness check by clustering standard errors at the area of study level, which addresses correlations within groups.[11]

After analysing the effects on the whole period, we aim to study the potential heterogeneity of the effects of our intervention. For this reason, as mentioned before, we perform

TABLE 1 Main treatment outcomes.

	Scholarship (1)	Exams (2)	Credits (3)	Grades (4)
Information treatment	0.048**	0.004	0.314	0.114
	(0.021)	(0.074)	(0.579)	(0.085)
Constant	0.794***	3.643***	29.321***	27.339***
	(0.021)	(0.055)	(0.423)	(0.060)
R^2	0.004	0.002	0.001	0.001
Observations	1303	1737	1737	5479

Notes OLS and linear probability estimates. We do not consider in the analysis scholarship students enrolled in the last year of university, since they usually do not have exams in the last period. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

our regression also by splitting our dependent variables into four different subperiods, namely January–February, March–April, May–June, July–August.

7 | RESULTS

Our sample includes 1737 female students, accounting for 26% of the total female scholarship recipients (6670) at Unibo. A detailed breakdown of these participants by area of study and year of enrolment can be found in Appendix D. The primary outcomes of our analysis, estimated by equation (1), are summarized in Table 1.

The variable *Scholarship* measures the likelihood that a student will meet the necessary credit requirements to confirm and renew her scholarship, which is crucial for her continued financial support. Specifically, this outcome tracks whether students can meet the required credit thresholds by the critical 10 August 2022 deadline—as detailed in Table A2 in Appendix B.[12] The *Exams* and *Credits* variables represent the number of passed exams[13] and the corresponding credits accumulated by each student between February and 10 August 2022.[14] Finally, the variable *Grades* measures academic performance. This variable offers a measure of the depth of a student's understanding of the exam passed.

The results of our analysis indicate a clear positive impact of the information treatment on the probability of scholarship confirmation, with a statistically significant increase of 4.8 percentage points. This underscores the effectiveness of the nudge in aligning academic behaviours with the goal of maintaining financial aid. Interestingly, while there is a notable increase in the likelihood of meeting scholarship requirements, the treatment does not significantly affect the total number of exams taken, the volume of credits accumulated, or the average grades obtained.

These results are interesting and may hint at underlying mechanisms that deserve further investigation. To explore this, we propose some extensions, including an examination of specific subperiods that can provide deeper insights into students' behaviours over time. We will also analyse various outcome variables, such as the likelihood of passing exams worth more than 5 credits, which reflects their strategies for tackling more challenging assessments. Additionally, we will look at the number of failed exams, offering valuable insight into how the treatment influences students' preparation when facing difficult exams.[15] Specifically, Figure 2 provides a visual representation of how the targeted informational intervention impacted the academic behaviours of treated students across different exam periods. By breaking down the analysis into distinct time frames—first period (January–February), second period (March–April), third period (May–June) and fourth period (July–August)—we can clearly observe shifts in student performance, highlighting the dynamic influence of the nudge over time.

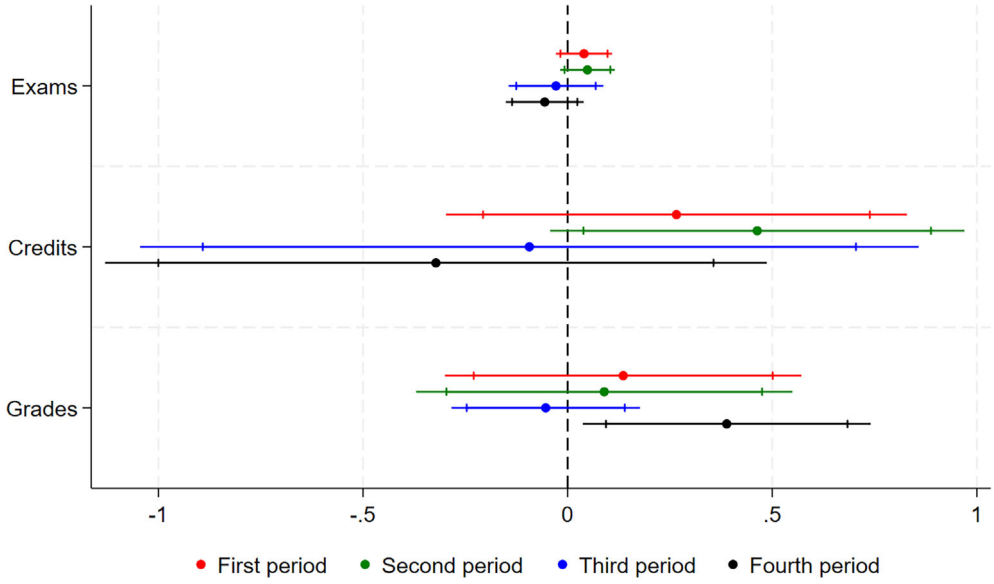

FIGURE 2 Performance in different periods. *Notes*: OLS estimates. Horizontal lines represent 95% confidence intervals based on robust standard errors. Caps in the horizontal lines delimit the 90% confidence intervals. First period, Jan–Feb; second period, Mar–Apr; third period, May–Jun; fourth period, Jul–Aug.

As highlighted by Haaland *et al.* (2023), it is crucial to differentiate between short- and long-term behavioural changes when assessing the impact of interventions. The improvement of the treated students related to their probability to confirm the scholarship seems to happen in particular in the short run, as Figure 2 points out a positive effect at 10% significance in the number of credits obtained during the second period (March–April). In the short run, the information nudge appeared to be particularly effective in encouraging students to meet immediate academic milestones, as evidenced by the notable increase in credits during the second period (March–April). This finding suggests that the students, motivated by the information on the importance of graduation in narrowing gender gaps, increased their academic efforts early in the semester, strategically accumulating credits to secure their scholarships. A second interesting outcome is observed in the fourth period (July–August), where there is a significant increase in grades among treated students at the 5% significance level. This improvement occurs despite the fact that scholarship renewal requirements are based on credits rather than grades, indicating a shift towards prioritizing academic quality over mere quantity. This behaviour may suggest that the nudge may have encountered a greater appreciation for academic excellence, motivating students to go beyond simply meeting the minimum credit requirements and strive for higher performance in their coursework. This shift towards qualitative improvement seems to suggest a deeper engagement with their studies, aligning their academic efforts with the broader educational and career goals highlighted in the informational message. Additionally, our findings are consistent with the possibility that treated students respond to the information by preparing more thoroughly for their upcoming exams. Once they have met or are close to meeting the credit requirements for maintaining their scholarships, they could in principle focus on preparing more effectively for their exams to achieve higher grades.

The observed changes in student behaviour among those who received the intervention are further underscored by the findings in Table 2. The results reveal that treated students not only seem to have increased their credit accumulation during the third period (May–June) but also strategically chose to take on more substantial exams, typically defined as those with over 5 credits. These larger exams demand significant preparation time and seem to reflect a conscious effort

TABLE 2 Probability of passing an exam over 5 credits.

	Overall	First period	Second period	Third period	Fourth period
	(1)	(2)	(3)	(4)	(5)
Information treatment	0.021***	−0.024	0.039	0.033***	0.017
	(0.008)	(0.018)	(0.024)	(0.011)	(0.014)
Constant	0.889***	0.926***	0.879***	0.871***	0.906***
	(0.006)	(0.012)	(0.019)	(0.008)	(0.010)
R^2	0.001	0.001	0.003	0.002	0.000
Observations	6331	966	659	3165	1541

Notes Linear probability estimates. First period, Jan–Feb; second period, Mar–Apr; third period, May–Jun; fourth period, Jul–Aug. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

TABLE 3 Number of failed exams.

	Overall	First period	Second period	Third period	Fourth period
	(1)	(2)	(3)	(4)	(5)
Information treatment	−0.053	0.020	−0.020	−0.017	−0.036**
	(0.035)	(0.014)	(0.012)	(0.027)	(0.014)
Constant	0.517***	0.072***	0.071***	0.276***	0.099***
	(0.026)	(0.010)	(0.009)	(0.019)	(0.011)
R^2	0.001	0.001	0.001	−0.000	0.003
Observations	1737	1737	1737	1737	1737

Notes Linear regression estimates. First period, Jan–Feb; second period, Mar–Apr; third period, May–Jun; fourth period, Jul–Aug. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

by students to secure their scholarships through more focused and challenging academic choices. Specifically, the probability of passing exams with more than 5 credits increased by 3.3 percentage points in the third period, contributing to an overall improvement of 2.1 percentage points across the whole year. This seems to indicate that the intervention encouraged students to engage with more rigorous coursework at critical points in the academic calendar, enhancing their likelihood of maintaining financial aid.

Moreover, Table 3 highlights a significant outcome during the subsequent summer period (fourth period, July–August), where the number of failed exams decreased by 0.036. While this change may appear modest, it is important to note that compared to the control group, which has an average of 0.517 failed exams, treated students in the fourth period experienced a 7% reduction in failed exams. This improvement indicates enhanced academic focus and preparation among the treated students, suggesting that the informational nudge did more than simply motivate a quantitative increase in effort; it also promoted a qualitative enhancement in their academic approach.[16]

The results highlight a notable shift in how students approach their studies, suggesting that they may have started adopting a more focused strategy that prioritizes exam preparation over simply increasing the number of attempts. In our analysis, we include some robustness checks and additional information in Appendix F, along with further heterogeneity analyses in Appendix G. Results suggest that the treatment effect is significant for first-generation students, freshmen and undergraduate students. These findings emphasize the differences in how effectively our intervention works across various groups.

To sum up, by encouraging students to tackle more demanding exams with a higher likelihood of success, the intervention aligns well with its goal of reducing gender disparities. This refined focus on preparation and performance underscores the broader impact of light-touch interventions in supporting female students in achieving their academic and financial goals.

8 | CONCLUSIONS

The conceptual foundation of our study is built on the fact that informational nudges are most effective when they deliver timely, relevant messages that directly resonate with the recipient's specific context and long-term goals. Drawing on insights of identity and self-perception theory and educational interventions, our framework highlights why such targeted nudges are particularly effective for female scholarship recipients who navigate both financial constraints and systemic barriers.

Our findings provide robust empirical support for this framework, demonstrating that informational nudges can improve academic performance and persistence when tailored to address a relevant challenge faced by women in higher education. Specifically, our treatment not only increased the likelihood of meeting scholarship requirements by almost 5 percentage points, but also seems to lead to gains in the number of credits earned and improved grades during critical academic periods.

These findings are consistent with existing research showing that low-cost, high-impact interventions can change behaviour when they address cognitive biases such as present bias or incomplete information about long-term returns. In our context, female students who received the nudge became more aware of how their educational attainment could mitigate gender gaps in the labour market, leading them to adjust their academic strategies accordingly.

The strength of our light-touch intervention lies in its strategic timing and seamless integration. Delivered between late January and mid-February as part of a broader needs assessment questionnaire through the ER.GO platform, the information treatment was embedded within a familiar administrative process, enhancing its relevance while minimizing any perceived disruption. By aligning the nudge with key academic milestones—such as winter exams, the start of spring classes, and the August scholarship renewal deadline—we maximized its effectiveness during moments when students were naturally re-evaluating their academic priorities. This deliberate timing ensured that the message reached students when they were most likely to internalize and act on it, consistent with research underscoring the critical role of well-timed interventions (Hoxby and Turner 2013; Castleman and Page 2015).

In addition, this design targeted a particularly vulnerable group: female scholars who already face significant socioeconomic barriers. These students, who often struggle with economic barriers and a sense of marginalization, are particularly sensitive to clear, direct incentives that reaffirm the value of persisting in their studies. In this context, reminding them of the tangible benefits of academic success—such as securing future employment and reducing gender disparities—becomes even more important. The added pressure to maintain their scholarships as a condition of continued enrolment makes timely reminders of academic incentives particularly relevant. Reinforcing the financial and career benefits of persistence not only motivated immediate academic effort, but also highlighted the long-term benefits of completing their degrees, providing an extra layer of support where it was most needed.

Our findings have significant implications for both policy and practice. First, they suggest that well-designed nudges can serve as a scalable tool for alleviating informational barriers faced by female students in the labour market. For policymakers, incorporating such interventions into existing support systems for financially vulnerable students could be a cost-effective strategy to promote educational persistence. Second, our study highlights the importance of tailoring interventions to specific contexts and target groups. Generic messages are unlikely to yield the same

impact; understanding the unique motivations and challenges of different student populations is essential for developing effective policy solutions.

In conclusion, our research contributes to the broader literature on behavioural interventions by focusing on a uniquely vulnerable population: female scholarship recipients who face pressures of academic performance, gender stereotypes and financial sustainability. While similar studies, such as Bayer *et al.* (2019), have explored the role of nudges in course enrolment, our analysis goes further by examining a wider range of academic outcomes, including exam performance, credit accumulation and scholarship retention. In doing so, we provide deeper insights into how informational nudges can be adapted to meet the needs of students who encounter significant barriers to educational success.

An important avenue for future research is to explore the long-term effectiveness of informational nudges and how their impact changes over time. As students become increasingly familiar with the content and format of such interventions, they may start to respond less actively, leading to a gradual decline in the desired outcomes. Understanding this phenomenon is essential for designing more robust and enduring strategies. Examining how students adapt to repeated nudges could provide valuable insights into when and why reminders might become less effective or even counterproductive. Such research is key to refining scalable interventions that maintain their efficacy across different contexts over time. A deeper grasp of these dynamics can equip policymakers to craft more targeted and lasting strategies, particularly for those facing significant structural barriers, making this a promising area for follow-up studies.

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ENDNOTES

[1] The Italian context presents important distinctions for understanding how nudges may operate differently than in other settings, particularly regarding performance requirements and deadlines, such as the necessity to accumulate a specific number of exams (credits) by 10 August of each academic year.

[2] The structural inequalities in the Italian labour market further heighten the importance of focusing on this group. Female students, particularly those from low-income backgrounds, face limited career advancement opportunities and wage disparities that can dissuade them from viewing higher education as a worthwhile investment.

[3] The full content of the initial message, along with the two reminders, can be found via Appendix E.

[4] See https://www.er-go.it/dossier-utente (accessed 9 March 2025).

[5] By embedding the intervention within the ER.GO trusted communication channels, the process felt seamless and routine, making participation for students feel like a natural part of their academic responsibilities.

[6] The sequence and timing of these outreach efforts were carefully aligned with best practices in survey research and behavioural intervention design, as discussed by Haaland *et al.* (2023). This approach aimed to minimize dropout rates while encouraging thoughtful and deliberate responses.

[7] See Appendix D for a detailed description of the unique administrative dataset that we utilize, and a comparison with national enrolment figures.

[8] In terms of representativeness, the University of Bologna awards over 60% of all scholarships in the region.

[9] Key characteristics of students were confirmed to be balanced across both treatment arms. For a detailed assessment of sample balance and further insights into the scholarship allocation process within the Italian higher education system, see Table A4 in Appendix D.

[10] However, in a robustness check available on request, we have included these students, and their presence does not affect our results.

[11] The results from this alternative specification, which are consistent with our main findings, are available on request.
[12] The reduction in observations from 1737 to 1303 in Table 1 is due to the exclusion of students in their final year when we estimate the variable *Scholarship*. This exclusion is based on a legal requirement: in their final year of study, whether at the undergraduate or graduate level, students are no longer eligible to confirm and renew their scholarships, and are instead required to complete their programme within the final available session.
[13] Note that to pass an exam, a student must achieve a minimum grade of 18. Consequently, the student must not have failed, rejected the grade, or withdrawn during the exam. Once an exam is passed and the grade is accepted, it cannot be retaken.
[14] Exam credits usually range from 2 to 12 in the European Credit Transfer and Accumulation System (ECTS), with each credit reflecting 6–10 hours of class work, and approximately 25–30 hours of total study, according to the ECTS classification. See Appendix B for further details.
[15] The variable 'Probability of passing an exam over 5 credits' is a dummy equal to 1 if the passed exam is worth more than 5 credits, and 0 otherwise. The reference unit is the passed exam.
[16] An alternative specification using a zero-inflated Poisson regression yields similar results and is available on request.
[17] These standardized measures ensure a precise and equitable evaluation of eligibility for social and financial benefits, including access to education subsidies.
[18] For instance, the GPA system widely used in the USA operates on a scale from 0 to 4, where a 4 represents an A grade, indicating excellence, and a 0 represents a failing grade.
[19] We focus on this period because 10 August is the critical deadline for confirming and maintaining scholarship eligibility. For robustness, in Appendix F, we extend the analysis to the full year to December 2022, and include two additional subperiods: late August to October, and November to December. Detailed results for these extended periods are presented in Tables A7 and A8.
[20] Students may attempt multiple exams in a session, whether they are from their current year or from previous semesters. For example, economics programmes often follow a pattern of offering one exam session per semester, while political science programmes vary, with up to three calls during the teaching semester, and two in the other semester. An additional autumn session usually provides a final opportunity for make-up exams.
[21] Consider that passed exams in all sessions are relevant for all students, both scholarship recipients and non-recipients, to complete their academic year. Each year, 60 credits are required for all undergraduate and postgraduate programmes. Furthermore, accumulating credits is important for scholarship recipients, as they must meet specific credit/exam thresholds by 10 August of each academic year to maintain their eligibility for financial aid in the following year (e.g. 25 out of 60 credits for the first year of undergraduate studies, or 80 out of 120 credits for the second year).
[22] It is possible to find the complete text of the first invite along with the content of the two reminder messages sent during the two-week survey period at https://www.dropbox.com/scl/fi/p3067hv7f73muxhqiq8gd/invite.docx?rlkey=khmlrx3sokftq6pwsqkcr1vmu&dl=0 (accessed 9 March 2025).
[23] See https://www.dropbox.com/scl/fi/ouzwc3voazlm3heb7uol9/nudge.docx?rlkey=dtic2s6z4oq42ltnjhcrb0k8x&dl=0 (accessed 9 March 2025) for the Italian version.

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APPENDIX A. CONCEPTUAL FOUNDATIONS AND RATIONALE FOR OUTCOME SELECTION

This appendix describes the conceptual reasoning behind our selection of outcome variables, explaining how these choices align with the research on informational nudges, educational incentives and behavioural responses.

A.1 Theoretical foundations: behavioural economics insights

The decision-making processes of students in higher education are often influenced by a range of cognitive biases, information asymmetries and motivational barriers that can lead to suboptimal choices. As highlighted in the behavioural economics literature, even well-informed individuals may struggle to act rationally due to tendencies like present bias, limited attention, and the underestimation of long-term benefits (Oreopoulos *et al.* 2017; Damgaard and Nielsen 2018). These insights are particularly relevant when considering interventions aimed at economically disadvantaged groups, such as female scholarship recipients, who frequently face compounded pressures related to financial stability, academic persistence and societal expectations.

Our intervention directly targets these biases by delivering timely, relevant information that emphasizes the economic benefits of higher education. By focusing on the role of educational attainment in narrowing the gender gap, the nudge reinforces the critical importance of maintaining scholarship eligibility, thereby encouraging students to enhance their academic efforts. The intention is to make the value of their educational pursuits more tangible, especially in terms of future financial independence and career growth, addressing both immediate academic needs and long-term aspirations.

A.2 The power of informational nudges in shaping educational outcomes

The extensive literature on nudges and educational interventions forms the backbone of our analysis. Research by Lavecchia *et al.* (2016) and Bettinger *et al.* (2012) demonstrates that low-cost, well-timed nudges can significantly influence students' academic behaviour, particularly when

they close information gaps related to financial aid, college enrolment and persistence. For instance, Castleman and Page (2015) show that personalized text message reminders effectively boost college enrolment rates by reducing procrastination and guiding students through complex decision-making processes. Similarly, Oreopoulos *et al.* (2017) argue that even modest interventions can yield substantial improvements in educational outcomes when they are tailored to address specific motivational challenges.

In our study, the informational nudge was designed with two key objectives in mind: (1) to update students' understanding of the long-term benefits of higher education, and (2) to increase the salience of academic requirements necessary for maintaining their scholarships. By framing the message around labour market outcomes, we aimed to bridge the gap between students' current academic decisions and their future economic opportunities, thereby encouraging behaviours that align with their long-term goals. The intervention was not merely informational but strategically targeted to make these connections explicit and personally relevant, ensuring that students could see a clear link between their educational performance and future success.

A.3 Outcome choice: aligning theory with data

Based on this theoretical framework, we carefully chose outcome variables that capture both the qualitative and quantitative dimensions of academic performance, as follows.

- *Credits*. The number of credits earned represents a horizontal measure of academic progress, indicating the extent to which students remain committed to a full course load. This metric is particularly crucial for scholarship recipients, as meeting credit requirements is essential to retaining financial aid. In this context, we also look at whether each exam passed by students is worth more than 5 credits. This variable acts as an indicator of the exam's intensity, as higher-credit exams usually encompass more substantial topics than their lower-credit counterparts. As a result, this criterion offers valuable insights into the overall rigour and depth of the assessments that students are facing.
- *Exams*. The number of exams passed serves as an alternative horizontal measure of academic progress, capturing student engagement independently of the credits assigned to each course. While credits indicate the overall academic achievement and progress toward degree completion, the number of exams passed reflects the level of effort and involvement in coursework. Tracking exams provides valuable insight into how actively students are engaging with their studies, especially in a system where passing exams is essential for earning credits, regardless of the specific credit value associated with each course.
- *Scholarship*. Scholarship retention is a high-stakes outcome directly linked to credit accumulation and academic performance. Since losing a scholarship often results in financial strain and an increased risk of dropout, this measure effectively captures the intersection of academic and financial decision-making. Research by Goldin (2014) and Blau and Kahn (2017) underscores how making financial incentives salient can encourage students to persist in their educational journey.
- *Grades*. Exam grades provide a vertical measure of academic performance, reflecting the depth of students' understanding and mastery of course material. By focusing on grades, we assess whether the informational nudge led to improved academic performance by motivating students to invest greater effort in their studies.
- *Failed exam*. Failed exams provide critical insight into academic difficulties that may not be captured by grades or credits alone. In the Italian system, passing exams is the only way to earn credits, so tracking failed exams reveals where students are struggling despite putting in the effort. This metric helps us to understand both engagement and the potential barriers to academic success, such as poor preparation or overwhelming course loads.

The combination of these outcomes offers a comprehensive perspective on how the information nudge influences student behaviour. By simultaneously analysing credits earned, exams passed, scholarship retention, grades, exams failed, and the probability of passing an exam higher than 5 credits, we capture the full range of academic engagement, progress and challenges. Each metric adds a distinct layer of insight. Credits and exams provide complementary views of academic progress: credits reflect overall achievement, while exams reveal the effort and commitment that students are putting into their studies. Scholarship retention introduces an important financial dimension, directly linking academic performance to students' financial stability, while grades provide a deeper look at the quality of learning. By including failed exams and the probability of passing exams worth more than 5 credits, our analysis gains additional depth. This approach highlights areas where students may be facing challenges despite their best efforts, uncovering potential barriers to success. It also sheds light on the strategic decisions that students make regarding whether to attempt more difficult exams. Together, these outcomes allow us to observe the broader behavioural changes triggered by the nudge, giving us a complete picture of its impact. This integrated approach not only assesses immediate academic performance, but also captures the long-term potential of targeted interventions to achieve meaningful educational outcomes for at-risk student populations.

APPENDIX B. FINANCIAL AID IN THE ITALIAN EDUCATION SYSTEM

B.1 Scholarships

Italy's financial aid framework is deeply embedded in the country's constitutional principles, specifically articles 3 and 34, which emphasize the removal of economic barriers and ensure educational access for all deserving individuals, regardless of financial means. While the lower levels of education are either free or heavily subsidized, financial aid becomes crucial at the tertiary level, where access to scholarships is determined by socioeconomic conditions, governed by national and regional regulations.

Public scholarships in Italy are primarily means-tested, ensuring that financial aid reaches those who need it most. However, they are also closely linked to academic performance, requiring students to meet specific criteria to qualify for and maintain this vital support, adding an additional layer of pressure on recipients. These scholarships are administered by regional authorities (ER.GO for the Emilia-Romagna region) based on a comprehensive evaluation of family income and assets using standardized indicators. In Italy, household wealth and financial status are primarily assessed using two key indices: the ISEE (Equivalent Economic Situation Indicator) and the ISPE (Equivalent Asset Situation Indicator). The ISEE captures a household's overall economic situation, while the ISPE focuses on its asset holdings. Together, these indicators provide a comprehensive measure of financial wellbeing, taking into account various factors such as real estate, personal assets, primary and secondary income, mortgages, and other relevant financial elements.[17]

This assessment process ensures that financial aid is directed towards students who demonstrate both financial need and strong academic performance. The eligibility thresholds, established annually at the national level, have remained steady since 2016, with the ISEE around €23,500, and the ISPE asset threshold at approximately €50,000. However, securing a scholarship is just the beginning; to maintain this crucial financial support, students must not only continue to meet these income requirements but also achieve a minimum number of academic credits each year. This dual requirement ensures that scholarships go to those who are both financially in need and committed to their academic success. Scholarship recipients benefit from more than just tuition exemptions; they also receive financial support that varies based on their proximity to the university. Students are categorized as in-site, commuting or out-site, with scholarship amounts ranging from €2000 to €6000 depending on their location. This tiered support system is designed

to accommodate the varying costs associated with attending university, ensuring that students from all backgrounds have the opportunity to succeed.

B.2 Tertiary education structure

Tertiary education in Italy follows a well-structured pathway that begins with undergraduate degrees and can progress to specialized master's programmes or long-cycle courses in fields such as law, medicine and architecture. Admission to these programmes is often regulated by entrance exams, with national tests ensuring that students meet the essential qualifications.

Within the European Credit Transfer and Accumulation System (ECTS), one credit represents approximately 25 hours of academic work, which includes both in-class activities and independent study. Exams are directly tied to these credit values, ranging from as few as 3 credits for more basic courses to as many as 15 credits for more comprehensive ones. Exams associated with fewer credits typically require less class time and focus on a more concise syllabus, while higher-credit exams demand more extensive instruction and cover a broader range of material. Students are required to balance mandatory courses with electives throughout their degree, typically accumulating around 30 credits per semester. In the first two years of a bachelor's programme, the curriculum is predominantly composed of core courses. By the third year, students are given greater flexibility to choose from a variety of electives, allowing for more specialized learning paths. Similarly, at the master's level, the first year is generally structured around compulsory courses, while the second year offers students the opportunity to tailor their studies through elective options. Despite this flexibility, the distribution of credits across semesters remains consistent, ensuring an even workload throughout each academic year.

The Italian grading system offers a distinctive approach to evaluating student performance, setting it apart from many other international models.[18] In Italy, grades range from 18 to 30, with the highest distinction being *cum laude* (with honours) for exceptional work. A score of 18 or above is considered passing, which the student can accept. Conversely, any score below 18 is not recorded, as it is deemed as a failed exam. This gives students the opportunity to retake the exam without the failure impacting their academic record, thereby allowing for continued progression without the stigma of a recorded failure.

B.3 Funding and equity challenges

The scholarship system is designed with the goal of promoting merit-based progression, where academic success is directly tied to financial aid eligibility. To retain their scholarships, students must meet strict academic benchmarks each year. While this system incentivizes timely graduation, it also places considerable pressure on students, especially those from disadvantaged backgrounds who may already face additional hurdles in their academic journey. Under this framework, students must accumulate a specified number of credits by 10 August each year to maintain their scholarships. Failing to meet these requirements not only results in the loss of future funding but also obligates students to repay the scholarships that they have already received. This creates a high-stakes environment where maintaining financial support becomes an ongoing challenge, particularly for those juggling academic responsibilities with financial or personal hardships.

Historically, the system has set substantial credit thresholds—such as requiring first-year undergraduate students to earn 25 out of 60 credits—to retain their scholarships. This approach is intended to keep students on track for graduation, addressing Italy's persistent dropout issues. The emphasis on credit accumulation rather than minimum grades reflects a strategy aimed at ensuring that students remain engaged and make steady progress towards their degrees. However, this focus on credits can raise concerns about equity, especially for students who struggle to meet these benchmarks due to circumstances beyond their control. For students from lower socioeconomic backgrounds, the pressure to accumulate credits can be particularly daunting.

These students may lack the resources and support systems that their more privileged peers enjoy, making the risk of losing financial aid even more acute. The additional burden of repaying scholarships if they fall short of credit requirements can exacerbate the financial strain on those already facing economic challenges.

While the system aims to enhance efficiency and reduce dropout rates, it also underscores the delicate balance between maintaining academic rigour and ensuring equitable access. The focus on credit accumulation ensures that students are making tangible progress, but it may inadvertently create barriers for those who are most in need of support. To ensure that the scholarship system remains fair and accessible, ongoing evaluation and potential adjustments are necessary to better accommodate the diverse needs of the student population.

B.4 Academic calendar and exam periods

We focus on the period from 30 January 2022, right after students complete the questionnaire, until 10 August 2022. Students have a two-week window to respond to the questionnaire, and our analysis continues by examining their exam behaviours during this time frame. We divide the period into four distinct subperiods aligned with the university's exam schedule, allowing us to capture key academic milestones and trends in student performance. The first period covers the end of January and February, coinciding with the conclusion of the winter exams. The second period covers March and April, when classes resume but before the major exams. The third period is May and June, marking the onset of the summer exam session. Finally, the fourth period extends from July to the first ten days of August, coinciding with the final exams that are critical for maintaining scholarship eligibility.[19]

The academic year at most Italian public universities follows a well-structured timetable, beginning in late September and concluding in late July. Each academic year, students are expected to complete 60 credits, evenly distributed across two semesters. The first semester starts in late September or early October, and runs until late December or early January, culminating in an exam period that extends from late January to late February or early March. The second semester begins shortly after, with classes continuing until late May or early June, followed by exams from late June to late July or early August. After a brief summer break, universities reopen for a short window in September, allowing students to retake exams before the new academic year begins.

This structured academic calendar shapes the temporal segmentation of our analysis. We outline the key dates and corresponding academic periods relevant to our study in Table A1, which provides a structured overview of the exam schedules across the academic year at Unibo, highlighting the balanced distribution of opportunities for students to take their exams. Each programme tailors its exam calls according to the curriculum, typically providing three opportunities per session, spread across key academic periods.[20] Across Unibo's programmes, about 80% have a standardized structure of two exam calls per session, for a total of six opportunities per academic year. Students carefully balance required and elective courses between the two semesters, and organize their studies to optimize preparation for these exam periods.

TABLE A1 Distribution of semesters, exam sessions and calls.

Period	Exam calls	Activities
1	End of January–March	Winter exams
2	April–June	Summer exam session begins
3	July–Early August	Final exams for scholarship renewal

TABLE A2 Merit requirements.

	Undergraduate		Postgraduate		Single-cycle degree	
10 August	Credits requirement	% of grant	Credits requirement	% of grant	Credits requirement	% of grant
1st year students	25	30–50%	30	30–50%	25	30–50%
2nd year students	80	40–50%	80	40–50%	80	40–50%
3rd year students	135	40–50%			135	40–50%
4th year students					190	40–50%
5th year students					245	40–50%

Table A2 highlights instead the meritocratic nature of scholarships in the Italian education system, emphasizing the role of academic performance in securing financial aid. In particular, credit requirements increase significantly as students progress through the academic years, reflecting the growing expectations placed on them. For first-year students, the credit threshold is modest, recognizing the transition to university life, while second- and third-year students face more demanding requirements of 80 and 135 credits, respectively. This progressive structure ensures that financial aid is linked not only to need, but also to consistent academic performance.[21]

The proportions of financial aid linked to these credit requirements underscore the importance of meeting academic milestones. For example, first-year students can secure 30–50% of their scholarship by reaching their credit goals, while upperclassmen, facing a heavier workload, have even more at stake in maintaining their financial support. This system creates a strong incentive for students to stay on track, balancing the demands of financial necessity with academic rigour. By linking scholarships to both financial need and academic diligence, this structured approach fosters a meritocratic environment while addressing socioeconomic disparities. The 10 August deadline, which determines scholarship retention, serves as a pivotal moment where students' financial and academic futures intersect.

APPENDIX C. ADDRESSING GENDER DISPARITIES AND DROPOUT RATES

C.1 Gender disparities

Understanding gender disparities involves exploring the complex factors that shape the educational and career paths of women, especially those from low-income backgrounds. This subsection examines these dynamics, supported by data and literature, to highlight key challenges and underlying mechanisms with a focus on the Italian situation.

Women constitute the majority of university enrolments, making up about 55% of the student population, according to the National University Evaluation Agency (ANVUR 2023). This percentage has remained relatively stable over time, indicating that women are not only participating in higher education, but are doing so in substantial numbers. Notably, women often outperform their male peers academically, achieving higher grades and graduation rates. However, this academic success does not automatically lead to equal outcomes in the labour market. Despite their strong academic achievements, women remain under-represented in STEM fields typically linked with higher-paying jobs and greater career advancement opportunities. This under-representation perpetuates the persistent gender gap in economic outcomes, even as women reach higher levels of education.

For low-income women, these challenges are intensified by financial pressures and limited access to professional networks, making the path from education to a career even more difficult to navigate (Global Perspectives 2020).

C.2 Access to financial aid and scholarships

While access to financial aid can provide crucial support, it also introduces additional challenges for women in Italian higher education. According to Eurydice (2016), only about 11% of students in Italy receive scholarships, with slightly higher rates—around 15%—at Unibo. These figures are significantly lower than the European average, where financial aid reaches 20–30% of students in some countries. In contrast, northern European countries such as Denmark, Finland and Sweden provide even more substantial support, offering grants to over 50% of students, along with generous loan schemes.

In stark contrast, southern European countries such as Italy offer more limited financial support, primarily based on financial need. Despite these challenges, female students in Italy excel academically, making up about 58% of university graduates—consistent with the European average. However, these women often come from less privileged cultural and socioeconomic backgrounds compared to their male peers. For instance, AlmaLaurea (2023) reports that only 28.4% of female graduates have at least one parent with a university degree, compared to 34.6% of male graduates. Similarly, 20.8% of female graduates come from high socioeconomic backgrounds, compared to 24.5% of male graduates. Notably, a higher percentage of women receive scholarships—26.9% compared to 22.8% of men.

Yet this academic success does not fully bridge the gap, especially in STEM fields, where women—particularly those on scholarships—remain significantly under-represented, with participation rates below 30% according to the European Commission (2015). This gender imbalance in STEM contributes to a persistent gap in career outcomes, restricting women's access to well-paying, stable jobs. The financial pressures associated with pursuing these demanding programmes, coupled with the lack of targeted support, make it even more difficult for low-income women to persist and thrive in these fields. The result is a cycle where, despite their talent and determination, many women struggle to break through the barriers that stand between them and equitable career opportunities.

C.3 Dropout at Unibo

To better understand the dropout issue driven by the many challenges that students face, we leveraged our data to paint an illustrative picture of the situation across various degree programmes. Rather than diving into exhaustive details, our goal is to highlight the broader issue of students dropping out— both from scholarship eligibility and from university enrolment—particularly in programmes where this problem is most acute. Table A3 showcases the top 20 undergraduate degree programmes (at bachelor's level) with the highest dropout rates from both scholarship eligibility and university enrolment, based on average data from 2017 to 2022. It highlights the percentage of students who either lost their scholarships or completely withdrew from university after their first year, shedding light on the critical points where academic and financial challenges collide.

The information reveals a significant and troubling trend: in several programmes, more than one-third of first-year students lose their scholarships, with dropout rates reaching nearly 50% in some cases. Of the 108 undergraduate programmes, a substantial proportion—nearly one-third—face the risk of at least 20% of their students losing their scholarship eligibility.

These numbers are not isolated outliers, but point to a broader, systemic problem that demands the attention of policymakers, institutions and stakeholders alike. The strong correlation between losing a scholarship and ultimately dropping out of college is particularly striking. For many low-income students, the scholarship serves as the foundation of their academic

TABLE A3 Dropout rates from scholarships and from university.

Programme	Dropout from scholarships (%)	Programme	Dropout from university (%)
Anthropology	49	Anthropology	22
Chemical engineering	48	Chemical engineering	20
Mathematics	43	Mathematics	18
Nursing	39	Tourism economics	14
Business	33	History	13
Computer science	33	Arts	13
Social educator	30	Law	11
History	30	Nursing	11
Labour consulting	28	Early childhood educator	10
Law	27	International sciences	9
Computer engineering	25	Economics	9
Tourism economics	25	Social work	8
Social work	24	Foreign languages	8
Arts	24	Development studies	8
Early childhood educator	23	Business	7
Foreign languages	23	Computer engineering	7
Literature	23	Computer science	7
International sciences	21	Communication	6
Development studies	20	Labour consulting	6

Notes Dropout rates by degree programmes: top 20 undergraduate courses based on first-year enrolments (average from 2017–22).

journey. When this financial support is lost, students often face overwhelming financial pressures, leading them to either significantly reduce their academic engagement or drop out altogether. The data clearly show that in several programmes, the loss of a scholarship often precedes dropout, reflecting the harsh reality of students struggling to cover the cost of education once their financial aid is withdrawn.

Notice that official university dropout rates in Italy, while already alarming, likely understate the full extent of the problem. In the Italian system, students can remain formally enrolled for years without taking exams, masking the true extent of attrition. Table A3 focuses specifically on those who have officially withdrawn from their studies from Unibo. However, if we were to include students who have effectively stopped participating in their academic programme—such as those who have not taken an exam for three consecutive semesters—then the dropout rates would closely mirror the scholarship loss rates. This alignment highlights a simple, non-causal correlation, but emphasizes the crucial role that financial aid plays in helping students to stay on course.

APPENDIX D. DESCRIPTIVES AND TRENDS AT UNIBO

D.1 Descriptive statistics

Table A4 provides a detailed comparison between the treated and control groups in our study, highlighting the success of the randomization process in generating comparable groups. Each row underlines important dimensions of our analysis, ranging from academic outcomes to demographic characteristics, providing a comprehensive snapshot of the baseline balance. The first six rows in Table A4 represent our dependent variables. Consistent with the findings from our empirical analysis, we observe significant differences between the two groups regarding the probability

TABLE A4 Sample balance between treated and control groups.

	Overall			Treated		Control			Delta	
	Obs.	Mean	S.D.	Mean	S.D.	Mean	S.D.	% treated	treated/ control	S.E.
Grades	5479	27.397	3.131	27.453	3.126	27.339	3.136	50.83	0.114	0.085
More than 5 credits	6331	0.900	0.301	0.910	0.286	0.889	0.314	50.40	0.021**	0.008
Scholarship	1303	0.818	0.386	0.843	0.364	0.794	0.405	49.27	0.048**	0.021
Failed exams	1737	0.491	0.737	0.464	0.719	0.517	0.755	50.37	−0.053	0.035
Credits	1737	29.480	12.068	29.635	11.720	29.321	12.415	50.37	0.314	0.579
Exams	1737	3.645	1.548	3.647	1.494	3.643	1.601	50.37	0.004	0.074
Italian citizenship	1737	0.873	0.333	0.873	0.333	0.872	0.334	50.37	0.001	0.016
ER.GO accommodation	1737	0.124	0.329	0.130	0.337	0.117	0.322	50.37	0.013	0.016
Scientific area	1737	0.086	0.280	0.085	0.278	0.087	0.282	50.37	−0.002	0.013
Technological area	1737	0.090	0.286	0.087	0.282	0.093	0.290	50.37	−0.006	0.014
Medical area	1737	0.070	0.255	0.070	0.255	0.070	0.255	50.37	0.000	0.012
Humanities	1737	0.409	0.492	0.403	0.491	0.415	0.493	50.37	−0.012	0.024
Social area	1737	0.345	0.476	0.355	0.479	0.335	0.472	50.37	0.020	0.023
Year of enrolment 1	1737	0.450	0.498	0.455	0.498	0.444	0.497	50.37	0.011	0.024
Year of enrolment 2	1737	0.374	0.484	0.366	0.482	0.382	0.486	50.37	−0.016	0.023
Year of enrolment 3	1737	0.133	0.340	0.137	0.344	0.129	0.335	50.37	0.008	0.016
Year of enrolment 4	1737	0.021	0.144	0.022	0.146	0.021	0.143	50.37	0.001	0.007
Year of enrolment 5	1737	0.022	0.148	0.021	0.142	0.024	0.154	50.37	−0.004	0.007
Graduate parents	1717	0.248	0.432	0.253	0.435	0.243	0.429	50.37	0.010	0.021
Average grade before treatment	1737	24.811	8.142	25.017	7.967	24.602	8.315	50.37	0.416	0.391
Sum of credits before treatment	1737	54.559	49.605	54.781	49.297	54.334	49.943	50.37	0.446	2.381

Notes The last two columns report the *t*-test results and the relative standard errors obtained by comparing the treated and control groups. ***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

of passing exams worth more than 5 credits and the likelihood of successfully confirming their scholarships.

In addition to academic performance, Table A4 also assesses sociodemographic factors such as citizenship, parental education, and the accommodation in public housing (accommodation) managed by the regional authority ER.GO. For instance, Italian citizenship is nearly identical between the groups, with both the treatment and control groups at 87.3%. Similarly, the proportion of students whose parents hold a university degree is comparable, at 25.3% for the treatment group versus 24.3% for the control group. Furthermore, the distribution of students across academic disciplines—ranging from science and technology to the humanities and social sciences—shows no significant imbalances. This uniformity is crucial, as it ensures that students from various academic backgrounds and socioeconomic conditions are equally represented in both groups. The robustness of this balance, reflected in the non-significant differences across most variables, provides confidence that the observed effects of the information intervention are due to the treatment itself. This balance is particularly important for interventions targeting behavioural changes, as even small imbalances could bias the results. By controlling for these potential confounders from the outset, our analysis maintains a high degree of internal validity. The balance demonstrated across academic and sociodemographic variables indicates that

TABLE A5 Sample balance between respondents and non-respondents among female students.

	Overall			Non-respondents			Respondents			Delta non-resp./	
	Obs.	Mean	S.D.	Obs.	Mean	S.D.	Obs.	Mean	S.D.	resp.	S.E.
Italian citizenship	6670	0.862	0.345	4933	0.858	0.349	1737	0.873	0.333	−0.015	0.0096
ER.GO accommodation	6670	0.110	0.312	4933	0.105	0.307	1737	0.123	0.328	−0.018*	0.0087
Scientific area	6670	0.084	0.278	4933	0.084	0.277	1737	0.086	0.280	−0.002	0.0078
Technological area	6670	0.096	0.294	4933	0.098	0.297	1737	0.090	0.286	0.008	0.0082
Medical area	6670	0.078	0.268	4933	0.081	0.272	1737	0.070	0.255	0.011	0.0075
Humanities	6670	0.409	0.492	4933	0.409	0.492	1737	0.409	0.492	−0.001	0.0137
Social area	6670	0.333	0.471	4933	0.329	0.470	1737	0.345	0.476	−0.017	0.0132
Year of enrolment 1	6670	0.360	0.480	4933	0.329	0.470	1737	0.450	0.498	−0.121***	0.0133
Year of enrolment 2	6670	0.403	0.490	4933	0.413	0.492	1737	0.374	0.484	0.039**	0.0137
Year of enrolment 3	6670	0.184	0.388	4933	0.202	0.402	1737	0.133	0.340	0.069***	0.0108
Year of enrolment 4	6670	0.030	0.171	4933	0.033	0.179	1737	0.021	0.144	0.012*	0.0048
Year of enrolment 5	6670	0.023	0.150	4933	0.023	0.151	1737	0.022	0.148	0.001	0.0042

Notes The last two columns report the *t*-test results and the relative standard errors obtained by comparing the non-respondents and the respondents groups.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

the randomization process was successful. This balance provides a solid foundation for the subsequent analysis, allowing us to confidently attribute any observed differences to the treatment itself, rather than to pre-existing biases or group differences.

One potential issue arising with this type of experiment is the self-selection of respondents; namely, the students who participated may be more sensitive to gender inequalities. To mitigate this risk, the process for inviting students was carefully designed to avoid signalling a specific focus on gender issues. The invitation framed the questionnaire as a tool for assessing the general socioeconomic status and service needs of scholars. Additional evidence can be found in Table A5, which presents descriptive statistics on observable characteristics of female scholarship students, differentiating between respondents and non-respondents. The last two columns indicate the significance of the differences between averages. The results show a higher and significant percentage of first-year students among the respondents, which is not surprising, as freshmen typically pay more attention to communications from ER.GO. However, this difference is unlikely to distort our results. Other socioeconomic characteristics reveal no significant differences between the two groups. The results are encouraging for the external validity of our analysis, although it is important to underline that this validity is limited to observable variables. There is still a potential for unobserved differences between participants and non-participants that are not captured by our administrative set of information.

D.2 Comparative enrolment trends: Italy versus Unibo

Here, we aim to provide an illustrative overview of Unibo's data, highlighting how its student body reflects the broader population of tertiary education students in Italy. In particular,

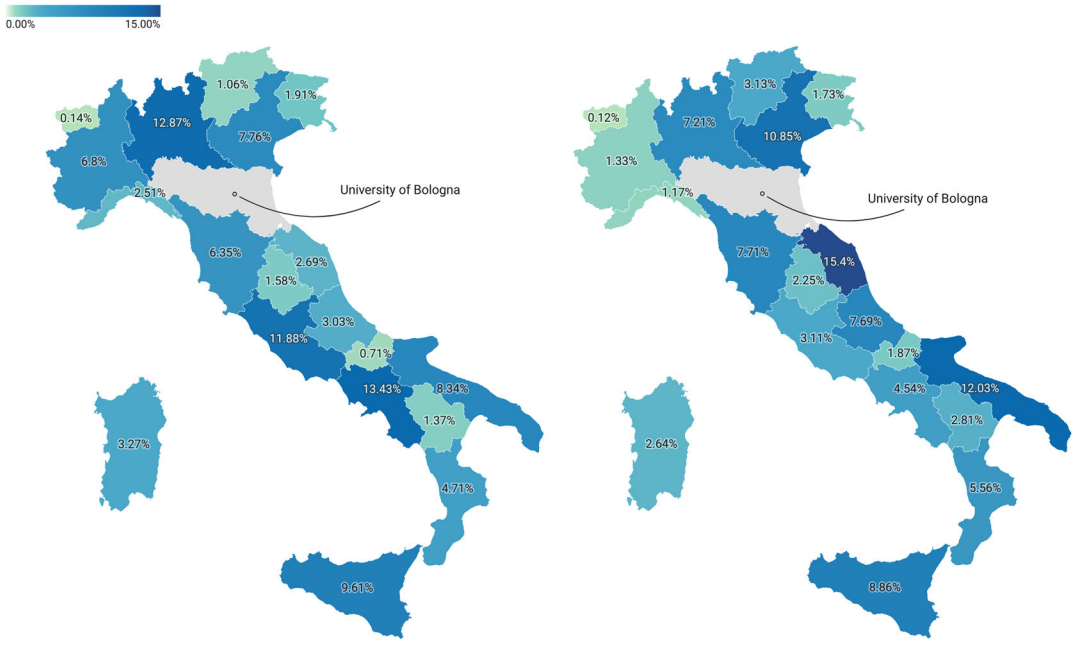

FIGURE A1 Percentage of students enrolled at university over 2010–21. *Notes*: Distributed on the basis of residence in Italy. On the left, students enrolled all over Italy; on the right, students enrolled at Unibo.

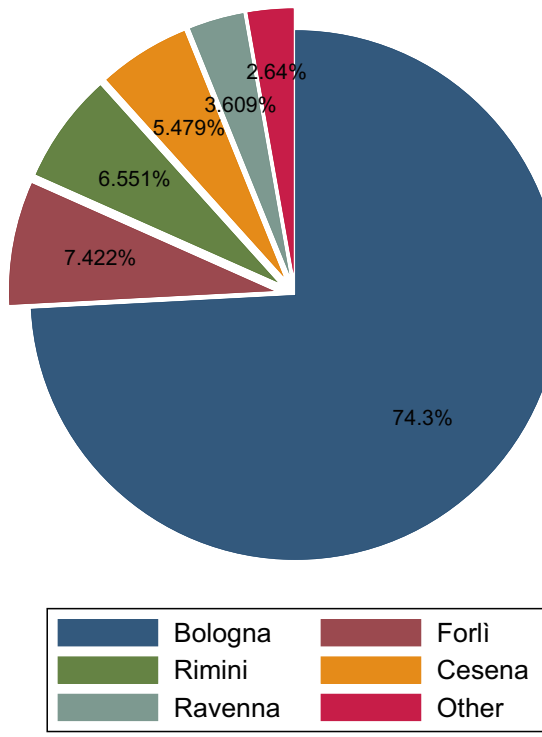

FIGURE A2 Students enrolled at Unibo and distributed among the different campuses of the University over 2010–21. The label 'Other' represents all the smaller towns where some courses of the universities are held, or the cases of students who do joint degrees with other universities in Emilia-Romagna.

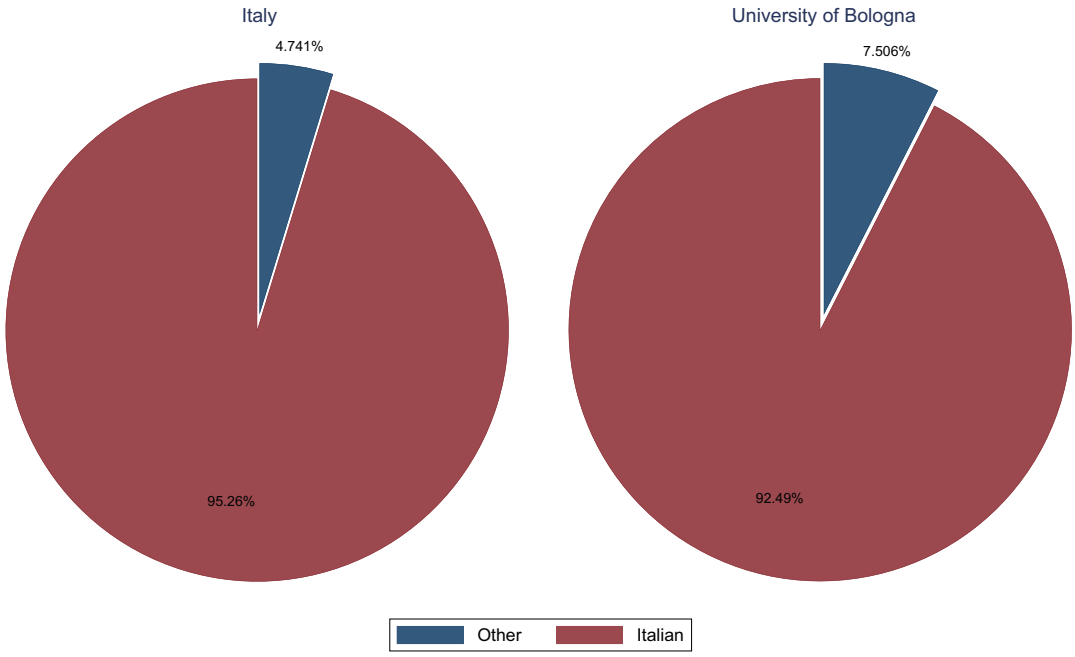

FIGURE A3 Students enrolled at university over 2010–21. *Notes*: Enrolments according to nationality: Italian in red, foreign in blue. On the left, foreign students enrolled all over Italy; on the right, foreign students enrolled at Unibo.

Figure A1 shows a comparison between the students at Unibo with those enrolled in Italy. These visuals emphasize Unibo's profile as an institution that attracts a significant number of students from outside its region, establishing it as an important educational hub for learners from across Italy. For instance, Figure A2 illustrates the distribution of student enrolment by region of residence for both the total Italian population and Unibo's students. The map on the left highlights the distribution of students throughout Italy, while the map on the right shows a nearly identical geographic distribution for students at Unibo. Although there are slight regional variations, especially in major metropolitan areas such as Milan, Turin, Rome and Naples—where university density is higher—the overall distribution of students between northern and southern Italy remains consistent.

Unibo is a very large university, with more than 80,000 students enrolled in undergraduate and postgraduate programmes. They are mainly enrolled in Bologna, but there is a certain percentage of students who carry out their educational activities on the campuses Forlí, Rimini, Ravenna and Cesena, depending on the path of the programme chosen. Figure A2 shows that about 8% of the students attend the campus at Forlí, about 6.5% at Rimini, and, to a lesser extent, Cesena and Ravenna.

Moreover, the two distributions over the last ten years are very similar from the point of view of foreign students. Among other results (available on request), we have Figure A3, which shows the percentage of foreign students enrolled in Italy and in Unibo, respectively, from 2010 to 2021. The percentages of foreigners are similar in the two distributions, with slight variations: about 5% for Italy, and about 7.5% for Unibo.

APPENDIX E. INFORMATION TREATMENT

As discussed in Section 5, students were prompted via text message and email to log into their ER.GO platform accounts to complete a questionnaire on services and background information

relevant to ER.GO interests.[22] Once students logged into their ER.GO portal accounts, they would find the link to the *Qualtrics XM* survey prepared by our research team. Within the questionnaire, it is possible to respond to questions about student background and the services managed by ER.GO. Once the questionnaire was completed, a randomly selected group of female students received the message discussed in this appendix.

Below, we present the English version of the information distributed randomly to female students at Unibo. The nudging message used in our experiment was thoughtfully crafted to highlight the tangible benefits of higher education for women, especially in narrowing gender gaps in the Italian labour market. This intervention was strategically designed to address both motivational and informational gaps that female students may face concerning the economic value of earning a university degree.

The message is structured to make the benefits of obtaining a degree not only clear, but personally relevant. By using data from ISTAT and explicitly comparing employment outcomes based on educational attainment, the message targets a key decision-making factor: the tangible economic returns of education. Highlighting statistics such as a 16.6% increase in employment rates for women with a bachelor's degree compared to those with only a high school diploma directly links the information to the recipients' future career prospects. Moreover, the message goes beyond general encouragement by quantifying the narrowing of the gender gap in employment rates, which drops from 13 percentage points to just 4 percentage points for college graduates. This precise focus aims to create a stronger personal connection for recipients, encouraging them to view their academic persistence as a pathway to greater financial independence and career success. The information treatment is as follows.[23]

> Among the major European countries, Italy has a significantly higher level of educational attainment for women than for men. The gender gap in employment opportunities at the end of education and training narrows considerably when moving from the high-school diploma to a tertiary degree.
>
> In particular, ISTAT reports that women with a bachelor's degree have, on average, a 16.6% higher employment rate than their peers with a high school diploma. This percentage increases to 42% when compared to their peers without a diploma.
>
> The gap, which is 31.7 points for those with less than a high school diploma, decreases to 20.2 points for high school graduates and 8.2 points for university graduates.
>
> The difference in the employment rate between women and men is greatly reduced by having a university degree, decreasing from 13 percentage points to only 4 percentage points.
>
> For further information: https://www.istat.it/it/files/2020/07/Livelli-di-istruzione-e-ritorni-occupazionali.pdf

From a behavioural economics perspective, this intervention makes use of concepts such as salience and social comparison. By presenting data on the benefits of higher education, the message increases the perceived value of continuing to study, especially for those who might otherwise underestimate the long-term benefits. In addition, the message implicitly invokes a form of social proof by showing that many women in Italy who attain higher levels of education experience significantly improved employment outcomes.

This seems particularly appropriate for female scholarship recipients, who often face both financial constraints and societal pressures. By presenting the benefits of education in such a concrete and data-driven way, the message aims to combat cognitive biases such as short-term thinking and underestimating future gains, which might otherwise lead to suboptimal educational decisions.

APPENDIX F. ROBUSTNESS ANALYSES

In this appendix, we present a series of robustness tables to further validate the findings discussed in the main text. Specifically, we expand Table 2 by incorporating various covariates, such as citizenship, ER.GO accommodation, type of academic degree, enrolment year, average grades, and total credits prior to treatment. Additionally, we extend our analysis to cover the entire period from February 2022 to December 2023. This broader time frame enables us to capture a more comprehensive view of the academic year, highlighting variations in student performance and scholarship retention across multiple exam sessions and key academic milestones.

In Table A6, we assess the robustness of our main results by incorporating additional available covariates. The analysis reveals that treated female students are nearly 4 percentage points more likely to retain their scholarships compared to their peers, reinforcing our primary findings. Exploring the results more closely, we observe noteworthy differences across various academic areas. For example, students in the technological and social areas demonstrate lower performance in exams, credits and grades compared to their counterparts in the scientific area, with significant negative coefficients highlighting the unique challenges faced in these disciplines. Similarly, humanities students show reduced credit accumulation, suggesting potential disparities in workload or course difficulty. Interestingly, students living in ER.GO accommodation do not exhibit significant differences in academic outcomes compared to their peers, indicating that housing support alone may not be a key factor in academic success. Second-year students perform relatively better in terms of exams and credits, while those in later years—particularly in their third and fourth years—experience a marked decline in grades and scholarship retention. This drop could reflect the cumulative pressures associated with academic progression, emphasizing the need for additional support mechanisms for upper-year students. Furthermore, the analysis also shows positive and significant coefficients of both average grades and credits before treatment.

Looking instead at Tables A7 and A8, our analysis extends the findings shown in Figure 2 across the full year of 2022. The results consistently support the positive impact of the informational treatment, particularly in enhancing student performance during key exam periods. Treated students tend to take exams with higher credits during the June session, and show a marked improvement in grades specifically during the July session. This suggests that the nudge effectively motivated students to engage more deeply with their coursework, particularly when it counted most. However, it is important to recognize that this positive impact is most pronounced within the first six months following the intervention. The treatment effect gradually diminishes, and essentially drops to zero by the end of the summer session in August. This pattern highlights a critical insight: while informational nudges can significantly influence behaviour in the short term, maybe their effects are not inherently sustained without further reinforcement. Results presented in Table A7 reveal that the informational treatment had a statistically significant positive effect on grades in the fourth period (July–August), with an increase of 0.389 points. This boost aligns with the critical academic period when students are most focused on securing the grades needed to meet scholarship requirements. Yet this improvement does not extend consistently into the subsequent periods, emphasizing the time-sensitive nature of the intervention's impact.

Table A8 reinforces these findings by showing that treated students improved their performance in more substantial exams, specifically those with over 5 credits, during the third period (May–June). This period often marks a critical phase in the academic year when students consolidate their knowledge from the second semester. The notable increase of 0.033 in the probability

TABLE A6 Performance in university—robustness with covariates.

	Scholarship (1)	Exams (2)	Credits (3)	Grades (4)
Information treatment	0.036**	0.012	0.285	0.126
	(0.018)	(0.072)	(0.568)	(0.082)
Italian citizenship	−0.039	−0.321***	−1.405	0.196
	(0.028)	(0.110)	(0.862)	(0.127)
ER.GO accommodation	0.039	0.095	0.356	−0.241*
	(0.025)	(0.104)	(0.823)	(0.134)
Technological area	−0.189***	−0.763***	−6.696***	−0.996***
	(0.051)	(0.188)	(1.434)	(0.188)
Medical area	−0.003	−0.038	−1.924	−0.483**
	(0.048)	(0.213)	(1.611)	(0.205)
Humanities	−0.065*	−0.452***	−2.798**	−0.071
	(0.036)	(0.156)	(1.209)	(0.137)
Social area	−0.102***	−0.914***	−4.460***	−1.107***
	(0.037)	(0.157)	(1.224)	(0.145)
Year of enrolment 2	−0.610***	0.395**	2.053*	−0.701***
	(0.053)	(0.156)	(1.239)	(0.159)
Year of enrolment 3	−1.247***	1.280***	9.456***	−1.738***
	(0.107)	(0.304)	(2.496)	(0.322)
Year of enrolment 4	−1.557***	1.296***	11.710***	−1.836***
	(0.175)	(0.495)	(4.115)	(0.495)
Year of enrolment 5		2.182***	11.781**	−1.701***
		(0.637)	(4.840)	(0.601)
Average grade before treatment	0.007***	0.015***	0.139***	0.072***
	(0.001)	(0.005)	(0.041)	(0.006)
Sum of credits before treatment	0.010***	−0.008***	−0.059***	0.009***
	(0.001)	(0.003)	(0.021)	(0.003)
Constant	0.644***	4.152***	31.169***	25.992***
	(0.049)	(0.201)	(1.558)	(0.202)
R^2	0.312	0.071	0.045	0.070
Observations	1303	1737	1737	5479

Notes OLS and linear probability estimates. We do not consider in the analysis scholarship students enrolled in the last year of university, since they usually do not have exams in the last period. The base level for the variable 'Type of academic degree' is 'Scientific area'; the base level for the variable 'Year of enrolment' is 'Year of enrolment 1'. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

of passing these larger, more demanding exams suggests that the informational nudge effectively motivated students to tackle more challenging coursework. However, the impact does not extend beyond this time frame, highlighting the need for ongoing engagement strategies to maintain these initial positive effects.

Exams with higher credit values require greater preparation, making success in these assessments a strong indicator of student commitment and academic effort. The increased likelihood of passing these exams underscores the potential of the nudge to encourage students to not only engage with their studies but also excel in areas that carry more weight in their overall academic progress.

TABLE A7 Grades throughout the period from February 2022 to December 2022.

Period	First (1)	Second (2)	Third (3)	Fourth (4)	Fifth (5)	Sixth (6)
Information treatment	0.136	0.090	−0.053	0.389**	−0.217	−0.013
	(0.222)	(0.234)	(0.117)	(0.179)	(0.242)	(0.267)
Constant	27.183***	27.849***	27.543***	26.858***	26.867***	27.710***
	(0.165)	(0.173)	(0.082)	(0.127)	(0.175)	(0.181)
R^2	−0.001	−0.002	−0.000	0.003	−0.000	−0.002
Observations	824	554	2700	1401	803	567

Notes OLS estimates. First period, Jan–Feb; second period, Mar–Apr; third period, May–Jun; fourth period, Jul–Aug; fifth period, Aug–Oct; sixth period, Nov–Dec. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

TABLE A8 Probability of passing an exam over 5 credits throughout the period from February 2022 to December 2022.

Period	First (1)	Second (2)	Third (3)	Fourth (4)	Fifth (5)	Sixth (6)
Information treatment	−0.024	0.039	0.033***	0.017	0.024	−0.014
	(0.018)	(0.024)	(0.011)	(0.014)	(0.021)	(0.027)
Constant	0.926***	0.879***	0.871***	0.906***	0.873***	0.836***
	(0.012)	(0.019)	(0.008)	(0.010)	(0.015)	(0.019)
R^2	0.001	0.003	0.002	0.000	0.000	−0.001
Observations	966	659	3165	1541	937	783

Notes Linear probability estimates. First period, Jan–Feb; second period, Mar–Apr; third period, May–Jun; fourth period, Jul–Aug; fifth period, Aug–Oct; sixth period, Nov–Dec. Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

APPENDIX G. HETEROGENEITY ANALYSIS

In this appendix, we expand our analysis to investigate how the effectiveness of the informational treatment varies based on specific student characteristics, such as family background, years of enrolment, and the type of university programme that they are pursuing. By examining these dimensions, we aim to uncover the subtle effects of the nudge across different subgroups within the student population. Tables A9, A10 and A11 provide insights into how these factors influence responses to the informational intervention. Specifically, we employ two distinct empirical strategies to analyse the heterogeneity of our main results. For clarity, we will explain our two methodologies using the analysis of family background as an example; the same approach applies to the other two variables examined.

First, we have

$$Y_i = \delta + \beta_1\ Info_i \times [GradPar_i = 1] + \beta_2\ Info_i \times [GradPar_i = 0] + \beta_3\ GradPar_i + \theta_i, \qquad \text{(G1)}$$

where Y_i represents the outcome variable for student i, $Info_i$ indicates the information treatment, and $GradPar_i$ (indicating graduate parents) is equal to 1 for students where at least one parent holds a bachelor's degree, and 0 otherwise. In this formal model, the coefficients of interest are β_1 and β_2. Here, θ_i is the robust error term. Coefficient β_1 measures the average effect of the treatment

TABLE A9 Heterogeneity analysis by parental education.

	Grades	Scholarship
	(1)	(2)
No graduate parents × Information treatment	0.079	0.053**
	(0.099)	(0.026)
Graduate parents × Information treatment	0.202	0.016
	(0.165)	(0.038)
Graduate parents	0.293**	0.076**
	(0.142)	(0.034)
Constant	27.283***	0.777***
	(0.070)	(0.019)
R^2	0.003	0.008
Observations	5418	1286
Graduate parents × Information treatment	0.123	−0.037
	(0.193)	(0.046)
Information treatment	0.079	0.053**
	(0.099)	(0.026)
Graduate parents	0.293**	0.076**
	(0.142)	(0.034)
Constant	27.283***	0.777***
	(0.070)	(0.019)
R^2	0.003	0.008
Observations	5418	1286

Notes OLS and linear probability estimates. We do not consider in the analysis scholarship students enrolled in the last year of university, since they usually do not have exams in the last period. Coefficients shown in the upper part of the table are the results of equation (G1), while coefficients in the lower part are the results of equation (G2). Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

for students with at least one graduate parent, and β_2 indicates the effect of the treatment for first-generation students. Thus this method allows us to discern the effect of the treatment among different social and demographic groups.

Second, our interest is also to test for the significance of the differences in the treatment coefficients between groups. For this aim, we simply interact $Info_i$ with $GradPar_i$ by changing the previous model as follows:

$$Y_i = \delta + \beta_2\ Info_i + \beta_3\ GradPar_i + \beta_4\ Info_i \times [GradPar_i = 1] + \theta_i. \tag{G2}$$

Among the variables considered, the only difference between the two equations is that in equation (G1), the variable $Info_i$ is interacted with both values of $GradPar_i$. In contrast, equation (G2) omits one value (the case where neither parent has graduated) and instead includes the variable $Info_i$ without interaction. This approach allows β_2 to measure the effect of the treatment for students with non-graduate parents, as in equation (G1), while β_4 captures the difference in treatment effects between the two groups. Consequently, Tables A9, A10 and A11 present the complete results of equation (G1) and β_4, as the other coefficients are identical.

Table A9 reveals that the information treatment significantly increases the likelihood of scholarship retention for first-generation students. This result is in line with previous findings, and highlights the critical role of targeted support for those from educationally disadvantaged backgrounds. These students are likely to face greater challenges in navigating higher education, and

TABLE A10 Heterogeneity analysis by year of enrolment.

	Grades	Scholarship
	(1)	(2)
Year of enrolment 1 × Information treatment	0.069	0.080***
	(0.125)	(0.025)
Year of enrolment 2 × Information treatment	0.358***	−0.021
	(0.138)	(0.040)
Year of enrolment 3 × Information treatment	−0.217	0.038
	(0.208)	(0.103)
Year of enrolment 1	0.047	0.005
	(0.133)	(0.033)
Year of enrolment 3	−0.179	−0.193***
	(0.174)	(0.075)
Constant	27.348***	0.806***
	(0.096)	(0.027)
R^2	0.004	0.029
Observations	5479	1303
Year of enrolment 1 × Information treatment	−0.289	0.100**
	(0.186)	(0.047)
Year of enrolment 3 × Information treatment	−0.575**	0.058
	(0.250)	(0.110)
Information treatment	0.358***	−0.021
	(0.138)	(0.040)
Year of enrolment 1	0.047	0.005
	(0.133)	(0.033)
Year of enrolment 3	−0.179	−0.193***
	(0.174)	(0.075)
Constant	27.348***	0.806***
	(0.096)	(0.027)
R^2	0.004	0.029
Observations	5479	1303

Notes OLS and linear probability estimates. We do not consider in the analysis scholarship students enrolled in the last year of university, since they usually do not have exams in the last period. Coefficients shown in the upper part of the table are the results of equation (G1), while coefficients in the lower part are the results of equation (G2). Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

the informational nudge appears to effectively bridge some of these gaps, enabling them to meet the academic requirements necessary to retain their scholarships.

Interestingly, as shown in Table A10, the nudge has a positive impact on the probability of scholarship retention, but this effect is significant only for first-year students, and is greater when compared to second-year students. Additionally, the effect on grades is both positive and significant for second-year students, although the coefficient differs significantly when compared to third-year students, while remaining consistent with first-year students. This pattern suggests that first-year students, who are often still adjusting to the demands of university life, may be more receptive to the motivational boost provided by the informational message. In contrast, students further along in their academic journey may have already developed their routines and strategies, making them less influenced by such interventions. Moreover, this finding indicates that

TABLE A11 Heterogeneity analysis by academic programme.

	Grades	Scholarship
	(1)	(2)
Undergraduate × Information treatment	−0.055	0.071**
	(0.127)	(0.028)
Postgraduate × Information treatment	0.162	0.021
	(0.118)	(0.035)
Single-cycle × Information treatment	0.386	−0.004
	(0.238)	(0.061)
Postgraduate	1.141***	0.073**
	(0.125)	(0.034)
Single-cycle	−0.021	−0.103**
	(0.192)	(0.047)
Constant	26.939***	0.795***
	(0.089)	(0.021)
R^2	0.036	0.032
Observations	5479	1303
Postgraduate × Information treatment	0.217	−0.051
	(0.173)	(0.045)
Single-cycle × Information treatment	0.441	−0.075
	(0.270)	(0.067)
Information treatment	−0.055	0.071**
	(0.127)	(0.028)
Postgraduate	1.141***	0.073**
	(0.125)	(0.034)
Single-cycle	−0.021	−0.103**
	(0.192)	(0.047)
Constant	26.939***	0.795***
	(0.089)	(0.021)
R^2	0.036	0.032
Observations	5479	1303

Notes OLS and linear probability estimates. We do not consider in the analysis scholarship students enrolled in the last year of university, since they usually do not have exams in the last period. Coefficients shown in the upper part of the table are the results of equation (G1), while coefficients in the lower part are the results of equation (G2). Robust standard errors in parentheses.
***, **, * indicate $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

while the treatment primarily affects first-year students' horizontal academic behaviour—such as increasing their likelihood of meeting scholarship requirements—it also has a vertical impact, particularly in the second year, where it appears to enhance academic performance as measured by grades.

In Table A11, we examine how the effectiveness of the informational treatment varies by academic programme. The analysis reveals that undergraduate students experience a positive impact from the treatment, as evidenced by a significant increase in their likelihood of confirming scholarships. However, this effect is not seen among students enrolled in single-cycle programmes (such as law or medicine) or those pursuing postgraduate degrees. While not statistically significant, this discrepancy likely reflects the differing academic pressures and expectations inherent to each programme type. Undergraduate students, who are often at the beginning of their academic

journeys and facing a steep learning curve, appear to gain the most from the nudge. For them, the informational message acts as a timely reminder of the tangible rewards of academic persistence, encouraging them to pursue the credits necessary to maintain their financial aid.

These results align with the broader narrative that those who benefit most from the informational treatment are students earlier in their academic careers and those from less-advantaged educational backgrounds. The significant effects observed within these groups highlight the importance of targeted interventions that address the unique needs and challenges of diverse student populations. It is evident that informational nudges can play a crucial role in levelling the playing field, particularly for students who may lack the informal support systems available to their peers from more privileged backgrounds. Overall, this analysis of heterogeneity underscores the value of precision in designing educational interventions. By identifying which subgroups respond most positively to the nudge, institutions can better allocate resources and develop programmes that effectively support students at risk of falling behind. This approach not only fosters academic success but also contributes to the broader goals of equity and inclusion in higher education. Additional results from extended heterogeneity analyses are available on request, offering further evidence of the varied impacts across student populations. These findings are essential for informing future strategies aimed at enhancing the effectiveness of informational interventions and ensuring that all students have the opportunity to succeed.