

Grade Inflation and First-Year Academic Performance in Higher Education

Caetano Leite Amorim

Dissertation

Master in Economics

Supervised by

Ricardo Biscaia

Flávia Barbosa

2026

Resumo

As classificações escolares devem fornecer um sinal comparável do desempenho académico dos estudantes, sobretudo quando contribuem diretamente para decisões de acesso ao ensino superior. Em Portugal, as classificações do ensino secundário desempenham um papel importante no acesso ao ensino superior público, a inflação de notas pode ter implicações não apenas para o acesso, mas também para o desempenho académico subsequente dos estudantes.

Esta dissertação analisa se a inflação de notas no ensino secundário português está associada ao desempenho no primeiro ano na Universidade do Porto. Utilizando dados administrativos de estudantes que ingressaram entre 2013 e 2019, o desempenho académico é medido através de dois resultados complementares: a média do primeiro ano e o número de ECTS concluídos. A inflação de notas é medida ao nível escola secundária–ano letivo. A análise empírica controla o desempenho académico prévio, características individuais, efeitos fixos de curso e efeitos fixos de ano letivo, com erros-padrão agrupados ao nível da escola secundária.

Os resultados mostram uma associação negativa consistente entre inflação de notas e desempenho académico no primeiro ano. A associação permanece negativa em cursos-ano com diferentes níveis de seletividade e é particularmente pronunciada para as classificações do primeiro ano em programas altamente seletivos.

Globalmente, os resultados sugerem que diferenças nas práticas de classificação do ensino secundário permanecem informativas após o acesso ao ensino superior. Embora a natureza observacional da análise não permita uma interpretação causal, os resultados indicam que a inflação de notas está associada ao desempenho académico subsequente e pode, por isso, ter implicações para além do seu papel no acesso ao ensino superior.

Palavras-chave

Inflação de notas; Ensino superior; Desempenho no primeiro ano; Desempenho académico; ECTS; Portugal.

Abstract

Grades are expected to provide a comparable signal of students' academic achievements, particularly when they contribute directly to admission decisions in higher education. In Portugal, where secondary-school grades play an important role in access to public higher education, grade inflation may therefore have implications not only for admission, but also for students' subsequent academic performance.

This dissertation examines whether grade inflation in Portuguese secondary education is associated with first-year performance at the University of Porto. Using administrative data for students entering between 2013 and 2019, academic performance is measured through two complementary outcomes: the first-year average and the number of ECTS completed. Grade inflation is measured at the secondary-school–academic-year level. The empirical analysis controls for prior academic achievement, individual characteristics, degree fixed effects and academic-year fixed effects, with standard errors clustered at the secondary-school level.

The results show a consistent negative association between grade inflation and first-year academic performance. The association remains negative across degree-years with different levels of selectivity and is particularly pronounced for first-year grades in highly selective programs.

Overall, the results suggest that differences in secondary-school grading practices remain informative after admission to higher education. Although the observational nature of the analysis does not allow for a causal interpretation, the findings indicate that grade inflation is associated with subsequent academic performance and may therefore have implications beyond its role in access to higher education.

Keywords

Grade inflation; Higher education; First-year performance; Academic achievement; ECTS; Portugal.

Contents

1. Introduction **1**

2. Literature Review **3**

2.1. Grade Inflation: Concept, Measurement and Consequences 3

2.2. Grade Inflation in Portugal 4

2.3. First-Year Performance in Higher Education 6

2.4. Synthesis and Research Gap 7

3. Methodology **9**

3.1. Research Questions 9

3.2. Data Sources and Sample Construction 9

3.3. Outcome Variables 11

3.3.1. First-Year Average 11

3.3.2. ECTS Completed in the First Year 13

3.3.3. Relationship Between the Two Outcomes 14

3.4. Main Explanatory Variable: Net Grade Inflation 14

3.5. Prior Academic Achievement 16

3.6. Control Variables and Fixed Effects 17

3.7. Empirical Strategy 18

4. Results and Discussion **20**

4.1. Baseline Analytical Results 20

4.1.1. First-Year Average 20

4.1.2. ECTS Completed 21

4.1.3. Comparison and Interpretation of the Baseline Results 22

4.2. Heterogeneity by Degree-Year Selectivity 25

4.2.1. Estimates by Selectivity Tercile 25

4.2.2. Comparison and Interpretation of the Selectivity Pattern 28

4.3. Mathematics A as a Common External Benchmark: Evidence from Economics and Management 29

4.3.1. First-Year Average 31

4.3.2. ECTS Completed 33

4.3.3. Comparison and Interpretation 34

4.4. Robustness and Supplementary Checks 35

4.4.1. Alternative Measure of Prior Achievement 37

4.4.2. Minimum ECTS Requirement and Alternative Treatment of the ECTS Outcome 38

4.4.3. Alternative Measure of Grade Inflation 39

4.4.4. Directional Verification Using the Mean-Movement Measure 40

5. Conclusion 41

References 44

Annex A. Supplementary Regression Results 46

Annex B. Alternative Grade-Inflation Indicators 59

Annex C. Supplementary Selectivity Results 61

List of Tables

Table 3.1. Sample construction and outcome-specific samples 11
Table 3.2. Descriptive statistics of first-year academic outcomes 12
Table 3.3. Secondary-school grade inflation by academic year and University unit 16
Table 4.1. Baseline regressions: First-year average 20
Table 4.2. Baseline regressions: ECTS completed 21
Table 4.3. Net grade inflation in low-selectivity degree-years 25
Table 4.4. Net grade inflation in intermediate-selectivity degree-years 26
Table 4.5. Net grade inflation in high-selectivity degree-years 27
Table 4.6. Economics–Management heterogeneity: First-year average, 2014–2019 31
Table 4.7. Economics–Management heterogeneity: ECTS completed, 2014–2019 33
Table 4.8. Robustness checks for the baseline estimates 36
Table A.1. Baseline: First-year average, secondary-school average control 46
Table A.2. Baseline: ECTS completed, secondary-school average control 47
Table A.3. ECTS ≥ 45: First-year average, admission-grade control 48
Table A.4. ECTS ≥ 45: ECTS completed, admission-grade control 49
Table A.5. ECTS ≥ 45: First-year average, secondary-school average control 50
Table A.6. ECTS ≥ 45: ECTS completed, secondary-school average control 51
Table A.7. ECTS > 45: First-year average, admission-grade control 52
Table A.8. ECTS > 45: ECTS completed, admission-grade control 53
Table A.9. ECTS > 45: First-year average, secondary-school average control 54
Table A.10. ECTS > 45: ECTS completed, secondary-school average control 55
Table A.11. ECTS capped at 60: Alternative prior-achievement controls 56
Table A.12. Economics–Management heterogeneity: First-year average, complete cases 2013–2019 57
Table A.13. Economics–Management heterogeneity: ECTS completed, complete cases 2013–2019 58
Table B.1. Share classified as relatively inflated 59
Table B.2. Mean movement: Verification of direction and scaling 60
Table C.1. Low selectivity: Secondary-school average control 61
Table C.2. Intermediate selectivity: Secondary-school average control 62
Table C.3. High selectivity: Secondary-school average control 63
Table C.4. Pooled selectivity interactions: Full sample 64
Table C.5. Pooled selectivity interactions: At least 20 observations per degree-year 65
Table C.6. Pooled selectivity interactions: At least 30 observations per degree-year 66

List of Figures

Figure 3.1. Distribution of the first-year average 12
Figure 3.2. Distribution of ECTS completed in the first year 13

1. Introduction

Grades summarise academic achievement and provide information used to allocate educational opportunities. Their comparability is therefore particularly important when school-assigned grades contribute to a competitive admission process. Relative grade inflation raises concern when higher internal grades are not matched by corresponding differences in externally assessed achievement: the same recorded grade may convey different information about preparation depending on the school in which it was awarded (Nata et al., 2014; Silva et al., 2025).

This issue is especially relevant in Portugal, where secondary-school achievement and national entrance examinations jointly determine candidates' admission grades, with program-specific requirements and weights (Silva et al., 2026). Portuguese evidence documents systematic differences between internal grades and examination performance and shows how grading differences can influence access when small changes in admission scores alter applicants' rankings (Nata et al., 2014; Neves et al., 2017). Silva et al. (2025) develop a relative, equipercentile approach that compares students' positions in internal-grade and examination distributions, reducing dependence on differences in examination difficulty across subjects and years.

A separate question is whether the relevance of grade inflation ends at admission. If internal grades overstate preparation relative to externally assessed performance, they may provide an imperfect signal of readiness for university study. Despite its relevance, this post-admission question has received less attention in the Portuguese grade-inflation literature, which primarily examines the distribution of grading advantages and their implications for access (Nata et al., 2014; Neves et al., 2017; Silva et al., 2025).

Grade-based achievement and credit accumulation should be distinguished: they measure performance in assessed coursework and progression through the curriculum, respectively (Pike & Saupe, 2002; van der Zanden et al., 2018; van Rooij et al., 2018). Both school grades and examination results predict university performance, although their relative importance varies across programs and levels of selectivity (Silva et al., 2026).

Against this background, the dissertation asks: how is grade inflation in secondary education associated with academic performance during the first year of higher education? The analysis considers two outcomes at the University of Porto: the student's first-year

average and the number of ECTS completed during the first year. The corresponding hypotheses are that greater measured grade inflation is associated with a lower first-year average and with fewer completed ECTS, conditional on prior academic achievement and the remaining observed characteristics.

The analysis links anonymized University of Porto records for 2013–2019 to school-year net grade inflation. Models control alternatively for admission grade and the secondary-school average, together with sex, age, displaced-student status, scholarship status, degree fixed effects and academic-year fixed effects. Standard errors are clustered at the secondary-school level. The estimates are interpreted as conditional associations rather than causal effects.

It also examines heterogeneity by degree-year selectivity, measured by the mean admission grade within each degree-year, and uses the programs of Economics and Management to assess the role of Mathematics A as a common external benchmark. These extensions recognise differences in program contexts and in the predictive content of prior achievement across admission environments (Ferrão & Almeida, 2019; Silva et al., 2026). More specifically, they address whether the association between net grade inflation and first-year performance varies across low, intermediate and high levels of selectivity and, among Economics and Management students, how that association changes after controlling for Mathematics A examination performance and whether it differs between the two programs.

This dissertation contributes by extending the study of Portuguese grade inflation beyond admission outcomes to performance after entry into higher education.

2. Literature Review

This review brings together three strands: the concept, measurement and consequences of grade inflation; evidence from Portuguese secondary education; and first-year performance in higher education. Together, they motivate the question of whether secondary-school grading practices remain associated with performance after university admission.

2.1. Grade Inflation: Concept, Measurement and Consequences

Higher grades do not, by themselves, establish that grading standards have become more lenient. Average grades may rise because students learn more, student composition changes, or curricula and assessments evolve. The empirical challenge is to distinguish these changes from increases in grades that are not matched by comparable improvements in the achievement they are intended to represent.

Pattison et al. (2013) frame grade inflation as a concern about grades' signaling capacity rather than a mechanical rise in their mean. Grades are informative when they retain a meaningful relationship with academic skills and subsequent outcomes. Using four nationally representative US cohorts, the authors find that grades changed over time but their signaling power attenuated relatively little. Their results caution against interpreting any upward movement as inflation and emphasise the need for an external or outcome-based benchmark.

Tyner and Gershenson (2020) distinguish static, dynamic and differential grade inflation. Static inflation is a contemporaneous gap between assigned grades and an external measure of achievement; dynamic inflation concerns changes in that gap over time; differential inflation describes systematic grading differences across students, schools or other groups. A school can therefore grade relatively generously without becoming more lenient over time, and differences between groups can persist while aggregate grades remain stable.

Standardised examinations provide a common benchmark for students whose internal grades are assigned by different teachers or schools. This comparison nevertheless has limitations: external tests may contain measurement error, cover different material from classroom assessments, and vary in difficulty across subjects and years. They are informative benchmarks rather than perfect measures of underlying ability.

Wikström and Wikström (2005) examine Swedish upper-secondary schools by comparing final school grades with Swedish Scholastic Assessment Test performance. They find modest grade inflation associated with intra-municipal competition and substantially more generous grading in independent schools. Their findings suggest that grading can respond to institutional incentives associated with school reputation, recruitment and students' access to higher education.

Nordin et al. (2019) study upper-secondary grade inflation in Sweden and its consequences for higher-education enrolment and earnings. The main earnings channel operates through the university attended and field chosen rather than enrolment alone. Their analysis illustrates the allocation consequences of grading differences: when admission depends on relative rank, leniency towards some students changes the opportunities available to others, with effects that can persist beyond education.

Denning et al. (2026), in an NBER working paper, link high-school records from Los Angeles and Maryland to postsecondary and earnings data. They distinguish teachers who award higher average grades from those more likely to award passing grades. Higher average grade inflation is associated with lower subsequent test scores, high-school graduation, college enrolment and earnings, whereas generous passing standards have different and more limited long-run effects. This recent working-paper evidence suggests that the form of grading leniency matters for subsequent outcomes.

The international literature therefore treats grade inflation as a problem of measurement, incentives and allocation. These dimensions are particularly relevant where locally assigned secondary-school grades carry substantial weight in competitive university admissions.

2.2. Grade Inflation in Portugal

Portugal combines school-based secondary achievement and national entrance examinations within a national admission competition. Conditional on examination performance, more generous internal grades can improve an applicant's rank relative to others competing for limited places. This makes differential grading standards consequential for access.

Nata et al. (2014) provide early evidence of systematic grading differences in Portugal. Independent private schools award higher internal grades than other school types to students with comparable examination results. The discrepancy is especially pronounced

near the top of the grade distribution, where small differences are particularly relevant for competitive admission.

Their results connect grading standards to admission incentives and are consistent with stronger incentives for schools facing market pressures to improve students' recorded qualifications. This interpretation parallels the competition mechanism examined by Wikström and Wikström (2005), while recognising the different institutional settings.

Neves et al. (2017) connect these differences to social inequality. Their longitudinal analysis finds that fee-paying private schools inflate classifications, that this advantage improves access to higher education, and that compensatory education does not eliminate achievement gaps between disadvantaged schools and the remaining system. Unequal access to schools with different grading practices can thus reinforce existing socioeconomic differences.

Raw differences between internal grades and examination scores can be difficult to compare because examination difficulty changes across subjects and years. An absolute gap also does not establish whether a student's relative standing improves or deteriorates between the two assessments. These limitations motivate measures based on relative positions.

Silva et al. (2025) use longitudinal administrative data covering Portuguese upper-secondary students over ten years. They compare each student's position in the school-grade distribution with the corresponding range in the national-examination distribution for the same subject and year. Examination scores below this range indicate relative inflation, scores within it indicate no relative inflation, and scores above it indicate relative deflation. The method focuses on relative standing and is less dependent on differences in examination levels or difficulty.

The authors examine public, TEIP, private and private association schools. Their results qualify a simple public–private division: funding arrangements, student composition and school context are associated with different inflation patterns. They also highlight differences towards the top of the grade distribution, where classification advantages matter particularly for selective programs.

Portuguese research thus establishes differences in grading comparability, their implications for access, and a distribution-sensitive way to measure them (Nata et al., 2014; Neves et al., 2017; Silva et al., 2025). Its principal focus remains the period before admission. The

relationship between these grading environments and performance after entry is less well established.

2.3. First-Year Performance in Higher Education

The first-year performance literature provides the second part of this connection. The transition to university changes academic demands, assessment and study autonomy. Two themes are especially relevant here: academic success has several dimensions, and prior achievement predicts subsequent performance.

Van der Zanden et al. (2018) review 80 studies and distinguish academic achievement, critical-thinking development and social-emotional well-being. Prior performance, study skills, motivation, relationships and participation in first-year programs recur as predictors. Their review places prior achievement within a broader set of academic and behavioural determinants rather than treating university outcomes as exclusively institutional products.

Van Rooij et al. (2018) examine grade point average, credits obtained and intention to persist as distinct outcomes. GPA records achievement in the work contributing to the average, whereas credits capture progression. Students can therefore obtain relatively high grades while completing little coursework, or accumulate many credits with a modest average.

Pike and Saupe (2002) compare conventional regression models with approaches incorporating secondary-school context when predicting first-year college grades. Models accounting for high-school effects predict GPA more accurately, particularly for lower-ability students. School of origin can therefore supply information beyond the individual grade, consistent with differences in the meaning of common numerical grades across schools.

Cyrenne and Chan (2012) analyse students from 84 Manitoba high schools entering the University of Winnipeg between 1997 and 2002. High-school average predicts university GPA, but school effects remain after controlling for grades and individual characteristics. School and neighbourhood characteristics also influence the relationship. Although the study does not directly measure inflation, it shows why the context in which grades are awarded can improve admissions information; equal grades may reflect different combinations of preparation and grading standards.

Ferrão and Almeida (2019) use multilevel models for 2,697 first-year students in 54 programs at a Portuguese public university. They attribute 34% of first-year GPA variance to between-program differences and identify entrance score as the strongest predictor. Its association with performance also varies across programs. These findings support accounting for program differences in academic demands, grading and student composition.

Silva et al. (2020) benchmark secondary schools using the subsequent first-year outcomes of more than 10,000 students across 65 degrees at the University of Porto and the Catholic University of Porto. Their rankings differ substantially from rankings based on national-examination performance alone. University outcomes therefore provide additional information about how schools prepare students for further study.

This idea is developed further by Silva et al. (2026), who use nationwide Portuguese administrative data to compare the predictive validity of teacher-assigned secondary-school scores and national-examination scores for performance in higher education. They find that school grades are generally more accurate predictors of subsequent performance, whereas national-examination scores are noisier and become relatively more informative in highly selective programs.

Predictive validity and grading comparability are different questions. School grades can predict university performance well on average while containing systematic school-level differences. Conversely, evidence of inflation does not establish that internal grades are generally inferior to examinations as predictors. Combining these literatures makes it possible to study grading environments without assuming that either assessment perfectly measures ability.

2.4. Synthesis and Research Gap

The gap concerns the direct connection between measured secondary-school inflation and university performance in Portugal. International research links inflation to later allocation and earnings (Denning et al., 2026; Nordin et al., 2019), but does not resolve this specific post-admission question. Portuguese inflation studies primarily examine access, while performance studies investigate grades, examinations and school effects without directly measuring the grading environment.

Before admission, grading differences may affect applicants' rankings. After admission, they may reveal that equal school grades conveyed different information about preparation. First-year outcomes allow the dissertation to examine whether measured grading environments remain informative once entry has occurred.

The literature also motivates examining grades and credit accumulation separately and testing heterogeneity across admission contexts. These considerations shape the empirical analysis that follows.

3. Methodology

This chapter describes the research questions, data sources, sample construction, variable definitions, and empirical strategy used to investigate the association between grade inflation in secondary education and academic performance during the first year of higher education. The analysis is based on administrative records from the University of Porto. Because the data is observational, the empirical results are interpreted as conditional associations rather than causal effects.

3.1. Research Questions

The dissertation investigates whether and how grading practices in secondary education contain information about students' subsequent performance in higher education. The central premise is that inflated school-assigned grades may provide a less accurate signal of academic preparation. The research questions are therefore as follows.

Research Question 1. Is net grade inflation at the secondary-school–academic-year level associated with students' first-year average at the University of Porto, conditional on prior academic achievement and the remaining observed characteristics?

Research Question 2. Is net grade inflation at the secondary-school–academic-year level associated with the number of ECTS completed during the first year, conditional on prior academic achievement and the remaining observed characteristics?

Research Question 3. Does the association between net grade inflation and first-year academic performance vary across degree-years with low, intermediate, and high levels of selectivity?

Research Question 4. Among students enrolled in Economics and Management, how does controlling for Mathematics A examination performance affect the estimated association between net grade inflation and first-year academic performance, and does that association differ between the two programs?

3.2. Data Sources and Sample Construction

The main source is an anonymised University of Porto administrative database covering 2013–2019. It records degree program, faculty, academic year, secondary school, admission

information, prior achievement, first-year average, ECTS completed, and selected demographic and socioeconomic characteristics.

National examination records provide each student's associated examination scores. Examination names and subject identifiers were harmonized before merging. A third dataset contains the school-year inflation indicators based on administrative records from the Portuguese Directorate-General for Education and Science Statistics (DGEEC) and the classification developed by Silva et al. (2025). Section 3.4 describes their construction.

The unit of observation is the student–academic-year–degree record. Students may appear more than once when enrolled in different years or programs. Seven substantively identical repeated candidature rows were removed, while records with genuinely different admission information were retained. The resulting database contains 26,610 observations.

The examination merge uses student identifier, academic year and degree code and matches 26,589 of the 26,610 records. Within the academic analytical sample, 24,887 of 24,894 records match at least one harmonised examination. The school-year inflation merge uses secondary-school information and academic year, matching 25,503 of the 26,610 records. Outcome-specific validity and complete-regression-information requirements produced 19,323 observations for first-year average and 19,249 for ECTS. Table 3.1 distinguishes the construction stages and parallel outcome samples.

Table 3.1. Sample construction and outcome-specific samples

Stage or sample	Definition or change	N
University administrative records, 2013–2019	Starting database	26,617
Substantively identical repeated candidature rows	−7	26,610
Database after candidature treatment	—	26,610
Records matched to the harmonised examination database	Information merge	26,589
Academic analytical sample	Valid prior-achievement and school information	24,894
First-year-average sample	Valid first-year average	24,264
ECTS sample	Valid non-negative ECTS	24,748
First-year-average sample with controls	Complete control-variable information	20,046
ECTS sample with controls	Complete control-variable information	19,971
Final first-year-average regression sample	Complete regression information and grade-inflation match	19,323
Final ECTS regression sample	Complete regression information and grade-inflation match	19,249

Source: University of Porto administrative records and matched examination and school-year data. Notes. The examination and grade-inflation matches refer to the database of 26,610 records. Outcome-specific samples are parallel branches, not consecutive exclusions. N counts student–academic-year–degree records.

3.3. Outcome Variables

First-year performance is measured using two continuous outcomes: the first-year average and the number of ECTS completed. The use of both measures follows the distinction in the student-success literature between grade achievement and academic progression (van der Zanden et al., 2018; van Rooij et al., 2018).

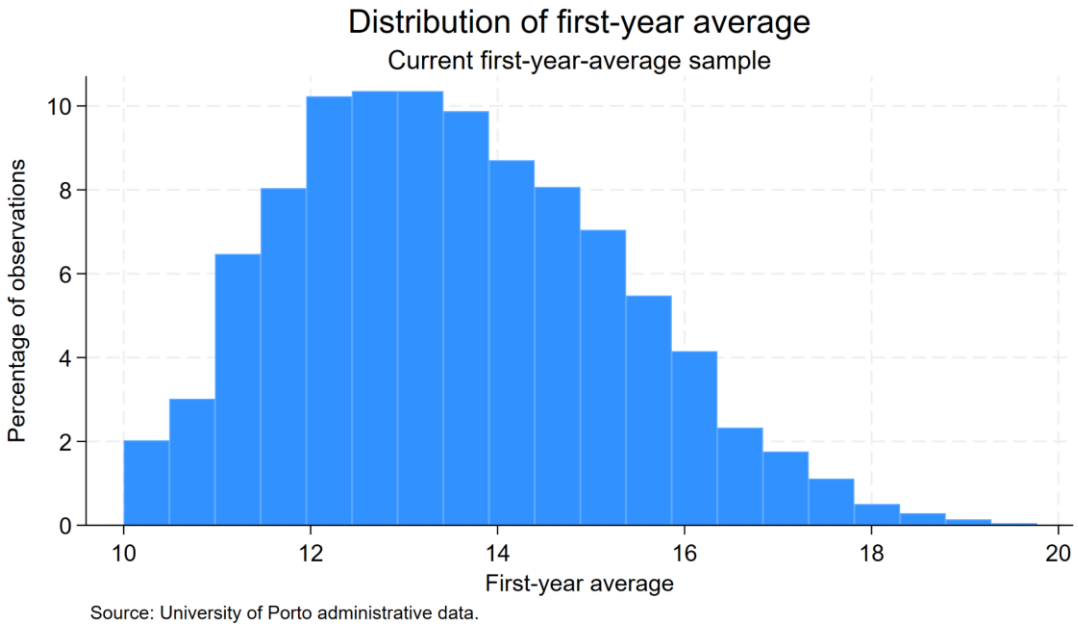
3.3.1. First-Year Average

The first outcome is the student's average grade in the first year of higher education. Portuguese higher-education grades are expressed on a 0–20 scale, with 10 representing the minimum passing grade. In the administrative data, valid observed averages range from 10.00 to 19.77. The original variable also contains administrative zeros. The audit showed that these zeros are associated with an absence of recorded academic progression and do not behave as valid grade averages; they are therefore treated as missing rather than as an observed grade of zero.

The first-year-average sample contains 24,264 valid observations. Descriptive statistics are reported in Table 3.2, while Figure 3.1 presents the distribution of the outcome. Most

observations are concentrated between approximately 12 and 15 points, and the distribution is unimodal, with progressively fewer observations towards the upper end of the scale. The variation above the minimum passing grade indicates substantial heterogeneity in academic performance, although the recorded average does not directly capture the number or severity of failed curricular units.

Figure 3.1. Distribution of the first-year average



Source: University of Porto administrative data. Sample restricted to observations with a valid first-year average (N = 24,264).

Table 3.2. Descriptive statistics of first-year academic outcomes

Outcome	N	Mean	SD	Min.	Median	Max.
First-year average	24,264	13.53	1.70	10.00	13.40	19.77
ECTS completed	24,748	48.82	16.87	0.00	60.00	99.50

Source: University of Porto administrative data. Notes. Descriptive samples contain valid outcome observations before the complete-control and grade-inflation-match restrictions. N is the number of observations; SD denotes the sample standard deviation.

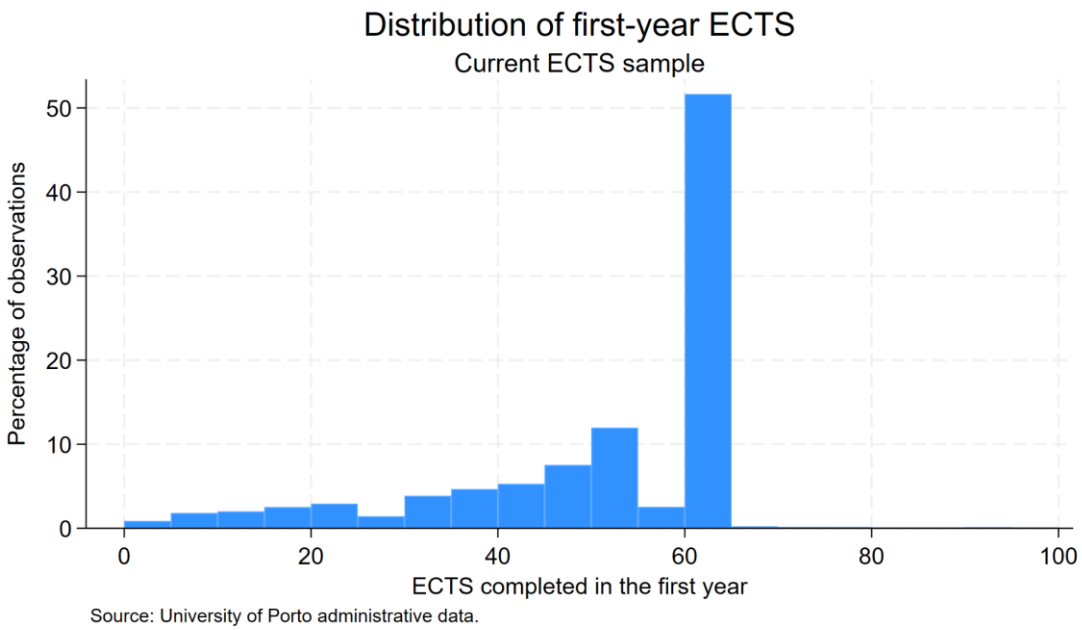
Two students may have the same recorded first-year average while having completed very different proportions of the first-year curriculum. The grade outcome should therefore be interpreted as a measure of achievement in the academic components contributing to the recorded average, rather than as a complete measure of first-year progression.

3.3.2. ECTS Completed in the First Year

The second outcome is the number of ECTS completed during the first year. The variable measures academic progression rather than the grade level obtained in completed courses. ECTS are non-negative. A standard full-time annual workload corresponds to 60 ECTS, but 60 is not imposed as a hard maximum because students may complete additional, credited or program-specific coursework. In the observed data, the variable ranges from 0 to 99.5 ECTS.

Zero ECTS is retained as a valid outcome because it identifies students who completed no credits during the year. The ECTS sample therefore contains 24,748 observations, including 632 zero-credit records. The 418 observations above 60 ECTS are retained in the baseline analysis. The distribution is strongly concentrated at 60 ECTS indicating that a share of students complete all the standard first-year workload. Consequently, ECTS completed provides relatively limited differentiation among students progressing normally, with much of its variation arising from the smaller group completing substantially fewer credits.

Figure 3.2. Distribution of ECTS completed in the first year



Source: University of Porto administrative data. Sample includes valid non-negative ECTS values, including zero (N = 24,748).

3.3.3. Relationship Between the Two Outcomes

The common outcome sample contains 24,118 observations. The Pearson correlation between first-year average and ECTS is 0.476 and the Spearman correlation is approximately 0.564. Students with higher grades tend to complete more credits, but substantial variation remains independent. The average is retained as the primary measure of achievement and ECTS as a complementary measure of progression. Restricting the common sample to positive ECTS removes six observations and leaves both correlations unchanged to three decimal places.

3.4. Main Explanatory Variable: Net Grade Inflation

The main explanatory variable is net grade inflation at the secondary-school–academic-year level. Its construction builds on the relative grade-inflation classification developed by Silva et al. (2025), which compares students' relative positions in the distributions of school-assigned grades and national examination results rather than relying on the absolute difference between the two scores. The classification follows an equipercentile logic. Each internal grade is located in the school-grade distribution for its subject and academic year. The corresponding percentile interval is identified in the national-examination distribution for the same subject and year. An examination score below this interval indicates relative inflation, a score within it indicates no relative inflation, and a score above it indicates relative deflation. For example, if an internal grade lies between the 80th and 85th percentiles and the corresponding examination interval is 15–16, an examination score of 14 is classified as relatively inflated. Scores within 15–16 are unchanged, while scores above 16 are relatively deflated. The measure compares relative positions rather than absolute score differences. The underlying classifications and the corresponding counts of relatively inflated, aligned and deflated student–examination observations by school, year and examination were provided for this study

The individual student-exam inflation classifications are subsequently aggregated at the secondary-school–academic-year level, in order to provide an indicator of inflation at this level. Net grade inflation is defined as:

$$GI_{st} = \frac{N_{st}^{\text{inflated}} - N_{st}^{\text{deflated}}}{N_{st}^{\text{total}}} \tag{3.1}$$

The numerator is the number of relatively inflated student–examination observations minus the number relatively deflated in secondary school s and academic year t. The denominator includes all classified observations, including those showing no relative inflation. Positive values indicate more inflation than deflation; negative values indicate the reverse. The indicator is a net balance rather than a probability and ranges from −1 to 1, or −100 to 100 percentage points. Zero indicates equal inflation and deflation shares, not necessarily the absence of either.

Each university record receives the indicator for its secondary school and academic year, measured before the university outcomes. In the regressions, the raw indicator is multiplied by 10: one regression unit therefore corresponds to a 0.1-unit, or 10 percentage-point, increase in the underlying measure.

An alternative indicator is the share classified as relatively inflated, calculated without subtracting deflation. Table 3.3 describes both measures in the main first-year-average regression sample (N = 19,323), weighting university records equally. Mean net inflation is 11.29 percentage points and the mean inflated share is 43.22%. Annual mean net inflation falls from 13.00 in 2013 to 9.12 in 2019, with intervening fluctuations. Across university units, it ranges from 5.93 among FBAUP students to 21.68 among FMDUP students. These differences describe students' secondary-school backgrounds, not grading practices within the University of Porto.

The supplementary analysis also uses mean movement, assigning scores of 1, 2 and 3 to relatively inflated, unchanged and relatively deflated observations, respectively, before averaging within each school-year. These category scores imply the exact identity mean movement = 2 − net grade inflation. This indicator therefore supplies an algebraic verification of direction and scaling rather than an independent measure of inflation.

Table 3.3. Secondary-school grade inflation by academic year and University unit

—	N	Net: mean	Net: SD	Share: mean	Share: SD
Full sample	19,323	11.29	24.30	43.22	12.94
Panel A: Year					
2013	2,767	13.00	25.66	44.13	13.79
2014	2,644	13.14	26.20	44.17	14.33
2015	2,721	10.82	23.89	42.91	12.59
2016	2,699	11.73	23.06	43.31	12.38
2017	2,863	10.44	23.59	42.87	12.39
2018	2,746	10.96	25.05	43.23	13.18
2019	2,883	9.12	22.34	42.01	11.74
Panel B: UP unit[1]					
FADEUP	669	10.38	25.76	42.97	13.79
FBAUP	570	5.93	21.84	40.43	11.45
FCNAUP	340	13.26	26.10	44.30	14.04
FCUP	2,998	7.82	22.65	41.43	12.02
FDUP	934	9.20	23.34	42.11	12.23
FEP	1,848	12.06	24.59	43.55	13.17
FEUP	4,719	12.60	24.49	43.85	13.07
FFUP	861	12.65	25.01	43.97	13.32
FLUP	2,867	8.64	22.00	41.85	11.70
FMDUP	311	21.68	28.18	48.94	15.41
FMUP	1,323	15.84	26.54	45.55	14.15
FPCEUP	869	8.68	22.44	41.95	11.80
ICBAS	1,014	18.36	26.76	46.89	14.40

Source: Matched administrative and school-year grade-inflation data. Notes. First-year-average regression sample, 2013–2019 (N = 19,323). Net denotes net grade inflation in percentage points; Share is the percentage classified as relatively inflated. Each university record receives equal weight. Both panels describe the same sample. Values characterise secondary schools of origin, not grading practices within University of Porto (UP) units.

3.5. Prior Academic Achievement

Controlling for prior achievement is necessary because students academic preparation can differ even when they come from similar grading environments. Without this adjustment, the inflation coefficient could partly capture pre-existing achievement differences.

Two alternative measures are expressed on the Portuguese 0–20 scale, correcting scale inconsistencies where necessary. The secondary-school average is calculated from the final grades obtained across the subjects completed in secondary education and therefore

[1] The abbreviations identify the following faculties and institutes of the University of Porto: FADEUP (Sports), FAUP (Architecture), FBAUP (Fine Arts), FCNAUP (Nutrition and Food Sciences), FCUP (Sciences), FDUP (Law), FEP (Economics), FEUP (Engineering), FFUP (Pharmacy), FLUP (Arts and Humanities), FMDUP (Dental Medicine), FMUP (Medicine), FPCEUP (Psychology and Education Sciences), and ICBAS (Biomedical Sciences).

summarises school-assigned performance across the curriculum. Because it is constructed from internally assigned grades, it may itself reflect differences in grading practices across schools, including those captured by the grade-inflation indicator, making it less directly comparable across school contexts as a measure of prior preparation. By contrast, the admission grade combines the secondary-school average with the required entrance-examination results under program-specific admission rules and therefore incorporates both internal and external assessment information.

The measures are entered in separate specifications. Admission grade already includes the secondary-school average, weighted between 50% and 65% under the admission arrangements for the observed cohorts. Including both would complicate interpretation. Comparing the alternatives instead assesses the sensitivity of the inflation coefficient to the prior-achievement adjustment.

This distinction is supported by Portuguese evidence on the predictive validity of secondary-school and examination results. Silva et al. (2026) show that school-assigned grades are generally strong predictors of subsequent performance in higher education, while national examination scores provide additional information and become relatively more relevant in highly selective programs.

3.6. Control Variables and Fixed Effects

Individual controls include sex, age, displaced-student status, and scholarship status. Displaced-student status identifies students who live away from their usual household to attend university and may capture differences in relocation, housing, and commuting circumstances that affect adjustment to university. Scholarship status indicates receiptients of a means-tested social-support grant, rather than a merit-based award, and therefore captures socioeconomic disadvantage. It may also be associated with academic progression because continued eligibility requires the successful completion of a minimum number of ECTS. Other variables potentially relevant for academic performance are motivation, academic adjustment and study strategies. These are not observed and remain possible omitted determinants.

Academic-year fixed effects account for common cohort-level changes, including assessment changes and differences in examination difficulty. Degree fixed effects account for persistent program in selectivity, curriculum, grading and expected credit accumulation.

This is relevant because the relationship between admission measures and university performance varies across programs (Ferrão & Almeida, 2019).

3.7. Empirical Strategy

Ordinary least squares (OLS) models estimate the association between school-year net grade inflation and each continuous outcome separately. The specifications add prior achievement and individual characteristics sequentially while retaining the same outcome-specific observations. Model 1 is:

$$Y_{icst} = \alpha + \beta GI_{st}^{10pp} + \delta_c + \lambda_t + \varepsilon_{icst} \quad (3.2)$$

Here, Y is the first-year average or ECTS completed by student i in degree c and academic year t, originating from secondary school s. GI is expressed in 10-percentage-point units; β is the corresponding conditional association. The terms δ and λ are degree and academic-year fixed effects, and ε is the error term. Model 1's R^2 reflects the joint contribution of inflation and the fixed effects, not inflation alone.

Model 2 adds prior achievement:

$$Y_{icst} = \alpha + \beta GI_{st}^{10pp} + \gamma P_i + \delta_c + \lambda_t + \varepsilon_{icst} \quad (3.3)$$

P denotes admission grade, the principal prior-achievement measure because it combines school and examination information and is used in admission decisions. The comparison with Model 1 assesses the association after accounting for observed academic preparation.

Model 3 introduces the remaining individual controls:

$$Y_{icst} = \alpha + \beta GI_{st}^{10pp} + \gamma P_i + X_i'\theta + \delta_c + \lambda_t + \varepsilon_{icst} \quad (3.4)$$

X contains sex, age, displaced-student status and scholarship status. All three models use the same observations within each outcome, so coefficient and R^2 changes reflect added covariates rather than sample changes. Standard errors are clustered at the secondary-school level across all specifications.

Models 2 and 3 are also estimated with the secondary-school average replacing admission grade, using the same outcome-specific samples. Admission grade remains the preferred adjustment; the alternative sequential results are reported in Annex A.

Robustness checks cap ECTS at 60 and restricts the sample separately to ECTS > 45 and ECTS ≥ 45. The thresholds are sample restrictions, not covariates. They assess the association among students completing approximately three quarters or more of a standard first-year workload and address averages potentially based on very limited coursework.

Two heterogeneity analyses examine academic context. First, selective degree-years admit students from higher and potentially narrower achievement distributions. Program requirements, peers and assessment practices can also shape performance. Prior research finds that the predictive contribution of school grades and examinations varies across programs and selectivity levels (Ferrão & Almeida, 2019; Silva et al., 2026).

Selectivity is proxied through the mean admission grade within each degree-year, calculated before final regression restrictions. Degree-years are divided into low, intermediate and high terciles, avoiding an imposed linear relationship. Checks exclude degree-years with fewer than 20 or 30 observed admission grades to assess sensitivity to imprecisely measured small groups. Because selectivity and the individual admission-grade control use related information, this heterogeneity requires careful interpretation.

The second analysis uses Economics and Management to examine Mathematics A as a common external measure of prior preparation within a relatively homogeneous academic setting. The programs belong to related fields, are offered within the same institution, and are analysed over 2014–2019, when Mathematics A is observed for all eligible students in both programs. Economics is the reference category, and the interaction between net grade inflation and the Management indicator tests whether the association differs between the two programs. Model 1 includes this interaction together with program and academic-year fixed effects. Model 2 adds the secondary-school average, Model 3 introduces the remaining individual controls, and Model 4 adds the Mathematics A examination grade. Comparing Models 3 and 4 shows whether the estimated association with net grade inflation is attenuated when this common external measure is included and how much Mathematics A contributes to explaining first-year performance. The secondary-school average is used instead of the admission grade because the latter already incorporates entrance-examination information and is strongly correlated with Mathematics A, making the examination's separate contribution more difficult to interpret.

4. Results and Discussion

4.1. Baseline Analytical Results

Tables 4.1 and 4.2 present the sequential baseline estimates for the first-year average and ECTS completed, respectively. For each outcome, Model 1 includes net grade inflation together with academic-year and degree fixed effects. Model 2 adds prior achievement measured by the admission grade, and Model 3 adds individual controls. The same outcome-specific observations are retained across all three models, allowing changes in the coefficients to be attributed to the added variables rather than to changes in sample composition. Standard errors are clustered at the secondary-school level.

4.1.1. First-Year Average

Table 4.1 reports the results for the first-year average:

Table 4.1. Baseline regressions: First-year average

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.072*** (0.017)	−0.082*** (0.020)	−0.080*** (0.018)
Admission grade	—	0.662*** (0.015)	0.667*** (0.014)
Male	—	—	−0.034 (0.023)
Age	—	—	0.003 (0.013)
Displaced student	—	—	0.000 (0.044)
Scholarship recipient	—	—	0.180*** (0.030)
Observations	19,323	19,323	19,323
School clusters	438	438	438
R^2	0.180	0.329	0.331
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Net grade inflation is negatively associated with first-year average in all three models. A 10 percentage-point increase is associated with a 0.072-point reduction in Model 1 (SE = 0.017). Adding admission grade changes the coefficient to −0.082 (SE = 0.020); adding individual controls yields −0.080 (SE = 0.018). All estimates are significant at the 1% level.

The association is therefore present before prior achievement and individual characteristics are controlled and remains similar after their inclusion.

Admission grade has coefficients of 0.662 in Model 2 and 0.667 in Model 3, both significant at 1%. R^2 increases from 0.180 to 0.329 after admission grade is introduced and to 0.331 after adding individual controls. Prior achievement supplies most of the additional explanatory contribution beyond the fixed effects and inflation in Model 1. Scholarship recipients have averages approximately 0.180 points higher than otherwise comparable students, significant at 1%. Male, age and displacement coefficients are small and not statistically distinguishable from zero.

The fully adjusted association is statistically precise but modest. Net inflation's standard deviation is 24.3 percentage points, implying an approximately 0.19-point lower average for a one-standard-deviation increase, or about 0.11 standard deviations of the outcome. This interpretation remains conditional on admission grade, individual characteristics and fixed effects.

4.1.2. ECTS Completed

Table 4.2 presents the results for ECTS completed:

Table 4.2. Baseline regressions: ECTS completed

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.464*** (0.107)	−0.503*** (0.119)	−0.485*** (0.109)
Admission grade	—	2.552*** (0.081)	2.563*** (0.084)
Male	—	—	−0.784*** (0.175)
Age	—	—	−0.222** (0.112)
Displaced student	—	—	−0.016 (0.232)
Scholarship recipient	—	—	1.289*** (0.182)
Observations	19,249	19,249	19,249
School clusters	438	438	438
R^2	0.116	0.170	0.174
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

The ECTS coefficients follow a similar pattern: −0.464 (SE = 0.107) in Model 1, −0.503 (SE = 0.119) after adding admission grade, and −0.485 (SE = 0.109) after individual controls. All are significant at 1%. The negative association with progression therefore persists across the sequential adjustments.

A one-point higher admission grade is associated with 2.563 additional ECTS in Model 3. R^2 rises from 0.116 in Model 1 to 0.170 in Model 2 and 0.174 in Model 3. Prior achievement again contributes more additional explanatory power than the remaining controls.

Male students complete approximately 0.784 fewer ECTS than otherwise comparable female students. Each additional year of age is associated with 0.222 fewer ECTS, and scholarship recipients complete 1.289 more ECTS. Displacement is not statistically associated with the outcome. These conditional associations suggest that individual circumstances are related to progression differently from recorded grades.

A 24.3 percentage-point increase in net inflation implies approximately 1.18 fewer ECTS under Model 3, equivalent to about 0.11 standard deviations of the outcome and modest relative to a standard 60-credit year. Students from more inflationary school environments therefore progress slightly less on average, conditional on the observed covariates.

4.1.3. Comparison and Interpretation of the Baseline Results

The baseline estimates provide a consistent answer for achievement and progression: higher school-year net inflation is associated with lower grades and fewer credits. The associations persist after adjustment for prior achievement and individual characteristics, while their magnitudes remain modest.

The results confirm that the two outcomes capture different dimensions of first-year performance. Model 3 explains 33.1% of the variation in the first-year average ($R^2 = 0.331$), compared with 17.4% of the variation in ECTS completed ($R^2 = 0.174$). The first-year average is treated as the primary outcome because it corresponds directly to the study's focus on academic achievement. Its stronger association with the observed measures of preparation supports this conceptual choice, although comparing R^2 across different outcomes does not by itself establish that one is a better measure. ECTS remain informative about progression, which can also reflect course-taking decisions, failed courses, program structure and other factors not captured by the available covariates (van

der Zanden et al., 2018; van Rooij et al., 2018). The control-variable results reinforce the distinction: sex and age are not significantly associated with the first-year average, but male and older students complete fewer ECTS after the other observed characteristics are held constant. Scholarship status is positively associated with both outcomes. Grades and ECTS should therefore be interpreted as complementary measures.

The central contribution of the baseline results is to extend the Portuguese evidence on grade inflation beyond access to higher education. Previous research shows that differences in school-assigned grades can affect students' positions in admission rankings and their probability of entering higher education (Nata et al., 2014; Neves et al., 2017; Silva et al., 2025). The results indicate that the relevance of the secondary-school grading environment does not necessarily end when admission decisions are completed. Students exposed to higher measured net grade inflation subsequently obtain somewhat weaker outcomes at the University of Porto, conditional on their observed admission profiles. Secondary-school grades are informative measures of prior achievement, but the context in which they are awarded may shape the information they convey. Students with similar entry grades may therefore differ in ways associated with their school of origin, which can retain predictive information about first-year university performance even after individual characteristics are considered (Cyrenne & Chan, 2012; Pike & Saupe, 2002). This contextual influence does not diminish the value of internal grades, which can capture dimensions of academic preparation that entrance examinations alone do not fully reflect (Silva et al., 2026). The present results extend this reasoning by showing that students with comparable admission profiles obtain slightly different university outcomes depending on the measured grading environment of their secondary school. The association observed after admission is therefore consistent with a broader pattern in which grading practices remain relevant for later educational and labour-market outcomes (Denning et al., 2026; Nordin et al., 2019).

The negative coefficients are consistent with an informational interpretation of grade inflation. If internal grades are inflated, and therefore overstate performance relative to a common external benchmark, they may signal a higher level of preparation than is subsequently demonstrated under university assessment. Differences that were partly obscured by secondary-school grading practices may then become visible when students enter a new academic environment. This interpretation is related to the signalling argument developed by Pattison et al. (2013), according to which the central concern is whether grades retain a stable relationship with the achievement they are intended to represent.

The findings also extend the fairness concern identified in the Portuguese literature. If differences in grading practices influence admission rankings and students admitted from more inflationary environments subsequently perform less strongly, conditional on observed prior achievement, the problem may involve both unequal treatment and potential allocative inefficiency. Applicants who lose places because of less favourable grading practices may, in principle, have been at least as well prepared for the program. The analysis does not observe the counterfactual performance of displaced applicants and therefore cannot estimate such inefficiency directly. It nevertheless identifies a post-admission pattern that is consistent with this concern. Common external examinations remain relevant in this context because they provide a shared benchmark for assessing the comparability of school-assigned grades. The results support using external assessment as a complement to internal grades, rather than treating either measure as sufficient on its own. They do not, however, identify the optimal weight that each component should receive in the admission process.

These implications for efficiency should nevertheless not be overstated. Although statistically significant, the estimated associations are modest: a one-standard-deviation increase in net grade inflation is associated with reductions of approximately 0.11 standard deviations in both outcomes. The results therefore identify a persistent statistical relationship, but do not demonstrate a substantial loss of allocative efficiency as measured by first-year performance. Prior achievement is quantitatively much more important: adding admission grade increases R^2 from 0.180 to 0.329 for the first-year average and from 0.116 to 0.170 for ECTS completed, whereas the remaining individual controls add comparatively little explanatory power. In the fully adjusted models, a one-point higher admission grade is associated with a 0.667-point higher first-year average and 2.563 additional ECTS. Prior performance is therefore the dominant observed predictor of university performance, while net grade inflation provides a smaller additional signal associated with the student's secondary-school grading environment.

Finally, the baseline estimates remain conditional associations. The fixed effects and observed controls improve comparability, but they cannot eliminate differences in motivation, study behaviour, self-regulation, academic adjustment, or other unobserved

characteristics. Net grade inflation is also a school-year-level proxy and may capture aspects of teaching, student composition, or school context in addition to grading practices.

4.2. Heterogeneity by Degree-Year Selectivity

The baseline estimates summarise the average relationship across degree programs with substantially different admission profiles. This section examines whether that relationship varies across low, intermediate, and high selectivity degree-years. As defined in the Methodology, selectivity is based on the mean admission grade of the students entering each program in each academic year and is calculated before the final regression restrictions are applied.

Tables 4.3–4.5 present the fully adjusted regressions for each selectivity group. Each table reports the estimates for the first-year average and ECTS completed, using admission grade as the measure of prior achievement. All specifications include the individual controls, academic-year fixed effects, and degree fixed effects, with standard errors clustered at the secondary-school level.

4.2.1. Estimates by Selectivity Tercile

Table 4.3. Net grade inflation in low-selectivity degree-years

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.055***	−0.521***
	(0.015)	(0.195)
Admission grade	0.548***	2.780***
	(0.023)	(0.166)
Male	−0.075*	−1.418***
	(0.040)	(0.449)
Age	0.033*	−0.140
	(0.019)	(0.255)
Displaced student	−0.081*	−0.641
	(0.049)	(0.493)
Scholarship recipient	0.136***	2.062***
	(0.047)	(0.388)
Observations	3,273	3,276
R^2	0.419	0.181
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

In low-selectivity degree-years, a 10 percentage-point increase in net grade inflation is associated with a 0.055-point reduction in the first-year average and approximately 0.521 fewer ECTS completed. Both coefficients are statistically significant at the 1% level. The negative relationship identified by the baseline regressions is therefore already present among students entering programs with comparatively lower admission grades.

Table 4.4. Net grade inflation in intermediate-selectivity degree-years

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.061***	−0.548***
	(0.016)	(0.126)
Admission grade	0.640***	2.304***
	(0.023)	(0.147)
Male	−0.101**	−0.885***
	(0.041)	(0.321)
Age	0.011	−0.455***
	(0.021)	(0.140)
Displaced student	−0.010	0.117
	(0.049)	(0.334)
Scholarship recipient	0.106***	0.688***
	(0.040)	(0.266)
Observations	6,508	6,503
R^2	0.304	0.135
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

The corresponding estimates for intermediate-selectivity degree-years are −0.061 for the first-year average and −0.548 for ECTS completed. Both remain statistically significant at the 1% level. These estimates are close to those found in the low-selectivity group, particularly for the first-year average.

Table 4.5. Net grade inflation in high-selectivity degree-years

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.098*** (0.021)	−0.442*** (0.096)
Admission grade	0.810*** (0.029)	2.812*** (0.141)
Male	0.014 (0.038)	−0.492** (0.192)
Age	−0.023 (0.022)	0.005 (0.228)
Displaced student	0.044 (0.058)	0.131 (0.275)
Scholarship recipient	0.272*** (0.047)	1.469*** (0.229)
Observations	9,542	9,470
R^2	0.265	0.115
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

In high-selectivity degree-years, a 10 percentage-point increase in net grade inflation is associated with a 0.098-point reduction in the first-year average and approximately 0.442 fewer ECTS completed. Once again, both estimates are statistically significant at the 1% level. The first-year-average coefficient is noticeably more negative than those obtained for the other two groups. The ECTS coefficient, however, is smaller in absolute magnitude than the corresponding estimates for low- and intermediate-selectivity degree-years.

The three tables consequently reveal different patterns across the two dependent variables. For the first-year average, the coefficients become progressively more negative as selectivity increases: −0.055, −0.061, and −0.098 in the low, intermediate, and high selectivity groups, respectively. For ECTS completed, the coefficients are −0.521, −0.548, and −0.442, showing little variation between the three levels. The negative association is therefore present throughout the higher education admission distribution, but only the first-year average displays an ordered relationship with selectivity.

Admission grade is positively associated with both outcomes in every group. Its grade coefficient rises from 0.548 to 0.640 and 0.810 across the low, intermediate and high groups, although these differences are not formally tested here. Grade-model R^2 values are 0.419, 0.304 and 0.265; while for ECTS R^2 values are 0.181, 0.135 and 0.115. The models therefore explain a larger share of grade variation for the low selective degrees at the

University of Porto. Male students complete fewer ECTS in all groups, while their grade coefficients are not consistent across selectivity levels. Scholarship coefficients are positive for both outcomes, and displacement coefficients are insignificant at 5%.

4.2.2. Comparison and Interpretation of the Selectivity Pattern

The separate regressions show that the association between net grade inflation and first-year performance is negative within each selectivity group. Formal evidence of heterogeneity, however, comes from the pooled interaction models reported in Annex C, Table C.4. For the first-year average, the association in the high-selectivity group differs significantly from those in both the low-selectivity group ($p = 0.001$) and the intermediate-selectivity group ($p < 0.001$), whereas the latter two do not differ from each other ($p = 0.787$). The pattern is therefore concentrated in the high-selectivity group rather than reflecting a continuous increase across all three levels. Its magnitude nevertheless remains moderate: the high–low difference corresponds to approximately 0.10 grade points for a one-standard-deviation increase in net grade inflation. For ECTS completed, none of the pairwise differences is statistically significant, providing no evidence that the association with academic progression varies systematically with selectivity.

A possible explanation for the stronger grade association in highly selective degree-years concerns the role of secondary-school classifications in competitive admission. Places in these programs are more difficult to obtain, and relatively small differences in admission grades can alter applicants' rankings. Consequently, any advantage arising from more generous school-assigned grades may be particularly relevant for students seeking access to highly selective programs. Families targeting these programs may have stronger incentives to position themselves in school environments perceived as favourable to competitive grades, while schools facing such demand may also experience stronger incentives to improve students' recorded classifications.Portuguese evidence show that grading advantages are especially consequential near the top of the achievement distribution and are unevenly distributed across school contexts (Nata et al., 2014; Neves et al., 2017; Silva et al., 2025).

If students from more inflationary grading environments enter highly selective programs with admission grades that provide a less precise indication of their academic preparation, the difference may become visible when they are assessed under university conditions. This mechanism would be consistent with a stronger negative association between net grade

inflation and first-year grades in the high-selectivity group. It also relates to evidence that national examination performance becomes relatively more informative in highly selective programs, where school-assigned grades may provide less differentiation among applicants with similarly strong admission profiles (Silva et al., 2026). The present analysis cannot determine whether family positioning, school incentives, or differences in preparation generate the observed pattern, but the results are consistent with these mechanisms.

The absence of a comparable selectivity pattern for ECTS does not necessarily contradict the result for the first-year average. Grades provide a relatively continuous measure of achievement under university assessment, whereas ECTS primarily record whether curricular units were completed. Their distribution is strongly concentrated at 60 credits, and credit accumulation can additionally reflect course-load decisions, program structure, and the threshold nature of passing individual courses. Differences in preparation may therefore appear in the grades obtained without producing an equivalent ordering in the number of credits completed (van der Zanden et al., 2018; van Rooij et al., 2018).

The supplementary specifications qualify, but do not overturn, this interpretation. When the secondary-school average replaces admission grade, the grade coefficients remain ordered across the three selectivity groups, although the high–low and high–intermediate differences are significant only at the 10% level. Excluding degree-years with fewer than 20 or 30 observations produces results close to those of the preferred specification. The evidence therefore supports a stronger association with first-year grades in highly selective contexts, but not a general conclusion that the relationship increases uniformly with selectivity or extends to ECTS completed. Moreover, selectivity does not itself cause the stronger association: it also captures differences in student composition, programme demands, peer environments, and assessment practices that cannot be separately identified in the available data.

4.3. Mathematics A as a Common External Benchmark: Evidence from Economics and Management

The previous section examined heterogeneity across degree-years with substantially different admission profiles. The comparison between Economics and Management provides a narrower test in which several features of the higher education context are held relatively constant. The two programs belong to closely related academic fields, are offered

within the same institutional environment, and share an important externally assessed indicator of prior preparation through Mathematics A, which is mandatory to access both degrees. Their overlapping analytical foundations make similar associations with net grade inflation plausible. A substantial difference between the two programs would therefore suggest that the relationship varies even across closely related academic settings.

Mathematics A is the central element of this exercise. As a nationally standardised examination observed for students in both programs, it provides an individual measure of prior quantitative preparation based on a common external assessment. Its inclusion after the secondary-school average and the remaining individual controls makes it possible to examine whether the association between net grade inflation and first-year performance is partly explained by preparation revealed through this specific examination. A substantial reduction in the net-grade-inflation coefficient would suggest that Mathematics A recovers information not fully captured by school-assigned grades, whereas persistence of the coefficient would indicate that the secondary-school grading environment retains additional predictive information. This exercise evaluates the incremental informational contribution of Mathematics A and should not be interpreted as identifying a causal effect of the examination.

The analysis uses the 2014–2019 sample, for which Mathematics A is observed for all eligible students in both programs. Economics is the reference category, and the interaction between net grade inflation and the Management indicator measures the difference between the two program-specific coefficients. Model 1 includes the interaction, program fixed effects, and academic-year fixed effects. Model 2 adds the secondary-school average, Model 3 introduces the remaining individual controls, and Model 4 adds the Mathematics A examination grade. As explained in the Methodology, the secondary-school average is used instead of the admission grade because the latter already incorporates entrance-examination information and is strongly correlated with Mathematics A. Including both measures would introduce overlapping information and make it more difficult to interpret the distinct contribution of the common external examination.

4.3.1. First-Year Average

Table 4.6 presents the sequential estimates for the first-year average.

Table 4.6. Economics–Management heterogeneity: First-year average, 2014–2019

Variable or statistic	Model 1	Model 2	Model 3	Model 4
Net inflation: Economics	−0.103*** (0.024)	−0.191*** (0.024)	−0.185*** (0.023)	−0.158*** (0.023)
Management × net inflation	0.003 (0.034)	0.024 (0.032)	0.023 (0.032)	0.014 (0.031)
Secondary-school average	—	0.825*** (0.052)	0.859*** (0.050)	0.793*** (0.066)
Male	—	—	0.000 (0.090)	0.003 (0.080)
Age	—	—	−0.024 (0.078)	0.003 (0.065)
Displaced student	—	—	0.101 (0.108)	0.033 (0.107)
Scholarship recipient	—	—	0.515*** (0.113)	0.504*** (0.107)
Mathematics A grade	—	—	—	0.287*** (0.034)
Observations	1,550	1,550	1,550	1,550
School clusters	225	225	225	225
R^2	0.029	0.210	0.226	0.290
Management slope	−0.099 (0.033)	−0.167 (0.036)	−0.162 (0.034)	−0.144 (0.035)
p-value: Management slope	.003	<.001	<.001	<.001
p-value: slope difference	.924	.461	.478	.649
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Economics is the reference program. The interaction coefficient measures the difference between the Management and Economics slopes. Standard errors are clustered at the secondary-school level. All models use the same observations. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Program and academic-year fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

In Model 1, a 10 percentage-point increase in net grade inflation is associated with a 0.103-point reduction in the first-year average among Economics students. The corresponding coefficient for Management is −0.099. The estimated difference between the two coefficients is only 0.003 points and is not statistically significant ($p = 0.924$). The negative association is therefore present in both programs before differences in prior achievement and individual characteristics are considered.

Adding the secondary-school average increases the magnitude of the estimated coefficients to −0.191 in Economics and −0.167 in Management. The difference between them

remains statistically insignificant ($p = 0.461$). The introduction of the individual controls in Model 3 produces coefficients of -0.185 and -0.162, respectively, without materially changing their relationship ($p = 0.478$).

The complete specification provides the most informative comparison because it incorporates both the secondary-school average and a common external measure of academic preparation. After Mathematics A is added, the estimated coefficient is -0.158 for Economics and -0.144 for Management. Both coefficients remain negative and statistically significant at the 1% level. Their difference is 0.014 points and is not statistically significant ($p = 0.649$). The result is therefore not an absence of an association within either program. Rather, it indicates that there is no evidence that the association differs between them.

The two prior-achievement measures contribute independently to the explanation of first-year performance. In Model 4, a one-point increase in the secondary-school average is associated with a 0.793-point increase in the first-year average, while a one-point increase in Mathematics A is associated with an additional increase of 0.287 points. Both coefficients are statistically significant at the 1% level. Internal grades and the external examination therefore capture related but distinct information about students' preparation.

The evolution of model fit reinforces this interpretation. The R^2 increases from 0.029 in Model 1 to 0.210 when the secondary-school average is included. It rises to 0.226 after the individual controls are added and to 0.290 following the inclusion of Mathematics A. The 6.4 percentage-point increase between Models 3 and 4 shows that the common examination contributes meaningful information about first-year achievement beyond students' overall secondary-school performance. Nevertheless, accounting for that additional information does not reveal a difference in the association with net grade inflation between the two programs.

4.3.2. ECTS Completed

Table 4.7 reports the corresponding estimates for ECTS completed.

Table 4.7. Economics–Management heterogeneity: ECTS completed, 2014–2019

Variable or statistic	Model 1	Model 2	Model 3	Model 4
Net inflation: Economics	−0.395*** (0.127)	−0.629*** (0.136)	−0.598*** (0.128)	−0.526*** (0.135)
Management × net inflation	−0.105 (0.193)	−0.048 (0.193)	−0.056 (0.188)	−0.079 (0.186)
Secondary-school average	—	2.178*** (0.217)	2.221*** (0.210)	2.051*** (0.237)
Male	—	—	−1.342*** (0.510)	−1.329*** (0.489)
Age	—	—	−0.307 (0.418)	−0.240 (0.396)
Displaced student	—	—	−0.320 (0.533)	−0.491 (0.527)
Scholarship recipient	—	—	1.793*** (0.483)	1.753*** (0.482)
Mathematics A grade	—	—	—	0.757*** (0.150)
Observations	1,551	1,551	1,551	1,551
School clusters	225	225	225	225
R^2	0.028	0.075	0.088	0.105
Management slope	−0.500 (0.170)	−0.677 (0.175)	−0.653 (0.167)	−0.605 (0.168)
p-value: Management slope	.004	<.001	<.001	<.001
p-value: slope difference	.589	.805	.767	.672
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Economics is the reference program. The interaction coefficient measures the difference between the Management and Economics slopes. Standard errors are clustered at the secondary-school level. All models use the same observations. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Program and academic-year fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

The ECTS results lead to the same conclusion. In Model 1, a 10 percentage-point increase in net grade inflation is associated with approximately 0.395 fewer ECTS among Economics students and 0.500 fewer ECTS among Management students. Although the Management coefficient is larger in absolute terms, the estimated difference of −0.105 ECTS is not statistically significant (p = 0.589). The program-specific coefficients become −0.629 and −0.677 after the secondary-school average is added and −0.598 and −0.653 after the remaining controls are introduced. The interaction remains statistically insignificant in both models, with p-values of 0.805 and 0.767, respectively. In Model 4, the

estimated association is −0.526 ECTS in Economics and −0.605 ECTS in Management. Both coefficients are statistically significant, but their difference remains statistically indistinguishable from zero ($p = 0.672$).

Prior achievement is also positively associated with academic progression. In the complete specification, a one-point increase in the secondary-school average is associated with approximately 2.051 additional ECTS, while a one-point increase in Mathematics A is associated with approximately 0.757 additional ECTS. The contribution of Mathematics A to model fit is nevertheless more limited than for the first-year average. Its inclusion increases the R^2 from 0.088 to 0.105, compared with an increase from 0.226 to 0.290 for the first-year average. This difference is consistent with the conceptual emphasis on grades as the primary measure of academic achievement. The complete specification explains 29.0% of its variation but only 10.5% of the variation in ECTS completed. Mathematics A also produces a substantially larger improvement in explanatory power for the first-year average. Academic grades are therefore more closely connected to the observed measures of prior preparation.

4.3.3. Comparison and Interpretation

The central result of this exercise emerges when Mathematics A is introduced in Model 4. Its inclusion increases R^2 from 0.226 to 0.290 for the first-year average and from 0.088 to 0.105 for ECTS completed, showing that the examination contributes meaningful information about prior preparation, particularly for subsequent grades. At the same time, the net-grade-inflation coefficients become only moderately less negative in both programs and remain statistically significant. Mathematics A therefore accounts for part, but not all, of the association between the secondary-school grading environment and first-year performance. The similar attenuation observed in Economics and Management, together with the insignificant interaction coefficients, also provides no evidence that this relationship differs systematically between the two programs.

The absence of statistically detectable heterogeneity is substantively plausible. Economics and Management are not two sharply contrasting educational environments. They are closely related programs within the same institution, share an externally assessed Mathematics A benchmark, and draw on overlapping quantitative and analytical preparation. These similarities reduce the number of contextual dimensions along which

the association could be expected to differ. The results therefore suggest that, within this relatively homogeneous comparison, the distinction between the two fields does not materially alter how the secondary-school grading environment is associated with first-year performance. The result does not imply that program context is generally irrelevant. The selectivity analysis covers a much wider range of admission environments and identifies a stronger association with first-year grades in highly selective degree-years. Economics and Management instead constitute a deliberately narrow comparison between related programs. The two findings are therefore compatible: heterogeneity may become visible across substantially different admission contexts without emerging between programs that share many institutional and academic characteristics.

The absence of a significant interaction should not be interpreted as proof that the coefficients are exactly equal. Statistical tests evaluate whether the observed differences can be distinguished from sampling variation, and modest program differences cannot be ruled out. The evidence nevertheless offers no basis for treating Economics and Management as having systematically different relationships with net grade inflation. The relevant conclusion is that the negative association is reproduced in both programs and remains similar after a common external measure of preparation is included.

The results are also unchanged when the analysis is repeated using complete Mathematics A cases over the 2013–2019 period (Mathematics A records are less complete in 2013). In the complete specification, the first-year average coefficients are −0.162 for Economics and −0.143 for Management, with no statistically significant difference between them ($p = 0.512$). The corresponding ECTS coefficients are −0.554 and −0.628, and their difference is also statistically insignificant ($p = 0.701$). The full estimates are reported in Annex A, Tables A.12 and A.13. The concentration of missing Mathematics A observations among Management students in 2013 therefore does not account for the main conclusion.

Taken together, the findings strengthen the generality of the baseline result within these two closely related programs.

4.4. Robustness and Supplementary Checks

The baseline analysis uses the admission grade as the preferred measure of prior achievement. This choice is supported both conceptually and empirically. The robustness analysis examines whether the main findings depend on this choice, on the number of

ECTS underlying the measurement of first-year performance, on the treatment of unusually high ECTS values, or on the way in which grade inflation is aggregated. It also verifies the direction of the estimated relationship using the mean-movement measure employed in the construction of the school-year indicators.

Table 4.8 summarises the fully adjusted robustness specifications, including the alternative prior-achievement control. All models retain the individual controls, academic-year fixed effects and degree fixed effects included in the complete baseline specification. Standard errors remain clustered at the secondary-school level. The sequential estimates and further specifications using the secondary-school average are reported in Annex A; the alternative grade-inflation indicators are reported in Annex B.

Table 4.8. Robustness checks for the baseline estimates

Panel A. First-year average

Specification	Coefficient (SE)	N	Clusters	R^2
Baseline	−0.080*** (0.018)	19,323	438	0.331
Secondary-school average	−0.123*** (0.019)	19,323	438	0.310
Share inflated	−0.147*** (0.035)	19,323	438	0.331
ECTS > 45	−0.065*** (0.018)	15,643	424	0.304
ECTS ≥ 45	−0.066*** (0.017)	15,869	424	0.306

Panel B. ECTS completed

Specification	Coefficient (SE)	N	Clusters	R^2
Baseline	−0.485*** (0.109)	19,249	438	0.174
Secondary-school average	−0.650*** (0.109)	19,249	438	0.166
ECTS capped at 60	−0.489*** (0.113)	19,249	438	0.182
Share inflated	−0.902*** (0.208)	19,249	438	0.174
ECTS > 45	−0.089*** (0.024)	15,643	424	0.094
ECTS ≥ 45	−0.099*** (0.027)	15,869	424	0.107

Notes. Standard errors clustered at the secondary-school level are in parentheses. All models include individual controls and academic-year and degree fixed effects. Admission grade is the prior-achievement control except in the secondary-school-average row. The coefficient refers to net grade inflation except in the share-inflated row; both are measured in 10-percentage-point units. Capping replaces ECTS above 60 with 60; the ECTS thresholds restrict the sample. * p < .10; ** p < .05; *** p < .01.

4.4.1. Alternative Measure of Prior Achievement

The first robustness check replaces the admission grade with the secondary-school average. Using the secondary-school average makes the net-grade-inflation coefficient more negative for both outcomes. A 10 percentage-point increase in net grade inflation is associated with a 0.123-point reduction in the first-year average, with a standard error of 0.019. The corresponding estimate for ECTS completed is −0.650, with a standard error of 0.109. Both coefficients are statistically significant at the 1% level. The comparable baseline estimates using the admission grade are −0.080 for the first-year average and −0.485 for ECTS. The negative association therefore does not depend on the use of the admission grade as the prior-achievement control.

The difference between the two specifications is substantively informative. The admission grade incorporates national examination performance and thus provides information based partly on a common external assessment. Once this broader measure of academic preparation is held constant, the remaining association between the secondary-school grading environment and first-year performance is smaller. By contrast, the secondary-school average is more connected to school-assigned achievement, leaving a larger estimated coefficient for net grade inflation. This pattern is consistent with the examination component of the admission grade recovering some of the information about academic preparation that may be obscured by differences in school grading practices. Complete sequential estimates using the secondary-school average appear in Annex A, Tables A.1 and A.2.

Model fit also supports retaining the admission grade in the preferred specification. For the first-year average, the fully adjusted R^2 is 0.331 with the admission grade and 0.310 with the secondary-school average. The corresponding values for ECTS are 0.174 and 0.166. These comparisons are based on the same outcome-specific numbers of observations. The admission grade therefore provides the stronger empirical adjustment for prior achievement, while the secondary-school-average specification demonstrates that the central result is not tied to that particular choice of control.

4.4.2. Minimum ECTS Requirement and Alternative Treatment of the ECTS Outcome

The first-year average is calculated from the courses contributing to each student's recorded average. Consequently, the same outcome may summarise a substantial part of the first-year curriculum for one student but only a small number of completed courses for another. To address this concern, the baseline regressions are repeated among students who complete at least 45 ECTS, corresponding to three quarters of the standard annual workload.

This restriction retains 15,869 observations, equivalent to approximately 82% of each baseline outcome sample. In the preferred admission-grade specification, a 10 percentage-point increase in net grade inflation is associated with a 0.066-point reduction in the first-year average, with a standard error of 0.017. The estimate remains statistically significant at the 1% level and is only moderately smaller than the baseline coefficient of −0.080. When the secondary-school average is used instead, the corresponding coefficient is −0.106, with a standard error of 0.017, and is also statistically significant at the 1% level.

The first-year-average result directly addresses the measurement concern motivating this check. The negative association remains present among students completing a substantial part of the first-year curriculum, reducing the concern that it arises solely from averages based on very few courses. For ECTS completed, the coefficient in the sample with at least 45 ECTS is −0.099 when admission grade is used and −0.154 when the secondary-school average is used. Both estimates are statistically significant at the 1% level. These coefficients should be interpreted cautiously: the restriction selects students according to progression and truncates the ECTS distribution. Their smaller magnitudes cannot therefore be interpreted directly as evidence of a weaker underlying relationship. The ECTS regressions in this subsample are primarily complementary to the first-year-average check.

The conclusions are unchanged when a strict threshold of more than 45 ECTS is applied. This excludes the 226 students who completed exactly 45 ECTS and produces a sample of 15,643 observations. In the admission-grade specifications, the coefficients are −0.065 for the first-year average and −0.089 for ECTS. The corresponding secondary-school-average estimates are −0.106 and −0.140. All remain statistically significant at the 1% level. The results consequently do not depend on whether students with exactly 45 ECTS are

included. Complete estimates for both thresholds are reported in Annex A, Tables A.3–A.10.

The upper tail is assessed separately by capping ECTS values above 60. The fully adjusted coefficient is −0.489 with admission grade and −0.653 with the secondary-school average, compared with baseline estimates of −0.485 and −0.650. The corresponding standard errors are 0.113 and 0.112, and both capped-outcome estimates are statistically significant at the 1% level. The full specifications appear in Annex A, Table A.11.

4.4.3. Alternative Measure of Grade Inflation

The baseline net-grade-inflation measure subtracts the proportion of student–examination observations classified as relatively deflated from the proportion classified as relatively inflated within each secondary-school–academic-year cell. As an alternative, the regressions use only the share classified as relatively inflated. This measure captures the prevalence of relative inflation without offsetting it against relative deflation.

Using the preferred admission-grade specification, a 10 percentage-point increase in the share classified as inflated is associated with a 0.147-point reduction in the first-year average, with a standard error of 0.035. The corresponding association with ECTS completed is −0.902, with a standard error of 0.208. Both estimates are statistically significant at the 1% level. The same conclusion emerges when prior achievement is measured using the secondary-school average. The estimated coefficients are −0.227 for the first-year average and −1.206 for ECTS completed, with standard errors of 0.036 and 0.205, respectively. These estimates are also statistically significant at the 1% level. Full results for the alternative inflation indicator are reported in Annex B, Table B.1.

The coefficient magnitudes should not be compared mechanically with those obtained using net grade inflation. Although both variables are expressed in units of 10 percentage points, they have different constructions and distributions. The relevant result is that the direction and statistical precision of the relationship are preserved. The findings therefore do not depend on subtracting relative deflation from relative inflation when constructing the school-year indicator. The share classified as inflated is not an independent source of evidence. Both indicators are derived from the same underlying classification of student–examination observations. This specification should therefore be interpreted as testing the sensitivity of the results to the aggregation of those classifications, rather than as an independent validation of the grade-inflation measure.

4.4.4. Directional Verification Using the Mean-Movement Measure

A final specification replaces net grade inflation with the mean-movement measure used during the construction and validation of the school-year indicators. As defined in the Methodology, the two variables are connected by the exact linear transformation:

$$\text{Mean movement}_{st} = 2 - \text{Net inflation}_{st} \tag{4.1}$$

Higher net grade inflation therefore corresponds mechanically to lower mean movement. Replacing one variable with the other must produce a coefficient with the same absolute magnitude and the opposite sign, while leaving the standard error, statistical significance and model fit unchanged. The estimates confirm this relationship. In the specifications controlling for admission grade, a 0.1-unit increase in mean movement is associated with a 0.080-point increase in the first-year average and 0.485 additional ECTS. The corresponding standard errors are 0.018 and 0.109. When the secondary-school average is used, the coefficients are 0.123 for the first-year average and 0.650 for ECTS, with standard errors of 0.019 and 0.109. All four estimates are statistically significant at the 1% level and are exactly equal in absolute magnitude to the corresponding net-grade-inflation coefficients.

The complete results are reported in Annex B, Table B.2. Because the relationship between the two indicators is deterministic, this exercise is not an independent robustness test. Its purpose is to verify algebraically that the direction and scaling of the main grade-inflation variable were implemented correctly.

Taken together, the robustness checks provide a consistent result. The association between net grade inflation and first-year performance remains negative when prior achievement is measured differently, when the analysis is restricted to students completing a substantial proportion of the first-year curriculum, when unusually high ECTS values are capped, and when the prevalence of relative inflation is used instead of the net measure.

5. Conclusion

This dissertation examined whether relative grade inflation in secondary education is associated with students' academic performance during their first year at the University of Porto. By linking secondary-school–year indicators of grade inflation to university administrative records, the analysis investigated whether the secondary-school grading environment remains informative about future performance after accounting for observed prior achievement, individual characteristics, and differences across degrees and academic years.

The central finding is a negative association between net grade inflation and both outcomes of first-year performance considered in the study. In the preferred specification, a 10 percentage-point increase in net grade inflation is associated with a 0.080-point reduction in the first-year average and 0.485 fewer completed ECTS. Although these differences are modest for an increase of this size, both associations are statistically significant and remain present across the alternative specifications examined. The results indicate that students with similar observed admission grades can have different subsequent academic outcomes associated with the grading environments of their secondary schools.

The comparison between measures of prior achievement provides an important qualification to this finding. Controlling for the admission grade produces smaller negative coefficients than controlling for the secondary-school average. This pattern is consistent with the examination component of the admission grade providing additional information about academic preparation beyond the secondary-school average. Nevertheless, the negative association remains after this broader measure of prior achievement is included.

The heterogeneity analysis shows that this relationship is not identical across all academic settings. For the first-year average, the negative association is stronger in highly selective degree-years, and the formal interaction tests support the differences between this group and the less selective groups. No comparable ordering is identified for ECTS completed. By contrast, the comparison between Economics and Management reveals no statistically detectable difference between their coefficients, including after Mathematics A examination performance is controlled for. These findings suggest that heterogeneity can emerge across substantially different admission contexts without necessarily appearing between closely related programs that share institutional conditions and a common external assessment benchmark.

The distinction between achievement and progression is consequently important to the interpretation of the results. The first-year average captures performance in the courses contributing to students' recorded grades, whereas completed ECTS capture advancement through the curriculum. The first-year average is the primary outcome because it corresponds more directly to the study's focus on academic achievement. Its stronger relationship with the observed measures of prior preparation and its clearer selectivity pattern complement this conceptual logic. ECTS nevertheless provide useful additional evidence about a different dimension of first-year performance.

The robustness checks reinforce the stability of the main findings. The negative associations persist when the secondary-school average replaces the admission grade, when high ECTS values are capped, and when the share classified as relatively inflated replaces net grade inflation. The negative association with the first-year average remains among students completing at least 45 ECTS and under the stricter requirement of more than 45 ECTS. This reduces the concern that the baseline result arises solely from averages based on a very limited number of completed courses.

These findings are relevant to the informational role of grades in university admissions. Differences in grading practices may complicate the comparison of applicants whose recorded achievement is similar, but whose academic preparation differs. The results therefore draw attention to the comparability of school-assigned grades and to the complementary information supplied by external assessments. They do not, however, establish an optimal weighting of school grades and examinations or quantify the consequences of alternative admission decisions. Questions of fairness and the allocation of students across programs remain important implications to investigate, rather than outcomes directly measured by this study.

Several limitations define the scope of the conclusions. The estimates describe conditional associations and do not identify a causal effect of grade inflation. Unobserved student characteristics, differences between schools, and selection into the university and its programs may contribute to the relationships observed. Moreover, the inflation indicator characterises a secondary-school–year environment; it does not measure the precise extent to which an individual student's grades overstate their preparation or establish intentional grading behaviour. The focus on one institution and on first-year outcomes also limits generalisation to other universities and to longer-term academic trajectories.

Future research could extend the analysis to additional institutions and follow students through later years, degree completion, and subsequent outcomes. Richer information on applicants, admission decisions, and academic preparation would help distinguish grading differences from student selection and school characteristics. Research designs exploiting changes in assessment or admission arrangements could also provide stronger evidence about causal mechanisms and the consequences of alternative ways of evaluating prior achievement.

Overall, this dissertation shows that the secondary-school grading environment contains information about first-year university performance beyond the information captured by observed admission achievement. Its contribution is to connect differences in the comparability of secondary-school grades with subsequent academic outcomes, while identifying the contexts in which these associations are more pronounced and the limits within which they should be interpreted.

References

Cyrenne, P., & Chan, A. (2012). High school grades and university performance: A case study. *Economics of Education Review, 31*(5), 524–542. https://doi.org/10.1016/j.econedurev.2012.03.005

Denning, J. T., Nesbit, R. L., Pope, N. G., & Warnick, M. (2026). *Easy A's, less pay: The long-term effects of grade inflation* (NBER Working Paper No. 34952). National Bureau of Economic Research. https://doi.org/10.3386/w34952

Ferrão, M., & Almeida, L. (2019). Differential effect of university entrance score on first-year students' academic performance in Portugal. *Assessment & Evaluation in Higher Education, 44*(4), 610–622. https://doi.org/10.1080/02602938.2018.1525602

Nata, G., Pereira, M. J., & Neves, T. (2014). Unfairness in access to higher education: A 11 year comparison of grade inflation by private and public secondary schools in Portugal. *Higher Education, 68*(6), 851–874. https://doi.org/10.1007/s10734-014-9748-7

Neves, T., Ferraz, H., & Nata, G. (2017). Social inequality in access to higher education: Grade inflation in private schools and the ineffectiveness of compensatory education. *International Studies in Sociology of Education, 26*(2), 190–210. https://doi.org/10.1080/09620214.2016.1191966

Nordin, M., Heckley, G., & Gerdtham, U. (2019). The impact of grade inflation on higher education enrolment and earnings. *Economics of Education Review, 73*, Article 101936. https://doi.org/10.1016/j.econedurev.2019.101936

Pattison, E., Grodsky, E., & Muller, C. (2013). Is the sky falling? Grade inflation and the signaling power of grades. *Educational Researcher, 42*(5), 259–265. https://doi.org/10.3102/0013189x13481382

Pike, G. R., & Saupe, J. L. (2002). Does high school matter? An analysis of three methods of predicting first-year grades. *Research in Higher Education, 43*(2), 187–207. https://doi.org/10.1023/a:1014419724092

Silva, M. C. A., Camanho, A. S., & Barbosa, F. (2020). Benchmarking of secondary schools based on students' results in higher education. *Omega, 95*, Article 102119. https://doi.org/10.1016/j.omega.2019.102119

Silva, P. L., DesJardins, S. L., Biscaia, R., Sá, C., & Teixeira, P. N. (2025). Public and private school grade inflation patterns in secondary education. *The B.E. Journal of Economic Analysis & Policy, 25*(2), 305–342. https://doi.org/10.1515/bejeap-2024-0136

Silva, P. L., Sá, C., & Biscaia, R. (2026). High school GPA and exam scores: Does their relevance for first-year academic performance vary with program selectivity? *Bulletin of Economic Research*. Advance online publication. https://doi.org/10.1111/boer.70053

Tyner, A., & Gershenson, S. (2020). Conceptualizing grade inflation. *Economics of Education Review, 78*, Article 102037. https://doi.org/10.1016/j.econedurev.2020.102037

van der Zanden, P. J. A. C., Denessen, E., Cillessen, A. H. N., & Meijer, P. C. (2018). Domains and predictors of first-year student success: A systematic review. *Educational Research Review, 23*, 57–77. https://doi.org/10.1016/j.edurev.2018.01.001

van Rooij, E. C. M., Jansen, E. P. W. A., & van de Grift, W. J. C. M. (2018). First-year university students' academic success: The importance of academic adjustment. *European Journal of Psychology of Education, 33*(4), 749–767. https://doi.org/10.1007/s10212-017-0347-8

Wikström, C., & Wikström, M. (2005). Grade inflation and school competition: An empirical analysis based on the Swedish upper secondary schools. *Economics of Education Review, 24*(3), 309–322. https://doi.org/10.1016/j.econedurev.2004.04.010

Annex A. Supplementary Regression Results

This annex reports the sequential baseline specifications using the secondary-school average, the minimum-ECTS checks, the alternative treatment of ECTS above 60, and the Economics–Management comparison using complete Mathematics A cases for 2013–2019. Tables A.1–A.10 retain the same observations across Models 1–3 within each table. Model 1 includes net grade inflation and fixed effects; Model 2 adds the indicated prior-achievement measure; Model 3 adds individual controls.

Table A.1. Baseline: First-year average, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.072*** (0.017)	−0.125*** (0.021)	−0.123*** (0.019)
Secondary-school average	—	0.576*** (0.015)	0.590*** (0.014)
Male	—	—	0.050** (0.025)
Age	—	—	0.009 (0.013)
Displaced student	—	—	0.045 (0.046)
Scholarship recipient	—	—	0.219*** (0.031)
Observations	19,323	19,323	19,323
School clusters	438	438	438
R^2	0.180	0.306	0.310
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Table A.2. Baseline: ECTS completed, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.464*** (0.107)	−0.669*** (0.120)	−0.650*** (0.109)
Secondary-school average	—	2.212*** (0.088)	2.241*** (0.085)
Male	—	—	−0.468** (0.182)
Age	—	—	−0.205* (0.111)
Displaced student	—	—	0.150 (0.235)
Scholarship recipient	—	—	1.431*** (0.183)
Observations	19,249	19,249	19,249
School clusters	438	438	438
R^2	0.116	0.162	0.166
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Table A.3. ECTS ≥ 45: First-year average, admission-grade control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.056***	−0.068***	−0.066***
	(0.016)	(0.019)	(0.017)
Admission grade	—	0.661***	0.669***
		(0.016)	(0.016)
Male	—	—	0.014
			(0.025)
Age	—	—	0.016
			(0.015)
Displaced student	—	—	0.023
			(0.041)
Scholarship recipient	—	—	0.169***
			(0.030)
Observations	15,869	15,869	15,869
School clusters	424	424	424
R^2	0.160	0.304	0.306
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.4. ECTS ≥ 45: ECTS completed, admission-grade control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.089*** (0.027)	−0.104*** (0.029)	−0.099*** (0.027)
Admission grade	—	0.842*** (0.038)	0.877*** (0.038)
Male	—	—	−0.143* (0.084)
Age	—	—	0.319*** (0.074)
Displaced student	—	—	−0.023 (0.089)
Scholarship recipient	—	—	0.438*** (0.097)
Observations	15,869	15,869	15,869
School clusters	424	424	424
R^2	0.077	0.102	0.107
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.5. ECTS ≥ 45: First-year average, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.056*** (0.016)	−0.108*** (0.019)	−0.106*** (0.017)
Secondary-school average	—	0.571*** (0.015)	0.589*** (0.015)
Male	—	—	0.094*** (0.025)
Age	—	—	0.021 (0.015)
Displaced student	—	—	0.068 (0.042)
Scholarship recipient	—	—	0.209*** (0.031)
Observations	15,869	15,869	15,869
School clusters	424	424	424
R^2	0.160	0.281	0.286
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.6. ECTS ≥ 45: ECTS completed, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.089***	−0.157***	−0.154***
	(0.027)	(0.029)	(0.027)
Secondary-school average	—	0.740***	0.790***
		(0.041)	(0.042)
Male	—	—	−0.035
			(0.083)
Age	—	—	0.328***
			(0.075)
Displaced student	—	—	0.040
			(0.090)
Scholarship recipient	—	—	0.495***
			(0.099)
Observations	15,869	15,869	15,869
School clusters	424	424	424
R^2	0.077	0.099	0.104
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.7. ECTS > 45: First-year average, admission-grade control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.056*** (0.016)	−0.068*** (0.019)	−0.065*** (0.018)
Admission grade	—	0.662*** (0.016)	0.670*** (0.016)
Male	—	—	0.015 (0.024)
Age	—	—	0.017 (0.015)
Displaced student	—	—	0.024 (0.041)
Scholarship recipient	—	—	0.168*** (0.030)
Observations	15,643	15,643	15,643
School clusters	424	424	424
R^2	0.159	0.302	0.304
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.8. ECTS > 45: ECTS completed, admission-grade control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.081***	−0.094***	−0.089***
	(0.024)	(0.026)	(0.024)
Admission grade	—	0.762***	0.798***
		(0.036)	(0.036)
Male	—	—	−0.181**
			(0.085)
Age	—	—	0.338***
			(0.073)
Displaced student	—	—	−0.006
			(0.085)
Scholarship recipient	—	—	0.432***
			(0.094)
Observations	15,643	15,643	15,643
School clusters	424	424	424
R^2	0.065	0.088	0.094
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.9. ECTS > 45: First-year average, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.056*** (0.016)	−0.108*** (0.019)	−0.106*** (0.018)
Secondary-school average	—	0.572*** (0.015)	0.589*** (0.014)
Male	—	—	0.093*** (0.025)
Age	—	—	0.023 (0.015)
Displaced student	—	—	0.070* (0.042)
Scholarship recipient	—	—	0.208*** (0.031)
Observations	15,643	15,643	15,643
School clusters	424	424	424
R^2	0.159	0.280	0.284
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.10. ECTS > 45: ECTS completed, secondary-school average control

Variable or statistic	Model 1	Model 2	Model 3
Net grade inflation	−0.081*** (0.024)	−0.143*** (0.026)	−0.140*** (0.024)
Secondary-school average	—	0.679*** (0.037)	0.729*** (0.039)
Male	—	—	−0.083 (0.085)
Age	—	—	0.349*** (0.074)
Displaced student	—	—	0.053 (0.085)
Scholarship recipient	—	—	0.487*** (0.096)
Observations	15,643	15,643	15,643
School clusters	424	424	424
R^2	0.065	0.086	0.092
Academic-year FE	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. The sample is selected on completed ECTS; these coefficients are conditional on satisfying the stated threshold.

Table A.11. ECTS capped at 60: Alternative prior-achievement controls

Variable or statistic	Admission grade	Secondary-school average
Net grade inflation	−0.489***	−0.653***
	(0.113)	(0.112)
Admission grade	2.521***	—
	(0.082)	
Secondary-school average	—	2.218***
		(0.085)
Male	−0.705***	−0.391**
	(0.172)	(0.181)
Age	−0.524***	−0.505***
	(0.100)	(0.099)
Displaced student	0.086	0.253
	(0.232)	(0.235)
Scholarship recipient	1.264***	1.407***
	(0.180)	(0.180)
Observations	19,249	19,249
School clusters	438	438
R^2	0.1818	0.1734
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. ECTS values above 60 are replaced by 60; the baseline ECTS sample is retained.

Table A.12. Economics–Management heterogeneity: First-year average, complete cases 2013–2019

Variable or statistic	Model 1	Model 2	Model 3	Model 4
Net inflation: Economics	−0.106***	−0.194***	−0.189***	−0.162***
	(0.024)	(0.024)	(0.022)	(0.022)
Management × net inflation	0.006	0.020	0.023	0.019
	(0.032)	(0.031)	(0.031)	(0.029)
Secondary-school average	—	0.824***	0.856***	0.804***
		(0.048)	(0.045)	(0.059)
Male	—	—	0.077	0.080
			(0.078)	(0.070)
Age	—	—	−0.051	−0.017
			(0.067)	(0.057)
Displaced student	—	—	0.091	0.027
			(0.102)	(0.102)
Scholarship recipient	—	—	0.530***	0.525***
			(0.109)	(0.103)
Mathematics A grade	—	—	—	0.292***
				(0.031)
Observations	1,810	1,810	1,810	1,810
School clusters	234	234	234	234
R^2	0.029	0.212	0.229	0.297
Management slope	−0.099	−0.174	−0.167	−0.143
	(0.033)	(0.037)	(0.035)	(0.035)
p-value: Management slope	.003	<.001	<.001	<.001
p-value: slope difference	.841	.526	.458	.512
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Economics is the reference program. The interaction coefficient measures the difference between the Management and Economics slopes. Standard errors are clustered at the secondary-school level. All models use the same observations. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Program and academic-year fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. Only observations with a recorded Mathematics A examination grade are included.

Table A.13. Economics–Management heterogeneity: ECTS completed, complete cases 2013–2019

Variable or statistic	Model 1	Model 2	Model 3	Model 4
Net inflation: Economics	−0.410**	−0.640***	−0.616***	−0.554***
	(0.160)	(0.164)	(0.153)	(0.158)
Management × net inflation	−0.113	−0.077	−0.065	−0.074
	(0.199)	(0.198)	(0.194)	(0.193)
Secondary-school average	—	2.147***	2.216***	2.103***
		(0.208)	(0.204)	(0.219)
Male	—	—	−1.058**	−1.050**
			(0.472)	(0.456)
Age	—	—	−0.465	−0.393
			(0.368)	(0.358)
Displaced student	—	—	−0.297	−0.431
			(0.489)	(0.484)
Scholarship recipient	—	—	1.928***	1.911***
			(0.444)	(0.440)
Mathematics A grade	—	—	—	0.644***
				(0.131)
Observations	1,812	1,812	1,812	1,812
School clusters	234	234	234	234
R^2	0.027	0.072	0.084	0.096
Management slope	−0.523	−0.717	−0.681	−0.628
	(0.146)	(0.155)	(0.147)	(0.147)
p-value: Management slope	<.001	<.001	<.001	<.001
p-value: slope difference	.569	.700	.738	.701
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Economics is the reference program. The interaction coefficient measures the difference between the Management and Economics slopes. Standard errors are clustered at the secondary-school level. All models use the same observations. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Program and academic-year fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. Only observations with a recorded Mathematics A examination grade are included.

Annex B. Alternative Grade-Inflation Indicators

The following tables report the fully adjusted specifications for the two alternative indicators. Each outcome is estimated separately using admission grade and the secondary-school average as alternative prior-achievement controls. The remaining covariates and fixed effects match the complete baseline specification.

Table B.1. Share classified as relatively inflated

Variable or statistic	First-year average Admission grade	First-year average School average	ECTS Admission grade	ECTS School average
Share relatively inflated	−0.147*** (0.035)	−0.227*** (0.036)	−0.902*** (0.208)	−1.206*** (0.205)
Admission grade	0.666*** (0.014)	—	2.559*** (0.084)	—
Secondary-school average	—	0.588*** (0.015)	—	2.230*** (0.086)
Male	−0.034 (0.023)	0.050** (0.025)	−0.782*** (0.175)	−0.467** (0.182)
Age	0.004 (0.013)	0.009 (0.013)	−0.220* (0.112)	−0.202* (0.111)
Displaced student	−0.000 (0.045)	0.044 (0.047)	−0.020 (0.234)	0.144 (0.238)
Scholarship recipient	0.180*** (0.030)	0.219*** (0.031)	1.288*** (0.182)	1.429*** (0.183)
Observations	19,323	19,323	19,249	19,249
School clusters	438	438	438	438
R^2	0.3309	0.3090	0.1742	0.1653
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. The share classified as relatively inflated is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. "School average" denotes the secondary-school average. The indicator measures the prevalence of relative inflation without subtracting relative deflation.

Table B.2. Mean movement: Verification of direction and scaling

Variable or statistic	First-year average Admission grade	First-year average School average	ECTS Admission grade	ECTS School average
Mean movement	0.080*** (0.018)	0.123*** (0.019)	0.485*** (0.109)	0.650*** (0.109)
Admission grade	0.667*** (0.014)	—	2.563*** (0.084)	—
Secondary-school average	—	0.590*** (0.014)	—	2.241*** (0.085)
Male	−0.034 (0.023)	0.050** (0.025)	−0.784*** (0.175)	−0.468** (0.182)
Age	0.003 (0.013)	0.009 (0.013)	−0.222** (0.112)	−0.205* (0.111)
Displaced student	0.000 (0.044)	0.045 (0.046)	−0.016 (0.232)	0.150 (0.235)
Scholarship recipient	0.180*** (0.030)	0.219*** (0.031)	1.289*** (0.182)	1.431*** (0.183)
Observations	19,323	19,323	19,249	19,249
School clusters	438	438	438	438
R^2	0.3312	0.3097	0.1745	0.1657
Academic-year FE	Yes	Yes	Yes	Yes
Degree FE	Yes	Yes	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Mean movement is scaled so that one regression unit represents a 0.1-unit increase in the raw indicator. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01. "School average" denotes the secondary-school average. Mean movement = 2 − net grade inflation in raw units; this is an algebraic verification, not an independent robustness test.

Annex C. Supplementary Selectivity Results

Tables C.1–C.3 report separate regressions by selectivity tercile using the secondary-school average. Table C.4 contains the pooled interaction models and the formal slope comparisons for both prior-achievement controls. Tables C.5 and C.6 repeat the pooled models after requiring at least 20 or 30 observed admission grades in each degree-year used to construct selectivity.

Table C.1. Low selectivity: Secondary-school average control

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.095***	−0.725***
	(0.018)	(0.204)
Secondary-school average	0.473***	2.410***
	(0.024)	(0.170)
Male	0.016	−0.958**
	(0.043)	(0.473)
Age	0.041**	−0.095
	(0.018)	(0.248)
Displaced student	−0.038	−0.426
	(0.052)	(0.500)
Scholarship recipient	0.147***	2.119***
	(0.049)	(0.379)
Observations	3,273	3,276
School clusters	307	307
R^2	0.3961	0.1735
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Table C.2. Intermediate selectivity: Secondary-school average control

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.113***	−0.743***
	(0.017)	(0.131)
Secondary-school average	0.572***	2.129***
	(0.021)	(0.128)
Male	−0.000	−0.505
	(0.041)	(0.320)
Age	0.018	−0.418***
	(0.019)	(0.128)
Displaced student	0.056	0.370
	(0.052)	(0.348)
Scholarship recipient	0.159***	0.897***
	(0.040)	(0.275)
Observations	6,508	6,503
School clusters	391	391
R^2	0.2869	0.1333
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Table C.3. High selectivity: Secondary-school average control

Variable or statistic	First-year average	ECTS completed
Net grade inflation	−0.140***	−0.575***
	(0.021)	(0.096)
Secondary-school average	0.702***	2.253***
	(0.020)	(0.175)
Male	0.090**	−0.253
	(0.039)	(0.199)
Age	−0.029	−0.047
	(0.026)	(0.239)
Displaced student	0.079	0.211
	(0.059)	(0.280)
Scholarship recipient	0.318***	1.584***
	(0.049)	(0.233)
Observations	9,542	9,470
School clusters	370	369
R^2	0.2381	0.0990
Academic-year FE	Yes	Yes
Degree FE	Yes	Yes

Notes. Cluster-robust standard errors at the secondary-school level are in parentheses. Net grade inflation is expressed in units of 10 percentage points. Female, non-displaced and non-scholarship students are the reference categories. Fixed-effect coefficients and the intercept are omitted. * p < .10; ** p < .05; *** p < .01.

Table C.4. Pooled selectivity interactions: Full sample

Variable or statistic	Grades Admission grade	Grades School average	ECTS Admission grade	ECTS School average
Net inflation: low selectivity	−0.057***	−0.107***	−0.499***	−0.690***
	(0.014)	(0.019)	(0.189)	(0.200)
Intermediate selectivity	−0.115*	0.069	0.172	0.879
	(0.063)	(0.059)	(0.571)	(0.561)
High selectivity	−0.188**	0.208**	−0.199	1.323**
	(0.088)	(0.082)	(0.645)	(0.635)
Intermediate × net inflation	−0.003	−0.007	−0.054	−0.070
	(0.010)	(0.013)	(0.108)	(0.114)
High × net inflation	−0.041***	−0.025*	0.062	0.122
	(0.012)	(0.014)	(0.132)	(0.140)
Admission grade	0.673***	—	2.569***	—
	(0.015)		(0.084)	
Secondary-school average	—	0.586***	—	2.227***
		(0.015)		(0.086)
Male	−0.035	0.049**	−0.783***	−0.464**
	(0.023)	(0.025)	(0.175)	(0.182)
Age	0.004	0.008	−0.220*	−0.206*
	(0.013)	(0.013)	(0.112)	(0.112)
Displaced student	−0.003	0.042	−0.007	0.163
	(0.043)	(0.045)	(0.235)	(0.241)
Scholarship recipient	0.180***	0.218***	1.288***	1.429***
	(0.030)	(0.031)	(0.183)	(0.185)
Observations	19,323	19,323	19,249	19,249
School clusters	438	438	438	438
R^2	0.3323	0.3102	0.1746	0.1664
Low-selectivity slope	−0.057***	−0.107***	−0.499***	−0.690***
	(0.014)	(0.019)	(0.189)	(0.200)
Intermediate-selectivity slope	−0.060***	−0.114***	−0.553***	−0.759***
	(0.016)	(0.017)	(0.130)	(0.132)
High-selectivity slope	−0.098***	−0.133***	−0.438***	−0.568***
	(0.020)	(0.021)	(0.092)	(0.092)
p: intermediate − low	.787	.582	.618	.541
p: high − low	<.001	.064	.642	.385
p: high − intermediate	<.001	.066	.156	.017

Notes. All models include academic-year and degree fixed effects. School-clustered standard errors are in parentheses. Net inflation is measured in 10-percentage-point units. Low selectivity, female, non-displaced and non-scholarship students are reference categories. "School average" denotes the secondary-school average. Slopes are linear combinations; p-values test their pairwise equality. The cut-off concerns admission-grade counts before regression restrictions. * p < .10; ** p < .05; *** p < .01.

Table C.5. Pooled selectivity interactions: At least 20 observations per degree-year

Variable or statistic	Grades Admission grade	Grades School average	ECTS Admission grade	ECTS School average
Net inflation: low selectivity	−0.058***	−0.109***	−0.497***	−0.686***
	(0.015)	(0.019)	(0.192)	(0.202)
Intermediate selectivity	−0.115*	0.069	0.210	0.910
	(0.063)	(0.059)	(0.570)	(0.560)
High selectivity	−0.184**	0.211***	−0.115	1.391**
	(0.087)	(0.081)	(0.646)	(0.635)
Intermediate × net inflation	−0.002	−0.006	−0.056	−0.071
	(0.010)	(0.012)	(0.110)	(0.116)
High × net inflation	−0.040***	−0.024*	0.060	0.120
	(0.012)	(0.013)	(0.135)	(0.142)
Admission grade	0.672***	—	2.542***	—
	(0.015)		(0.086)	
Secondary-school average	—	0.586***	—	2.200***
		(0.015)		(0.086)
Male	−0.034	0.050**	−0.792***	−0.476***
	(0.023)	(0.025)	(0.175)	(0.181)
Age	0.003	0.007	−0.212*	−0.201*
	(0.013)	(0.013)	(0.112)	(0.112)
Displaced student	−0.001	0.044	−0.003	0.163
	(0.044)	(0.046)	(0.236)	(0.242)
Scholarship recipient	0.181***	0.219***	1.277***	1.416***
	(0.030)	(0.031)	(0.188)	(0.189)
Observations	19,143	19,143	19,067	19,067
School clusters	438	438	438	438
R^2	0.3296	0.3078	0.1702	0.1620
Low-selectivity slope	−0.058***	−0.109***	−0.497***	−0.686***
	(0.015)	(0.019)	(0.192)	(0.202)
Intermediate-selectivity slope	−0.060***	−0.114***	−0.553***	−0.757***
	(0.016)	(0.017)	(0.130)	(0.132)
High-selectivity slope	−0.098***	−0.133***	−0.438***	−0.566***
	(0.020)	(0.021)	(0.092)	(0.092)
p: intermediate − low	.876	.649	.614	.541
p: high − low	.001	.073	.659	.399
p: high − intermediate	<.001	.066	.155	.017

Notes. All models include academic-year and degree fixed effects. School-clustered standard errors are in parentheses. Net inflation is measured in 10-percentage-point units. Low selectivity, female, non-displaced and non-scholarship students are reference categories. "School average" denotes the secondary-school average. Slopes are linear combinations; p-values test their pairwise equality. The cut-off concerns admission-grade counts before regression restrictions. * p < .10; ** p < .05; *** p < .01.

Table C.6. Pooled selectivity interactions: At least 30 observations per degree-year

Variable or statistic	Grades Admission grade	Grades School average	ECTS Admission grade	ECTS School average
Net inflation: low selectivity	−0.061***	−0.115***	−0.511**	−0.711***
	(0.016)	(0.020)	(0.220)	(0.230)
Intermediate selectivity	−0.057	0.103	0.721	1.354**
	(0.072)	(0.066)	(0.625)	(0.619)
High selectivity	−0.124	0.246***	0.403	1.865***
	(0.095)	(0.088)	(0.691)	(0.688)
Intermediate × net inflation	0.001	−0.000	−0.047	−0.051
	(0.011)	(0.013)	(0.131)	(0.138)
High × net inflation	−0.038***	−0.018	0.072	0.145
	(0.012)	(0.013)	(0.158)	(0.167)
Admission grade	0.677***	—	2.588***	—
	(0.016)		(0.089)	
Secondary-school average	—	0.588***	—	2.193***
		(0.015)		(0.092)
Male	−0.025	0.060**	−0.763***	−0.450**
	(0.024)	(0.026)	(0.171)	(0.177)
Age	−0.006	0.001	−0.239**	−0.221*
	(0.014)	(0.014)	(0.113)	(0.118)
Displaced student	0.001	0.046	0.001	0.161
	(0.044)	(0.046)	(0.245)	(0.250)
Scholarship recipient	0.179***	0.220***	1.240***	1.383***
	(0.031)	(0.032)	(0.195)	(0.196)
Observations	18,562	18,562	18,486	18,486
School clusters	435	435	435	435
R^2	0.3270	0.3042	0.1645	0.1543
Low-selectivity slope	−0.061***	−0.115***	−0.511**	−0.711***
	(0.016)	(0.020)	(0.220)	(0.230)
Intermediate-selectivity slope	−0.060***	−0.115***	−0.558***	−0.762***
	(0.015)	(0.017)	(0.131)	(0.133)
High-selectivity slope	−0.099***	−0.133***	−0.439***	−0.567***
	(0.020)	(0.021)	(0.092)	(0.092)
p: intermediate − low	.933	1.000	.720	.710
p: high − low	.002	.174	.650	.387
p: high − intermediate	<.001	.088	.140	.014

Notes. All models include academic-year and degree fixed effects. School-clustered standard errors are in parentheses. Net inflation is measured in 10-percentage-point units. Low selectivity, female, non-displaced and non-scholarship students are reference categories. "School average" denotes the secondary-school average. Slopes are linear combinations; p-values test their pairwise equality. The cut-off concerns admission-grade counts before regression restrictions. * p < .10; ** p < .05; *** p < .01.