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Social Origins and University Drop-Out During the Great Recession: The Role of the Field of Study

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Introduction

The recession that followed the Global Financial Crisis of 2007–08, with a downward leap of approximately 5% of OECD countries' economic prosperity (Grusky et al., 2011), has had profound influences on individual persons and societies. Evidence of this Great Recession's short- and medium-term effects includes reduced employment chances for individuals, deterioration of households' economic conditions, and an increased aggregate level of poverty and inequality in both the USA (Reinhart and Rogoff, 2009; Grusky et al., 2011) and Europe (Jenkins et.al. 2013). In this paper our attention is focused on the potential longer-term effects of the crisis for social inequality. The deterioration of the economic situation faced by adults likely impacts their offspring as well, both in psychological (increased tension within the family) and material terms (ability to pay for goods and services). Through these channels, the crisis might have influenced this next generation's chances of pursuing prestigious and expensive educational degrees, and thus their occupational status in the future. As educational degrees are a strong predictor of future occupational positions, in this paper we suggest that analyzing the current effects of the Great Recession on dropping out of university according to social background reveals the potential longer-term effects of the crisis on social inequality. While the influence of the Great Recession on higher education institutions revenues and expenditures (Gansemer-Topf et al., 2018), university enrollment (Barr and Turner, 2013; Schizzerotto et. al., 2018; Ford et al., 2021; Lindemann and Gangl, 2022), and drop-out risk (Ghignoni, 2017) has already attracted scholarly attention, little is known of the role of the field of study as a potential mediator of the association between social origins and withdrawal from university. In other words, the question of whether certain fields of study are better than others in

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protecting students from dropping out during economic downturns is still unanswered. Hence, we aim at contributing to the debate by analyzing how the Great Recession has affected social origin inequality in leaving university according to field of study.

Policymakers in contemporary Western societies often address higher education as a central arena for investments devoted to increasing national economic performance and reducing social inequality. On the one side, longer periods in the educational system allows young people to acquire higher levels of human capital and skills that, at the aggregate level, positively correlate with higher levels of socioeconomic development (Hanushek and Woessmann, 2008, 2012). On the other side, educational credentials are usually considered by students and their families as a means of protection against being employed in lower-paying jobs (Breen and Jonsson, 2005; Hout and Di Prete, 2006). Thus, it is unsurprising that university withdrawals are seen as a waste of public and private resources (Aina, 2013) and as a threat to policymakers' efforts to decrease inequality in educational opportunities.

We believe that Italy in particular represents an interesting case in this regard. By analyzing the diffusion of the event of dropping out from university in the adult population of 15 European countries with of PIAAC data, Schnepf (2017) identifies Italy as the country with the highest rate (1/3 of all individuals aged 25–64 who had at any point enrolled at university left before gaining a degree). According to ANVUR[1] (2018), around 12% of all students who start a bachelor's degree[2] leave before entering their second year, and by the end of the legal duration of the course (after 3 years from enrollment), around 22% have left without an undergraduate degree. Drop-out rates of bachelor students grow monotonically alongside the years since enrollment, reaching around 37% after 10 years. However, as we are about to discuss in the following pages, there is great variation in the drop-out rate according to both type of degree (with bachelor's courses exhibiting a drop-out rate double than that of Master's and single-cycle degrees) and discipline. Among European countries, Italy also has the lowest rate of tertiary completion after a drop-out episode: only 6.1% of adults eventually gained a tertiary degree after experiencing a drop-out, compared to 37.7% of adults in Germany and 58.2% in Sweden (Schnepf, 2017). In other words, leaving university constitutes a much more definitive event in Italy than in any other European country. Because of both the dimension of the phenomenon of withdrawing and its significance for an individual's educational career in this country, focusing on Italy can help to detect effects of the Great Recession potentially present yet less visible in other European countries, due to the lower numbers involved. In addition, although more and more scholars have recently begun to address the determinants of university enrollment in Italy, the phenomenon of university disenrollment is still substantially understudied,[3] despite its high social relevance.

In the next section we provide a detailed description of the Italian context for what concerns both the education system and the economic situation in the years of the Great

[1] The Italian National Agency for the Evaluation of Universities and Research Institutes (ANVUR) regularly publishes reports on the Italian university system. The latest available report can be downloaded here: https://www.anvur.it/wp-content/uploads/2018/11/ANVUR-Completo-con-Link.pdf (December 2022).

[2] The information is computed on the most recent cohort of freshmen available in ANVUR (2018), that of students starting in late 2015. The % of students no longer enrolled after three years since matriculation is, instead, computed on students starting their studies in the second half of 2013. The % of dropouts after 10 years from enrollment is computed based on students who started their bachelor's in 2006.

[3] One reason for this is the limited availability of pertinent survey data. However, since 2010, the Italian Ministry of Education has collected administrative information about all students and their educational careers in Italy (in the so-called *Anagrafe Nazionale degli studenti*—National Register of Students). This information is not yet linked to the individual characteristics needed to analyze inequality in educational opportunities.

Recession. Section "Theoretical Framework" illustrates the theoretical background, the previous literature, and the research hypotheses while the successive section clarifies the data, variables and methods. Following, we present the results of our analyses; and finally, Sect. "Conclusions" summarizes and discusses our main findings.

The Context

The Italian educational system

Education in Italy is compulsory for children aged 6 to 16 years and it is organized in four stages: primary school, lower secondary school, upper secondary school, and tertiary education. Tracking appears at upper secondary school (from 9th grade onwards) where three tracks are available: academic (*liceo*), technical (*istituto tecnico*) and vocational (*istituto professionale*). Each track lasts five years and ends with an examination of competencies known as *Esame di Maturità*. Every student who passes this exam may enroll at university, regardless of which track he or she completes.[4]

The implementation of the Bologna Process in 2001 deeply changed the Italian tertiary educational system. The previous system was based on a single tier that lasted between 4 and 6 years, depending on the chosen field of study. It was particularly selective and characterized by a high workload. The state of affairs changed dramatically after the introduction of the Bologna Process, announced in 1999 and fully implemented in 2001. Compared to other European countries, Italy was an outlier with respect to the time of the implementation of the reform: the policymaker opted for immediate full implementation, as the reform was intended as a tool for solving urgent problems of Italian tertiary education, namely low enrollment rates and frequent drop-outs. Higher education in Italy since 2001 is organized according to a sequential system, the so-called "3 + 2", which comprises a 3-year bachelor's degree, resulting in the *laurea triennale*, plus a 2-year Master's degree, leading to the *laurea magistrale*. The latter is a prerequisite for doctoral programs. The only few exceptions are very specific degrees in Veterinary, Surgery, Dentistry, Pharmacy, Architecture, Construction Engineering, Law, and Primary Education. These represent the so-called *Lauree a ciclo unico* (single-cycle degrees), which still follow a pre-reform organization of the curriculum with a legal duration that varies from 4 years for Primary Education to 6 years for Surgery. Italian students are allowed to switch their field of study during university studies and, in this case, they are not considered drop-outs. The differences in terms of prestige and reputation between Italian universities are practically negligible, especially when compared to the higher education systems of France, the United Kingdom, or the United States, which are characterized by the presence of elite institutions. As a result, the choice of field of study in Italy is a particularly relevant decision, to which prestige and future remuneration are related (Ballarino and Bratti, 2009; Triventi et al., 2017).

According to OECD (2011), fees requested to attend university in Italy are low if compared to the United States or United Kingdom. They are however higher than in

[4] Some vocational schools, managed at local level, offer three-year qualifications, which do not grant access to university.

other European countries, such as for example Denmark, Finland, Norway, and Sweden, where no tuition fees apply. The cost of tertiary education that students need to pay varies according to both discipline and region. The Italian Association for the Protection of Consumers (*Federconsumatori*) computes the average fees for degrees in STEM and Medicine to be the highest: between a minimum of € 554.65 for medium and low-income families and a maximum of € 2281.13 for high-income families. Costs of tertiary education in other fields are slightly lower (from a minimum of €525.60 to a maximum of €2127.11, according to family income) (Federconsumatori, 2014). However, the national average conceals a great geographical variation, with universities located in the northern regions requesting higher tuition fees than those located in the South and islands. Currently, the University of Pavia in Lombardy is the most expensive in the country, with an average yearly tuition fee of €3902.00 for the highest income families (Federconsumatori, 2021). The panorama of tuition fees in Italy is quite complex, as each tertiary educational institution defines the fees to be paid according to its own institutional strategy. However, all universities adopt a progressive mechanism according to family income, which is measured through ISEE (Index of the equivalent economic condition). Thanks to support measures and additional subsidies (i.e., the recent 'no-tax area' measure), very low-income families are exempted from the payment of tuition fees (students with ISEE up to €20,000 are required to only pay a regional tax of €140 or less according to region) (Federconsumatori, 2021). Students not eligible for a complete waiver pay a tuition fee according to their ISEE, the amount of which, as well as thresholds defining ISEE classes, depends on the university.[5] The main support measure for students from low-income families is the so-called *Diritto allo studio program* (literally "right to education"). Eligible students may receive different types and levels of aid on the basis of their family income measured through the ISEE: these could take the form of tuition waivers, subsidies for food and housing, or scholarships. Unfortunately, the program's main issue (also present before the Great Recession) is that not all students eligible for a scholarship receive it, due to funding shortcomings at the regional level. Even though the *Diritto allo studio* is a nation-wide program ruled by the central government, individual aid is provided locally and thus has to be funded by local governments. As a result, students' chances to be funded are not equally distributed among regions. More precisely, in the Northern regions that have more resources at their disposal, more funds are allocated for the *Diritto allo studio* program in order to cover the costs of the scholarship for eligible students in comparison to other regions. TableA.1 in the online Appendix depicts this state of affairs well, showing that the risks of being eligible but not receiving any funds due to financial constraints at the local level is higher in the Center-South of Italy. In southern regions such as Molise, Calabria, Campania, and Puglia, the coverage rate of grants supplied under the 'Right to education' continuously lags below 70%, meaning that less than 2/3 of students receive

[5] For instance, the University of Trento in the north of Italy currently identifies the following ISEE classes for students as not eligible for a complete waiver:
i) ISEE up to €26,000.00: annual fee between €146.00 and €366.00.
ii) ISEE between €26,000.01 and €86.999,99: annual fee between €367.00 and €2,384.00.
iii) ISEE above €87,000.00 or missing ISEE declaration: annual fee of €2,384.00.
Annual fees for medium and high ISEE also vary according to merit (see for example https://infostudenti.unitn.it/en/tuition-fees-22-23).

the scholarship for which they are eligible. Throughout the recession, the rate remained instead above 95% in Valle d'Aosta, Trentino Alto Adige, Friuli Venezia Giulia, and Emilia Romagna. The problematic coverage granted by the *Diritto allo Studio* measure is also highlighted by the OECD, according to which Italy has the lowest coverage rate in Europe (OECD, 2018).

The Economic Conjuncture

The Great Recession constitutes by far the worst economic downturn in Italy in the last 70 years (Brandolini et.al., 2013). Figure 1 shows descriptive statistics on the economic situation of the country between 2000 and 2016. GDP data (Fig. 1, Panel A) signal a steep decline in 2009, accompanied by a long-lasting downward trend between 2009 and 2015. Because the contraction of the Italian employment rate during the Great Recession was most affected by the non-renewal of fixed-term contracts rather than layoffs (D'Amuri, 2011), data on both the general and youth unemployment[6] rates (Fig. 1, Panels B and C) provide a better picture of when students and their families started to experience conspicuous losses of economic resources. It was in 2008 but even more from 2009 that the youth employment rate ballooned, reaching more than 17%. Our results are in line with those of Brandolini et.al. (2013), who show how the average monthly equivalent disposable income in 2008 remained roughly equal to 2007, and began shrinking starting in 2009. As a result, the incidence of relative poverty in 2010 was already 1.8 times greater than that of 2007.

The increase in the general unemployment rate resulted in worsened economic conditions within families, which made university participation for youth less affordable. At the same time, the growing rate of youth unemployment mirrors declining chances for youths to find jobs. These two phenomena portray a situation in which direct costs increase, while opportunity costs decrease. It should be noted that, contrary to the countercyclical characteristics of enrollment rates at American universities (Christian, 2007; Barr, 2013; Gansemer-Topf et al., 2018), every economic crisis since the 1970's has been accompanied by a negative effect on the transition rates from upper secondary school to university in Italy (Schizzerotto et.al., 2018). This is also shown by macro data on gross enrollment rates (Fig. 1, Panel E). Note that the Great Recession could have accelerated the previously decreasing trend in enrollment rates (Schizzerotto et.al., 2018). It has to be also stressed that the proportion of NEET (not in education, employment or training) increased sharply in the aftermath of the economic crisis (Fig. 1, Panel D).

[6] More precisely, we report the unemployment rate for people aged 18-29 with an upper secondary school qualification. For the sake of simplicity, this indicator is referred to as the youth unemployment rate.

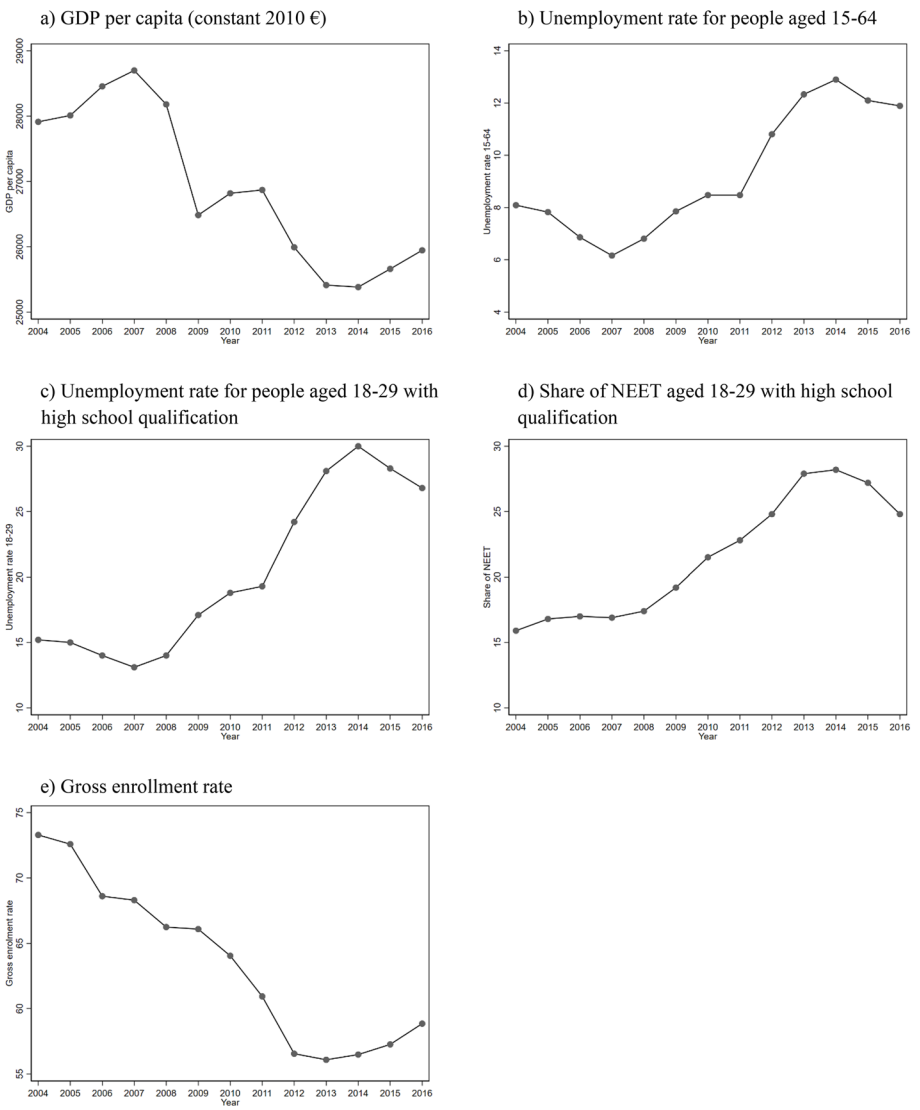

Fig. 1 Descriptive statistics. *Note:* The gross enrollment rate is the ratio between all individuals enrolling at university for the first time in the academic year t – regardless of the year in which they obtained a high-school qualification – and the number of pupils who passed final high school examinations in the school year t-1. *Source:* Data for panels a, b, c, and d was supplied by the Italian Statistical Office (Istat) through the I.Stat data warehouse; data for panel e was provided by the *Italian Statistical Yearbook* for the number of students enrolled in university for the first time; and data for the number of high school graduates was supplied by the Italian Ministry of Education (*Anagrafe nazionale degli alunni*)

Theoretical Framework and Hypotheses

In this section we present the theoretical framework that guides our empirical analysis. We start the discussion with arguments on the relationship between parental education (which we use as a proxy of social origin, as is better explained in the next section) and university participation, and successively decline them in a context influenced by the Great Recession.

Social Background and University Participation

Following a rational action theory (RAT) approach, educational choices[7]—in our case university persistence (i.e., not dropping out)—are influenced by three main factors. First, the costs involved in enrolling/remaining in education, which can be direct- (tuition fees, expenses for learning materials, etc.) or indirect costs (renounced earnings). Second, the likelihood of success at the successive stage in case of continuation (i.e., the probability of receiving a degree). Third, the perceived benefit of each available alternative (in our case: remaining at university vs. dropping out) (Gambetta, 1987; Breen and Goldthorpe, 1997). While both the likelihood of success and the perceived benefit positively influence university participation, the direct and indirect costs exert a negative influence. This argument can be summarized by the following formula:

$$U = (P \cdot B) - \left(C_d + C_o\right)$$

where U is the utility of university persistence, P the probability of success, B the expected benefit, and C_d and C_o are respectively the direct and indirect (or opportunity) costs.

A student's socioeconomic background can influence university persistence through each of these factors (Becker, 2022; see also Aina et al., 2022 for a review of the determinants of dropping out). Children from more educated and well-off parents not only can rely on the higher economic resources of their parents to undertake expensive educational choices (Boudon, 1974), but also benefit from their parents' higher parental cultural capital which is better suited to sustaining their competence development (Jaeger, 2022; Aina, 2013). In this way a virtuous circle with beneficial effects on the likelihood of educational success is triggered. In addition, because individuals aim to maintain at least the same living standards they experienced while growing up, the benefit attached to educational alternatives will be influenced by the family of origin's socioeconomic status (van de Werfhorst and Hofstede, 2007; Holm and Jaeger, 2008). More precisely, students from more advantaged families will attach a higher utility to prestigious educational degrees, the only type likely to protect them from the risk of downward social mobility. Children from less advantaged families could instead achieve the same result through less demanding educational choices (Breen and Goldthorpe, 1997; Goldthorpe, 1996).

The predictions derived from RAT received recurrent empirical support in the international literature (for examples see: Becker and Hecken, 2009; Argentin and Triventi, 2011; Stocké, 2019; and Becker, 2022 for a review of studies supporting the Breen and Goldthorpe 1997 model discussed here). Studies on university drop-out are relatively less common, but since drop-out is the alternative to educational continuation, the above considerations are equally applicable to the study of the decision to leave university (Breen and Goldthorpe, 1997). Similar to university enrollment, the decision to withdraw after initial enrollment is heterogeneously distributed across socioeconomic backgrounds: less advantaged students are more likely than their peers with highly educated parents to prematurely leave university.

[7] We follow previous work by Mare (1980), Boudon (1974), and Breen and Goldthorpe (1997) in considering individual educational careers as the result of a series of consecutive choices between continuing in education and leaving to enter the labor market. In this paper we focus on the event of dropping out, which is analyzed through the lens of Rational Action Theory and the Breen and Goldthorpe (1997) model of educational decision-making. For a discussion of the theoretical foundations and a review of the theoretical aspects of the empirical research adopting this approach, please see Becker 2022.

Previous studies have revealed a social gradient in dropping out in several different countries, such as: in the US (Stratton et al., 2008), UK (Smith and Naylor, 2001; Crawford, 2014), Scotland (Christie et al., 2004), Spain (Lassibille and Navarro Gomez, 2008), France (Gury, 2011), and Italy (Di Pietro, 2004; Di Pietro and Cutillo, 2008; Triventi and Trivellato, 2009; Aina, 2013; Cingano and Cipollone, 2007). However, analyses of the decision to leave university have rarely focused on the horizontal dimension of education (i.e., the field of study). Yet, as pointed out by Lucas (2001) also following a RAT approach (Becker, 2022), the consideration of the vertical dimension of education is not enough to fully understand how social inequalities are reproduced in contemporary Western societies. Indeed, students from the most advantaged socioeconomic backgrounds are prone to exploit both the vertical and horizontal dimensions of education when the former does not guarantee protection from the risk of downward social mobility. The perceived benefit of a degree, in fact, depends not only on the mechanism of status maintenance addressed above, but also on the (expected) specific economic return of the degree in the labor market, which increasingly depends on the field of study (Reimer et al., 2008; Triventi et al., 2017; Ballarino and Bratti, 2009; Vergolini and Vlach, 2017).

The Great Recession and Drop-Out Behavior

The Great Recession, by negatively affecting families' economic resources and individuals' opportunities in the labor market, is likely to have conspicuously influenced the evaluations of the costs and benefits of university persistence. In this section we adapt the theoretical model depicted in the previous section to account for individuals' rational responses to changes resulting from an exogenous shock like an economic crisis.

First, we expect that the Great Recession increased the relative weight of direct costs (C_d) in the equation for predicting university persistence. As seen in the previous section, the economic crisis greatly diminished households' disposable income, making tertiary education less affordable for students and their families, regardless of the specific field of study. Even if students from low-income families can benefit from financial aid to fund their university participation, the *Diritto allo studio* program was not reinforced during the Great Recession to help needy students. Rather to the contrary, the coverage rate declined in many regions (see Table A.1 in the Appendix). Based on this reasoning, we formulate our first hypothesis:

H1 *Increasing direct costs results in an increased drop-out rate (regardless of the field of study).*

As shown by the utility function above, however, direct costs constitute just a portion of the total cost of tertiary education: another important part is foregone earnings (i.e., opportunity- or indirect costs). During periods of economic growth, indirect costs could keep some students away from university due to good opportunities in the labor market that high school graduates may enjoy.

This changes during economic recessions, when massive youth unemployment greatly reduces indirect costs. In this scenario, the youth unemployment rate exerts an important positive effect on the probability that an individual remains in education (for simplicity, shown in Table 1 as a plus for opportunity costs), resulting in a lower drop-out rate. This argument begets an alternative hypothesis:

H1b *Reducing opportunity costs results in a decreased drop-out rate (regardless of the field of study)*

Previous studies on the Italian case in this regard do not seem to converge. Adamopoulou and Tanzi (2017) highlight reduced social inequality in university participation in the aftermath of the Great Recession, with a decrease in the drop-out risk in addition to an increased likelihood of on-time graduation for highly motivated students. The evidence reported by Ghignoni (2017) suggests that the influence of parental education on university dropout has instead strengthened with respect to the pre-crisis period. Given the significant impact of the Great Recession in Italy, we believe that the scenario depicted by *H1a* could be the most reliable, as university persistence in times of economic crisis may have become too costly and those more stricken by the crisis tended to become NEET (see Fig. 1, Panel D, and Lindemann and Gangl, 2022).

This portrayed situation becomes substantially more complex when we acknowledge that the population of students, rather than being homogeneous, is divided into very diverse fields of study. Data collected by ANVUR (2018) indicates that drop-out behavior is unevenly distributed across fields. In the cohort of freshmen undergraduate students of 2015/2016 for example, around 20% of students in the field of Law did not transition to their second year, whereas the rate decreases to around 12% in the field of Chemistry and reaches the minimum, of 7%, in the field of Medicine. The qualitative dimension of education plays a significant role for both tertiary education experiences and future prospects in the labor market. Fields are each associated with different levels of direct cost, where the most remunerative ones (e.g., those leading to liberal professions: medicine, law, engineering and economics) can be very expensive.[8] First and foremost, these fields are more frequently characterized by heavy workloads that may restrict opportunities for working part-time off campus. Specific degrees within these fields are organized on a pre-reform unitary curriculum (the single-cycle degrees), requiring more time to be completed. Moreover, economic resources are needed to travel to and live in the few cities that host such departments in Italy,[9] and to buy technical materials. Focusing on the role of direct costs, which we expect is the principal underlying mechanism, one could expect that their increase especially affected students enrolled in the most expensive fields, leading to a greater increase in the drop-out rate from those fields in particular.

H2a *The Great Recession is associated with a higher increase in the risk of drop-out for students in remunerative fields in comparison to other fields.*

At the same time, it has to be noticed that the most prestigious fields also provide better opportunities in the labor market (in terms of both employability and future earnings). Students and their families may then perceive their pursual as worthy of greater self-denial. In our theoretical argumentation, the question arises: are the greater benefits associated with

[8] We used the term remunerative fields to indicate those fields of study that are linked to better labor market outcomes (such as employability and income), and that are also considered prestigious. The term "liberal profession" (*professioni liberali*) is widely used in the Italian language to point at those professions that require registration to a professional roll after having passed an access exam.

[9] For example, the medical fields are not present in all the Italian universities, and some specific engineering fields (i.e., the polytechnic) are implemented only in few big cities, such as Milan and Turin, and in a couple of smaller towns in the Centre (Ancona) and South of Italy (Bari).

Table 1 Effect of costs, likelihood of success, and perceived benefit on university participation and persistence in periods of economic expansion and recession

Factor	Economic expansion	Great Recession		Arguments
Direct costs	–	– –	(H1a)	Worsened household's economic condition
Opportunity costs	–	+	(H1b)	Increase in youth unemployment (*warehouse* effect)
Likelihood of success	+	+		No changes
Economic returns of remunerative degrees	+	–	(H2a)	Different field of studies could be differently affected by the crisis
		+	(H2b)	

Note: The table is to be read line by line starting from the first column. It illustrates for each considered factor (in the 1st column) the specific factor's effect on university persistence during periods of economic expansion (2nd column) and during the Great Recession (3rd column). The fourth column summarizes the expected mechanisms underlying the effect of the corresponding factor on university persistence

the most remunerative degrees high enough to better protect students from the negative influences of the Great Recession? If yes, we expect to find that:

H2b *The Great Recession is associated with a lower increase in the risk of drop-out for students in remunerative fields in comparison to other fields*

Returning to the utility function above, considering the opposing scenarios of *H2a* and *H2b* means asking ourselves which factor—expected benefit (B) and the direct costs (C_d)—matters most.[10]

Table 1 summarizes the possible effects of the Great Recession addressed above.

Eventually, in order to investigate the potential long-term effects of the Great Recession on social inequality, we analyze whether the crisis affected the occurrence of drop-out differently by field of study and parental education. More precisely, we aim to understand whether students from underprivileged families in particular, who despite fewer socio-economic resources were pursuing the most prestigious educational choices, were those who suffered the most from the Great Recession, as opposed to their more affluent peers pursuing a path of social reproduction. We expect that the increase in the costs of higher education more severely affected the small group of students on a path of upward social mobility attending courses in very expensive fields of study. Thus, our final hypothesis is:

H3 *Students from less wealthy families enrolled in the most remunerative fields of study experience the highest drop-out rates*

Our argument is based on the role played by the field of study, but from a logical point of view, we cannot exclude that the duration and type of degree in which students are enrolled plays a relevant role as well. In fact, we have surveyed two heterogeneous populations in our data: students enrolled in single-cycle degree programs and students enrolled in bachelor's degree programs. Those belonging to the first group are usually more positively selected, more intrinsically motivated, and tend to show a stronger academic profile in high

[10] In our theoretical setting, we assume that the probability of success (P in the utility function) remains stable and is not affected by the Great Recession.

school. They mainly come from the academic track, have received higher grades, show fewer failures (Table 3), and report enrollment out of personal interest more than bachelor's students, who seem instead to be a bit more reactive to family pressure and labor market circumstances (Table A.9 in the Appendix). We can notice that all single-cycle degrees are offered in remunerative fields of study, with the only exception being Primary Education (a 4-year degree in the field of Humanities). Following our argumentation, in this case too there can be different forces acting in opposite directions (i.e., costs and future rewards) and the empirical analysis, which is split by type of degree (bachelor's vs. single-cycle), will help us to understand which force is prevailing.

Data, Variables, and Method

This section is divided into two parts. The first part provides detailed information about the data and variables considered in this study. The second part illustrates the method for estimating the effect of the Great Recession on withdrawal (propensity score matching), and introduces the logic behind a set of robustness checks performed later.

Data and Variables

We employ data from the two latest available waves of the "Survey on the educational and occupational paths of high school graduates" (SPHG henceforth). The SPHG is a repeated cross-sectional study of representative samples of Italian high school graduates, conducted by the National Statistical Office (Istat) every four years.[11] The aim of the SPHG is to collect retrospective information on the academic and professional careers of high school graduates four years after completion of their upper-secondary degrees. The two waves used in this study (2011 and 2015) were collected from students graduating high school in 2007 and 2011, respectively. Our dependent variable is a dummy variable taking the value 1 in case a student enrolled at university after high school graduation but subsequently dropped out. The variable takes the value 0 if the student who enrolls never drops out, either obtaining a university degree or still studying at the time of the interview.[12] Our main explanatory variable is a dummy variable designed to properly identify the timing of the economic crisis. As the second wave of the SPHG collects information on students who graduated from high school in 2011, interview subjects could only enroll at university (and potentially withdraw) after the crisis had started, in 2009. Hence, our crisis variable takes the value 1 for all students interviewed in the second wave. As the first wave was conducted in 2011 on 2007 high school graduates, it comprises students that experienced the crisis during their university studies. As a result, we decided against coding all first wave students as 0 in our crisis variable. Instead, those students who i) enrolled in university before 2009 and dropped out during/after 2009 or ii) enrolled in university during/after 2009 that thus could only have dropped out during the crisis (likewise second-wave students) were extracted from the first wave. These students (1,692 individuals) were assigned the value

[11] Information about the sampling procedure, the response rate and the method of data collection is described in detail in Istat technical reports (Istat 2013; Istat 2015).

[12] Istat considers as drop-out students that are no longer enrolled at the university and that do not obtain any degree. This means that we are not able to distinguish between drop-out and stop-out (student who withdraws from enrollment at a university for a period of time).

Table 2 Definition of the dummy variable that identifies the economic crisis

Wave 2011			Wave 2015		
Enrollment year	Drop-out		Enrollment year	Drop-out	
	Pre-crisis	Post-crisis		Pre-crisis	Post-crisis
2007	0[a]	1[c]	2011	–	1
2008	0[b]	1[d]	2012	–	1
2009	–	1	2013	–	1
2010	–	1	2014	–	1
2011	–	1	2015	–	1

[a]It takes value 0 if the student enrolled in 2007 and dropped out before 2008

[b]It takes value 0 if the student enrolled in 2008 and dropped out before 2008

[c]It takes value 1 if the student enrolled in 2007 and dropped out after 2009

[d]It takes value 1 if the student enrolled in 2008 and dropped out after 2009

1 in our crisis variable. The rest of the first-wave interviewees (93.64%) were assigned the value 0.

Our analyses compare two samples: an overall sample comprising all students who enrolled in university and a restricted sample[13] (26,775 and 22,714 respectively, after *list-wise* deletion), comprising only students who continued to university immediately after high school graduation (thus, only those enrolled in university in 2007 for the first wave, and in 2011 for the second wave). In other words, the restricted sample excludes all late enrollees: a population of students more likely to drop out. The comparison between these two samples is important for our discussion, as late enrollees from the first wave could have enrolled during the crisis (crisis variable equal to one). Considering late enrollees in our analysis could result in an overestimation of the Great Recession's effect, as they show a higher propensity to drop out. The definition of this variable is summarized in Table 2.

Pivotal explanatory variables in our analysis are parental education, field of study, and type of degree. Fields of study are grouped into seven categories: Health professions; Law; Engineering & Architecture; Economics and Statistics; Scientific (comprising the fields of: mathematics, physics, geology, chemistry, pharmacy, biology, veterinary, and agriculture); Social Sciences (comprising: psychology, social, and political science); and Humanities (comprising: arts, education, and languages). We consider the first four fields (Health professions; Law; Engineering & Architecture; Economics and Statistics) to be the most remunerative fields, and compare them to the other fields. Parental education is coded following the dominance criterion[14] (i.e., we consider the highest level of education achieved by at least one of the parents) (Erikson, 1984) and consists of three categories: i) Compulsory

[13] The analyses for the restricted sample were performed in the Adele Laboratory Istat (*Laboratorio per l'Analisi dei Dati ELEmentari*) in compliance with legislation concerning the confidentiality of personal data. The ADELE Laboratory is a Research data center, a secure site accessible by researchers to conduct their own statistical analyses on microdata (http://www.istat.it/en/information/researchers/analysis-of-individual-data). We used Adele lab because Istat does not release the information of the time of enrolment. Results and opinions presented in this chapter are our responsibility and are not official statistics.

[14] We consider parental education since we do not have specific hypotheses about the role played by the father or by the mother in the decision to drop out.

education (Primary or Lower secondary degree), ii) Upper secondary degree, and iii) Tertiary or Post-secondary degree. We run our analyses separately by type of degree. The type of degree is a dummy variable that separates bachelor's degrees from single-cycle degrees. This distinction is important, as the risk of dropping out is higher for students attending bachelor's degree courses in comparison to the more academically-oriented students of single-cycle degrees. According to ANVUR (2018), the non-transition rate from the first to the second year is, for single-cycle degrees, half of that for bachelor's degrees, and has been continuously so during the entire considered period. As previously stated in Sect. "the Context", not all fields of study offer single-cycle degrees. More precisely, in our data, single-cycle degrees are to be found in the fields of: Law, Engineering & Architecture (degrees in Building Engineering and in Architecture), the Scientific fields (in this field the specific degrees in Veterinary, Pharmacy and Pharmaceutical Chemistry are offered as single-cycle degrees), and in Humanities (4 years single-cycle degree in Primary Education).[15]

Parental education is used as a proxy for social origin and for the economic resources available to the students. The soundness of this choice is justified because people with higher educational credentials tend to have higher disposable incomes (see Figure A.1 in the Appendix).

Our choice of control variables is derived from previous empirical studies on educational inequalities on the basis of social origin, in line with our theoretical approach based on rational action theory. This approach identifies the socio-economic resources available to students as important factors influencing educational participation. These resources in our data are measured through parental class (highest occupation between the two parents)[16] in addition to parental education, as discussed previously. Availability of resources is pivotal, as it defines the evaluation of the costs of university persistence. The latter is also affected by the perception of one's own probability of success, which largely depends on the student's talents, previously acquired knowledge, and academic efforts. We thus considered in our analyses the grades obtained on the final exams of both lower and upper secondary school, failures during the educational career up to university enrollment, remedial exams, and the track followed during upper secondary school. We added individual demographic features likely to influence educational events and behaviors as well, including: gender, as females tend to show higher levels of educational achievement and attainment than males (Brint, 2017); age, as university enrollment in Italy is possible irrespective of age, but time constraints due to family or work obligations, as well as health and concentration, are likely to differ across age ranges; and region of residence, as in assessing the utility of a tertiary degree, students may have quite different labor market contexts in mind according to region of residence. Unfortunately, our data do not allow to control for students' mobility (i.e., the behavior of moving to another region to attend university). This phenomenon is quite relevant in Italy, though in the years covered by our analyses, it does not seem to change dramatically: 20.4% were mobile students in 2006/2007; 19.2% in 2008/2009; and 21.8%

[15] The field of Health offers two single single-cycle degrees as well (Surgery and Dentistry). In the following analyses we do not however consider them due to their high singularity (see note 24). Additional results on these two specific degrees will be provided as a note to the main text.

[16] We do not consider social class to be the main explanatory variable since the information about parental occupation in the data is not detailed enough to permit the construction of a suitable categorization. Therefore, we code occupation into a few categories—service class, white-collars, self-employed, and working class—and use it only as a control variable.

Table 3 Descriptive statistics. Overall sample

	Bachelor's		Single-Cycle	
	Pre-crisis	Post-crisis	Pre-crisis	Post-crisis
Dropout (% of yes)	15.26	30.50	7.37	18.52
Field of study				
Medicine	7.96	9.69	–	–
Law	1.46	2.72	51.38	54.15
Engineering & Architecture	17.01	15.42	13.73	15.16
Scientific	14.40	15.89	19.90	14.90
Economics & Statistics	15.65	14.39	–	–
Social sciences	16.51	15.49	–	–
Humanities	27.01	26.40	14.99	15.80
Parental education				
Compulsory	24.71	26.40	21.22	20.47
Upper secondary	54.89	55.81	50.48	50.45
Tertiary	17.70	17.78	28.30	29.08
Parental social class				
Service class	18.72	18.09	26.08	23.64
White collar	31.54	31.24	33.45	34.52
Self-employed	13.66	12.54	12.41	13.41
Working class	36.08	38.12	28.06	28.43
High school track				
Academic	50.21	47.86	71.58	71.83
Technical	33.61	25.98	20.68	14.57
Vocational	16.18	26.16	7.73	13.60
Final mark lower secondary school				
Sufficient	12.64	11.92	8.33	5.83
Good	33.58	31.48	23.56	21.76
Very good	32.11	28.07	32.31	30.44
Excellent	21.67	28.54	35.79	41.97
Final mark upper secondary school				
60–69	25.49	28.56	17.15	18.85
70–79	28.33	33.34	25.54	28.17
80–89	23.27	23.50	23.38	27.07
90–100	22.92	14.60	33.93	25.91
Failure (% of yes)	13.31	18.40	9.11	10.75
Remedial exams (% of yes)	45.07	49.99	37.41	38.02
Sex (% of females)	58.53	57.46	68.71	67.62
Age (more than 23 years old)	16.75	22.72	10.55	13.02
N	7724	8491	1668	1544

Source: SPHG 2011 and 2015

in 2011/2012 (ANVUR, 2014).[17] Additionally, another potentially relevant variable that is however not present in our ISTAT dataset is the reception of a scholarship through the *Diritto allo studio*. According to Moderna et al. (2020), scholarships in the Italian context prove to reduce dropout rates; however, only slightly (2.7 percentage points). We believe that the potential bias arising from not controlling for scholarship reception in our analyses should thus be limited and not modify the substantive results. The effect is small and seems circumscribed to students at the income threshold (measured by means of the ISEE index) that defines their eligibility for the scholarship program (Mealli and Rampichini, 2012).

Table 3 reports the descriptive statistics for students before and after the crisis (overall sample),[18] showing how incidence of drop-out doubled in the second cohort of students, and how the latter show distinctive features (especially in terms of previous scholastic career).

Method: Propensity Score Matching

As a result of the differences detected between the two cohorts (students before and after the crisis), we resort to a propensity score matching (PSM) estimator (Rosenbaum and Rubin, 1983) to determine the influence of the Great Recession on the dropout rate among the two groups. This procedure controls for potential compositional effects that may arise by comparing enrolled students from different periods. PSM is a two-step procedure.[19] In our case the first step consists in estimating for all students the probability (i.e., the propensity score) of being a student in the post-crisis period according to the set of covariates discussed above. In the second step, students in the post-crisis period (the "treated") are matched with students from the pre-crisis period who are most similar to them (the "controls"). Level of similarity is measured by the propensity score. A kernel algorithm combined with a caliper fixed at 0.01 was used to match treated and untreated individuals on the basis of their own propensity scores.[20] We thus obtain two comparable (i.e., equivalent) groups, on the basis of the chosen set of observable characteristics. In other words, PSM permits us to eliminate any kind of compositional effect due to the observed covariates. The set of covariates was selected in order to control for the most important personal and background features likely to affect the risk of leaving university. The assortment of chosen covariates is quite large, to avoid the risk of bias derived from differences in the composition of the two cohorts. In the next section, we present our main results visually by plotting the effect of the Great Recession on dropping out (i.e., the difference in the dropout probability before and after the crisis). More precisely, we estimate the quantity:

$$\delta_i = E\left[Y_i|D_i = 1, p(x)\right] - E\left[Y_i|D_i = 0, p(x)\right] \tag{1}$$

[17] It is reasonable to suppose that it may be influenced by social origins and previous school characteristics. In other words, we can assume that students that decide to move to another region are good students coming from advantaged socio-economic backgrounds. Therefore, the possible bias due to not controlling for this variable should be not problematic.

[18] The descriptive statistics on the restricted sample, which substantially overlap those reported here, are provided in the appendix (Table A.2).

[19] See Caliendo and Kopeinig (2008) for further information on how to implement PSM.

[20] We report a set of statistics about the goodness of the matching procedure in the appendix (Tables A.6, A.7).

where, δ_i is the estimated effect for individual I (the average treatment effect, ATT henceforth), Y is the outcome (drop-out); D, the dummy variable indicating the period (0 meaning pre-crisis and 1 meaning post-crisis); and $p(x)$ the propensity score. To ascertain the effect of the Great Recession across fields of study, parental education, and type of degree, we estimate separate models, stratifying according to field, parental education, and type of degree. Regarding the type of degree, we consider only students enrolled in a bachelor's or a single-cycle degree program, thus excluding Master's students. This choice is justified because Master's students should be very different from those enrolled in university for the first time.

Assumptions and Sensitivity Checks

PSM relies on the assumption that we are able to observe and include in our model all relevant factors for the phenomenon under scrutiny. We chose to analyze the SPHG data, as they are particularly rich and supply a large set of covariates covering the main dimensions affecting drop-out risk.[21] Valid critiques of PSM mention its inability to consider unobserved features such as, in our case, students' innate abilities and personal motivation. Thanks to SPHG, we are in a position also to consider—aside from a variety of information on the student's previous scholastic career—the grade of the concluding exam of lower secondary education (end of 8th grade), which can serve as a proxy for individual abilities (Contini and Triventi, 2016).

Individual motivation and parental support also affect the drop-out risk. Standard surveys, such as the SPHG, generally lack a suitable measure for these factors, however. Thus, it is crucial to include a set of robustness checks to estimate the eventual bias around our estimates. We rely on the method suggested by Ichino et al. (2008) and Nannicini (2007) to test the underlying assumption of the PSM, namely the plausibility of the selection on observables. The authors suggest adding a simulated, unobservable variable (S) to the model to detect changes in estimates of the treatment's effect (in our case, the Great Recession). To parameterize the simulation, unobservable variables are set to mimic the behavior and relevance of observed, crucial factors for drop-out risk, such as parental education and previous educational achievements. Obtained results are discussed in Sect. "Sensitivity checks".

Another important consideration is that only students who enroll in university are in the position to drop out. The process of selection into enrollment could bias the estimates calculated for enrolled students. It is well known that people from well-off families tend to perform better at upper secondary school and are therefore more likely to enroll in university (Argentin and Triventi, 2011). As our models are based on a socially selected population, they must be interpreted as a lower bound of the true effects. We believe that detecting any statistically significant effect on the drop-out risk, even if it is just the lower bound, is relevant for policy purposes. However, we also include the results of an additional analysis that, following previous papers on the determinants of the drop-out risk in Italy (Cingano and Cipollone, 2007; Di Pietro, 2004; Ghignoni, 2017), relies on a model with sample selection (Heckman, 1979) to estimate the effect of the economic crisis on leaving university, using the number of available university courses at a regional level as exclusion

[21] The variables used to estimate the propensity score (i.e., the control variables) are those listed in Table 2, with the addition of the region of residence.

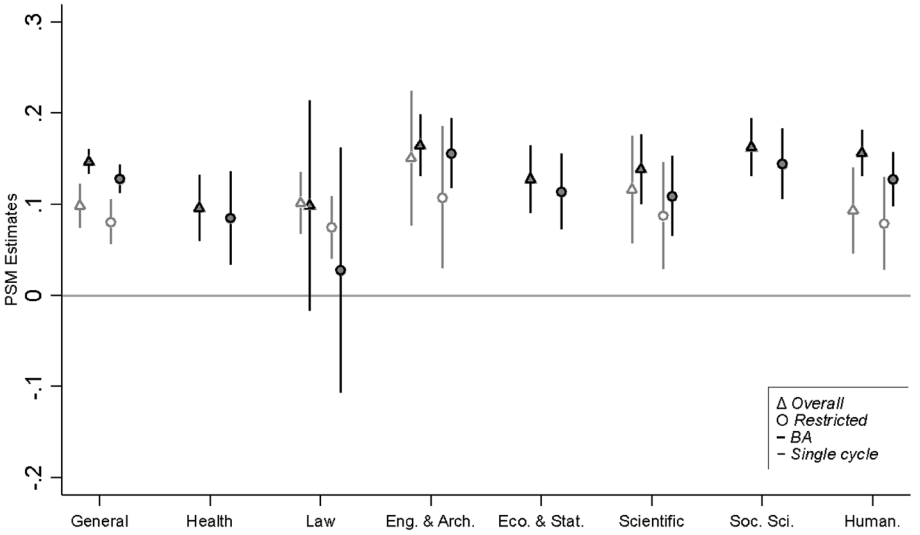

Fig. 2 Effect of the economic crisis on drop-out probability according to field of study, type of degree, and (restricted vs. full) sample. PSM estimates. *Note:* The figure shows the ATT estimates and the corresponding 95% confidence intervals according to model 1 from the previous section. Circles represent the effects for students who enrolled in university immediately after obtaining their high school diplomas (restricted sample), while triangles represent the estimates for the whole sample (overall sample). Filled and black circles and triangles represent the estimates for bachelor's degrees, while the hollow and gray ones represent the estimates for the single-cycle degrees. For the fields "Economics & Statistics" and "Social Sciences" we report the estimates only for the bachelor's degree, since no single-cycle degrees have been activated for these fields. The single-cycle degree in Medicine is excluded for its peculiarities, as explained in note to the main text

restriction.[22] Here, we focus on the parameters of the interaction between parental education, economic crisis, and field of study.

Main Findings

Figure 2 displays the first set of results: the ATTs and relative standard errors from both the general model and the models stratified according to field of study[23] in the two subsamples of separately analyzed bachelor's and single-cycle degrees. The circles correspond to estimates from the restricted sample (computed excluding the late enrollees), while triangles correspond to estimates from the overall sample (including late enrollees). Filled black markers represent the estimates for bachelor's degrees, while the gray hollow markers represent the estimates for the single-cycle degrees.

[22] Data for our Heckman selection models come from the *Atlante Statistico Territoriale delle Infrastrutture* (http://asti.istat.it/asti/), maintained by the National Institute of Statistics. For each indicator, average values between 2007 and 2011 were considered for the first wave, and average values between 2011 and 2012 for the second wave. ATLAS data are only available until 2012. The number of faculties and degree courses after the implementation of the Bologna Process in Italy (2001) showed substantial stability over time.

[23] All results are presented graphically, while the tables with the full estimates are reported in the online appendix (Tables A.3, A.4, A.5 and A.6).

A first interesting result emerges from the comparison of the estimates of the general model between the two types of degree in the overall sample. For both types of degree, we have an increase in the drop-out risk, which is however somewhat lower for single-cycle degrees. For students enrolled in a bachelor's degree, the drop-outs increase by 14.67 percentage points (pp, henceforth) in the Great Recession period, while for single-cycle degrees, the effect of the Great Recession is lower, at 9.83 pp.[24] This picture is confirmed by the results coming from the restricted sample. All in all, this result concurs with *H1a*, meaning that the negative effect on university persistence attributed to the increase in direct costs exceeded the positive effects attributable to decreasing opportunity costs.

Figure 2 also allows us to analyze the effect of the Great Recession on withdrawals by field of study. Generally, the estimates of the effect of the Great Recession on drop-out in single-cycle degrees overlap with those for bachelor's degrees. The differences between degree types within fields are narrow. Only for Humanities is there a noticeable (although not statistically significant) discrepancy, with the effect of the Great Recession being smaller for single-cycle degrees. A possible reason for this is that the single-cycle degree in Humanities mainly aims at training primary education teachers. As education is mainly public in Italy and primary education is obligatory, public primary education opportunities need to be provided during economic downturns as well. The 4-year single-cycle degree in Primary Education thus offers the chance of good labor market returns in terms of employability, however not necessarily in terms of income.

In general, the drop-out rate during the Great Recession clearly increased for every considered field of study, with no exceptions.[25] This also means that all remunerative fields (Health, Law, Engineering & Architecture, and Economics & Statistics) were not really able to protect students from the increased drop-out risk, neither in bachelor's nor in single-cycle degree programs. The rising incidence of withdrawals more strongly affected the remunerative field of Engineering & Architecture.[26] Both bachelor's and the single-cycle degrees in this field show the highest increase in the drop-out: + 15.6 pp and + 10.7 pp in the restricted sample, respectively (and + 16.5; + 15.0 in the overall sample, which also includes late enrollees). Despite the higher score, however, the increase in drop-outs during the recession does not significantly differ from the rates in other fields (considering both the overall and the restricted samples, with the only exception being the bachelor's in Health professions in the overall sample, which will be discussed below).

In comparison to Engineering & Architecture, the remunerative fields of Economic & Statistics show a slightly lower increase in incidences of drop-out: + 12.7 pp in the

[24] It should be noted that the estimate of 9.83 pp does not consider the highly positively selected students pursuing the single-cycle degrees in Surgery or Dentistry. These two single-cycle degrees have an extraordinary length in Italy (6 years instead of the standard 5 years) and allow successful students to access some of the most remunerative professions. The admission procedure is more competitive than in any other field, as a result of a stringent *numerus clausus* and very demanding entrance examinations. Students who pass the highly competitive test exhibit an extremely low drop-out rate. If we were to include Surgery and Dentistry students, the general estimate of the effect of the Great Recession on drop-out from single-cycle degrees would diminish by about 2 pp, thus dropping to + 7.64 pp. This is the case because there is no effect of the Great Recession on drop-out for these two specific single-cycle degrees. Surgery and Dentistry are the only two degrees exhibiting a point estimate that is practically zero.

[25] Only the two specific single-cycle degrees in Surgery and Dentistry (here not considered) deviate from the general pattern, which is attributable to their high singularity (see note 24).

[26] The striking post-crisis increase in incidences of drop-out recorded by the comparatively prestigious fields of Engineering & Architecture and its dependence on a disproportionately higher drop-out rate of students from less advantaged families will be discussed below.

overall- and + 11.4 pp in the restricted sample. This might be a result of the slight advantage graduates with a degree in Economics have in the labor market in terms of the number of positions they may fill.[27] According to Unioncamere (2012),[28] employers in the Italian private sector (which is dominated by small and medium-sized enterprises), tend to perceive the bachelor's in Economics as an indicator of higher flexibility and trainability due to the mix of technical skills students of Economics develop during their studies, in comparison to those with undergraduate degrees in Social Science or Engineering, for example. The two remunerative fields of Law and Health show an even lower influence of the Great Recession on drop-out rate, which for the bachelor's in both fields is less than 10 pp in both the overall and the restricted sample.

The results for the undergraduate degree in Law are difficult to interpret due to the high uncertainty around the estimate, which is due to the small numbers: only 299 students from the overall sample and 205 from the restricted sample are enrolled in a bachelor's degree program in Law. In fact, degrees in Law are single-cycle degrees for the most part. There are a handful of exceptions aimed at specific professional profiles (e.g., legal experts) which do not allow access to legal careers. While labor market returns in this field tend to be low, especially in the short- and middle term, the prestige associated with legal occupations is higher in comparison to that associated with occupations in other fields (Ballarino and Bratti, 2009; Vergolini and Vlach, 2017). Legal professions are traditionally among the aforementioned liberal professions in Italy, access to which is only possible with a single-cycle degree in Law in addition to successfully passing a difficult national examination that is regulated in terms of social closure (Parkin 1974).

The field of Health, too, shows a less than average increase in the rate of drop-out during the Great Recession. This result is based on graduates from this field having some of the highest employability in the country, so that the chance of obtaining a degree in the field shows very high attractivity. On one hand, the demand for graduates from health disciplines is likely to remain stable regardless of economic conditions, unlike for graduates of fields such as Architecture, for example. On the other, as Italy features a public healthcare system, the main employer of graduates from the medical field is the state itself, and the Italian public sector has frequently behaved in an anti-cyclical fashion. To the contrary, graduates from other remunerative fields such as Engineering and Economics are mainly employed in the private sector, which behaves pro-cyclically.

To sum up, given that the highest increase in drop-out rates during the Great Recession is in one of the most remunerative fields of study, our first analyses provide some results in the direction of *H2a*. However, the results do not fully corroborate this hypothesis, as the estimates of the influence of the recession on drop-out rates overlap. As we are going to discuss below, the increase in instances drop-out in the aftermath of the economic crisis seems to be generalized across both remunerative, and other fields.

We now move to computing the influence of the Great Recession on rates of drop-out according to both field of study and parental education, as shown in Fig. 3. To test *H3*, we group results according to each respective field's labor market returns, with the most remunerative fields being: Health, Law, Engineering & Architecture, and Economics &

[27] According to AlmaLaurea (https://www.almalaurea.it/en), an Interuniversity Consortium that represents approximately 90% of Italian graduates, there are far fewer bachelor's degrees awarded annually in Statistics (less than 1000) than in Economics (more than 20,000). Therefore, the Economics & Statistics field is mainly composed of Economics students.

[28] *Unioncamere* is the Italian public office legally representing all local Chambers of Commerce.

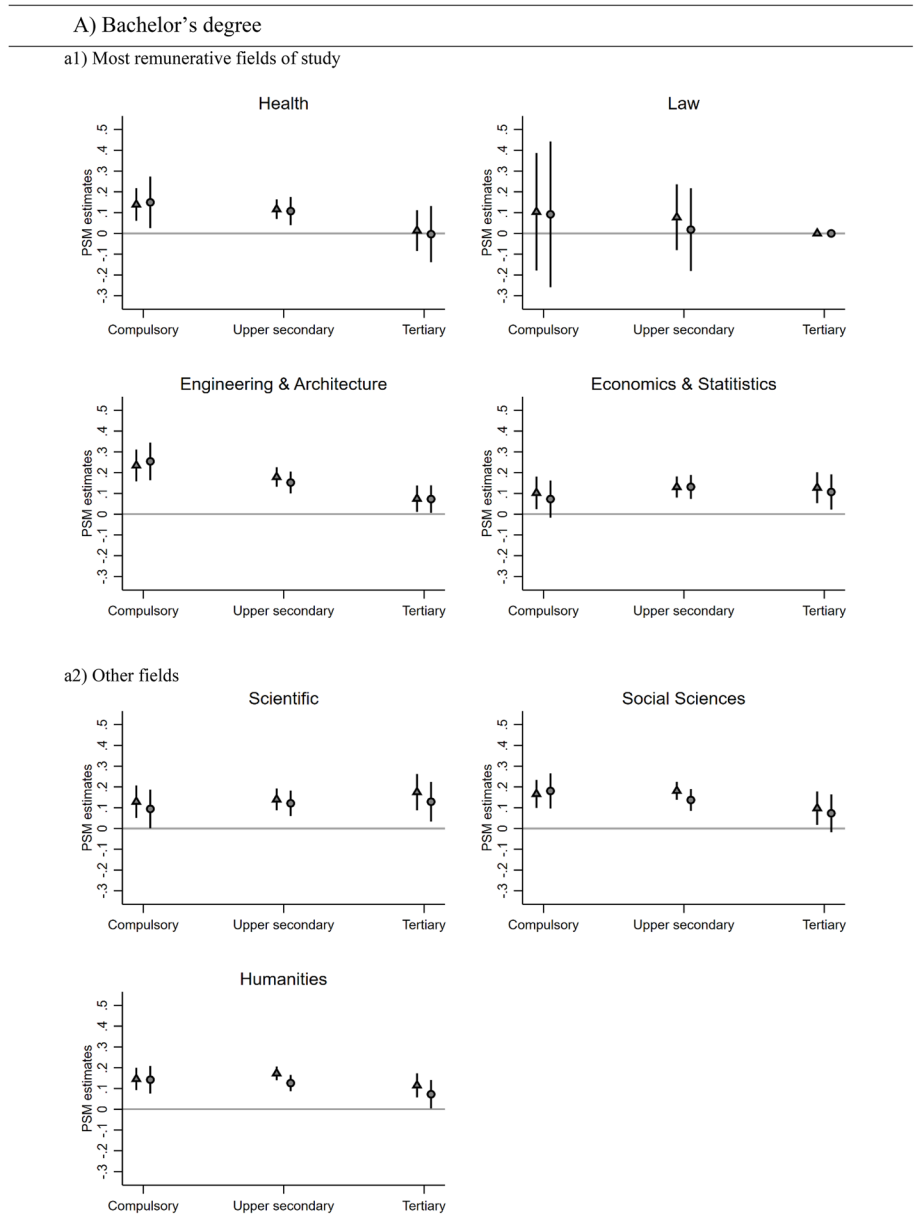

Fig. 3 Effect of the economic crisis on drop-out probability according to parental education, field of study, economic crisis, and type of degree. PSM estimates. *Note:* The figure shows the ATT estimates and the corresponding 95% confidence intervals according to model 1 from the previous section. Triangles represent the effects on the whole sample (overall sample), while circles represent estimates for students who enrolled in university immediately after obtaining their high school diplomas (restricted sample)

Statistics (Ballarino and Bratti, 2009; Triventi et al., 2017; Vergolini and Vlach, 2017). Panel A reports the estimates for bachelor's degrees (in panel a1 for the remunerative fields

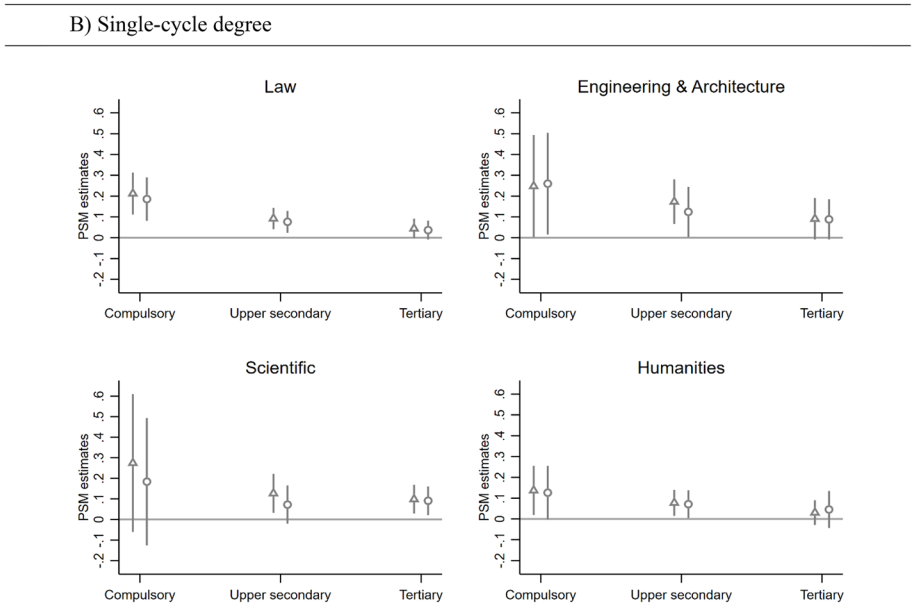

Fig. 3 (continued)

and in panel a2 for all other fields, respectively). Panel B shows the estimates for single-cycle degrees.

Looking at the remunerative bachelor's degrees first, we notice that especially the less-advantaged students (i.e. those with parents with compulsory education only) experienced a stronger increase in drop-out in comparison to their fellows with tertiary-educated parents during the Great Recession. The difference amounts to 9 pp or more in every highly remunerative field, apart from Economics & Statistics, where no social gradient is found. The bachelor's in Law is again difficult to interpret due to low numbers, as discussed above. For the remunerative field of Engineering & Architecture, there is a difference of 18.1 pp in the drop-out rate increase for students with less educated parents; with respect to the drop-out rate of the most advantaged students, the difference is statistically significant. When we consider less remunerative bachelor's degrees, the picture changes substantially. In this latter group of fields, the difference across social origins in drop-out increase during the Great Recession is negligible, and the event of dropping out is not concentrated on a particular origin.

Examining single-cycle degrees, we notice a similar social gradient for the remunerative fields. Law, for example, shows a statistically significant difference of + 14.9 pp between the most and the least advantaged families in the drop-out rate increase. Similar results are shown by Engineering & Architecture. We see a dramatic increase in the post-crisis drop-out rate for students with parents who only completed compulsory education (+ 26 pp in the restricted sample), while the rate increased by 8 pp only for students from more advantaged families. This demonstrates that the higher drop-out rate from Engineering and Architecture depicted by Fig. 2 is not homogeneously distributed across parental education. Instead, our evidence suggests that the discussed noticeable increase in the number of dropouts after the crisis mainly depends on the behavior of the least-advantaged students who were pursuing the most prestigious educational degrees. These students dropped-out

Table 4 Sensitivity analysis of the effect of the economic crisis on dropout. Overall sample

	Outcome effect	Selection effect	ATT	% of bias
Bachelor's degree				
Confounderlike				
No confounder	–	–	0.147	
Sex	1.453	1.050	0.146	0.680
High parental education	0.653	1.034	0.148	0.680
Good final mark in lower secondary school	0.444	1.156	0.150	2.041
Academic track	0.382	1.013	0.147	0.000
No grade retention	0.563	0.682	0.141	4.082
Good final mark in upper secondary school	0.619	0.714	0.141	4.082
Single-cycle degree				
Confounderlike				
No confounder	–	–	0.098	
Sex	1.733	1.075	0.109	10.885
High parental education	0.482	1.034	0.110	11.902
Good final mark in lower secondary school	0.274	1.236	0.112	13.937
Academic track	0.213	1.137	0.112	13.937
No grade retention	0.312	0.823	0.108	9.868
Good final mark in upper secondary school	0.442	0.829	0.107	8.850

more than their advantaged peers because of the Great Recession. These results point in the direction of a corroboration with H3.

Sensitivity Checks

According to the discussion of the assumptions underlying our analytical strategy, a set of robustness checks for the estimates presented thus far will be supplied. Specifically, this section addresses two main sources of bias: i) potentially unobservable factors; and ii) sample selection. Due to the remarkable similarity between the results from the overall and restricted samples, the analysis in this section relates only to the overall sample.

To test the plausibility of the selection on observables assumption underlying PSM, we rely on the strategy presented in Ichino et al. (2008) and use the Stata routine *sensatt* designed by Nannicini (2007). This strategy applies a simulation procedure to mimic the bias resulting from unobservable factors, relying on the distribution of observed variables. In other words, we estimate the bias of unobserved factors as if they could affect the drop-out rate in a way similar to the most relevant variables, such as parental education and the previous school career. Since the routine requires dummy variables, the original variables were recoded as dummies for the simulations and were used one by one to estimate the effect of an unobservable variable. Table 4 shows the average of the simulated ATT obtained by repeating each simulation 500 times. Table 4 shows both the original ATT of models in Fig. 2 together with the corresponding ATT simulated in the presence of potential unobserved confounders (*S*). On the basis of these two quantities,

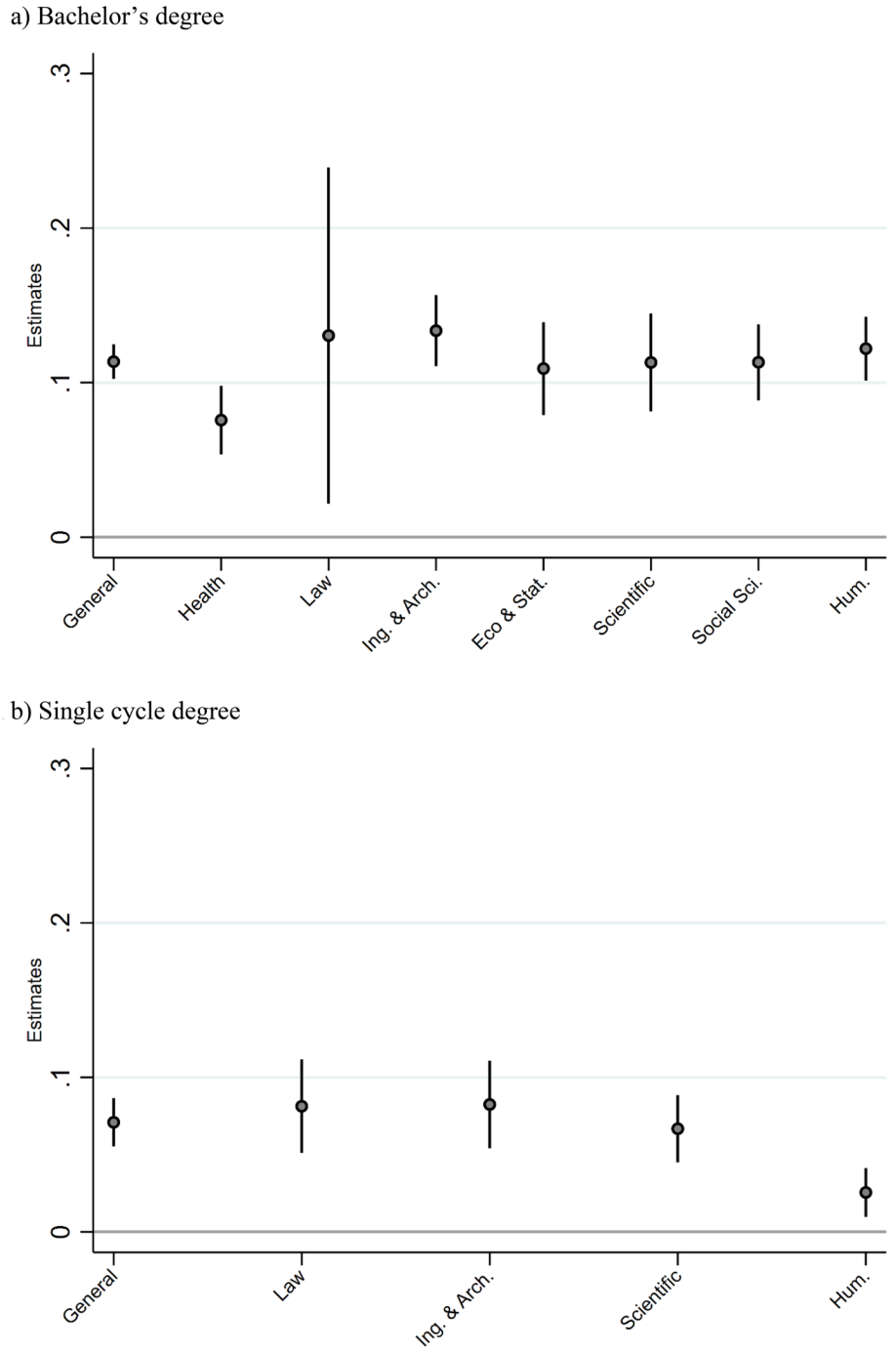

Fig. 4 Effect of the economic crisis on drop-out probability according to field of study and type of degree. Heckman selection model. Overall sample. *Note:* The figure reports the estimates from the Heckman selection model and the corresponding 95% confidence intervals

the percentage of potential bias in the original model is computed.[29] The first rows in the table present estimates for the general model. Additional statistics are also reported in the table. The first is the "outcome effect", or the average odds ratio of the unobserved variable (S) resulting from the following logit model: $Pr(Y = 1|D = 0, S, W)$, where Y is the outcome, D is the treatment status, S is the unobserved variable and W is a set of control variables. The "selection effect" is the average odds ratio resulting from $Pr(D = 1|S, W)$. For example, if the unobserved variable S was distributed like the observed variable sex (i.e., male) in the general model, we would have observed a positive effect on the chance of being amid in the post-crisis period ($1.050 > 1$), and also a positive effect on the risk of dropping out ($1.453 > 1$). In this case, the effect of the economic crisis would hardly be lower than the ATT estimated through the propensity score matching estimator (0.146 vs 0.147). The other simulations show that potential unobserved confounders do not substantially affect our main findings and that the higher biases are related to factors connected to school career. More precisely, for the model regarding the bachelor's degree, the simulated estimates range from 0.141 to 0.150, and the highest bias is about 4%. A bit higher bias is found for the single-cycle degree, comprised of simulated estimates between 0.107 and 0.112 (the ATT estimated with the propensity score matching is 0.098), with the highest bias at about 14%.

A second critical issue regards the potential selection of our sample, which only comprises enrolled students. As a robustness check, we re-estimated our models, applying the strategy suggested by Heckman (1979). More precisely, following previous papers on the determinants of drop-out risk in Italy (Cingano and Cipollone, 2007; Di Pietro, 2004; Ghignoni, 2017), we compute a selection model using as endogenous variables the availability of university courses at the regional level. We estimate our model considering the interaction between field of study and economic crisis.[30] Figure 4 shows the results of the Heckman selection model. As predicted, the estimates from propensity score matching on the sample of enrollees constitute the lower bound of the true parameters.

Conclusions

In this paper, our main interest is on the influence of the Great Recession on university withdrawals and the resulting impact of these withdrawals on social inequalities in the long run. The phenomenon of university drop-out is a source of great concern in Western countries, and even more so in Italy, given the worryingly high numbers involved and the tendency of Italian employers to perceive dropping out from university as a signal of lower productivity compared to people who never enrolled (Ghignoni et al. 2019). Our evidence suggests that the decrease in economic prosperity caused by the Great Recession exacerbated the situation, to the greater detriment of students from less-advantaged families who were enrolled in the most remunerative fields of study. While we cannot state that financial

[29] Bias is computed according the following formula: % bias = |((ATT no confounder-ATT confounderlike)/ATT no confounder)•100|.

[30] Unfortunately, the information on the number of university courses is not available by field of study. As a result, we could not carry out separate analyses according to field of study and are forced instead to rely on the parameters of interaction between fields and the crisis-variable. We are convinced that this allows us to retrieve important information on how our results could be affected by selection bias, which could not be obtained otherwise despite its being a suboptimal solution.

constraint is the one main factor shaping the increase in the drop-out risk we found in our data, our results do not contradict the argument derived by a rational action framework: that unforeseen increases in university costs can be a relevant factor in explaining the event of a drop-out. By employing a Propensity Score Matching technique, we were able to measure the risk of dropping out of university in two comparable samples of enrolled students before and during the Great Recession, and we found a generalized increase in drop-out risk after the crisis, net of an ample set of individual and family features.

From a theoretical point of view, while both the direct and the opportunity costs have a negative effect on university participation and persistence in normal times, during recessions the increase in direct costs could lower participation (and thus increase dropout) while the decrease in opportunity costs due to greater youth unemployment could translate into increased enrollments and fewer withdrawals. Our results suggest that the decrease in opportunity costs was not enough to compensate for the dramatic increase in direct costs. During the Great Recession the drop-out rate increased by almost 15 pp in bachelor's and 10 pp in single-cycle over the pre-crisis period, according to *H1a*. Hence, our study finds no empirical support for the "warehouse hypothesis" (H1b), in line with the findings of Schizzerotto et. al. (2018), on the impact of the Great Recession on university enrollment in Italy. The effects of the crisis on the Italian labor market might have increased students' fears of becoming unemployed irrespective of the degree gained. As perceived benefits of higher education declined, students might have rationally decided to stop pursuing a demanding and expensive university degree if it was not able to protect them from unemployment risks.

In addition, this paper contributes to the debate in that it considers the horizontal dimension of educational inequality as well, by examining differences in the drop-out rate during the Great Recession according to field of study. What we find is that, in the aftermath of the economic crisis, each and every field of study experienced a substantially increased drop-out rate. The highest increase was recorded by one of the most remunerative fields of study, that of Engineering and Architecture. Despite this evidence in favor of *H2a* (that the drop-out increase affects remunerative fields the most), the results are however less than conclusive, as the estimates of several fields overlap. Finally, this study also contributes to the debate by analyzing the potential long-term influences of the Great Recession on social inequality. Our analysis of the effect of the economic crisis on university drop-out according to parental education and field, shows that students from less advantaged backgrounds on a positive path of upward social mobility (i.e., those pursuing degrees in the most remunerative and prestigious fields) were those most affected by the deterioration of economic prosperity brought about by the Great Recession. In the fields of Health, Law, and Engineering and Architecture, students with less educated parents showed an increase in drop-out rate nearly four times higher than that of their peers with tertiary-educated parents. As Italy has the lowest rate of tertiary education competition after a drop-out episode (6.1%) among European countries (Schnepf, 2017), and as a withdrawal carries severe consequences for labor market opportunities in Italy, we conclude that the Great Recession exerted a strong effect on social inequality by reducing the upward mobility chances of students from less advantaged families in the long run, according to *H3*. Our findings complete the picture, emerged from recent studies, of increased social inequalities due to adverse macroeconomic conditions during the Great Recession. On the one hand, the Great Recession impacted differently on university enrollment rates according to family background, to the advantage of children of highly educated parents (Lindemann and Gangl 2020, 2022) especially in elite institutions (Ford, 2021). On the other hand, at the same time the Great Recession pushed out of university

in disproportionately high numbers those students from lower economic backgrounds attending the most remunerative fields.

In addition to affecting the individual evaluations of the costs and benefits of university persistence as our theoretical argumentations developed within a rational action framework suggest, the Great Recession is likely to have impacted higher education institutions as well, imposing more stringent budget constraints. Changes in resource allocation patterns during the recession could have affected students' experiences of university and thus their persistence (Gansemer-Topf et al., 2018). Non-renewal of fixed term contracts and thus decreasing staff-to-student ratio, as well as decreases in student services and academic support, are factors likely to increase the challenges of pursuing a university degree. This is especially true for students from the least advantaged backgrounds, for whom decreases in institutional support due to unfavorable economic conjunctures might represent a substantial obstacle to successful graduation. While different data than those employed in this paper would be needed to measure how much the impact of the Great Recession on dropout is direct (via increased costs) or indirect (via changes in institutional strategies), both arguments converge in highlighting the negative potential of economic downturns for the overall dynamic of social inequality.

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Data Availability The data that support the findings of this study are available from Istat (the Italian Statistical Office). Some restrictions apply to the availability of these data. The analyses for the restricted sample were performed in the Adele Laboratory Istat (Laboratorio per l'Analisi dei Dati ELEmentari) in compliance with legislation concerning the confidentiality of personal data.

Declarations

Conflict of interest The authors have no interests to declare related to the results of this research.

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