



Are Business and Economics Alike?

Carmen Aina¹ · Chiara Mussida² · Gabriele Lombardi³

Received: 5 February 2021 / Accepted: 4 November 2021

© The Author(s) under exclusive licence to Società Italiana di Economia (Italian Economic Association) 2021

Abstract

Using administrative data on the entire Italian population of students at their first enrolment in the tertiary system during the academic years 2008–2014, we investigate the major choice process and the subsequent behaviour after the first academic year, namely university persistence, switching major or dropout, of students enrolled in two majors perceived as similar, that are Economics and Business. We investigate the two sequential stages separately for the universes of Economics and Business students. Our main findings suggest that on average, well-prepared students are more likely to switch major than dropout. Moreover, a better student intake at degree level entails a progressive reduction in dropout rates. Likewise, a peer group more homogeneous in terms of academic grades has a higher propensity to stay in the initial major, whereas a student cohort characterised by high competitiveness, proxied by the number of credits achieved, is less persistent, especially once enrolled in Economics.

Keywords University persistence · Major choice · Major switching · Dropout · Peers~measures

JEL Classification I20 · I21 · C30

✉ Carmen Aina
carmen.aina@uniupo.it

Chiara Mussida
chiara.mussida@unicatt.it

Gabriele Lombardi
gabriele.lombardi3@unisi.it

¹ Università del Piemonte Orientale and GLO - Dipartimento di Studi per l'Economica e l'Impresa, Via Perrone 18, 28100 Novara, Italy

² Università Cattolica del Sacro Cuore and GLO, Novara, Italy

³ Università Degli Studi Di Siena, Siena, Italy

1 Introduction

Raising the share of individuals holding tertiary education qualifications has acquired a central role in the policy agenda of several governments in advanced and developed countries. Despite the huge literature on the economic returns to general education (Altonji et al. 2016), the need to widen the fraction of university degree holders to compete in a globalised marketplace is a more recent issue. Thus, increasing educational attainment has become relevant in both national and international debate on higher education, and thence several policy initiatives have been adopted to enrich the quality, efficiency and attractiveness of university education at large (Dale 2007). Nonetheless, interventions addressed to increase university enrolment rates may not achieve the expected outcome, namely increasing the number of graduates. This slow progress in reaching higher education achievement, in spite of the rise in participation, is explained by university “failure”, i.e. dropouts.¹

Within OECD countries, about one third of university students do not complete their degree, despite dropouts being not evenly distributed (OECD 2019). For instance, this issue is especially important in the US, where, on average, more than one student in two abandons university without obtaining any university degree by year six of their academic careers,² and in Italy where the dropout rate for short degree is about 15% between the first and the second academic year, but it increases to more than 25% within four years from first-enrolment (Anvur 2018).

Over the years many studies have been done to investigate the determinants of student persistence, indicating that a wide range of student and school factors influences this process. For instance, completion also varies with the major decision, which is made by students according to their tastes, preferences and abilities (Montmarquette et al. 2002; Zafar 2011; Stinebrickner and Stinebrickner 2014). In making this choice, students have imperfect information about their human capital along with the true knowledge about potential fields of study. Only their coursework exposure offers them the opportunity to learn how well the field matches their preferences and abilities. To provide further evidence on university non-completion behaviour in Italy, through switching major or dropout, in this study we focus on students enrolled in two specific degree courses, namely Economics and Business, over the academic years 2008–2014.³

There are two broad views from where we can look at student non-completion. One is a positive view, where dropout and switching major are adaptation processes through which students can correct wrong career decisions. This view assumes that students have some ex-ante abilities and exogenous preferences and that information asymmetries may lead students to misfit with the chosen major. The second interpretation is

¹ We refer to dropouts as students who leave the university system without earning a degree. All in all, they denote a non-smooth university path which decreases the share of graduates available to the economic system.

² Figures available online at <https://www.collegeatlas.org/college-dropout.html>.

³ Certainly, investigating the academic progression of students at large, looking at both dropout and stopout behaviours enrolled in all fields of study is also an interesting topic. Nevertheless, in this empirical exercise we focus only on Economics and Business degree courses to fulfil the gap in the existing literature about this issue, leaving for a future study this more comprehensive analysis.

more negative. It is the view according to which students abilities and preferences are endogenous and dropouts are a consequence of an institutional failure. In this study, by following the mentioned literature and after checking for potential influences of the institutions,⁴ we are more sympathetic with the positive view.

Our hypothesis is that both students in these two fields are sharing a similar major choice process in terms of interests and abilities, as it is a common thinking that these majors are substitute goods to some extent (see Siegfried and Wilkinson 1982; Salemi and Eubanks 1996; Asarta and Butters 2012; Asarta et al. 2013). Nonetheless, studies that tested this hypothesis have not been conducted in the Italian context, yet. Considering the formal openness of the Italian university system (i.e. all individuals with 5-year high school diploma may enrol at university), analysing the academic progression of students within these two majors, namely Economics and Business, can be informative on the underlying mechanisms that lead toward completion or not. In particular, we can shed light on whether students are really aware of the initial choice made as well as of the different degree of difficulty, with Economics degree having, on average, a greater number of quantitative courses than Business. In this manner, by comparing the performance of those enrolled in Economics and Business during the first-year, we highlight potential differences between the determinants that influence persistence in the initial degree choice. Essentially, we may underline the main characteristics of student retention given uncertainty or misperception of how the field is broader than they thought because of information asymmetry. To do so, after modelling a college major choice (i.e. Business or Economics), within each sub-sample separately, we investigate two ways students respond to struggles at university: dropping out and switching major. The advantage of our approach is at least threefold. First, we add evidence about the university behaviour of students enrolled in Economics and Business during the first academic year at national level, since much of the research concerning this topic relies on data about a single institution, but only very rarely on dataset covering the whole university system (see, for an overview, Aina et al. 2021). Second, we contribute to understand what correlates motivate major switching for these two fields of study, as this aspect has been largely unstudied, especially in Italy (Aina 2011) due to lack of data. In our case, instead, we have access to the administrative data of the entire tertiary education system, so it is possible to control major switchers as a whole since a student who moves to a different major than the initial choice is followed both in the starting institution and in any others available in Italy. Third, we focus on two degree courses, namely Economics and Business, as generally it is not completely clear to high school leavers what are the differences between the two paths. In this way, we underline which student's characteristic, namely pre- and post- enrolment ones, affect persistence, or dropout or switching major. This point can contribute to design policy interventions to increase consciousness in major decision and avoid waste of time and money, both at individual and institutional level, such as, for example, high school counselling, especially for degree courses that on the principle are considered alike (Siegfried and Wilkinson 1982).

Overall, the three outcomes considered are exhaustive and mutually exclusive. The sample means (%) of dropping out, switching major, and major persistence for

⁴ See Sect. 5 and footnote 8, where we explain our robustness check for a possible negative view.

Economics and Business over the period investigated (2008–2014) are 13.4% and 11.8%, 15.9% and 8.6%, 70.7% and 79.6%, respectively.

Our main findings suggest that on average well-prepared students are more likely to switch major than dropout. In addition, a better student intake at degree level entails a progressive reduction in dropout rates. Likewise, a peer group that is more homogeneous in terms of academic grades has a greater propensity to stay in the initial major, whereas a student cohort characterised by high competitiveness, measured by the number of credits achieved, is less persistent, especially once enrolled in Economics.

The paper is organised as follows. In the next section, we provide a literature review of previous studies. Section 3 briefly introduces the Italian tertiary education system. Section 4 describes the main characteristics of the data and the samples analysed. Section 5 presents in detail the methodology applied. Results are discussed in Sect. 6, while Sect. 7 draws conclusions.

2 Literature Review

This paper contributes to the literature on early university student performance, while extending the analysis to the major switching, besides retention in the initial major choice and dropout decision.

A significant number of studies refers to college major choice, highlighting its relevance on worker's job and earnings prospects. Overall, major decision is affected by earnings returns (Berger 1988; Paglin and Rufolo 1990), preferences for specific work environment (Arcidiacono 2004), the impact of peers and the composition of first-year classes (Ware and Lee 1988; Fischer 2017), parents' characteristics (Ware et al. 1985; Aina and Nicoletti 2018), and economic conditions (Blom et al. 2020). It is also influenced by gender, with women discouraged to study fields like STEM or economics, by determining a lower enrolment in competitive environment (Rask and Tiefenthaler 2008; Griffith 2010; Card and Payne 2017; Aina et al. 2021), as well as by stereotypes and cultural beliefs about gender roles (Reilly 2012).

Researchers have also long documented the determinants of dropping out from university, by focusing on both pre- and post-enrolment student characteristics. Many factors influence non-completion, including students' age, suggesting that enrolment at an older age, irrespective of the motive, reduces the chances of completing the degree (Stratton et al. 2008; Montmarquette et al. 2001; Smith and Naylor 2001); gender, which denotes that on average women are more persistent than men (McNabb et al. 2002; Arulampalam et al. 2004a,b; Cappellari and Lucifora 2009; Astorne-Figari and Speer 2018), especially because of differences in study effort and beliefs about ability (Stinebrickner and Stinebrickner 2012), but less when their classmates are men (Mastekaasa and Smeby 2008; Belloc et al. 2010); ethnicity, that underlines a poor performance of "minority" students.

Likewise, dropout rates are driven by differences in pre-college preparation of the students (Smith and Naylor 2001; et al. 2004a,b; Stratton et al. 2008), awareness of their academic skills (Manski 1989; Altonji 1993; Stinebrickner and Stinebrickner 2001; Cunha et al. 2005), early academic achievements, since good grade performance

reduces withdrawal (Montmarquette et al. 2001; Bennet 2009; Belloc et al. 2010; Stinebrickner and Stinebrickner 2012), and students' aptitude to interact with mates and professors (see Tinto 1975; Pascarella and Terenzini 1978a,b; Pascarella et al. 1978). The importance of peer effects in enhancing the likelihood of degree achievement has been explored, too (Stinebrickner and Stinebrickner 2006; Ost 2010).

Several contributions also look at parental background and family networks, which are substantial and contribute to the university performance gap between wealthy and poor (Stinebrickner and Stinebrickner 2003; Di Pietro 2004; Johnes and McNabb 2004; Cappellari and Lucifora 2009; Trivellato and Triventi 2009; Contini et al. 2018).

Finally, universities applying less selective admission criteria are characterised by lower completion rates (Arulampalam et al. 2007; Bound et al. 2009; Bowen et al. 2009; Carrieri et al. 2015).

To sum up, the existing literature on dropouts shows that the mechanisms behind students' attrition are not entirely identified as certain variables increase the risk of non-graduation in any context (for instance, higher age at university enrolment, limited interaction with peers, lower educated parents), whereas others display inconsistent effects (i.e. gender, financial aid). Empirical evidence suggests that dropout is a multifactor concern that arises from the interaction between a wide range of personal and contextual factors. Therefore, a better understanding of this complex and dynamic process requires longitudinal data enabling researchers to study this topic as a whole, not focusing to only one institution.

The literature on switching major, instead, is relatively scarce. Few papers have studied major switching, mainly in the United States college context where students may switch at relatively low effort and cost. In fact, when high school leavers start university they have imperfect knowledge about the peculiarities of the field of study chosen as well as their tastes and abilities. Under a progressive reduction of such information uncertainty, Altonji (1993) and Arcidiacono (2004), for example, find that students may change majors. Similarly, Stinebrickner and Stinebrickner (2014) show that students are more willing to leave difficult majors in response to grades. Astorne-Figari and Speer (2018) in studying how students respond to struggles in university, instead, underline gender differences between persistence and switching majors, with women more likely than men to change subjects. In addition, Astorne-Figari and Speer (2019) report that a good predictor of university mismatch is low grades, increasing the major switching probability. In particular, they point out that women mostly shy away from competitive majors at higher rates, while men and better prepared women are undeterred.

In this paper we aim to add evidence on dropout, as well as to fill the gap in the literature on switching decisions by using administrative records of students enrolled in two degree courses of the Italian tertiary education system, namely Economics and Business, separately. In Italy, the studies are substantially carried out on single institution disregarding switching decision. At the best of our knowledge, only the paper of Aina (2011) partly explores this outcome for a large university (i.e. switching behaviour), by analysing college withdrawal and stopout, separately. The latter refers to students that abandon the starting university and move to another one, without distinguishing between major retention or major change.

3 Institutional Background

In Italy, all students with a high school diploma, which can be academic (*Liceo Classico*, *Liceo Scientifico*, *Liceo Linguistico*, *Liceo delle Scienze Umane*, *Liceo Musicale e Coreutico* and *Liceo Artistico*), technical (*Istituti Tecnici*) or vocational (*Istituti Professionali*) and usually completed at age 19, can enrol at the higher education (HE hereafter) system.

The Italian university system traditionally included only academic degrees (i.e. namely *Diploma di Laurea*) with little vocational or professional purposes and with an official duration that varies between 4 and 6 years depending on the field of study. In 2001, law n. 509/99 started to implement the principles of the (so called) 'Bologna process' reform, which shortened the duration of the undergraduate programmes, by introducing a two-tier structure of the university degree. Now in Italy the HE system consists of two levels of degree, namely first-level degree (i.e. Bachelor degree), whose legal duration is three years, and an optional second-level degree lasting two-years (i.e. Master degree). Once attained the Bachelor degree, a graduate can decide to either enter the labour market or continue the studies with a Master degree. However, some degree subjects, like Medicine and Surgery, Dentistry and Dental Prosthesis, Law, Primary Education Sciences, Veterinary, Architecture, Pharmaceutical Chemistry and Technology, are still structured in a single cycle university degree lasting 5-years or more.

University degree courses are designed in credits, namely each exam is associated with a given number of university credits (CFUs hereafter). A CFU is usually equivalent to 25 h of student workload (including individual study hours). The average quantity of academic work performed by a full-time student in one academic year is by convention measured as 60 CFUs.⁵ Accordingly, a short degree requires 180 CFUs, whereas a Master degree 120 CFUs.

The 'Bologna process' reform also gave to universities full autonomy over teaching, including freedom of freely deciding on curricula, number of exams, and their contents. These institutional changes, especially the introduction of three-years degrees and the reduced workload, have shrunk the opportunity costs of tertiary education investment, making the university choice more appealing (see, e.g., Cappellari and Lucifora 2009), but only partially reduced the dropout rates, which still remain high.

Financial aid for university students is limited but public university fees are moderate because mainly state funded and fees are established on the family financial resources basis. Nevertheless, there is a clear socio-economic gradient in university enrolment: children with low income and/or poorly educated parents are unlikely to enrol in a university. Indeed, the Italian public-school system, which is strongly egalitarian with reference to quality and cost of the education provided as is unrelated to family income, fails to generate equality of opportunity in educational attainment (Checchi et al. 1999). As demonstrated by an extensive literature, high school track choices are highly characterised by strong social stratification in Italy (Contini and Scagni 2011; Checchi et al. 2013). Despite having an open educational system in terms of access barriers to university, this gap in the university enrolment is also in

⁵ The CFU system is equivalent to the European Credit Transfer and accumulation System (ECTS).

part enlightened by the lack of vocational degrees and this is one of the main factors explaining the strong intergenerational correlation in educational attainment in Italy (Hanushek and Wößmann 2006; Brunello and Checchi 2007).

4 Data and Sample

Using the administrative data of the National Archive of Students and Graduates (i.e. Archivio Nazionale degli Studenti e dei Laureati, ANS) provided by the Ministry of University and Research (MUR),⁶ we investigate the records of students' career between 2008 and 2014. The sample analysed includes the universe of 1,687,172 students at their first enrolment in the Italian HE system. On average, 3.7% and 11% of the total sample of students enrol in Economics and Business, respectively.

In this work, we investigate two sequential stages, separately for Economics and Business:

1. Whether a student at her/his first enrolment in the Italian HE enrolls in either Economics (L-33 and 28 degree classes) or Business (L-18 and 17);
2. Whether this student—during her/his second year of enrolment—is either: i) still enrolled in Economics or Business; ii) switched major; iii) dropped out from the Italian HE system.

The number of observations pertaining to each step analysed by year (from 2008 to 2014) and majors, referring to the universe of Economics and Business students, is reported in Table 1.

During the academic years under investigation, namely 2008–2014, the enrolment rates both in Economics and Business show a negative trend. On average, 8,916 students enrol in Economics losing up to 4.32% of enrolments in the considered period. For Business, we find on average 26,267 students enrolled with a loss of student intake up to 16.7%.

Tables 2 and 3 report the descriptive statistics for Economics and Business, respectively.

In line with the literature, the determinants of the decision to enrol in Economics or Business include a set of individual, economic, geographical, and time characteristics, while the subsequent possible outcomes (persistence, switching major, dropout) are also due to (indicators for) local economic and labour market conditions, and post enrolment performance at individual and peer level.

Regarding the individual characteristics, we control for gender, type of high school (i.e. dummies for *Liceo Classico*, *Liceo Scientifico*, Others Lyceum, Technical and Vocational Schools), years from high school completion and university enrolment, high school final mark, and citizenship. We are aware that using administrative data we gain in terms of richness of information about individual pre-enrolment characteristics and academic performance details, but we miss some additional variables that can shape university decision, like parental background (i.e. parents' education and

⁶ Database MOBYSU.IT [Mobilità degli Studi Universitari in Italia], research protocol MUR—Universities of Cagliari, Palermo, Siena, Torino, Sassari, Firenze and Napoli Federico II, scientific reference Prof. Massimo Attanasio (UNIPA), Data Source ANS-MUR/CINECA.

Table 1 Number of observations by year, major, and sequential steps

Sequential steps	Number of observation per year						
	2008	2009	2010	2011	2012	2013	2014
Economics							
i) Enrolled in Economics	9,114	9,551	9,488	9,396	8,639	8,402	7,824
% w.r.t. Total	(3.67)	(3.81)	(3.88)	(3.89)	(3.69)	(3.63)	(3.32)
ii) Still in Economics	5,958	6,602	6,672	6,671	6,344	6,160	5,691
% w.r.t. i)	(65.26)	(69.12)	(70.32)	(71.00)	(73.43)	(73.32)	(72.74)
iii) Switching major	1,929	1,565	1,561	1,447	1,252	1,225	1,002
% w.r.t. i)	(21.17)	(16.39)	(16.45)	(15.25)	(14.49)	(14.58)	(12.81)
iv) Dropout	1,237	1,384	1,255	1,278	1,043	1,017	1,131
% w.r.t. i)	(13.57)	(14.49)	(13.23)	(13.60)	(12.07)	(12.10)	(14.46)
Business							
i) Enrolled in Business	29,488	28,306	26,995	25,977	24,427	24,113	24,565
% w.r.t. Total	(11.87)	(11.28)	(11.03)	(10.76)	(10.42)	(10.40)	(10.43)
ii) Still in Business	21,940	22,090	21,420	20,770	19,764	19,715	20,263
% w.r.t. i)	(74.40)	(78.04)	(79.35)	(79.96)	(80.91)	(81.76)	(82.49)
iii) Switching major	4,077	2,614	2,372	2,117	1,950	1,611	1,362
% w.r.t. i)	(13.83)	(9.23)	(8.79)	(8.15)	(7.98)	(6.68)	(5.54)
iv) Dropout	3,471	3,602	3,203	3,090	2,713	2,787	2,940
% w.r.t. i)	(11.77)	(12.73)	(11.87)	(11.90)	(11.07)	(11.56)	(11.97)
Total no. of observations	248,385	250,999	244,645	241,485	234,324	231,756	235,578

Source: Authors' calculations from ANS 2008–2014 data

occupation, family income) and individuals' tastes. However, as it has been shown in several studies (see among others Dustmann 2004; Bauer and Riphahn 2006), choosing the high school track at an early age reduces intergenerational educational mobility. Consequently, in Italy where the choice is made typically when children are 13 or 14 years old, evidence confirms that the type of track selected is strongly correlated to the socio-economic status of parents, with children from poor social status backgrounds becoming increasingly more likely to attend technical or vocational high schools, undermining their subsequent educational achievements (Checchi and Flabbi 2013; Panichella and Triventi 2014). Furthermore, also descriptive statistics suggest that about 22.7% of children with parents with at most compulsory education not

Table 2 Descriptive statistics for the economics sample: means and (standard deviations)

Independent variables	Descriptive statistics conditioned to				
	Entire sample	Enrolled in economics	Still in economics	Switcher	Dropout
	(1)	(2)	(3)	(4)	(5)
Female	0.560 (0.496)	0.452 (0.498)	0.463 (0.499)	0.456 (0.498)	0.394 (0.489)
<i>Macro-area of provenience</i>					
North-West	0.231 (0.421)	0.189 (0.391)	0.193 (0.394)	0.196 (0.397)	0.158 (0.365)
North-East	0.180 (0.352)	0.193 (0.395)	0.202 (0.402)	0.179 (0.383)	0.167 (0.373)
Centre	0.184 (0.390)	0.186 (0.389)	0.166 (0.373)	0.276 (0.447)	0.178 (0.383)
South & Islands	0.405 (0.486)	0.432 (0.495)	0.439 (0.496)	0.349 (0.477)	0.497 (0.500)
<i>Type of High School</i>					
Scientific Lyceum	0.405 (0.491)	0.394 (0.489)	0.424 (0.494)	0.413 (0.492)	0.210 (0.408)
Classic Lyceum	0.147 (0.354)	0.093 (0.290)	0.095 (0.294)	0.135 (0.341)	0.032 (0.175)
Technical School	0.229 (0.420)	0.376 (0.484)	0.356 (0.479)	0.314 (0.464)	0.557 (0.497)
Professional School	0.052 (0.222)	0.043 (0.203)	0.035 (0.183)	0.040 (0.197)	0.093 (0.291)
Other Lyceum	0.167 (0.358)	0.094 (0.243)	0.090 (0.236)	0.098 (0.277)	0.108 (0.239)
Years from HS to Un	0.163 (0.585)	0.134 (0.535)	0.105 (0.469)	0.085 (0.397)	0.344 (0.857)
Non-Italian citizen	0.024 (0.152)	0.041 (0.198)	0.042 (0.201)	0.031 (0.173)	0.045 (0.207)
HS Final Mark	78.579 (11.940)	77.755 (11.725)	78.947 (11.802)	76.334 (11.335)	73.157 (10.379)
Log Distance	2.762 (2.043)	2.531 (1.970)	– –	– –	– –

Table 2 (continued)

Independent variables	Descriptive statistics conditioned to				
	Entire sample	Enrolled in economics	Still in economics	Switcher	Dropout
	(1)	(2)	(3)	(4)	(5)
Unemployment rate	–	–	25.966	25.287	28.373
	–	–	(11.570)	(10.846)	(12.374)
<i>Quartiles of the HS grade distribution (Ref: 4th quartile)</i>					
1st quartile	–	–	0.266	0.298	0.291
	–	–	(0.442)	(0.457)	(0.455)
2nd quartile	–	–	0.249	0.231	0.225
	–	–	(0.432)	(0.422)	(0.418)
3rd quartile	–	–	0.234	0.269	0.285
	–	–	(0.423)	(0.444)	(0.451)
4th quartile	–	–	0.251	0.202	0.199
	–	–	(0.434)	(0.402)	(0.399)
<i>Quartiles of the Lyceum diploma share (Ref: 4th quartile)</i>					
1st quartile	–	–	0.268	0.232	0.335
	–	–	(0.443)	(0.422)	(0.472)
2nd quartile	–	–	0.232	0.227	0.277
	–	–	(0.422)	(0.419)	(0.447)
3rd quartile	–	–	0.264	0.251	0.229
	–	–	(0.441)	(0.433)	(0.420)
4th quartile	–	–	0.236	0.290	0.159
	–	–	(0.425)	(0.454)	(0.366)
<i>Post enrolment performance at individual and peer level</i>					
CFU	–	–	36.322	17.167	3.147
	–	–	(18.720)	(19.743)	(6.701)
GPA	–	–	21.552	13.186	4.985
	–	–	(6.865)	(11.676)	(9.359)
Competitiveness (CFU)	–	–	29.149	27.853	26.488
	–	–	(7.651)	(7.577)	(6.778)
Competitiveness (GPA)	–	–	21.448	23.376	23.252
	–	–	(6.403)	(5.924)	(5.671)
N. of Observations	1,687,172	62,414	44,088	9,981	8,345

Source: Authors' calculations from ANS 2008–2014 data

Table 3 Descriptive Statistics for the Business sample: Means and (Standard Deviations)

Independent Variables	Descriptive Statistics Conditioned to				
	Entire Sample	Enrolled in Business	Still in Business	Switcher	Dropout
	(1)	(2)	(3)	(4)	(5)
Female	0.560 (0.496)	0.469 (0.499)	0.481 (0.500)	0.446 (0.497)	0.401 (0.490)
<i>Macro-area of provenience</i>					
North-West	0.231 (0.421)	0.221 (0.415)	0.230 (0.421)	0.276 (0.398)	0.263 (0.383)
North-East	0.180 (0.352)	0.141 (0.348)	0.147 (0.354)	0.114 (0.318)	0.118 (0.322)
Centre	0.184 (0.390)	0.182 (0.386)	0.179 (0.383)	0.212 (0.409)	0.179 (0.384)
South & Islands	0.405 (0.486)	0.456 (0.482)	0.444 (0.478)	0.398 (0.490)	0.440 (0.496)
<i>Type of High School</i>					
Scientific Lyceum	0.405 (0.491)	0.412 (0.492)	0.439 (0.496)	0.422 (0.494)	0.223 (0.416)
Classic Lyceum	0.147 (0.354)	0.100 (0.300)	0.107 (0.309)	0.128 (0.334)	0.034 (0.180)
Technical School	0.229 (0.420)	0.348 (0.476)	0.329 (0.470)	0.276 (0.447)	0.530 (0.499)
Professional School	0.052 (0.222)	0.055 (0.227)	0.044 (0.206)	0.053 (0.224)	0.124 (0.329)
Other Lyceum	0.167 (0.358)	0.085 (0.257)	0.081 (0.249)	0.121 (0.316)	0.089 (0.255)
Years from HS to Un	0.163 (0.585)	0.137 (0.546)	0.106 (0.474)	0.091 (0.399)	0.374 (0.908)
Non-Italian citizen	0.024 (0.152)	0.034 (0.181)	0.034 (0.181)	0.045 (0.155)	0.040 (0.195)
HS Final Mark	78.579 (11.940)	78.118 (11.900)	79.192 (11.908)	75.420 (11.349)	72.923 (10.468)
Log Distance	2.762 (2.043)	2.622 (2.087)	– –	– –	– –
Unemployment rate	– –	– –	25.477 (12.423)	26.764 (12.393)	27.203 (12.555)

Table 3 (continued)

Independent Variables	Descriptive Statistics Conditioned to				
	Entire Sample	Enrolled in Business	Still in Business	Switcher	Dropout
	(1)	(2)	(3)	(4)	(5)
<i>Quartiles of the HS grade distribution (Ref: 4th quartile)</i>					
1st quartile	–	–	0.260	0.260	0.311
	–	–	(0.438)	(0.439)	(0.463)
2nd quartile	–	–	0.243	0.266	0.245
	–	–	(0.429)	(0.442)	(0.430)
3rd quartile	–	–	0.240	0.281	0.280
	–	–	(0.427)	(0.450)	(0.449)
4th quartile	–	–	0.257	0.193	0.164
	–	–	(0.437)	(0.304)	(0.370)
<i>Quartiles of the Lyceum diploma share (Ref: 4th quartile)</i>					
1st quartile	–	–	0.250	0.241	0.314
	–	–	(0.433)	(0.428)	(0.464)
2nd quartile	–	–	0.249	0.284	0.331
	–	–	(0.432)	(0.451)	(0.471)
3rd quartile	–	–	0.247	0.277	0.236
	–	–	(0.432)	(0.447)	(0.425)
4th quartile	–	–	0.254	0.198	0.119
	–	–	(0.435)	(0.399)	(0.324)
<i>Post enrolment performance at individual and peer level</i>					
CFU	–	–	38.506	10.467	3.678
	–	–	(18.229)	(15.513)	(7.390)
GPA	–	–	22.082	10.428	5.553
	–	–	(6.476)	(11.662)	(9.750)
Competitiveness (CFU)	–	–	32.414	29.472	28.512
	–	–	(8.224)	(7.476)	(6.802)
Competitiveness (GPA)	–	–	23.601	23.402	23.382
	–	–	(0.911)	(0.837)	(0.668)
N. of Observations	1,687,172	183,871	145,962	16,103	21,806

Source: Authors' calculations from ANS 2008–2014 data

achieved high school diploma, whereas this percentage falls once their parents have a high school diploma or a university degree (i.e. 5.9% and 2.3%, respectively) (MIUR 2019). In this respect, despite the lack of family background variables, by using high school dummies in our estimate specifications we seek to indirectly control for these factors. Nevertheless, we are aware that high school track dummies are mere proxies that cannot by themselves fill the gap, although the strong socio-economic gradient in the mechanism of high school choice in Italy. Accordingly, it is necessary to bear in mind in the interpretation of the results that there are still some unobserved family characteristics not fully controlled by our proxies.

We note that 45.2% of females enrol in Economics, compared to a similar 46.9% in Business (column (2) of Tables 2 and 3, respectively).

With respect to high school diploma, Economics and Business report relatively high and similar shares of incumbents from Scientific Lyceum (39.4% and 41.2%, respectively) and Technical Schools (37.6% and 34.8%).

Remarkably, students enrolling in Economics and Business show a similar average high school final mark, at around 78 on a 100-point scale.

Looking at the citizenship of the students, we note that the percentages of non-Italian citizenship that achieved a high school diploma in Italy are relatively low for both Economics and Business (4.1% and 3.4%, respectively).

For the economic and geographic characteristics of the students' origin, we control for the macro-area of provenience (North-West, North-East, Centre, South and Islands), as well as the distance between high school town and university (Tables 2 and 3).

The distance between high school town and university expressed in logarithmic terms is introduced in the selection equation for identification purposes since we assume it affects the decision to enrol but not the student university behaviour during her/his enrolment. The choice of the instrument was mainly driven by the existing literature (see, for instance, Frenette 2006; Spiess and Wrohlich 2010), which suggests that university distance plays a crucial role in university attendance, especially when HE system is not well widespread at national level. Thus, in our study, given that the degree courses analysed are almost available in each province (see Cottini et al. 2019), that public fees are pretty low in Italy, but financial aid for university students is limited, accounting for distance in the university choice process allows us to indirectly control also for the potential heterogeneity of the student body coming from better advantaged family background, for the costs of reaching the university or the indirect costs of renting apartments, and students' preferences. Then, the identification strategy applied ensures to deliver more consistent estimates. Nevertheless, we are aware that someone could argue that non-resident students might be more selected and more motivated to reach their goals, making our instrument potentially weak. To overcome this weak instrument concern, namely that it may influence not only university choice but also subsequent academic outcomes, we checked in our working samples whether the share of students who switch major or dropout after the first academic year is not different amongst the two categories: stayers versus movers.⁷ Although this descriptive evidence

⁷ We applied several thresholds of distance to distinguish between stayers and movers. Despite the cutoff point used to define the two groups, the descriptive statistics always reported that our academic outcomes

support our instrument choice, we also performed a test of validity for our instrument. Following Roodman (2011), we added the instrument to the second stage equation that is our after one year equation (see Sect. 5 for details on the econometric approach adopted). Technically, as explained by the author, the regression is still identified. If there is a significant coefficient on the added instrument, this is probably a weak instrument, while the opposite is true for a not significant coefficient (for a similar application, see Roodman and Morduch 2014). We find that the estimates remain unchanged with respect to our benchmark model and, notably, that the instrument is not significant for both outcomes.⁸ All in all, both the descriptive analysis and the test reassures us about the validity of our instrument.

As mentioned, the second step investigates whether, after one year from first-enrolment in Economics or Business, students are still enrolled in their initial major, have switched major (i.e. to any degree course different from the initial choice) or have dropped out.

In this stage, we introduced additional variables with the aim of capturing: (1) local economic and labour market conditions; (2) the nature of the peer quality and the degree of preparation of student intake between institutions; (3) post enrolment performance at individual and peer level.

For (1), we include the unemployment rate by province of degree course and gender for the age group 18–29, as an indicator for the local economic and labour market conditions (see, for instance, Contini et al. 2018).

We also add control variables for the distribution of high school final mark and of the share of freshmen holding an academic high school diploma (2). These indicators are calculated by enrolment academic year and major (i.e. Business of Economics) and reported in quartiles. In short, these variables allow to indirectly capturing both the selectivity admission criteria of a degree program in a specific university and its prestige (Ost 2010). We use these variables as proxies of the quality and competitiveness of the university, as the available national university rankings are not provided at degree program level. For instance, the Censis rankings of Italian universities draw a classification of tertiary institutions according to a bunch of indicators, such as scholarships, infrastructures, level of internalisation, communication, employability, etc., which is more adequate if the whole university supply is analysed rather than a single degree programme. Censis also delivers the ranking of the overall teaching quality of the degree programmes belonging to a specific area, but we cannot rely on this information as this classification considers together both Economics and Business, preventing to get a reliable sorting by major. Therefore, considering these limitations, our measures constitute the best attempt to control for selectivity and prestige.

For the post enrolment performance (3), we introduced four variables to account for the performance of students during their first year as a driver for the decision about the prosecution of their own studies. The first two variables included are the number

Footnote 7 continued

are unaffected by distance. For further robustness, we also checked the distribution of the average mark obtained in the first year (i.e. whether above or below the average mark) among the two categories and still no differences emerged.

⁸ For the sake of brevity, we do not include the tables for the descriptive analysis and for the test of validity of our instrument in the paper, but they are available upon request.

of credits earned (CFU) and the Grade Point Average (GPA) achieved during the first year weighted by the corresponding number of credits acquired.

For GPA, we note how students who decide to remain enrolled in the same class are those who are able to achieve on average a sufficient performance, remembering that in the Italian HE system a successful exam reports a mark from 18 up to 30 with honours. From Tables 2 and 3, we note that Economics and Business have similar GPA averages. However, it emerges that Business students have a slightly better GPA than the Economics ones both when they decide to stay or dropout, while the opposite emerges regarding the decision of switching major.

To better investigate the importance of peer effect/environment, we also include two variables to test the degree of competitiveness of peers, by considering CFU and GPA. These are calculated as follows:

$$C(CFU)_{i|c,t} = \frac{1}{n-1} \sum_{j \neq i} CFU_{j|c};$$

$$C(GPA)_{i|c} = \frac{1}{n-1} \sum_{j \neq i} GPA_{j|c,t},$$

where C is competitiveness in CFU or GPA; i the student which the indicator refers to, c the major where the student i is enrolled, t the academic year of enrolment of each student, n the number of students in a (certain) degree course in a given University c ; j each other student in the degree course apart from i . Thus, these two indicators attempt to measure how competitive is the environment each individual has to deal with. According to the statistics reported in Tables 2 and 3, we note that students from both Economics and Business switch major and dropout more as the competitiveness of their courses decreases. Finally, Business students are those who seem to face the most competitive environment.

5 Model

This section presents the empirical strategy adopted to explore the decision of Italian high school leavers to enrol at Economics (the same applies to Business) degree course and the subsequent status observed at the end of the first enrolment year (i.e. at the start of the second academic year as reported in the administrative data). Estimates are run separately by degree programmes examined, namely Economics and Business. Here we refer to Economics. We analyse two sequential steps that can be summarised as follows:

- (1) Probability of enrolling in Economics (= 1);
- (2) After the initial academic choice, at the beginning of the second year we model student's status conditional on (1) (= 1):
 - (2a) Probability of being still enrolled in Economics;
 - (2b) Probability of switching major (i.e. to any degree programme different from Economics);

(2c) Probability of dropping out from the HE system.

First, we focus on the determinants of the decision to enrol (1). Second, conditional on the fact of being enrolled, we exploit the panel component of the administrative records of ANS dataset to investigate what happens after the first enrolment year (probability) by analysing the following (alternative) outcomes: (2a) whether the student is still enrolled in the initial degree course; whether the student switching major, namely he/she is still observed in the university system but in a different field of study from the initial choice (2b); or whether she/he dropped out (2c). The control variables pertaining to each step (probability) are described in Sect. 4 and in Tables 2 and 3 for sub-samples, namely Economics and Business, respectively. Notice that the motivations to investigate these three statuses (i.e. persistence, stopout and dropout) at the start of the second academic year are twofold. First, the status of each student is the result of a sequential process made under gradually decreasing levels of uncertainty. In short, the outcome after the first enrolment year is a multivariate process mediated by different determinants (i.e. pre- and post- enrolment characteristics) observed in a temporal interval. Second, we choose to investigate the academic status at the beginning of the second academic year and not later as we aim at underlying students' behaviour during the early stage of their academic career, without mixing further factors and choices that can happen after a greater exposure to academic life. Furthermore, students are more likely to reconsider the initial decision one year from the first enrolment (Aina et al. 2021), postponing the analysing can undermine the effectiveness of the actions to be implemented to tackle both early withdrawal and switching major.

When estimating the impact of the first choice on current one, we focus on students who entered HE at a certain point of their lives.⁹ Thus, because of partial observability, one has to account for potential endogenous selection to avoid not consistent estimates.

We control for selectivity by running a two-equation model, where the selection equation and the after-one-year status equation are assumed to follow a bivariate distribution and correlation among error terms is accounted for. The model is jointly estimated by using a full-information maximum likelihood,¹⁰ which produces consistent and fully efficient estimates (Reize 2001). The advantage of using this model, compared to the standard Heckman approach to selection bias (Heckman 1979), relies on its flexibility about the distributional forms the outcomes may assume.

In particular, the after-one-year status equation models the probability an individual occupies one of the three alternative status, i.e. still in Economics, switching major, dropout. We assume it follows a multinomial distribution, which means individuals were allowed to choose among alternatives that are not inherently ordered. As stated, in this empirical exercise we focus on switching major by and large, without considering the “academic distance” between the initial major and the new ones as we are also interested to analyse the determinants of dropout. As in Astorne-Figari and Speer (2019), the “direction” of major switching will be investigated in a separate article, which will be focused exclusively on understanding the switching status.

⁹ Since we are interested in modelling academic progression after the initial choice, the sample is composed of only freshmen (i.e. first time observed in the HE system), although they can enrol at university in subsequent years than the one of high school diploma attainment (i.e. gap years).

¹⁰ Our model is estimated using the routine *cmp* written in STATA by Roodman (2011).

The after-one-year status equation allows to investigate the later educational outcomes conditional on being firstly observed in Economics.

The selection equation has a binary outcome, which takes value one if the individual has enrolled in Economics and zero otherwise.

Both equations derive from latent continuous variables and assume normally distributed errors.

The specification applied to estimate the probability of enrolling in Economics is derived from a latent continuous variable (y_{1i}^*), which is defined at time $t-1$ and is related to a vector of explanatory variables z and an additional variable, q , introduced for identification purposes (see Sect. 4 for details). The corresponding standard linear model can be represented as follows:

$$y_{1i}^* = z_1' \alpha + \delta q_i + v_i, \tag{1}$$

where α is a vector of associated parameters to z , δ is a parameter associated to the instrument q and v is an error term.

While y_1^* is unobserved, y_1 is observed and related to y_1^* through the following relationship:

$$y_{1i} = \begin{cases} 1 & \text{if } y_{1i}^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

Under the normality assumption of the residual v , the selection equation is modelled as a probit specification.

The latent continuous variable representing the after-one-year status equation (y_{2ij}^*), is defined at time t and it is related to a set of current explanatory variables x . The subscripts i and j index students and multinomial outcomes respectively. The corresponding standard linear model reads:

$$y_{2ij}^* = x_{ij}' \beta_j + u_{ij}, \tag{2}$$

where β is a vector of associated parameters to x , and u is an error term.

While y_2^* is unobserved, y_2 is observed, conditional on $y_{i1} = 1$, and it is related to y_2^* through the following general relationship:

$$y_{2ij} = \begin{cases} j \text{ if } y_{2ij}^* = \max(y_{2i1}^*, y_{2i2}^*, y_{2i3}^*) \\ 0 \text{ otherwise} \end{cases}$$

Under the normality assumption of the residual u , the corresponding model is a multinomial probit.

The two-equation model allows the error terms of Eqs. 1 and 2 to be correlated. Accordingly, we also estimate two correlation terms, ρ_{vu2} and ρ_{vu3} , which measure the correlation between the selection equation and the outcomes of the after-one-year

equation, that are still in Economics (our base category), switching major, and dropout, and inform about the selectivity process at work in the investigated issues.¹¹

Finally, we calculate the average marginal effects (*AMEs*), which would be helpful when interpreting the impact of explanatory variables on outcomes of interest.

6 Results

In this Section, we comment on the results for the model described in Sect. 5. The coefficient estimates of the determinants of the probability of enrolling at Economics or Business (selection equation) are reported in Table 4. Tables 5 and 6 show the *AMEs* for the after-one-year status equation. In column (1) of both Tables there are the correlates of probabilities of switching major, while in column (2) the correlates of dropping out (both switching major and dropout must be interpreted with respect to the base category of remaining in the initial major).

With reference to the selection equation, Table 4 shows that females have a lower probability of enrolling to both Economics and Business compared to males. This latter finding confirms the literature on major choice, which found gender differences in the choice of field of study, with women less prone to enrol in Science, Technology, Engineering and Mathematics (*STEM*), as well as Economics degrees, which are generally more academically demanding (Rask and Tiefenthaler 2008; Griffith 2010; Owen 2010; Card and Payne 2017). Also stereotypes and cultural beliefs about gender roles shape the major preferences of both men and women (Jacobs 1995; Correll 2001; Goldin et al. 2006; Reilly 2012; Alon and Di Prete 2017).

Looking at secondary school track, those with high school diploma from scientific lyceum (our baseline category) have a higher likelihood of enrolling both in Business and Economics with respect to the other types of lyceum (classic and other lyceum), while they show a relatively low probability of enrolling on both fields compared to those graduated in a technical college. The relatively low probability referred to classic or other lyceum might be due to compositional effects. Classic, and especially linguistic lyceum, are primarily attended by female which, as said above, are more likely to enrol in fields related to humanities rather than in Economics and/or Business (Aina et al. 2021). For those graduated in a professional high school, which represent a low percentage of the total sample, we find a relatively low probability of enrolling in Economics and a relatively high probability of enrolling in Business.

The final mark at the high school is negatively associated with the likelihood of enrolling both in Economics and Business (Montmarquette et al., 2001; Bennet, 2009; Belloc et al., 2010; Stinebrickner and Stinebrickner, 2012; Contini et al., 2018). Nevertheless, the magnitude of such effects is close to zero.

We find a negative association between years passed from high school graduation and the probability of enrolling in both degree courses, which confirms the tendency

¹¹ As a robustness check, we included in our specification university-specific fixed effects to account for possible heterogeneity in the way programmes are organized and taught across institutions (as well as to consider possible institutional failures to deal with students' abilities and ambitions) according to the negative view explained in the Introduction. The results remained basically unchanged. For the sake of brevity, we do not report these findings. These are available upon request.

Table 4 Coefficient estimates for the selection equations

Independent Variables	Selection Equation (β)	
	Economics	Business
	(1)	(2)
Female	- 0.111*** (0.004)	- 0.121*** (0.003)
<i>Type of High School (Ref: Scientific Lyceum)</i>		
Classic Lyceum	- 0.187*** (0.006)	- 0.193*** (0.004)
Technical School	0.239*** (0.004)	0.258*** (0.003)
Professional School	- 0.060*** (0.009)	- 0.043*** (0.006)
Other Lyceum	- 0.320*** (0.007)	- 0.362*** (0.005)
HS Final Mark	- 0.002*** (0.000)	- 0.001*** (0.000)
Years from HS to Un	- 0.087*** (0.004)	- 0.089*** (0.002)
Non- Italian citizen	0.262*** (0.010)	0.183*** (0.008)
Log Distance	- 0.027*** (0.001)	- 0.018*** (0.001)
Dummy for geographical area of residence (<i>NUTS1</i>)	Yes	
Dummies for year of first enrolment	Yes	
Constant	- 1.623*** (0.014)	- 0.988*** (0.010)
N. of Observations	1,687,172	

Standard errors in brackets. *** = p-value ≤ 0.001 ; ** = p-value ≤ 0.05 ; * = p-value ≤ 0.1

Source: Authors' calculations from ANS 2008–2014 data

of Italian students of enrolling immediately after achieving the high school diploma (Anvur, 2018).

There is a positive association between being a non-Italian citizenship with an Italian diploma and the probability of enrolling both in Economics or Business, especially in the former case.

The (logarithm of) distance between high school and university, introduced for identification purposes, reduces the likelihood of enrolling in both degree courses (Table 4).¹² Likely, this result is partly due to Italian HE institutions offering a wider range of degrees by opening new sites in neighbouring provinces since the 1990s (Bratti et al. 2008; Cottini et al. 2019).

¹² For a detailed discussion of the instrument choice and its validity, see Sect. 4.

Table 5 AMEs for after-one-year status equation on the Economics sample

Economics sample		
Independent variables	Average marginal effects	
	Switching major (1)	Dropout (2)
Female	0.083*** (0.020)	− 0.136* (0.073)
<i>Type of High School (Ref: Scientific Lyceum)</i>		
Classic Lyceum	0.271** (0.036)	− 0.894*** (0.251)
Technical School	− 0.170*** (0.029)	1.564*** (0.384)
Professional School	− 0.204*** (0.043)	1.750*** (0.571)
Other Lyceum	0.097** (0.042)	0.657* (0.369)
Years from HS to Un	− 0.189*** (0.019)	0.529** (0.214)
Non— Italian citizen	− 0.424*** (0.057)	− 0.840** (0.378)
Unemployment rate	− 0.004*** (0.001)	0.021*** (0.007)
<i>Quartiles of the HS distribution (Ref: 4th quartile)</i>		
1st quartile	− 0.016 (0.028)	0.121 (0.105)
2nd quartile	− 0.134*** (0.028)	− 0.085 (0.098)
3rd quartile	0.092*** (0.026)	0.150 (0.095)
<i>Quartiles of the lyceum diploma share (Ref: 4th quartile)</i>		
1st quartile	− 0.042* (0.025)	1.098*** (0.338)
2nd quartile	0.034 (0.025)	0.883*** (0.274)
3rd quartile	− 0.001 (0.023)	0.532*** (0.181)
<i>Post enrolment performance at individual and peer level</i>		
CFU	− 0.025***	− 0.214

Table 5 (continued)

Economics sample	Average marginal effects	
	Switching major	Dropout
	(1)	(2)
Independent variables		
	(0.001)	(0.065)
GPA	0.025***	0.026
	(0.004)	(0.017)
Competitiveness (CFU)	0.010***	0.050***
	(0.002)	(0.015)
Competitiveness (GPA)	− 0.041***	− 0.050***
	(0.004)	(0.019)
Dummies for geographical area of residence (<i>NUTSI</i>)	Yes	
Dummies for year of first enrolment	Yes	
Rho	− 0.526***	0.605***
	(0.065)	(0.059)
N. of Observations	1,687,172	

Standard errors in brackets. *** = p-value \leq 0.001; ** = p-value \leq 0.05; * = p-value \leq 0.1
 Source: Authors' calculations from ANS 2008–2014 data

Tables 5 and 6 report the correlates of switching major and dropout after one year from first enrolment for Economics and Business, respectively.

Females show a higher propensity of switching major (Astorne-Figari and Speer 2018) and a lower probability of dropout in Economics compared to male counterparts (Table 5), whereas those enrolled in Business tend to both switch and dropout less, although the latter is not statistically significant (Table 6). About early withdrawal, results are in line with the existing literature which suggest that women's completion advantage is mainly due to higher ex-post payoffs to tertiary education, insurance against income deprivation and stronger commitment to education (see for instance, Arulampalam et al. 2004a, b; Cappellari and Lucifora 2009). In fact, evidence reports that higher completion rates of women are due gender differences in study effort, resulting in better grades and beliefs about ability (Stinebrickner and Stinebrickner 2012). With reference to switching major, females are generally more likely to change degree courses, especially they shy away from more competitive environments (i.e. Economics) (Astorne-Figari and Speer 2018, 2019).

About the high school track the patterns are similar for students in Economics and Business (Contini et al. 2018). About switching major, the *AMEs* is positive and significant for classic and other lyceum, while it is negative for both technical and professional schools, compared to the reference category. This finding suggests that, once enrolled, students with a more academic background despite being unhappy with the initial major choice are more likely to keep staying in the HE system, by looking for a more appropriate field of study. The opposite is true for the decision of withdrawal

Table 6 AMEs for after-one-year status equation on the Business sample

Business sample		
Independent variables	Average marginal effects	
	Switching major (1)	Dropout (2)
Female	– 0.023* (0.013)	– 0.028 (0.019)
<i>Type of High School (Ref: Scientific Lyceum)</i>		
Classic Lyceum	0.136*** (0.020)	– 0.149*** (0.044)
Technical School	– 0.404*** (0.017)	0.348*** (0.050)
Professional School	– 0.375*** (0.031)	0.414*** (0.049)
Other Lyceum	0.041* (0.023)	0.094*** (0.036)
Years from HS to Un	– 0.125*** (0.016)	0.115*** (0.012)
Non– Italian citizen	– 0.298*** (0.042)	– 0.308*** (0.043)
Unemployment rate	– 0.003*** (0.001)	– 0.000 (0.001)
<i>Quartiles of the HS distribution (Ref: 4th quartile)</i>		
1st quartile	0.021 (0.021)	0.180*** (0.030)
2nd quartile	0.035* (0.021)	0.118*** (0.028)
3rd quartile	0.113*** (0.019)	0.141*** (0.027)
<i>Quartiles of the lyceum diploma share (Ref: 4th quartile)</i>		
1st quartile	0.036* (0.021)	0.165*** (0.031)
2nd quartile	0.085*** (0.020)	0.171*** (0.031)
3rd quartile	– 0.029 (0.020)	0.112*** (0.029)
<i>Post enrolment performance at individual and peer level</i>		
CFU	– 0.039***	– 0.064

Table 6 (continued)

Business sample	Average marginal effects	
	Switching major (1)	Dropout (2)
Independent variables		
GPA	(0.006) 0.026*** (0.002)	(0.005) – 0.001 (0.003)
Competitiveness (CFU)	0.018*** (0.001)	0.016*** (0.002)
Competitiveness (GPA)	– 0.183*** (0.010)	0.018 (0.013)
Dummies for geographical area of residence (<i>NUTS1</i>)	Yes	
Dummies for year of first enrolment	Yes	
Rho	– 0.869*** (0.024)	0.900*** (0.012)
N. of Observations	1,687,172	

Standard errors in brackets. ***p-value ≤ 0.001 ; **p-value ≤ 0.05 ; *p-value ≤ 0.1
 Source: Authors' calculations from ANS 2008–2014 data

as we find a positive association between all types of high school other than classic lyceum and the probability of dropout.

Interestingly, gap years between high school diploma and university enrolment are negatively associated with switching major, while positively associated with dropout (again, for both Economics and Business). This suggests that, once struggling with the major choice, students not enrolling immediately after high school diploma prefer to withdraw instead of changing major.

For switching major and dropout, non-Italian citizens have a low probability to experience both these outcomes most likely because of their self-selection into university, namely only the high abilities ones are observed (Tables 5 and 6).

We also add control variables for: (1) local labour market conditions; (2) the nature of the peer quality and the degree of preparation of student intake between institution; (3) post enrolment performance at individual and peer level and the degree of competitiveness (for details on their definition, see Sect. 4).

For the former group (1), we include the unemployment rates, defined using the province of the degree course and the age group between 18 to 29 years. The indicator reveals that high local youth unemployment rates, as expected, reduces the probabilities of switching major in both samples after one year, whereas only for Economics the poor labour market conditions are positively associated with dropout. The latter suggests that during recessions the prevailing mechanism at place, at least for students enrolled in Economics, is the need to earn income rather than the fall in the opportunity costs

(Contini and Salza 2020). This finding is in line with Smith and Naylor (2001) and Bradley and Migali (2019).

For group (2), we include dummy variables controlling for the rankings of the university degree course intake in terms of average HS grade and share of students with an academic diploma by academic year. These distributions calculated at major, university and academic year level are defined in quartiles. Table 5 shows that a student intake with better high school grades (i.e. within second and third quartiles) enhances the probability of switching major compared to the worst one (i.e. first quartile), while the results are mixed with regard to dropout as degree courses with students belong to the second quartile are more persistent, instead those belong to the third quartile are much more at risk of withdrawal. The quartile measures of the quota of students holding academic diploma highlight that institutions, attracting less fresh-men with academic diploma, experience significant attrition rates, whose magnitude gradually increases as this portion decreases. Similarly, Table 6 reports that an average intake of better quality students (i.e. higher final grade or larger share of students with academic high school), on the one hand, increases the probability of switching major, on the other hand, it reduces the risk of dropout.

In the latter group (3), the proxies that measure the student performance obtained during their first academic year are the CFU achieved and the corresponding GPA obtained.¹³ Acquiring more CFU, as expected, reduces both the probabilities of switching major and dropping out. The magnitude of this effect is particularly larger for the outcome dropout for the Economics sample (21.6 percentage points). With reference to the individual quality measure (i.e. GPA), a positive association is found only for the probabilities of switching major, suggesting that this proxy enhances persistence in the HE system, despite in a different subject, while is irrelevant in dropout decision.

We also introduce indicators to investigate the importance of peer effects in enhancing the likelihood of degree achievement, exploiting the role played by quantity (i.e. CFU) and quality (i.e. GPA) relative measures (Stinebrickner and Stinebrickner 2006). Estimates show for both majors that the degree of CFU competitiveness gained by the peers in the first year has a positive effect on the probability of switching major or dropout. In particular, for each additional CFU achieved by any cohort of students, the probability of dropout for an Economics student increases of about 5 percentage points, whereas by only 1.6 percentage points for Business ones. Conversely, an improvement in the quality of the reference peers, measured by the GPA competitiveness, where significant, exerts a negative effect on such outcomes. To be more precise, increasing of one grade this indicator reduces of 4 and 18 percentage points the risk of switching major for Economics and Business students, respectively. The probability of withdrawal, instead, decreases only for Economics students, while is insignificant for Business ones. These findings related to the GPA competitiveness confirm the existing literature on both switching major and dropout, such as (Astorne-Figari and Speer

¹³ As a robustness check, we estimated our model without the variables CFU and GPA, as they might be considered a potential source of endogeneity. The results remained the same for all variables with only few exceptions. For after one year equations, we find difference for females for switching major. Without the control variables, female in Economics do not (significantly) switch, while for Business the probability is positive. Other small changes are observed for the dummy variables of both HS and lyceum diploma share distributions. Estimates are reported in the Online Appendix (see Tables A1, A2 and A3).

2019) suggesting low grades as good predictor of major switching probabilities, as well as Montmarquette et al. (2001), Bennet (2009), Belloc et al. (2010), Stinebrickner and Stinebrickner (2012), suggesting that early academic achievements as good grade performance reduces withdrawal.

In all our estimates we add dummy variables for both the geographical area of residence of the students (*NUTSI* level), and for the year of first enrolment at university. The geographical controls have been introduced to capture spatial mobility of the students (D'Agostino et al. 2019). Spatial mobility for educational purposes, indeed, as explained in the literature, has grown for Italian tertiary students in recent years, with an acceleration during the Great Recession. This can be explained by a stronger selectivity of post-secondary education choices and a reduction of the enrolment probability of less motivated students, who were less likely to relocate for studying even in the past (Cattaneo et al. 2017).

Time dummies for each year in our panel have been included for capturing potential time effects.¹⁴

7 Concluding Remarks

In approach, this empirical exercise provides evidence that is generalisable to the whole population of college students enrolled in Economics or in Business, at least for the Italian tertiary education system. Our study adds to the strand of literature concerning the correlates of student university behaviour one year from enrolment. In particular, after controlling for a key stage of the university career, namely the major choice in two specific fields of study (i.e. Economics and Business), we jointly exploit major persistence, switching major, and dropout, thus improving our knowledge in regard to these three outcomes. The analyses are carried out on students enrolled in the HE system during the academic years 2008/09 up to 2014/15 drawn from the ANS dataset.

Findings suggest that with reference to the major choice, namely Economics and Business, there is no difference in terms of pre-enrolment characteristics as the pattern that emerged is similar amongst these two fields of study. While, in regard to the dropout probability, results show that Business students are less likely to withdraw compared to Economics ones when the quantity competitiveness (i.e. the number of credits acquired by peers) is higher and the freshmen obtained a professional, technical or other lyceum diploma. On the other hand, dropout propensity is lower for female students, classic lyceum graduates and students that achieve more credits when enrolled in Economics. At large, higher unemployment rates promote enrolment decision as well as persistence after one year, except for Economics. About switching major, instead, results underline that major change is lower for Business students than Economics ones when they are females, with a classic, technical or other academic diploma. Conversely, students in Economics are less likely to switch compared to Business ones when the quality competition (i.e. better grades of peers in the degree

¹⁴ Rho coefficient estimates for both Economics and Business suggest that selection exists. This reassures on our model choice.

course) increased. Furthermore, the proxies for the average quality of student intake, measured by average high school grades and share of academic high school diploma, strongly reduce the risk of withdrawal as the peers' quality improves. Despite comparing similar majors, at least in the public mind, our findings contribute to enlarge the knowledge of student university behaviour one year from first enrolment in the Italian context. In particular, we notice that students with strong pre-enrolment characteristics are more likely to switching major rather than dropping out. Besides, institutions that applied admission criteria (i.e. better intake) are more efficient as they reduce their share of withdrawal. By having a more homogeneous cohort of freshmen, they can reduce the degree of competitiveness amongst students as well, thus increasing persistence.

Our results can inform discussions on university persistence. To tackle early withdrawal, on the one hand, policy makers should ensure inclusiveness at access, by offering equality of opportunities in education since high school track choices, as it is still heavily related to social stratification, along with well-designed scholarship system to overcome potential financial constraints. On the other hand, it is also required that students will be better informed about their competencies at the end of the high school, to make more conscious university choices. Accordingly, tertiary education systems should strengthen the orientation activities to promote a better major matching and ensure a more extensive number of degree programmes, so that even weaker students can find the academic path that matches their characteristics and aspirations. Finally, universities should also foster initiatives that encourage social and academic integration that can avoid dropout/switching major, for example by helping students from disadvantaged backgrounds to enhance their sense of belonging to the institution (Deil-Amen 2011) and by improving problem-based learning that can reinforce connections between peers (Severien and Schmidt 2009; Zhao and Kuh 2004).

Further studies should investigate whether switching major, by helping a better academic match, it is able to increase not only persistence but graduation on time too, in comparison with those that keep staying enrolled in the initial major choice, although they are unhappy with it.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40797-021-00177-w>.

Acknowledgements Carmen Aina gratefully acknowledges the financial support of the Università del Piemonte Orientale (grant FAR2017). We are grateful to Irene Brunetti, Dalit Contini, Lavinia Parisi, Roberto Zotti and two anonymous referees and the Editor for valuable comments. We thank participants at AIEL and SIE conferences in 2020 for useful comments.

Authors' contributions Carmen Aina: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – review & editing, Funding acquisition. Chiara Mussida: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – review & editing. Gabriele Lomabardi: Data cleaning and Descriptive Statistics.

References

Aina C (2011) The determinants of success and failure of Italian university students. evidence from administrative data. *Rivista Internazionale Di Scienze Sociali* 2:85–108

- Aina C, Nicoletti C (2018) The intergenerational transmission of liberal professions. *Labour Econ* 51:108–120
- Aina C, Bratti M, Lippo E (2020) Ranking high schools using university student performance in Italy. *Econ Polit*
- Aina C, Baici E, Casalone G, Pastore F (2021). The determinants of university dropout: A review of the socio-economic literature. *Socio-Economic Planning Sciences*, forthcoming
- Alon S, DiPrete TA (2017) Gender differences in the formation of a field of study choice set. *Sociol Sci* 2:50–81
- Altonji J (1993) The demand for and return to education when education outcomes are uncertain. *J Law Econ* 11(1):48–83
- Altonji J, Arcidiacono P, Maurel A (2016) The analysis of field choice in college and graduate school: determinants and wage effects. *Handb Econ Educ*, pages 305–396.
- Anvur (2018) Rapporto biennale sullo stato del sistema universitario e della ricerca 2018.
- Arcidiacono P (2004) Ability sorting and the returns to college major. *J Econ* 121(1–2):343–375
- Arulampalam W, Naylor R, Smith J (2004a) Factors affecting the probability of first year medical student dropout in the UK: a logistic analysis for the intake cohorts of 1980–92. *Med Educ* 38:492–503
- Arulampalam W, Naylor R, Smith J (2004b) A hazard model of the probability of medical school dropout in the UK. *J R Stat Soc Ser A* 167(1):157–178
- Arulampalam W, Naylor R, Smith J (2007) Dropping out of medical school in the UK: Explaining the changes over ten years. *Med Educ* 38:385–394
- Asarta CJ, Butters RB (2012) The discouraged-business-major hypothesis revisited: could economics be the encouraged-business-major? *J Econ Educ* 43(1):19–32
- Asarta CJ, Scott MF, Perumal A (2013) How to transfer students perform in economics? Evidence from intermediate macroeconomics. *J Econ Educ* 44(2):110–128
- Astorne-Figari C, Speer J (2018) Drop out, switch majors, or persist? The contrasting gender gaps. *Econ Lett* 164:82–85
- Astorne-Figari C, Speer J (2019) Are changes of major major changes? The roles of grades, gender, and preferences in college major switching. *Econ Educ Rev* 70:75–93
- Bauer P, Riphahn RT (2006) Timing of school tracking as a determinant of intergenerational transmission of education. *Econ Lett* 91(1):90–97
- Belloc F, Maruotti A, Petrella L (2010) University drop-out: and Italian experience. *High Educ* 60:127–138
- Bennet R (2009) Determinants of undergraduate student dropout rates in a university business studies department. *J Furth High Educ* 27:123–141
- Berger M (1988) Predicted future earnings and the choice of college major. *Ind Labor Relat Rev* 41(3):418–429
- Blom E, Cadena B, Keys B (2020) Investment over the business cycle: in-sights from college major choice. *J Labor Econ*
- Bound J, Lovenheim M, Turner S (2009) Why have college completion rates declined? An analysis of changing student preparation and collegiate resources. *Am J Appl Econ* 2(3):129–157
- Bowen W, Chingos M, McPherson M (2009) *Crossing the finish line: Completing college at America's public university*. Princeton University Press, Princeton
- Bradley S, Migali G (2019) The Effects of the 2006 tuition fee reform and the Great Recession on university student dropout behaviour in the UK. *J Econ Behav Organ* 164:331–356
- Bratti M, Checchi D, DeBlasio G (2008) Does the expansion of higher education increase the equality of educational opportunities? Evidence from Italy. *Labour* 22:53–88
- Brunello G, Checchi D (2007) Does school tracking affect equality of opportunity? New International evidence. *Econ Policy* 22(52):783–861
- Cappellari L, Lucifora C (2009) The “bologna process” and college enrollment decisions. *Labour Econ* 22(52):638–647
- Card D, Payne A (2017) High school choices and the gender gap in stem. Technical report, National Bureau of Economic Research.
- Carrieri V, D'Amato M, Zotti R (2015) On the causal effects of selective admission policies on students' performances: evidence from a quasi-experiment in a large Italian university. *Oxf Econ Pap* 67(4):1034–1056
- Cattaneo M, Malighetti P, Meoli M, Paleari S (2017) University spatial competition for students: the Italian case. *Reg Stud* 51(5):750–764

- Cecchi D, Flabbi L (2013) Intergenerational mobility and schooling decisions in Germany and Italy: The impact of secondary school tracks. *Rivista Di Politica Economica* 3:7–57
- Cecchi D, Ichino A, Rustichini A (1999) More equal but less mobile? Education financing and intergenerational mobility in Italy and in the US. *J Public Econ* 74(3):351–393
- Cecchi D, Fiorio C, Leonardi M (2013) Intergenerational persistence of educational attainment in Italy. *Econ Lett* 118:229–232
- Contini D, Scagni A (2011) Inequality of opportunity in secondary school enrolment in Italy, Germany and Netherlands. *Qual Quant Int J Methodol* 45(2):441–464
- Contini D, Cugnata F, Scagni A (2018) Social selection in higher education. enrolment, dropout and timely degree attainment in Italy. *High Educ* 75:785–808
- Correll SJ (2001) Gender and the career choice process: the role of biased self-assessments. *Am J Sociol* 106:1691–1730
- Cottini E, Ghinetti P, Moriconi S (2019) Higher education supply, neighborhood effects and economic welfare. *Cesifo Working Papers* N.7483.
- Cunha F, Heckman J, Navarro S (2005) Separating uncertainty from heterogeneity in life cycle earnings, the 2004 hicks lecture. *Oxford Econ Pap* 57(2):191–261
- D’Agostino A, Ghellini G, Longobardi S (2019) Out-migration of university enrolment: the mobility behaviour of Italian students. *Int J Manpow* 40(1):56–72
- Dale R (2007) Changing meanings of “the Europe of knowledge” and “modernizing the university,” from Bologna to the “new Lisbon.” *Eur Educ* 39(4):27–42
- Deil-Amen R (2011) Socio-academic integrative moments: rethinking academic and social integration among two-year college students in career-related programs. *J Higher Educ* 82(1):54–91
- Di Pietro G (2004) The determinants of university dropout in Italy: a bivariate probability model with sample selection. *Appl Econ Lett* 11:187–191
- Dustmann C (2004) Parental background, secondary school track choice, and wages. *Oxf Econ Pap* 56(2):209–230
- Fischer S (2017) The downside of good peers: how classroom composition differentially affects men’s and women’s stem persistence. *Labour Econ* 46:211–226
- Frenette M (2006) Too far to go on? distance to school and university participation. *Educ Econ* 14(1):31–58
- Goldin C, Katz LF, Kuziemko I (2006) The Homecoming of American college women: the reversal of the college gender gap. *J Econ Perspect* 20:133–156
- Griffith AL (2010) Persistence of women and minorities in stem field majors: Is it the school that matters? *Econ Educ Rev* 6:911–922
- Hanushek E, Wößmann L (2006) Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries. *Econ J* 116(510):C63–C76
- Heckman J (1979) Sample selection bias as a specification error. *Econometrica* 47(1):153–161
- Jacobs JA (1995) Gender and academic specialties: trends among recipients of college degrees in the 1980s. *Sociol Educ* 68:81–98
- Johnes G, McNabb R (2004) Never give up on the good times: Student attrition in the uk. *Oxford Bull Stat* 66(1):23–48
- Manski C (1989) Schooling as experimentation: a reappraisal of the post-secondary dropout phenomenon. *Econ Educ Rev* 8(4):305–312
- Mastekaasa A, Smeby J (2008) Educational choice and persistence in male-and female-dominated fields. *High Educ* 55(2):189–202
- McNabb R, Pal S, Sloane P (2002) Gender differences in educational attainment: the case of university students in England and Wales. *Economica* 69:481–503
- MIUR (2019) La dispersione scolastica nell’anno scolastico 2016/17 e nel passaggio nell’anno scolastico 2017/18, Report Gestione Patrimonio Informativo e Statistica.
- Montmarquette C, K., K. C., and Mahseredjian, S. (2002) How do young people choose college majors? *Econ Educ Rev* 21:543–556
- Montmarquette C, Mahseredjian S, Houle., R. (2001) The determinants of university dropouts: a bivariate probability model with sample selection. *Econ Educ Rev* 20(5):475–484
- OECD (2019) Education at a glance: Oecd indicators. OECD Publishing, Paris
- Ost B (2010) The role of peers and grades in determining major persistence in the sciences. *Econ Educ Rev* 46:923–934
- Owen A (2010) Grades, gender, and encouragement: a regression discontinuity analysis. *J Econ Educ* 41(3):217–234

- Paglin M, Rufolo A (1990) Heterogenous human capital, occupational choice, and male-female earnings differences. *J Law Econ* 8(1):123–144
- Panichella N, Triventi M (2014) Social inequalities in the choices of secondary school. *Eur Soc* 16(5):666–693
- Pascarella E, Terenzini P (1978a) The relation of students' precollege characteristics and freshman year experience to voluntary attrition. *Res High Educ* 9:347–366
- Pascarella E, Terenzini P (1978b) Student-faculty informal relationships and freshman year educational outcomes. *J Educ Res* 71(4):183–189
- Pascarella E, Terenzini P, Hiberl J (1978) Student-faculty interactional settings and their relationship to predicted academic performance. *J Higher Educ* 49(5):450–463
- Rask K, Tiefenthaler J (2008) The role of grade sensitivity in explaining the gender imbalance in undergraduate economics. *Econ Educ Rev* 27(6):676–687
- Reilly D (2012) Gender, culture, and sex-typed cognitive abilities. *PLoS ONE* 7(7):e39904. <https://doi.org/10.1371/journal.pone.0039904>
- Reize F (2001) Firm estimation of a bivariate probit selection rule: an application on firm growth and subsidization. *ZEW Discussion paper n. 01–13*.
- Roodman D (2011) Fitting fully observed recursive mixed-process models with cmp. *Stata J* 11(2):159–206
- Roodman D, Morduch J (2014) The impact of microcredit on the poor in Bangladesh: revisiting the evidence. *J Dev Stud* 50(4):583–604
- Salemi MK, Eubanks C (1996) Accounting for the rise and fall in the number of economics majors with the discouraged business-major hypothesis. *J Econ Educ* 27(3):350–361
- Severien SE, Schmidt HG (2009) Academic and social integration and study progress in problem based learning. *High Educ* 58:59–69
- Siegfried, J.J: and Wilkinson, J.T. (1982) The economics curriculum in the United States: 1980. *Am Econ Rev* 72(2):125–138
- Smith J, Naylor A (2001) Dropping out of university: a statistical analysis of the probability of withdrawal for UK university students. *J R Stat Soc Ser A* 164(2):389–405
- Spieß K, Wrohlich K (2010) Does distance determine who attends a university in Germany? *Econ Educ Rev* 29(3):470–479
- Stinebrickner R, Stinebrickner T (2001) How do college students form expectations? *Rev Econ Stud* 81:289–313
- Stinebrickner T, Stinebrickner R (2003) Working during school and academic performance. *J Law Econ* 21(2):473–491
- Stinebrickner T, Stinebrickner R (2006) What can be learned about peer effects using college room-mates? Evidence from new survey data and students from disadvantaged backgrounds. *J Public Econ* 90(8–9):1435–1454
- Stinebrickner T, Stinebrickner R (2012) Learning about academic ability and the college dropout decision. *J Law Econ* 30(4):707–748
- Stinebrickner R, Stinebrickner T (2014) A major in science? Initial beliefs and final outcomes for college major and dropout. *Rev Econ Stud* 81(1):426–472
- Stratton L, P'Toole D, Wetzel J (2008) A multinomial logit model of college stopout and dropout behavior. *Econ Educ Rev* 27(3):319–331
- Tinto V (1975) Dropout from higher education: a theoretical synthesis of recent research. *Rev Educ Res* 45:89–125
- Trivellato P, Triventi M (2009) Participation, performance and inequality in Italian higher education in the 20th century. *High Educ* 57(6):681–702
- Ware N, Lee V (1988) Sex differences in choice of college science majors. *Am Educ Res J* 25(4):593–614
- Ware N, Steckler N, Leserman J (1985) Undergraduate women: who chooses a science major? *J Higher Educ* 56(1):73–84
- Zafar B (2011) How do college students form expectations? *J Law Econ* 29(2):301–348
- Zhao C, Kuh GD (2004) Adding value: learning communities and student engagement. *Res High Educ* 45:115–138