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Escaping into a master's degree in times of crisis? Master's degree applications and enrolment over the business cycle

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ABSTRACT

The consequences of graduating in a recession could be severe and long-lasting. Bachelor's graduates can, however, avoid entering the labour market by continuing their education. Using a Norwegian dataset containing information on all graduates and their applications to and enrolment in master's degree programmes over a 15-year period, we find that a one percentage point increase in the field-specific unemployment rate results in a 6.5 percentage points increase in applications and a 3.9 percentage points increase in enrolment. Moreover, using a survey of the 2020 bachelor's graduates cohort, that is, the Covid-19 cohort, we find evidence indicating that those pushed into a master's degree by conditions in the labour market differ substantially from those whose decision to enrol in a master's degree is not driven by labour market conditions.

1. Introduction

Recessions usually involve higher unemployment and a declining availability of work, implying lost opportunities, which often leads to lower earnings for employees. Over the past two decades, the world has experienced several economic downturns that have substantially affected the workers' professional situations and lives in general. However, not only existing workers are affected by recessions.

A group particularly vulnerable during economic downturns is recent graduates. In times when many firms stop hiring, trying to enter the labour market is especially difficult. Also, being at the start of their careers, recent graduates have relatively little work experience making them less competitive in general, and in particular in a labour market with lower availability of jobs and tougher competition for those (few) available. At the same time, the first phase of young professionals' careers is often characterised by high productivity and earnings growth. Thus, losing this phase to unemployment or a poor work match might be particularly harmful to further career development (von Wachter, 2020).

In the present study, we investigate whether education and more investment in human capital can dampen the consequences of recessions for recent graduates. Specifically, we study bachelor's graduates' inclination to acquire more education, that is, a master's degree, during economic downturns. When deciding whether to continue with a master's degree, bachelor's graduates are facing a trade-off between future enhanced earnings, on the one hand, and present earnings and labour market experience, on the other hand. But the relative weights of these trade-offs are changing over the business cycle, as a bad economy often implies lower (present) earnings and a higher risk of skill mismatch.

In times of economic crisis, several countries increase public spending on education to mitigate the consequences of the crisis. This happened during both the global financial crisis of 2008 and the Covid-19 recession (Estermann, Pruvot, Kupriyanova & Stoyanova, 2020). However, little is known about the effects of these increased spending efforts. Here, we ask the following questions: To what extent do recent graduates actually invest in more education in times of crisis, and, if they do so, who are making these investments?

We study applications to and enrolment in master's degree programmes over the business cycle, with a particular focus on the Covid-19 recession. We employ register data on the population of bachelor's degree graduates in Norway from 2007 until 2021, along with their applications to and enrolments in master's degree programmes. In addition, we study responses to a unique survey on the impact of the Covid-19 crisis on the labour market opportunities for recent graduates and their investment in more education in 2020.

Because the consequences of coincidentally graduating in a recession might be severe, knowing the potential for educational enrolment to

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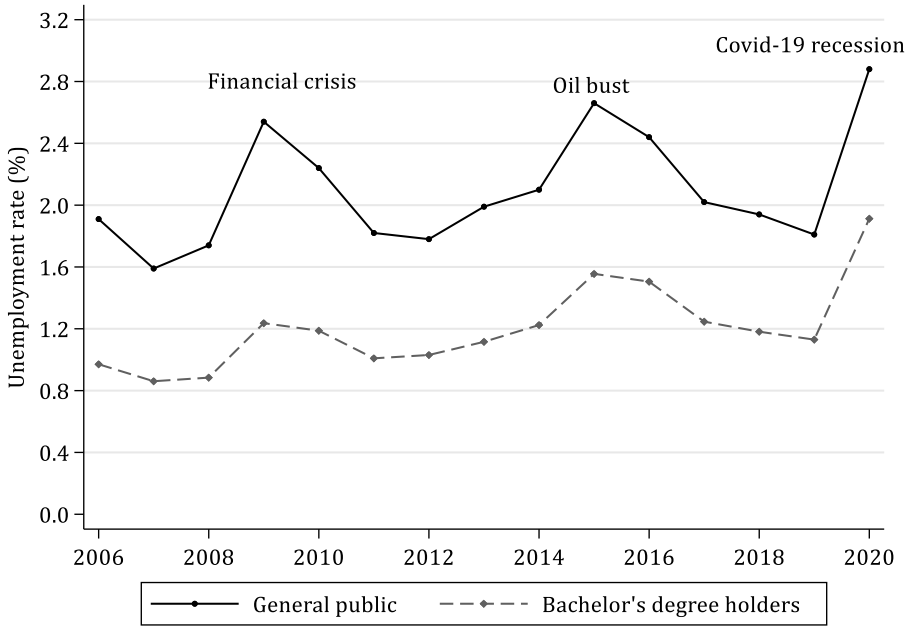

Fig. 1. *Unemployment rates in Norway 2006–2020, for the general public and bachelor's degree holders*. Note: Unemployment rates are measured in November of the given year. Bachelor's degree holders consist of people who have higher education with a duration of four years or less as their highest degree obtained. Source: Own calculations based on data from microdata.no, Statistics Norway (2022a).

mitigate the impact of economic downturns for recent graduates is essential. People graduating during recessions are more likely to experience long-lasting unemployment (e.g., Liu, Salvanes & Sørensen, 2014; Raaum & Røed, 2006). Also, research shows that poor career starts, for those who happen to graduate during recessions, cause persistent lower wages, lasting up to ten years after graduation (Altonji, Kahn & Speer, 2016; Brunner & Kuhn, 2014; Oreopoulos, von Wachter & Heisz, 2012; Schwandt & von Wachter, 2019; Van den Berge, 2018). Liu, Salvanes and Sørensen (2016) find that higher skill mismatch explains most of this loss in employees' long-term earnings. Furthermore, Oreopoulos, von Wachter and Heisz (2012) show that the earnings of less advantaged graduates, graduates with low predicted earnings based on the college attended, programme of graduation and years of study, are more permanently affected by recessions than more advantaged graduates. In addition, the social insurance system is generally not designed to cover recent graduates. For example, being new in the labour market, many recent graduates are not eligible for unemployment insurance (Schwandt & von Wachter, 2019).

Also, the impact of graduating during a recession has been found to extend beyond the labour market. Research has shown that those facing an economic downturn in their early career later experience poorer health because of unhealthy behaviour, and higher mortality than those with a more fortunate entrance into the labour market (Cutler, Huang & Lleras-Muney, 2015; Schwandt & von Wachter, 2019; von Wachter, 2020). In addition, family formation, crime and attitudes have been found to be affected (Bell, Bindler & Machin, 2018; Currie & Schwandt, 2014; Giuliano & Spilimbergo, 2014; Maclean & Hill, 2015).

Therefore, delaying entrance into the labour market during recessions while also acquiring more education could be beneficial, helping dampen the social consequences of recessions. The aim of the present paper is to study the potential for education as a mitigating tool during economic downturns in general and during the Covid-19 recession in particular. For increased public spending on more study places to be an effective tool, individuals need to respond to higher unemployment by seeking more education (unless there is already a queue of qualified applicants because of a limited capacity). On the one hand, a tougher labour market implies a lower opportunity cost of advancing to a master's degree, here in terms of forgone earnings and experience, which might increase the demand for education. On the other hand, higher unemployment could imply a lower (future) return to education. In addition, the availability of sources for funding education, such as side jobs, may decrease in economic downturns and could make higher education less possible. Thus, whether or to what extent higher unemployment and recessions will increase applications to master's degree programmes is not given.

The literature on the impact of business cycle fluctuations on the demand for more education is scarce. There are some studies of the impact on the decision to enrol in college (e.g., Betts & McFarland, 1995; Christian, 2007; Hazarika, 2002; Light, 1995) and on high school completion (e.g., Card & Lemieux, 2001; Reiling & Strøm, 2015), but according to Altonj, Kahn & Speer *'surprisingly little attention has been paid to the graduate school decision'* (2016, p. 365). Altonji, Kahn and Speer (2016) and Kahn (2010) mainly study career effects from graduating from college or university in economic downturns, however, they also pay some attention to educational demand, finding that high national unemployment rates (slightly) increase the probability of holding an advanced degree. Altonji, Acidiacono and Maurel (2016) build upon the literature and present a series of models that highlight the key factors in individuals' education decisions, including the effects of labour market conditions. Bedard and Herman (2008) and Johnson (2013) study the variations in the decision to enrol in graduate school over the business cycle in the United States. Bedard and Herman (2008), examining students with science and engineering degrees, find that only master's degree enrolment for male students is procyclical, meaning that men are more likely to enrol in master's degree programmes during economic upturns. Professional school enrolment is found to be countercyclical for women, implying that women are less likely to enrol in professional school during economic upturns, while all other types of enrolment are acyclical. Johnson (2013) finds countercyclical female graduate school enrolment but no cyclical pattern for men.

The present paper extends the literature by providing more evidence on the cyclicality of master's degree enrolment. In addition, the current paper studies the applications to—not only the enrolment in—master's degree programmes. Thus, we can learn more about the willingness to

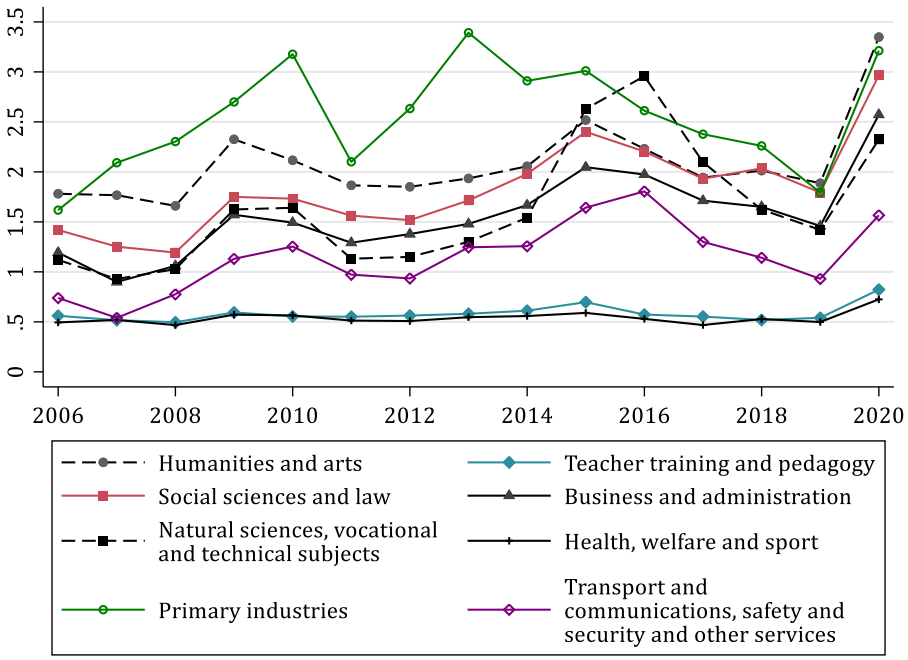

Fig. 2. *Field-specific unemployment amongst individuals with a bachelor's degree as their highest obtained education.* Note: Field-specific unemployment rates (percent) measured in November of the given year. Source: Own calculations based on data from microdata.no, Statistics Norway (2022a).

engage in education during economic downturns and the potential for education to be a mitigating tool. Our ambition is twofold. The first aim is to show how applications and enrolment in master's degree programmes are affected by recessions. The second aim is to answer the following: What characterises those who are pushed into master's degree programmes during recessions? We specifically study the Covid-19 recession by using responses to a survey on the labour market impacts of the pandemic.

The remainder of the present paper is organised as follows: Section 2 gives more details on the Covid-19 recession in Norway and the Norwegian higher education system. Section 3 describes the data and presents descriptive statistics. Section 4 presents the empirical strategy, while Section 5 presents the results. Finally, in Section 6, we conclude the paper.

2. Background and institutions

2.1. The covid-19 recession in Norway

Despite several governmental measures to mitigate the economic consequences, the Norwegian labour market was affected by the recession following the onset of the Covid-19 pandemic. From the fall of 2019 to the spring of 2020, Norway went from a good economy with a low unemployment rate to seeing the highest unemployment rate since the Second World War. In April 2020, because of strict infection prevention measures, a substantial share of employers was (permanently or temporarily) laid off. Norwegian newspapers widely indicate that 10.4% of the labour force were registered as unemployed by the Norwegian Labour and Welfare administration (NAV, 2020).

As is common during recessions, recent graduates with little labour market experience were hit particularly hard compared with other individuals with higher education. For recent graduates with a master's degree, the unemployment rate was 8.5% in the fall of 2020, while the general unemployment rate for those with higher education was 3.2% in the same period (Skjelbred & Ulvestad, 2021).

The Covid-19 recession is the third period of increased unemployment in Norway since the burst of the IT bubble at the beginning of the millennium. However, the unemployment rate during the Covid-19 pandemic exceeded all recent experiences. Fig. 1 presents the development in the unemployment rate in Norway from 2006 until 2020 for the public in general and for bachelor's degree holders in particular, as registered by Statistics Norway. Because the unemployment rate is registered in November each year, it does not necessarily capture the peak unemployment rate of each recession.

As Fig. 1 shows, the unemployment rate for the general public was 2.9% in November 2020. Compared with the other recessions during the period under study, the unemployment rate was 2.5% during the global financial crisis in November 2009 and 2.7% during the oil bust in November 2015. The figure further shows that the unemployment rate for people holding a bachelor's degree follows the fluctuations of the general public but with a lower unemployment rate.

As a response to the Covid-19 recession and the increased number of unemployed, the Norwegian government increased transfers to higher education institutions to increase education capacity and strengthen the opportunity for continuing education (Meld. St. 16 (2020–2021)). This resulted in an increase in the number of participants in formal education by 4% from 2020 to 2019, mostly at the tertiary level (Andresen, Grendal & Keute, 2021). However, these transfers mainly resulted in increased availability of bachelor's degree programmes, and the increase in the availability of master's degree programmes was limited.

2.2. The higher education system in Norway

The Norwegian higher education system consists of universities, university colleges and specialised university colleges. There are ten universities, four traditional universities and six modern universities (established as universities after 2004). The four traditional universities mainly provide longer professional education (in areas such as medicine and law), as well as liberal education at the bachelor's and master's levels. Historically, the six modern universities and university colleges have mainly offered professional diplomas of a three-year duration in areas such as nursing and early childhood education (Sandsør, Hovdhaugen & Bøckmann, 2021).

In 2003, Norway implemented the 3 + 2 + 3° system with a

Table 1
Descriptive statistics of the sample of bachelor's degree graduates.

	(1) All mean	sd	(2) Women mean	sd	(3) Men mean	sd
Female (%)	63.9					
Age at graduation	27.1	6.5	27.2	6.8	27.0	6.0
Grades						
Average high school grade	4.1	0.6	4.2	0.6	4.1	0.6
Average grade bachelor	3.2	0.7	3.2	0.6	3.3	0.7
Bachelor grade average above B (%)	13.9		13.2		15.2	
Bachelor grade average above C (%)	65.2		65.1		65.3	
Graduation year	2015	4.3	2015	4.3	2015	4.3
Graduation in spring (%)	86.6		87.1		85.9	
Field (%)						
Humanities and arts	8.9		8.4		9.7	
Teacher training and pedagogy	11.3		14.4		6.0	
Social sciences and law	11.9		11.9		12.0	
Business and administration	12.0		10.4		14.8	
Natural sciences, vocational and technical subjects	18.8		8.5		37.2	
Health, welfare and sport	34.9		45.3		16.5	
Primary industries	0.8		0.6		1.1	
Transport and communications, safety and security and other services	1.3		0.6		2.6	
Institution (%)						
Traditional university	33.3		30.5		38.3	
Modern university	37.7		39.4		34.8	
University college	20.0		20.5		19.0	
Specialised university	8.9		9.5		7.9	
applied in graduation year (%)	29.9		25.0		38.6	
enrolled in graduation year (%)	17.5		13.6		24.4	
N	323,438		206,700		116,738	

Note: Bachelor's degree graduates from Norwegian higher education institutions from 2007 until 2021. High school grades are measured on a scale from 2 to 6 (1 is fail). Bachelor's grades are measured on a scale from 1 (E) to 5 (A). 'Graduating in spring' refers to the spring term, which runs from January until July. 'Applied in graduation year' refers to the bachelor's degree graduates who applied for a master's degree programme within the same calendar year as their bachelor's degree graduation. 'Enrolled in graduation year' refers to the bachelor's degree graduates who were enrolled in a master's degree programme within the same calendar year as their bachelor's degree graduation.

bachelor's, master's and PhD structure, following European standards.[1] Applications, both to bachelor's and master's degrees, are to specific programmes at a given higher education institution. This means that prospective bachelor's students select their major upon entry into higher education. Bachelor's graduates who desire to continue their education need to gain admission to a master's degree programme. Admission to master's degree programmes requires the completion of a relevant bachelor's degree within the same field, either from Norway or from an approved programme abroad. Most programmes select students based on the average grade from the bachelor's degree and have a minimum requirement of holding a grade C, but for popular programmes, the admission threshold might be higher. In contrast to the centralised system for admission to bachelor's degree programmes, the admission system for master's degree programmes is decentralised; it is administered by each respective higher education institution. The application deadline is April 15 for programmes starting in August, which is most of the programmes, while the application deadline is November 1 for programmes starting in January. At both deadlines, one can apply to as many institutions as one wishes but usually to only a fixed number of programmes within the institution. Each higher education institution has a given capacity for master's degrees, as indicated by the number of seats available for each study programme. Because most Norwegian higher education institutions are publicly funded and the funding contains a base component that is intended to cover study seats, the number of seats available is largely a political decision.

There are virtually no tuition fees in Norway; there is only a small fee to register as a student each semester. In 2022, this fee was approximately 80 USD (685 NOK).[2] All students are entitled to apply for student loans and grants from the Norwegian State Educational Loan Fund. The loan is free of interest for full-time students. Up to 40% of the loan is converted into a grant if the student completes the education, does not live with their parents and has income and assets below a certain threshold (Lånekassen, 2020).

3. Data and descriptive statistics

3.1. Field-specific unemployment rates

We use data on unemployment made available by Statistics Norway. To identify the relevant unemployment rate for bachelor's graduates, we compute field-specific unemployment rates for individuals holding a degree of the corresponding length. More specifically, the unemployment rate is based on individuals with a bachelor's degree as their highest attained education and with higher education of four years or less, both abroad and domestic, in the given year.[3] The field-specific unemployment rates are given by the ratio of unemployed individuals to all the individuals in the labour force within each field of education.

We do not restrict the sample to recent graduates. Doing so might lead to a substantial underestimation of unemployment because recent graduates might be less likely to register as unemployed since they often are not eligible for unemployment benefits. Nevertheless, to avoid any simultaneity problems, the unemployment rates are measured in November the year before graduation, when the bachelor's graduates are not part of the labour stock used to calculate the unemployment rates.

Fig. 2 displays the field-specific unemployment rates from 2006 to 2020. We see that all fields experience fluctuations but that the two fields of *teacher training and pedagogy* and *health, welfare and sport* have lower unemployment rates and experience less volatility than the other fields. *Humanities and arts* have, relatively speaking, high rates of unemployment, but the *natural sciences, vocational and technical subjects* are particularly volatile. All fields experienced increasing unemployment between 2008 and 2009, 2014 and 2015, and 2019 and 2020.

3.2. Graduation and application data

In the main analysis, we combine two detailed datasets collected by higher education administrative services and made available for research by the Norwegian Directorate for ICT and joint services in higher education and research (Unit). The first dataset contains information about bachelor's degree graduates from virtually all Norwegian

[1] There still exist some five-year consecutive master's degree and six-year professional programmes, but these are not the focus of the present study.

[2] https://www.uia.no/student/administrer-dine-studier/semesteravgift-refusjon

[3] The definition is based on level 6 in the Norwegian Standard for Classification of Education (NUS). The definition includes all lower-level tertiary education with four years or less duration, including single subjects and degrees at universities and university colleges. The definition also includes higher education degrees with the given duration awarded prior to the introduction of bachelor's degrees in 2003.

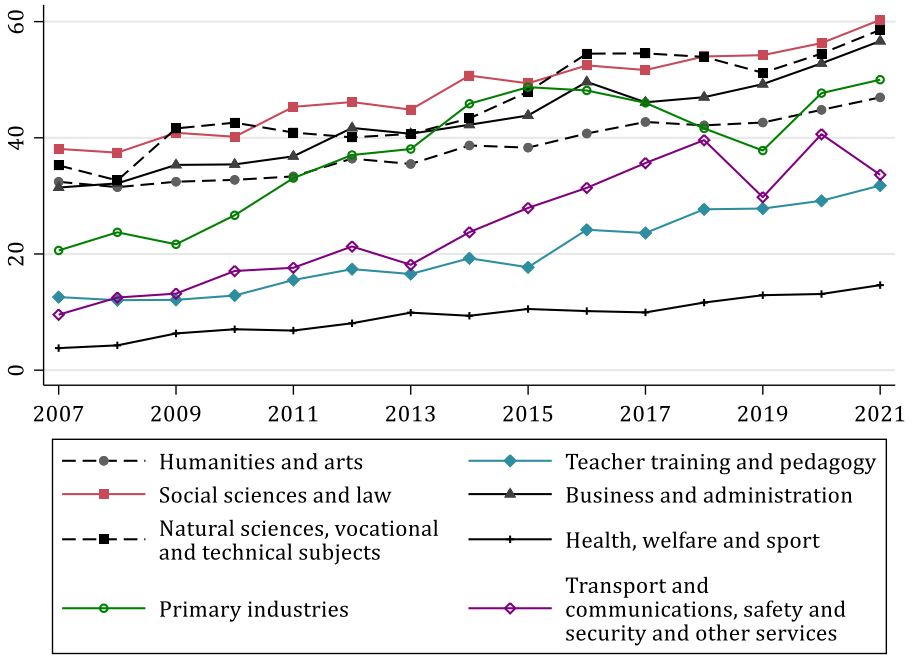

Fig. 3. Shares of bachelor's degree graduates applying for a master's degree programme just after finishing their bachelor's degree, by field.

higher education institutions[4] between 2007 and 2021. The dataset includes information on the field of bachelor's degree programme, gender, birth year, average grades from high school and average grades from the bachelor's degree programme. The second dataset includes all applications to and enrolment in master's degree programmes in the same period. A person is considered enrolled if they are registered as a student in the offered study programme. The combined data set contain observations of 323,438 individuals graduating in the period between 2007 and 2021.

Table 1 gives the descriptive statistics of our sample. Column (1) presents the statistics for all bachelor's graduates, while columns (2) and (3) present the statistics separately for women and men, respectively. Of the bachelor's graduates, 63.9% are women, and the average age at graduation is 27. 65.2% have obtained an average bachelor's degree grade above a C (or above 3 when converted to numeric values), and most graduated in the spring term (87%). The majority of the bachelor's degree graduates are educated within the areas of *health, welfare and sport* (35%). However, there are substantial gender differences in the field of study, with 45.3% of women being bachelor's graduates within the fields of *health, welfare and sport* compared with 16.5% of men. Moreover, 37.2% of men are bachelor's graduates within the *natural sciences, vocational and technical subjects* compared with 8.5% of women. Of the individuals in our sample, 33.1% have obtained their bachelor's degree at a traditional university and 37.1% at a modern university.

Finally, 29.9% of the bachelor's degree graduates are found to have applied for a master's degree programme within the same year they graduated. However, the gender difference is substantial, with the same being true for 25.0% of the female bachelor's graduates compared with 38.6% of the male bachelor's graduates. 17% of the bachelor's degree graduates are enrolled in a master's degree programme within the same year as their graduation.

[4] The data are retrieved from the administrative system shared by all public higher education institutions and most private institutions. Among the larger institutions, it is only one private business school that is not included. The majority of the students are, however, accounted for, given that public institutions accounted for 93% of the education slots in Norway (Database for Statistics on Higher Education [DBH], 2021)). See Table B1 in the Appendix for a full list of included and excluded institutions.

Fig. 3 shows the share amongst the bachelor's degree graduates who applied for admission to at least one master's degree programme in the same calendar year as they finished their bachelor's degree. The application rates have increased in all fields during the period under study. Health, welfare and sport has considerably lower application shares than most of the other fields. In 2021, 14.6% of the bachelor's graduates in health, welfare and sport applied for a master's degree programme, while the same was true for 60.3% within social sciences and law.

3.3. Survey of recent graduates and the covid-19 recession in 2020

To learn more about those who chose to continue their education after obtaining a bachelor's degree during the Covid-19 recession, we use data from a survey of recent graduates in 2020 (Skjelbred & Eide, 2021). This survey is part of a biannual survey of recent graduates conducted by the Nordic Institute for Studies in Innovation, Research and Education (NIFU). The survey usually covers master's degree graduates only, but occasionally, bachelor's degree graduates are included. The aim is to investigate the labour market status of recent graduates and to learn more about the quality and relevance of recent graduates' education.

The survey of the 2020 cohort of recent graduates was distributed to (in addition to the whole population of Norwegian masters' degree graduates) a stratified random draw of half of the population of Norwegian bachelor's degree graduates graduating in the spring of 2020 (N = 12,181). The survey was conducted in the autumn of 2020, and the response rate was 52% (N = 6335).[5] The respondents were fairly representative of the population. There was a weak overrepresentation of women and older graduates amongst the respondents, but these differences were small in magnitude (see Appendix Table B2). The respondents were, on average, 27 years old, 64.7% were female, and *health, welfare and sport* was the largest field (31.4%). Furthermore, about a third of the respondents graduated from one of the traditional universities and about a third graduated from one of the modern universities.

[5] A person is considered as a respondent if they completed at least ten questions.

In addition to the questions about the respondent's labour market status and assessments of the relevance and quality of their education, the 2020 survey included questions about the graduate's perceived impact of the Covid-19 pandemic on their labour market opportunities. Also—and importantly—the survey included questions about whether the recent graduate had continued with more education and the motivation for doing so. This gives us the opportunity to study motivations for continuing education and their relation to the Covid-19 recession.

4. Empirical strategy

The aim of the present paper is to evaluate the effects of business cycles on recent graduates' willingness to continue their education. More specifically, our empirical strategy is to estimate the impact of business cycle fluctuations on master's degree applications by exploiting variations in the unemployment rates at the time of bachelor's degree graduation between fields over time. Our baseline estimation equation is given by the following:

$$Y_{ijt} = \alpha + \delta u_{jt-1} + x_i'\beta + \lambda_j + \gamma_t + o_{ijt}, \quad (1)$$

where Y_{ijt} is the outcome variable (application to or enrolment in a master's degree programme) for individual i holding a bachelor's degree in field j in year t. δ is the coefficient of interest that measures the impact of the unemployment rate. The unemployment rate is measured in November the year before the application deadlines. The main application deadline is in April, but there is also a second deadline in November. x_i' is a vector of individual, time-constant control variables. λ_j are the field of study fixed effects, which account for mean differences in the likelihood of applying for a master's degree programme between fields. γ_t are graduation year fixed effects, controlling for any other variation that might affect the number of applications, apart from the change in unemployment. o_{ijt} is the error term.

The main specification of application is an indicator variable taking a value of 1 if the graduate applied to a master's degree programme in the year of graduation and 0 otherwise. Similarly, the main specification of enrolment is an indicator variable taking a value of 1 if the graduate enrolled in a master's degree programme in the year of graduation, where enrolment is defined as being registered as a master's degree student.

The identification of the impact of business cycles on master's degree applications and enrolment is based on (1) the use of the relevant unemployment rate that appropriately captures the entry-level labour market conditions at the time of graduation and (2) that the graduates themselves do not affect the unemployment rate (simultaneity bias). Identification further relies on the assumption that (3) the composition of graduates across cohorts is unrelated to the unemployment rate. Violations occur if the timing of graduation is related to the business cycle, for example, if students delay their graduation in economic downturns or if unemployment rates affect dropout from bachelor's degree programmes. Finally, (4) when studying enrolment, the number of admissions cannot depend on the state of the economy.

(1) Because the labour market opportunities of recent graduates often differ between fields of study, we use field-specific unemployment rates based on individuals with the relevant level of education (bachelor's degree as their highest attained education). (2) Also, to make sure that the graduates themselves do not contribute to the unemployment rates, we use unemployment rates measured in November the year before graduation.

Regarding the timing of graduation and selection bias (3), we investigate whether there are signs of any changes to the bachelor's degree cohorts related to the unemployment rate (see Table A1 in the Appendix). The reasoning here is that, if there are changes in the composition of bachelor's degree graduates caused by the business cycle, these might become visible in this exercise. We do find a moderate, significant relationship between the unemployment rate and the share of women. However, we do not see any association with the shares graduating in the spring or fall term, nor any relationship with the average grade level in the cohort. Thus, we cannot conclude that there are no signs of selection bias, but the expected relationships in presence of selection bias are not present. This finding is consistent with Oreopoulos, von Wachter and Heisz (2012), who argue that the effect of unemployment on graduation timing is small.

In the present study, we focus on two outcomes: whether or not the bachelor's degree graduate decides to apply for a master's degree programme in the graduation year and whether or not the graduate enrols in a master's degree programme. We see the decision to apply as being as good as independent of changes to the number of study places. Enrolments, however, reflect both the applicants' willingness to accept an offer they receive and the institutions' willingness and possibility of enroling students. Thus, a key question is whether the capacities at master's degree level has been changed in accordance with business cycle fluctuations in the period we study (4). Our examination of political documents, research reports and information from education institutions suggests that the availability of master's degrees has not

Table 2
The relationship between unemployment and master's degree applications.

	(1) Applied in graduation year	(2) Applied in graduation year	(3) Applied in graduation year
Unemployment rate	0.213***	0.062**	0.065**
	(0.04)	(0.01)	(0.02)
Teacher training and pedagogy		−0.085**	0.007
		(0.02)	(0.02)
Social sciences and law		0.117***	0.106***
		(0.00)	(0.01)
Business and administration		0.081***	0.108***
		(0.01)	(0.01)
Natural sciences, vocational and technical subjects		0.110***	0.121***
		(0.01)	(0.01)
Health, welfare and sport		−0.194***	−0.111***
		(0.02)	(0.02)
Primary industries		−0.023**	0.035
		(0.00)	(0.02)
Transport and communications, safety and security and other services		−0.066**	−0.036*
		(0.01)	(0.01)
Graduation spring term			0.110*
			(0.04)
Modern university			−0.108*
			(0.03)
University college			−0.138*
			(0.04)
Specialised university			−0.038
			(0.06)
Female			−0.030
			(0.03)
Average grade bachelor's degree			0.124**
			(0.03)
Constant	0.039	0.187***	−0.375***
	(0.06)	(0.02)	(0.06)
Graduation year	No	Yes	Yes
Age at graduation	No	No	Yes
R-squared	0.117	0.152	0.229
N	323,438	323,438	323,438

Note: The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for the type of institution. Standard errors are in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. *$p<0.05$,** $p<0.01$,***$p<0.001$.

Table 3
The relationship between unemployment and master's degree enrolment.

	(1) enrolled in graduation year Coef./se	(2) enrolled in graduation year Coef./se	(3) enrolled in graduation year Coef./se
Unemployment rate	0.148***	0.037**	0.039**
	(0.02)	(0.01)	(0.01)
Teacher training and pedagogy		−0.106***	−0.025
		(0.01)	(0.02)
Social sciences and law		0.033***	0.032**
		(0.00)	(0.01)
Business and administration		0.032***	0.059***
		(0.00)	(0.01)
Natural sciences, vocational and technical subjects		0.065***	0.080***
		(0.00)	(0.01)
Health, welfare and sport		−0.163***	−0.088***
		(0.01)	(0.01)
Primary industries		0.019***	0.078*
		(0.00)	(0.02)
Transport and communications, safety and security and other services		−0.081***	−0.057***
		(0.01)	(0.01)
Graduation spring term			0.096*
			(0.04)
Modern university			−0.097*
			(0.03)
University college			−0.128*
			(0.04)
Specialised university			−0.008
			(0.08)
Female			−0.032
			(0.02)
Average grade bachelor's degree			0.112*
			(0.03)
Constant	−0.005	0.146***	−0.283**
	(0.04)	(0.01)	(0.06)
Graduation year	No	Yes	Yes
Age at graduation	No	No	Yes
R-squared	0.082	0.106	0.185
N	323,438	323,438	323,438

Note: The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for type of institution. Standard errors are in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. *$p<0.05$,**$p<0.01$,***$p<0.001$.

fluctuated with unemployment rates. During the Covid-19 pandemic, educational institutions received additional financing to increase educational capacity. However, these increases in public transfers to education institutions because of business cycle fluctuations have mostly been allocated to lower education levels than the master's level. Similarly, we do not find evidence suggesting that other political priorities which could have coincided with fluctuations in unemployment rates have impacted the availability of master's degrees. In the later years, there has been a strong political commitment to the competence development of teachers and to ensure sufficient education of health care workers to keep up with the increased demands of the welfare state. However, neither of these efforts have been directed at two-year master's degree programmes. Fig. B1 in the Appendix confirms that there has been a stable development in the number of enrolments in the period under study.

Table 4
The relationship between unemployment and master's degree applications and enrolment by gender.

	(1)	(2)	(3)	(4)
	Women		Men	
	applied in graduation year	enrolled in graduation year	applied in graduation year	enrolled in graduation year
Unemployment rate	0.068*	0.036*	0.055***	0.029**
	(0.02)	(0.01)	(0.01)	(0.01)
Teacher training and pedagogy	0.013	−0.030	−0.015	−0.041*
	(0.02)	(0.02)	(0.02)	(0.01)
Social sciences and law	0.123***	0.033***	0.083***	0.035*
	(0.01)	(0.01)	(0.01)	(0.01)
Business and administration	0.081***	0.034**	0.126***	0.072***
	(0.01)	(0.01)	(0.01)	(0.01)
Natural sciences, vocational and technical subjects	0.193***	0.138***	0.086***	0.050**
	(0.01)	(0.01)	(0.01)	(0.01)
Health, welfare and sport	−0.115***	−0.097***	−0.075**	−0.079***
	(0.02)	(0.01)	(0.02)	(0.01)
Primary industries	0.048	0.083*	0.026	0.081**
	(0.03)	(0.02)	(0.02)	(0.02)
Transport and communications, safety and security and other services	0.056**	−0.005	−0.078***	−0.087***
	(0.01)	(0.00)	(0.01)	(0.00)
Graduation spring term	0.098	0.082	0.132**	0.122**
	(0.04)	(0.04)	(0.03)	(0.03)
Modern university	−0.116*	−0.095*	−0.093**	−0.098**
	(0.04)	(0.04)	(0.02)	(0.02)
University college	−0.137*	−0.119*	−0.137**	−0.139**
	(0.05)	(0.05)	(0.04)	(0.03)
Specialised university	−0.067	−0.031	0.005	0.033
	(0.05)	(0.06)	(0.07)	(0.11)
Average grade bachelor's degree	0.102**	0.087*	0.157***	0.150***
	(0.03)	(0.03)	(0.02)	(0.02)
Constant	−0.656**	−0.512*	−0.423***	−0.331***
	(0.17)	(0.19)	(0.05)	(0.04)
Graduation year	Yes	Yes	Yes	Yes
Age at graduation	Yes	Yes	Yes	Yes
R-squared	0.234	0.179	0.202	0.178
N	206,700	206,700	116,738	116,738

Note: The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for type of institution. Standard errors are in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. *$p<0.05$,**$p<0.01$,***$p<0.001$.

5. Results

5.1. Applications and enrolments

We start out by presenting the results for applications. Table 2 reports the regression results from estimations of various specifications of Eq. (1) in Section 4, with 'applied in graduation year' as the outcome variable. The outcome variable equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. In column (1), we only include the unemployment rate and find a positive and significant coefficient of

Table 5
The relationship between unemployment and master's degree applications and enrolment by average bachelor's degree grades.

	(1) Average grade below D (> D)	(2) Average grade between D and C (D ≤ and > C)	(3) Average grade between C and B (C ≤ and > B)	(4) Average grade between B and A (B ≤ and > A)	(5) Average grade A
Applied in graduation year					
Unemployment rate	0.007	0.055**	0.066**	0.058***	−0.072
	(0.01)	(0.01)	(0.02)	(0.01)	(0.09)
enrolled in graduation year					
Unemployment rate	−0.006	0.018	0.045**	0.034*	0.098
	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)
The control variables	Yes	Yes	Yes	Yes	Yes
Applied in graduation year					
°r-squared	0.044	0.119	0.213	0.242	0.297
enrolled in graduation year					
R-squared	0.017	0.076	0.160	0.192	0.276
N	8020	104,541	165,873	44,621	382

Note: The average bachelor's degree grade is measured on a scale from 2 to 5, where 2 equals E and 5 equals A. The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. Standard errors are in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. The control variables consist of those presented in column (3) of Table 2. Table B3 in the Appendix gives the corresponding results for those with average bachelor's degree grades above and below the field averages. *p<0.05,**p<0.01,***p<0.001.

0.213. Thus, a one percentage point increase in the field-specific unemployment rate is associated with about a 20 percentage points increase in applications. However, in column (2), we include field of study fixed effects and graduation year fixed effects, seeing a substantial reduction in the coefficient of interest (the unemployment rate). In

Table 7
Main activity in November 2020.

	(1) All means (%)	(2) Women Mean (%)	(3) Men Mean (%)
Employed	60.1	65.0	51.2
Unemployed	5.8	4.8	7.8
Outside labour force	3.2	2.9	3.6
Student			
Master's degree programme	22.8	19.4	29.2
sOther studies	8.0	8.0	8.2
N	6008	3886	2122

Note: The respondent's main activity is defined by a set of questions. A person is considered a student if the person reports studies as their main activity and answers that they were engaged in education in the reference week in November 2020. A person is considered employed if the person worked at least one hour or was on paid leave from such work (i.e., vacation, parental leave) in the reference week in November 2020. A person is considered unemployed if they did not work and actively sought work. A person is considered outside the labour force if they were neither employed, a student nor actively seeking labour.

Table 8
Motivation for education for master's students.

		All		Men		Women	
		N	%	N	%	N	%
1	Had previously planned to take a higher-level education after the one I completed in the spring of 2020	786	57.5	468	59.7	418	55.7
2	Increased interest in the subject led me to continue	147	10.8	67	10.9	80	10.7
3	Wished to improve my opportunities in the labour market	295	21.6	120	19.5	175	23.3
4	Problems with finding a relevant job after I completed my study programme in the spring of 2020	116	8.5	47	7.6	69	9.2
5	Other reasons	22	1.6	14	2.3	8	1.1
N		1366	100	620	100	752	100

Note: Responses to the question 'What was the most important reason for you being engaged in this education?' Responses from graduates who were enrolled in a master's degree programme. There are no significant differences between men and women in their motivations for further studies (Pearson's chi squared, $p = 0.12$).

Table 6
The relationship between unemployment and master's degree applications and enrolment by type of higher education institution.

	(1) Traditional university Coef./se	(2) Modern university Coef./se	(3) University college Coef./se	(4) Specialised university Coef./se
Applied in graduation year				
Unemployment rate	0.047	0.069**	0.079*	0.094**
	(0.02)	(0.02)	(0.02)	(0.02)
enrolled in graduation year				
Unemployment rate	0.023	0.036***	0.052***	0.101***
	(0.01)	(0.01)	(0.01)	(0.02)
Control variables	Yes	Yes	Yes	Yes
Applied in graduation year				
r-squared	0.229	0.183	0.176	0.360
enrolled in graduation year				
R-squared	0.180	0.139	0.127	0.399
N	107,809	122,066	64,667	28,896

Note: The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. Standard errors are in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. Control variables consist of those presented in column (3) of Table 2.
*p<0.05,**p<0.01,***p<0.001.

Table 9
Mean response to questions about the impacts of the Covid-19 recession.

Answer to question about motivation, presented in Table 8	Problems finding relevant job 4	Improve opportunities 3	Previous plan or interest 1 or 2	Differences 4–3	4-(1 or 2)	3-(1 or 2)
The Covid-19 pandemic has weakened my career prospect	4.1	2.9	2.9	1.1***	1.2***	0.1
The Covid-19 pandemic has made me consider a different career path	2.6	2.0	1.7	0.6***	0.9***	−0.3***
N	116	295	933			

Note: Mean responses to the questions: 'To what extent do you agree with the following statements?' 'The Covid-19 pandemic has weakened my career prospects' and 'The Covid-19 pandemic has made me consider a different career path'. Scale: 5 categories: Strongly disagree (1) – Strongly agree (5). The groups are defined by the responses to the question reported in Table 8, where responses 1 and 2 are grouped into 'Previous plan or interest', response 3 is called 'Improve opportunities', and response 4 is 'Problems finding relevant job'. Students reporting 'Other reasons' are excluded. 'Differences' are pairwise *t*-test comparisons of the groups. *$p<0.05$,**$p<0.01$,***$p<0.001$.

Table 10
Distribution of characteristics of students 'pushed' and 'not pushed' into education.

Answer to question about motivation, presented in Table 8	(1) Strongly pushed 4	(2) Moderately pushed 3	(3) Not pushed 1 or 2	(1)-(3) Difference	(2)-(3)	(1)-(2)
Female (%)	59.5	59.3	53.4	6.1	5.9	0.2
Age at graduation	25.9	25.3	25.0	0.9*	0.3	0.6
Immigrant (%)	6.9	6.4	6.0	0.9	0.3	0.5
Both parents have higher education (%)	29.3	39.3	47.2	−17.9***	−7.9*	−10.0
Grades						
Average grades bachelor's degree	3.5	3.6	3.7	−0.3***	−0.2***	−0.1*
Grade A or B from bachelor (%)	45.5	53.9	66.1	−20.6***	−12.2***	−8.4
Grade C or better from bachelor (%)	96.4	98.3	99.5	−3.0**	−1.2	−1.9
Top grades from high school (%)	20.2	22.7	32.5	−12.4**	−9.8**	−2.5
Field (%)						
Humanities and arts	10.3	10.2	11.0	−0.7	−0.9	0.2
Teacher training and pedagogy	3.4	9.2	4.8	−1.4	4.3**	−5.7*
Social sciences and law	17.2	24.4	22.3	−5.1	2.1	−7.2
Business and administration	24.1	18.6	18.2	5.9	0.4	5.5
Natural sciences, vocational and technical subjects	31.0	20.7	35.5	−4.4	−14.8***	10.4*
Health, welfare and sport	11.2	12.9	5.8	5.4*	7.1***	−1.7
Primary industries	0.9	2.7	1.7	−0.9	1.0	−1.8
Transport and communications, safety and security and other services	1.7	1.4	0.5	1.2	0.8	0.4
Institution (%)						
Traditional university	49.1	43.7	54.6	−5.4	−10.8**	5.4
Modern university	28.4	30.8	25.5	2.9	5.3	−2.4
University college	10.3	13.2	10.1	0.3	3.1	−2.9
Specialised university	12.1	12.2	9.9	2.2	2.3	−0.1
N	116	295	933			

Note: Students are considered as 'Strongly pushed' if their main motivation for master's degree studies was 'Problems with finding a relevant job after I completed my study programme in the spring of 2020′, answer 4 in Table 8, and 'Moderately pushed' if their main motivation was 'Wished to improve my opportunities in the labour market', answer 3 in Table 8. Students are considered 'Not pushed' if their main motivation for master's degree enrolment was 'Had previously planned to take a higher-level education after the one I completed in the spring of 2020′, answer 1 in Table 8, or 'Increased interest in the subject led me to continue', answer 2 in Table 8. Bachelor's degree grades are self-reported and measured on a scale from 1 (E) to 5 (A). Respondents from non-grade-awarding bachelor's degrees, that is, degrees that only give pass or fail (2.3% of respondents) are excluded from the computation of grades. High school grades are measured on a scale from 2 to 6 (1 is fail). A person is defined as an immigrant if they are foreign born and have foreign-born parents. The column difference and the corresponding significance stems from pairwise *t*-test comparisons of the three groups. *$p<0.05$,**$p<0.01$,***$p<0.001$.

column (3), we present our preferred specification; the results from the estimation of the full Eq. (1) in Section 4. Here, we also add the following individual, time-constant control variables: a dummy for graduation in the spring term, type of study institution (dummy coded), a dummy for gender, average grade from bachelor's degree and controls for age at graduation (dummy coded).

We find that a one percentage point increase in the unemployment rate is associated with an increase in applications of 6.5 percentage points. On average, this corresponds to an increase of about 22%, given that 29.9% of bachelor's graduates, on average, apply to a master's degree programme the same year as graduation (reported in Table 1). Thus, we find a countercyclical relationship between applications to master's degree programmes and the business cycle, where bachelor's graduates are more (less) likely to apply for a master's degree programme during economic downturns (upturns).

In Table 3, we present the results for enrolment numbers in master's degree programmes, here following the same procedure as in Table 2. We see a strong, positive association between the unemployment rate and enrolment in column (1), where we only include the unemployment rate. When we include field of study fixed effects and graduation year fixed effects, in column (2), we see a substantial reduction in the coefficient of interest, but there is still a significant and positive relationship of 0.037. The results from the estimation of the full Eq. (1), including all individual, time-constant control variables, are given in column (3). We also find a countercyclical pattern for master's degree enrolment where a one percentage point increase in the unemployment rate is associated with a 3.9 percentage points increase in enrolment in master's degree programmes. As for applications, this corresponds to an increase of about 22% on average because the average enrolment rate is 17.5% (reported in Table 1).

The countercyclical pattern that we find is consistent with the literature examining the impact of the business cycle on the decision of

individuals to enrol in college, which, in general, finds that enrolment in college increases when the unemployment rate rises (e.g., Johnson, 2013, p. 123). The scarcer literature on the impact of business cycle fluctuations on those that have completed the first cycle of higher education finds heterogeneity in sensitivity to the unemployment rate (Altonji, Kahn & Speer, 2016; Bedard & Herman, 2008; Johnson, 2013; Kahn, 2010). Hence, in the next section, we investigate whether responsiveness to business cycle fluctuations differs across subgroups.

In addition, in the Appendix, Table A5, we have included the results from a sensitivity analysis, where we estimate Eq. (1), excluding one field at a time. We find that our results are particularly sensitive to the exclusion of the field *of health, welfare and sport*. Excluding this field reduces the coefficient substantially, from 6.5 to 3.1 percentage points for applications. For enrolment, the coefficient is reduced from 3.9 to 1.8 percentage points, and there is no longer a significant relationship. *Health, welfare and sport* is the largest field of the population, with 34.9% of the bachelor' s graduates (see Table 1). However, it is also the field with the lowest share of graduates applying for master's degree programmes (Fig. 3).

In Section A of the Appendix we show that our results are robust to a number of variable and sample specifications. Here we show that our main results are virtually the same when excluding the years of the Covid-19 pandemic (2020 and 2021).

5.2. Heterogeneous responses

5.2.1. Gender

Earlier research on graduate degree enrolment over the business cycle has found different patterns for men and women. Bedard and Herman (2008) show a procyclical relationship for men with science and engineering degrees, a countercyclical relationship for female enrolments in professional school and no pattern for other types of enrolment. Johnson (2013) indicates a countercyclical pattern for female graduate school enrolments but an acyclical pattern for males. To investigate whether there are differences between men and women in our sample, we estimate Eq. (1) for women and men separately. The results, both for applications and enrolments, are given in Table 4.

Table 4 shows that, in our sample of bachelor's graduates in Norway, there is a countercyclical relationship between business cycles and applications to and enrolment in master's degree programmes for both women and men. However, the relations are somewhat stronger for women. A one percentage point increase in the unemployment rate is associated with a 6.8 percentage points increase in applications for women and a 5.5 percentage points increase for men. Furthermore, because the average share applying for master's degree programmes is higher for men than women (reported in Table 1), the percentage increase is, on average, 27% for women but only 14% for men. The same is true for enrolment; a one percentage point increase in unemployment is associated with 3.6 and 2.9 percentage points increases for women and men, respectively, implying an average increase of 27% for women and 12% for men.

5.2.2. Grades

Bedard and Herman (2008) provide evidence suggesting that the countercyclical pattern they find for male PhD enrolment is driven by high-GPA students. Here, we do not find any evidence suggesting that the countercyclical pattern is driven by those with the highest grade averages. The relationship between the unemployment rate and applications to master's degree programmes is equally strong for those with average grades above and below the field averages, both for men and women (not shown). However, to study to what extent there are heterogeneous responses to the business cycles when it comes to average bachelor's degree grades, we estimate Eq. (1) for different groups of graduates classified by their average grades from the bachelor's degree.

Table 5 presents the estimation coefficients from estimations of Eq. (1) for groups with different grade averages for both outcomes: 'applied in graduation year' and 'enrolled in graduation year'. We find the strongest countercyclical relationship for those with average grades between a C and B. However, there are also countercyclical relationships between applications and the business cycle for those with average grades between a D and C and between a B and A. For enrolment, there is no relationship between enrolment and the business cycle for those with average grades below a C. This is likely to be driven by both the grade-based admission system and admission requirements of a minimum grade average of a C employed by many master's programmes.

5.2.3. Higher education institutions

There might also be heterogeneous responses to changes in unemployment rates between types of higher education institutions. For example, Johnson (2013) concludes that graduate school enrolment seems to be less responsive to changing business cycles than enrolment in community college. In Table 6, we show the results of the estimations of Eq. (1) for the four different types of higher education institutions. All types of higher education institutions display countercyclical patterns in master's applications and enrolment over the business cycle, but responsiveness is smaller and nonsignificant for traditional universities. Also, when studying average percentage changes, considering that the average application and enrolment rates differ between the four types of higher education institutions (the average application and enrolment rate across higher education institutions is reported in Table B4), we find that a one percentage point increase in the unemployment rate is associated with an increase in applications of 28% for modern universities, 38% for university colleges and 33% for specialised universities (11% for traditional universities). Studying enrolment numbers, the differences are even larger: 28% for modern universities, 57% for university colleges and 51% for specialised universities (9% for traditional universities). Thus, we find substantial differences between the higher education institutions, where those graduating from a university college or a specialised university seem to be more responsive to changes in field-specific unemployment rates.

5.3. Who was pushed into more education during the covid-19 recession?

To uncover more about the motivations and assessments of those continuing their education after graduating with a bachelor's degree during the Covid-19 pandemic, we study the responses to a survey of recent bachelor's graduates in 2020. The survey is presented in Section 3.3. Exploiting this survey, we can investigate how different subgroups experienced the impact of the Covid-19 recession.

Of the 6008 respondents who graduated with a bachelor's degree in the spring of 2020, 22.8% continued their education at the master's degree level, as shown in Table 7. The distribution in Table 7 indicates that the share continuing their education was higher for men than for women, but this difference disappears if we control for the same observable characteristics as in the main analysis (not shown).

Some bachelor's degree graduates will continue their education, regardless of the state of the labour market. However, in the present study, we are mainly interested in those who were pushed into continuing their education because of the Covid-19 recession. To separate those who were pushed into more education, we use a question in the survey regarding the main motivation for continuing education ('What was the most important reason for you being engaged in this education?'). The response distribution of this question is displayed in Table 8. Those replying that their main motivation for enroling in a master's degree programme was either (1) 'Had previously planned to take a higher-level education after the one I completed in the spring of 2020′ or (2) 'Increased interest in the subject led me to continue' can be considered as not driven to continue their education by the labour market conditions. Because these graduates likely would have continued with a master's degree regardless of the conditions in the labour market, we label this group as 'not pushed'.

On the contrary, we consider those who responded that their

motivation for the master's degree enrolment was (3) 'Wished to improve my opportunities in the labour market' or (4) 'Problems with finding a relevant job after I completed my study programme in the spring of 2020′ as being pushed into continuing their education because of the state of the labour market, which could have been affected by the Covid-19 recession.

To further identify the extent to which the graduates had been induced by the Covid-19 recession to continue their studies, we use the responses to two statements about the perceived impact of the Covid-19 pandemic on the graduate's career ('The Covid-19 pandemic has weakened my career prospects' and 'The Covid-19 pandemic has made me consider a different career path'). The group of students reporting 'problems with finding a relevant job' (4) as their main motivation for master's studies in Table 8 also had a relatively high score on the Covid-19 statements, as reported in Table 9. More specifically, 80% of these master's students strongly or somewhat agreed with the statement that the Covid-19 pandemic had weakened their career prospects. The results suggest that we can consider those motivated to continue their studies because of 'problems with finding a relevant job' (4) as 'strongly pushed' into education by the labour market conditions.

Table 9 further shows that the group of students who reported 'wished to improve my opportunities' (3) as their main motivation for being enrolled in master's studies considered themselves less impacted by the Covid-19 pandemic than those whose main motivation was 'problems with finding a relevant job' (4) but somewhat more than those driven by a previous plan or interest ('not pushed'). Hence, we label those with a desire to improve opportunities as their main motivation as being 'moderately pushed' into continuing education by the labour market conditions.

Comparing the three groups of master's degree students in Table 10, the survey analysis generally confirms our findings from the analysis of the register data. First, we do not find any significant difference between women and men, meaning that there is no significant difference in the representation of women and men in the three groups. This is also true if we control for the same observable characteristics as in the analysis of register data on applications and enrolment (see Table B5 in the Appendix). This finding corresponds with the countercyclical pattern we find for both men and women. Also, consistent with the finding of a stronger countercyclical relationship for women than men in the register data, we see a higher share (although not statistically significant) of women amongst those 'moderately' or 'strongly pushed' into more education.

Second, from Table 10, we see that bachelor's graduates who were pushed into continuing their education because of labour market conditions differ regarding their grades from their bachelor's degree. Those who were not pushed have a higher grade average than those who were strongly and moderately pushed into continuing their education. Also, those who were moderately pushed have a significantly higher average than those who were strongly pushed.

In addition, there is a substantially higher share of students with an average grade within the two upper grade tiers amongst those who were not pushed compared with those who were either moderately or strongly pushed. Although two-thirds of those not pushed into education have an average grade of either A or B, this is true for only less than half of those strongly pushed. Moreover, the share with these grades amongst those moderately pushed lies between those strongly pushed and those not pushed, although the difference is only significant from those not pushed. Finally, and consistent with many programmes requiring an average grade of C, almost everyone across all three groups has an average grade above C. However, there are also significantly fewer students with a grade average above C amongst those strongly pushed than amongst those not pushed into continuing their education.

In the analysis of register data in Section 5.2, we have found the strongest countercyclical relationship for both applications and enrolment for graduates with a bachelor's degree average between a C and B. This survey confirms that those with mid-range grades to a greater extent are pushed by conditions in the labour market to continue their education at the master's level. Also, we see from Table 10 that there are substantially fewer individuals with top grades from high school amongst those strongly or moderately pushed into a master's degree than amongst those not pushed.

Thus, our results indicate that the marginal students, pushed into master's degree enrolment because of the state of the labour market, are somewhat less successful than those who choose to continue, irrespective of the state of the labour market (considering grade averages). The explanation for this could either be that those with a lower grade average are less motivated for continuing education or consider themselves as having fewer returns from more education, or that these are the ones that struggle more with finding jobs in a tighter labour market, or both.

In addition, we find that those who were pushed into continuing their education to a substantially lesser extent come from families where both parents have a higher education than those who were not pushed. This is also true if we control for other characteristics (see Table B5 in the Appendix). Because we know that there is strong intergenerational transmission of education and that children tend to inherit the educational level of their parents (e.g., Black & Devereux, 2011), it is interesting to see that graduates with parents with less education seem to be more responsive to the state of the labour market. Furthermore, this is also interesting when considering educational attainment. Like the majority of the OECD member countries, the dropout rates amongst students in higher education in Norway are substantial (OECD, 2009). In 2022, the dropout rate at the masters's degree level was 31.7%, compared to a dropout rate of 28.8% amongst the bachelor's degree students (Statistics Norway, 2022b). There are, however, few studies of dropout predictors amongst master's degree students specifically (Rotem, Yair & Shustak, 2021), but both lower grades and parental education are found to be associated with higher dropout rates at the bachelor's level (see Behr, Giese, Kamdjou and Theune (2020) for an overview). Hence, this could imply that those pushed into continuing their education by tighter labour markets are less likely to complete the degree than those not pushed.

Considering the higher education institutions, we find that the survey results confirm what we found when studying register data in Section 5.2: graduates with a bachelor's degree from a traditional university are less responsive to labour market conditions than graduates with a bachelor's degree from other types of higher education institutions. In the analysis of register data, we have found countercyclical relationships for those graduating from a modern university, university college or a specialised university but no significant relation between master's degree applications or enrolment for bachelor's degree graduates from a traditional university. In Table 10, we see that there is a larger share of graduates from a traditional university amongst those not pushed into continuing their education (although only significantly different when compared with those who are moderately pushed).

Finally, we note that students within the field *of health, welfare and sport* are overrepresented amongst those strongly and moderately pushed into continuing education because of labour market conditions. This is also indicated in the register data sensitivity analysis (Table A5 in the Appendix) where we find a substantially smaller relationship between applications and unemployment rates, and a non-significant relationship for enrolment, when excluding *health, welfare and sport* from the regressions.

6. Concluding remarks

The impact of entering the labour market during a recession might be severe. There is a substantial amount of research showing that those who graduate during recessions have a higher risk of unemployment and labour market mismatch and that the consequences are long-lasting. Therefore, the possibility of mitigating the consequences of a bad economy through investing in education has received attention both in

research and policy, and particular attention has been paid to the decision to enrol in higher education. As the fraction of the population attending and completing a bachelor's degree has been steadily increasing over time, more information is needed regarding the decision to continue onto a master's degree during economic downturns.

By exploiting rich, nation-wide data on the bachelor's graduate cohorts over the past 15 years and a survey of bachelor's graduates during the Covid-19 pandemic, we evaluate the possibilities for continued education at the master's level to serve as a policy tool to mitigate the consequences of graduating during a recession. We find that a one percentage point increase in the field-specific unemployment rate increases the probability of applying to a master's degree immediately after the bachelor's degree by 6.5 percentage points, along with a 3.9 percentage points higher probability of enrolment. This implies an average increase of 22% for both applications and enrolment of a one percentage point increase in the field-specific unemployment rate. As most fields experience fluctuations of one percentage point or more during the period, we see this as a considerable response. The findings are robust to different sample and variable specifications.

Thus, our findings suggest that the relationship between the business cycles and applications to and enrolments in a master's degree is countercyclical, meaning that bachelor's graduates are more (less) likely to apply to and enrol in a master's degree programme during economic downturns (upturns). Unlike Bedard and Herman (2008) and Johnson (2013), we find that both women and men have countercyclical application and enrolment patterns. Moreover, while Bedard and Herman (2008) find the cyclicality to be stronger amongst high-GPA students, we find the cyclicality to be stronger amongst students with mid-range grade averages. In addition, we see that bachelor's degree graduates from all types of higher education institutions display countercyclical patterns in master's applications and enrolment, but that the responsiveness is nonsignificant and substantially smaller for graduates from traditional universities.

Inspection of the Covid-19 graduate survey provides more information about those who were pushed into master's education by the state of the labour market. The survey results confirm several of the findings from the register data. For example, the bachelor's graduates who were pushed into a master's education by conditions in the labour market had lower grade averages from the bachelor's degree than those not driven into continuing their education by the state of the economy. While 46% of those who were strongly pushed to continue with a master's degree because of conditions in the labour market had a grade average of B or better from the bachelor's degree, the corresponding share amongst those enrolled in a master's degree because of reasons unrelated to conditions in the labour market was 66%. One possible explanation might be that those with lower grades struggle relatively more with finding a job in a tougher labour market. This could impact the trade-offs between present and future earnings if the present earnings they forgo are lower for those with lower grades than for those with higher grades. Another possible explanation might be that those with lower grades in general lack motivation for continuing their education, or see themselves as having lower returns to more education, but are (to a greater extent) pushed into more education in a tighter labour market. Most likely, it is a combination of both these mechanisms.

Our findings suggest that increased education capacity at the master's degree level could be a possible policy tool as more bachelor's graduates apply for master's degree programmes in times of crisis. Also, the responsiveness seems to be fairly high. It is, however, worth noticing that the characteristics of those pushed into continuing their education, lower grade averages and less parental education, have been found to be associated with higher dropout rates (at the bachelor's degree level). This implies that increases in applications and enrolments caused by recessions might not translate into equally large increases in educational attainment.

Author statement

Both authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, and revision of the manuscript. Furthermore, both authors certify that this material or similar material has not been and will not be submitted to or published in any other publication.

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Declarations of Competing Interest

None.

Data availability

The authors do not have permission to share data.

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Appendix

A Robustness and sensitivity

In this section, we examine the robustness and sensitivity of our results; First, we investigate whether there are signs of selection bias related to the composition of bachelor's degree cohorts. Second, we investigate whether the results are robust to different variable specifications. Third, we investigate whether the results are robust to the exclusion of the Covid-19 cohorts. Fourth, we investigate whether the results are robust to other sample specifications. Fifth, we perform a sensitivity analysis where we sequentially exclude one field at a time in the regressions.

Sample selection bias

The identification of the true relationship between business cycle fluctuations and applications to and enrolment in master's degree programmes requires that the students do not time their graduations based on the state of the economy. For example, if some students drop out of bachelor's degree programmes during economic upturns, or if students delay their graduations in downturns, our estimates of the relationship between the unemployment rate and applications to and enrolment in master's degree programmes will be biased. To investigate whether there are any signs of such selection bias in our sample, we run regressions of several cohort characteristics on the unemployment rate. The results are presented in Table A1. We see from Table A1, that there are no significant relationships between the unemployment rate and average grades, neither from the bachelor's degree nor from high school. Nor do we find any significant relationship between the unemployment rate and the share graduating in the spring semester. Both average grades and the share graduating in the spring semester are characteristics one could expect to be related to the unemployment rate if students timed their graduation or dropped out of the bachelor's degree programmes in accordance with the business cycle. We cannot, however, conclude firmly that the compositions of the bachelor's degree cohorts

Table A1
OLS estimates of the relationship between the unemployment rate and various bachelor's degree cohort characteristics.

	(1) Share female	(2) Share graduated in spring term	(3) Average grade bachelor's degree	(4) Average high school grade	(5) Share aged ≥ 30 at graduation	(6) Share traditional university	(7) Share modern university	(8) Share univer-sity college	(9) Share specialised university
Unemployment rate	0.022*	0.005	0.009	−0.015	0.029	−0.005	0.001	0.006	−0.003
	(0.01)	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.01)	(0.00)	(0.01)
Graduation year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Field fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.183	0.017	0.035	0.081	0.027	0.125	0.033	0.024	0.046
N	323,438	323,438	323,438	242,016	323,438	323,438	323,438	323,438	323,438

Note: The table reports the OLS estimates from regressions with various characteristics of bachelor's degree cohorts as the outcome variable. Standard errors in parentheses, clustered by field. The results are similar if we include control variables (those included in column (3) of Table 2) in the regressions (not shown). The unemployment rate is measured in November, the year before graduation. *$p<0.05$,**$p<0.01$,***$p<0.001$.

Table A2
The relationship between unemployment and master's degree applications with different timings and definitions of applications and unemployment rates.

	(1) Applied in graduation year	(2) Applied in graduation year	(3) Applied in graduation year or year after	(4) Applied in graduation year or year after
Unemployment rate prior to graduation	0.065**		0.035	
	(0.02)		(0.02)	
Unemployment rate graduation year		0.061***		0.035*
		(0.01)		(0.01)
Teacher training and pedagogy	0.007	0.001	−0.125**	−0.087*
	(0.02)	(0.02)	(0.03)	(0.03)
Social sciences and law	0.106***	0.104***	0.089***	0.088***
	(0.01)	(0.01)	(0.01)	(0.01)
Business and administration	0.108***	0.101***	0.022*	0.052**
	(0.01)	(0.01)	(0.01)	(0.01)
Natural sciences, vocational and technical subjects	0.121***	0.118***	0.045**	0.054**
	(0.01)	(0.01)	(0.01)	(0.01)
Health, welfare and sport	−0.111***	−0.113***	−0.241***	−0.204***
	(0.02)	(0.01)	(0.02)	(0.02)
Primary industries	0.035	0.031	−0.065**	−0.029
	(0.02)	(0.02)	(0.02)	(0.03)
Transport and communications, safety and security and other services	−0.036*	−0.037*	−0.142***	−0.114***
	(0.01)	(0.01)	(0.02)	(0.02)
Graduation spring term	0.110*	0.114*	0.007	0.016
	(0.04)	(0.04)	(0.01)	(0.01)
Modern university	−0.108*	−0.107*	−0.064	−0.131*
	(0.03)	(0.03)	(0.03)	(0.04)
University college	−0.138*	−0.137*		−0.159*
	(0.04)	(0.04)		(0.05)
Specialised university	−0.038	−0.036	0.016	−0.049
	(0.06)	(0.06)	(0.08)	(0.08)
Female	−0.030	−0.031	−0.031	−0.034
	(0.03)	(0.03)	(0.03)	(0.03)
Average grade bachelor's degree	0.124**	0.122**	0.142**	0.140**
	(0.03)	(0.03)	(0.03)	(0.03)
Constant	−0.375***	−0.386***	−0.243***	−0.258***
	(0.06)	(0.05)	(0.03)	(0.03)
Graduation year	Yes	Yes	Yes	Yes
Age at graduation	Yes	Yes	Yes	Yes
R-squared	0.229	0.226	0.230	0.243
N	323,438	297,777	323,438	297,777

Note: Column (1) repeats the baseline results from Table 2, column (3). The unemployment rate, in columns (1) and (3), is measured in November, the year before graduation. The unemployment rate graduation year, in columns (2) and (4), is measured in November, the year of graduation. The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree and 0 otherwise. The outcome 'Applied in graduation year or year after' equals 1 if the graduate applied for a master's degree programme in the same calendar year as they graduated with a bachelor's degree or the year after graduation and 0 otherwise 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded institution category. Standard errors in parentheses, clustered by field. *$p<0.05$,**$p<0.01$,***$p<0.001$.

are unrelated to the unemployment rate as a one percentage point increase in the unemployment rate is associated with a significant 2.2 percentage point increase in the cohort's female share.

Definitions of applications and of the unemployment rate

In Table A2, we present results from estimations of Eq. (1), but where we have used different definitions of the unemployment rates and

Table A3
The relationship between unemployment and master's degree applications and enrolments excluding the years of the Covid-19 pandemic (2020 and 2021).

	(1) Applied in graduation year Baseline results	(2) Applied in graduation year excluding 2020 and 2021	(3) Enrolled in graduation year baseline results	(4) Enrolled in graduation year excluding 2020 and 2021
Unemployment rate	0.065**	0.069**	0.039**	0.042**
	(0.02)	(0.02)	(0.01)	(0.01)
Teacher training and pedagogy	0.007	0.005	−0.025	−0.020
	(0.02)	(0.01)	(0.02)	(0.01)
Social sciences and law	0.106***	0.106***	0.032**	0.038***
	(0.01)	(0.01)	(0.01)	(0.01)
Business and administration	0.108***	0.100***	0.059***	0.055***
	(0.01)	(0.01)	(0.01)	(0.01)
Natural sciences, vocational and technical subjects	0.121***	0.117***	0.080***	0.074***
	(0.01)	(0.01)	(0.01)	(0.01)
Health, welfare and sport	−0.111***	−0.103***	−0.088***	−0.079***
	(0.02)	(0.01)	(0.01)	(0.01)
Primary industries	0.035	0.022	0.078*	0.068*
	(0.02)	(0.03)	(0.02)	(0.03)
Transport and communications, safety and security and other services	−0.036*	−0.044**	−0.057***	−0.059**
	(0.01)	(0.01)	(0.01)	(0.01)
Graduation spring term	0.110*	0.115*	0.096*	0.100*
	(0.04)	(0.04)	(0.04)	(0.04)
Modern university	−0.108*	−0.106*	−0.097*	−0.097*
	(0.03)	(0.03)	(0.03)	(0.03)
University college	−0.138*	−0.137*	−0.128*	−0.127*
	(0.04)	(0.04)	(0.04)	(0.04)
Specialised university	−0.038	−0.033	−0.008	−0.003
	(0.06)	(0.06)	(0.08)	(0.08)
Female	−0.030	−0.033	−0.032	−0.032
	(0.03)	(0.03)	(0.02)	(0.02)
Average grade bachelor's degree	0.124**	0.119**	0.112*	0.107*
	(0.03)	(0.03)	(0.03)	(0.03)
Constant	−0.375***	−0.383***	−0.283**	−0.287**
	(0.06)	(0.06)	(0.06)	(0.06)
Graduation year	Yes	Yes	Yes	Yes
Age at graduation	Yes	Yes	Yes	Yes
R-squared	0.229	0.224	0.185	0.180
N	323,438	271,295	323,438	271,295

Note: Column (1) and (3) repeat the baseline results from column (3) of Table 2 and 3, for applications and enrolments, respectively. The unemployment rate is measured in November, the year before graduation. The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and 0 otherwise. The outcome 'Applied in graduation year or year after' equals 1 if the graduate applied for a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree or the year after graduation and 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded institution category. Standard errors in parentheses, clustered by field. *$p<0.05$,**$p<0.01$,***$p<0.001$.

applications. In column (1), we repeat the main results for applications, presented in column (3) of Table 2. In column (2), we use unemployment rates measured in November in the graduation year, instead of the unemployment rates measured in November the year *prior to* graduation, as is our preferred specification. Using unemployment rates in the graduation year does practically not change the results, the coefficient of interest is reduced from 0.065 in column (1) to 0.061 in column (2).

In columns (3) and (4), we include applications in the year after graduation, in addition to applications in the graduation year, so that the outcome variable is equal to 1 if the graduate has applied for a master's degree programme in the graduation year *or the year after,* and is 0 otherwise. Comparing the results in columns (3) and (4) to columns (1) and (2), respectively, we see that the association between the unemployment rate and applications to master's degrees is still positive in this alternative specification of applications, but that the relationship is not as strong as in the main specification in column (1) and it is only significant in column (4). These results suggest that application in the graduation year is the most relevant for examining the relationship between business cycles and the decision to continue education.

Exclusion of the Covid-19 pandemic

In Table A3, we show the results when estimating Eq. (1) excluding the bachelor's cohorts graduating during the years of the Covid-19 pandemic, given the substantial impact of the Covid-19 pandemic on unemployment rates. Comparing column (1) with (2), and column (3) with (4), we see that the results are quite similar when excluding the years of the pandemic. The Covid-19 pandemic is thus not the sole driver of the results; the changes we see in applications and enrolments are related also to other business cycles and economic crises in the period under study.

Other sample specifications

In Table A4, we examine the sensitivity to our results using various sample specifications. The result from our preferred specification is repeated in column (1). Column (2) presents results from the estimation of Eq. (1), but only includes graduates with a bachelor's degree grade average above C. This does not change our results notably. In column (3), we only include two-years master's degree programmes in the definition of the outcome, excluding one-year programmes and experienced-based programmes. In column (4), the field *business and administration* is excluded from the analysis, as we lack data from a relatively large private business school, BI Norwegian Business School, with about 20,000 students in total. Neither of these alter our results. In column (5), we exclude bachelor's degree graduations from the fall term, as these have fewer chances to apply and enrol in a master's degree programme within the graduation year. We see that the association

Table A4
The relationship between unemployment and master's degree applications using different sample specifications.

	(1) Repeating main result	(2) Grade average above C from bachelor's degree	(3) Two years master's degree programmes only	(4) Excluding field "Business and administration"	(5) Excluding graduations in fall term	(6) Age at graduation ≥ 30
	Applied in graduation year	Applied in graduation year	Applied in graduation year	Applied in graduation year	Applied in graduation year	Applied in graduation year
Unemployment rate	0.065**	0.064***	0.065**	0.061**	0.052*	0.060**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Teacher training and pedagogy	0.007	0.014	0.008	−0.008	−0.022	0.028
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Social sciences and law	0.106***	0.121***	0.105***	0.102***	0.107***	0.115***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Business and administration	0.108***	0.151***	0.105***		0.097***	0.140***
	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)
Natural sciences, vocational and technical subjects	0.121***	0.148***	0.121***	0.120***	0.101***	0.153***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Health, welfare and sport	−0.111***	−0.142***	−0.112***	−0.123***	−0.151***	−0.119***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Primary industries	0.035	0.046	0.035	0.035	−0.004	0.049
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Transport and communications, safety and security and other services	−0.036*	−0.022	−0.054**	−0.031	−0.062**	−0.041*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Graduation spring term	0.110*	0.158**	0.109*	0.106		0.126*
	(0.04)	(0.04)	(0.04)	(0.04)		(0.04)
Modern university	−0.108*	−0.122**	−0.109*	−0.118*	−0.124*	−0.120**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
University college	−0.138*	−0.154**	−0.139*	−0.139*	−0.150*	−0.150*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
Specialised university	−0.038	−0.040	−0.038	−0.099*	−0.051	−0.041
	(0.06)	(0.06)	(0.06)	(0.03)	(0.06)	(0.06)
Female	−0.030	−0.037	−0.030	−0.012	−0.034	−0.032
	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Average grade bachelor's degree	0.124**	0.092***	0.123**	0.109**	0.133**	0.141**
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	−0.375***	−0.686**	−0.373***	−0.346**	−0.254***	−0.405***
	(0.06)	(0.14)	(0.06)	(0.06)	(0.04)	(0.06)
Graduation year	Yes	Yes	Yes	Yes	Yes	Yes
Age at graduation	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.229	0.229	0.231	0.227	0.223	0.232
N	323,438	210,879	323,438	284,705	280,209	256,234

Note: The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for type of institution. Standard errors in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. *$p<0.05$,**$p<0.01$,***$p<0.001$.

Table A5
Sensitivity analysis. Excluding fields, one at a time, from the regression.

	(1) Ex. humanities and arts	(2) Ex. teacher training and pedagogy	(3) Ex. social sciences and law	(4) Ex. business and administration	(5) Ex. natural sciences, vocational and technical subjects	(6) Ex. health, welfare and sport	(7) Ex. primary industries	(8) Ex. transport and communications, safety and security and other services
Applied in graduation year Unemployment rate	0.071**	0.075***	0.066**	0.061**	0.068*	0.031*	0.065**	0.065**
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
enrolled in graduation year Unemployment rate	0.041**	0.041**	0.044**	0.035**	0.042*	0.018	0.039**	0.039**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Applied in graduation year r-squared	0.243	0.237	0.226	0.227	0.219	0.179	0.230	0.231
enrolled in graduation year R-squared	0.195	0.187	0.191	0.183	0.174	0.160	0.186	0.186
N	294,673	286,730	284,794	284,705	262,487	210,582	320,902	319,193

Note: The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and 0 otherwise. The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and 0 otherwise. Standard errors in parentheses, clustered by field. The unemployment rate is measured in November, the year before graduation. Control variables as in column (3) of Table 2. *$p<0.05$,**$p<0.01$,***$p<0.001$.

between the unemployment rate and applications is reduced somewhat, but that the relationship is still positive, significant, and fairly strong. In column (6), we exclude bachelor's degree graduates that are above 30 years as these are more likely to have (more) work experience. This does not alter our results notably.

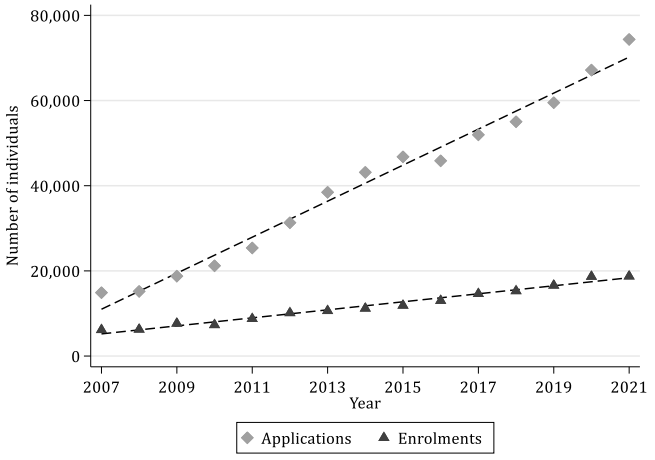

Fig. B1. Number of individual applicants and individuals enrolled. Note: The figure shows the scatter plot of the number of unique individuals who have applied to and enrolled in education each year. In addition, the figure shows the linear prediction plots of applications and enrolments.

Sensitivity analysis

To evaluate the importance of the different fields for our results, we estimate Eq. (1) excluding one field at a time from the regressions. Table A5 displays the results. Studying applications, we see that the coefficients on the unemployment rate are quite similar in the exclusion of most field, running from 0.061 when excluding *business and administration* in column (4) to 0.075 when excluding *teacher training and pedagogy* in column (2). However, when excluding *health, welfare and sport* in column (6), the coefficient is reduced substantially to 0.031. Also, we find the same patten for enrolments. Most of the coefficients lie between 0.035 and 0.044 but is only 0.018 for *health, welfare and sport*, and not significant. We understand this as the bachelor's graduates in the field *health, welfare and sport*, being particularly responsive to changes in the unemployment rate. Also, this field is the largest amongst the bachelor's graduates. 34.9% of the students graduated within this field (see Table 1).

B Additional tables and figures

Table B1
Norwegian higher education institutions and data availability.

Name of institution	Abbreviation	Type of institution
Data on bachelor's graduates and applications		
University of Oslo	UiO	Traditional university
University of Bergen	UiB	Traditional university
Norwegian University of Science and Technology	NTNU	Traditional university
University of Tromsø	UiT	Traditional university
Norwegian University of Life Sciences	NMBU	Modern university
University of Agder	UiA	Modern university
Oslo Metropolitan University	OsloMet	Modern university
Nord University	Nord	Modern university
University of Stavanger	UiS	Modern university
University of South-Eastern Norway	USN	Modern university
Western Norway University of Applied Sciences	HVL	University college
Innland Norway University of Applied Sciences	HINN	University college
Volda University Colleges	HiVolda	University college
Østfold University College	HiØ	University college
Oslo National Academy of the Arts	KHIO	Specialised university
Molde University College	HiMolde	Specialised university
Norwegian School of Economics	NHH	Specialised university
Norwegian School of Sport Sciences	NIH	Specialised university
Norwegian Academy of Music	NMH	Specialised university
MF Norwegian School of Theology Religion and Society	MF	Specialised university
VID Specialized University	VID	Specialised university
NLA University College	NLA	Specialised university
Lovisenberg Diaconal University College	LDUC	Specialised university
Ansgar University College	AHS	Specialised university
Fjellhaug international University College	FIUC	Specialised university
Only data on bachelor's graduates		
Kristiania University College	None	Specialised university
The Academy Barratt Due	BDM	Specialised university
Noroff University College	Noroff	Specialised university
Only data on applications		
Oslo School of Architecture and Design	AHO	Specialised university
Sami University of Applied Sciences	SUAS	Specialised university
Norwegian Police University College	PHS	Specialised university
Queen Maud University College	DMMH	Specialised university
Norwegian Defence University College	FHS	Specialised university
No data		
BI Norwegian Business School	BI	Specialised university
Queen Maud University College	DMMH	Specialised university
Bergen School of Architecture	BAS	Specialised university

Note: The table shows the Norwegian higher education institutions their uniceristy category, and whether we have access to data both on bachelor's degree graduates and applications and enrolment, only on bachelor's graduates, only data on applications, or no data. Higher education institutions for which we have no data and for which we only have data on bachelor's graduates is excluded from the analysis. A series of mergers have taken place in the period we study, and the institutions are named and categorised based on the institutional structure in 2021.

Table B2
Representativity of respondents in the survey of recent graduates and the Covid-19 recession in 2020.

	(1) Sample	(2) Respondents	(3) Difference
Age at graduation	26.6	27.1	−0.4***
Female (%)	62.3	64.7	−2.4**
Field of study (%)			
Humanities and arts	8.6	9.1	−0.5
Teacher training and pedagogy	10.9	10.6	0.3
Social sciences and law	11.9	13.4	−1.5**
Business and administration	14.0	13.7	0.3
Natural sciences, vocational and technical subjects	18.8	18.9	−0.1
Health, welfare and sport	33.4	31.4	2.0**
Primary industries	1.1	1.3	−0.2
Transport and communications, safety and security and other services	1.2	1.3	−0.1
Unknown	0.3	0.4	−0.1
Type of higher education institution (%)			
Traditional university	30.3	32.4	−2.1**
Modern university	36.1	35.6	0.5
University college	18.9	17.9	0.9
Specialised university	14.8	14.1	0.7
N	12,181	6335	

Note: The table reports the distribution of characteristics of the sample of individuals invited to the survey and the respondents of the survey, as well as the findings from *t*-test comparison of the distribution of characteristics in the sample and amongst the respondents. Field of study and type of higher education is converted to binary indicators of the field and the *t*-test is thus a test of proportions. *$p<0.05$, **$p<0.01$, ***$p<0.001$.

Table B3
The relationship between unemployment and master's degree applications and enrolments by average bachelor's degree grades.

	Bachelor's grades below field average		Bachelor's grades above field average	
	(1) applied in graduation year	(2) enrolled in graduation year	(3) applied in graduation year	(4) enrolled in graduation year
Unemployment rate	0.065**	0.032*	0.065**	0.045**
	(0.02)	(0.01)	(0.01)	(0.01)
Graduation spring term	0.088*	0.077*	0.165*	0.143*
	(0.03)	(0.03)	(0.05)	(0.05)
Teacher training and pedagogy	−0.020	−0.063***	−0.001	−0.023
	(0.02)	(0.01)	(0.02)	(0.02)
Social sciences and law	0.072***	−0.008	0.122***	0.053**
	(0.01)	(0.00)	(0.01)	(0.01)
Business and administration	0.020**	−0.031**	0.177***	0.130***
	(0.01)	(0.01)	(0.01)	(0.01)
Natural sciences, vocational and technical subjects	0.070***	0.014*	0.156***	0.129***
	(0.01)	(0.01)	(0.00)	(0.01)
Health, welfare and sport	−0.131***	−0.109***	−0.170***	−0.139***
	(0.02)	(0.01)	(0.02)	(0.01)
Primary industries	0.017	0.051*	0.025	0.080*
	(0.02)	(0.02)	(0.02)	(0.02)
Transport and communications, safety and security and other services	−0.082***	−0.090***	−0.026*	−0.059***
	(0.01)	(0.01)	(0.01)	(0.01)
Modern university	−0.095*	−0.074*	−0.117**	−0.116*
	(0.03)	(0.03)	(0.03)	(0.04)
University college	−0.129*	−0.100*	−0.143*	−0.152*
	(0.04)	(0.04)	(0.04)	(0.05)
Specialised university	−0.050	−0.019	−0.031	−0.003
	(0.05)	(0.05)	(0.06)	(0.09)
Female	−0.012	−0.014	−0.042	−0.046
	(0.02)	(0.01)	(0.03)	(0.02)
Constant	−0.217***	−0.133***	−0.316**	−0.234
	(0.03)	(0.02)	(0.08)	(0.11)
Graduation year	Yes	Yes	Yes	Yes
Age at graduation	Yes	Yes	Yes	Yes
R-squared	0.150	0.104	0.249	0.194
N	161,345	161,345	162,093	162,093

Note: Column (1) and (2) show the outcomes for those that have average bachelor's degree grades below the field average. Column (3) and (4) gives the outcomes for those that have average bachelor's degree grades equal to or above the field average. The outcome 'Applied in graduation year' equals 1 if the graduate applied for a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and is 0 otherwise. The outcome 'Enrolled in graduation year' equals 1 if the graduate was enrolled in a master's degree programme in the same calendar year as he or she graduated with a bachelor's degree and is 0 otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for type of institution. Standard errors in parentheses, clustered by field. The unemployment rate is measured in November the year before graduation. *$p<0.05$,**$p<0.01$,***$p<0.001$.

Table B4
Shares applied for and enrolled in master's degree program by type of higher education institution of the bachelor's degree.

	(1) Traditional university mean	(2) Modern university mean	(3) University college mean	(4) Specialised university mean
applied in graduation year	42.1	24.3	20.7	28.5
enrolled in graduation year	27.1	12.9	9.2	20.0
N	107,809	122,066	64,667	28,896

Note: 'Applied in graduation year' refers to the bachelor's degree graduates who applied for a master's degree programme within the same year as their bachelor's degree graduation. 'Enrolled in graduation year' refers to the bachelor's degree graduates who were enrolled in a master's degree programme within the same year as their bachelor's degree graduation.

Table B5
Linear probability estimates of being pushed to education by labour market.

	(1) Strongly pushed	(2) Moderately pushed	(3) Pushed
Female (%)	0.032	0.007	0.023
	(0.04)	(0.03)	(0.04)
Age at graduation	0.005	0.002	0.005
	(0.00)	(0.00)	(0.00)
Immigrant (%)	−0.014	−0.018	−0.016
	(0.04)	(0.06)	(0.07)
Both parents have higher education (%)	−0.064**	−0.029	−0.064*
	(0.02)	(0.03)	(0.02)
Average grades bachelor's degree	−0.063**	−0.061**	−0.089***
	(0.02)	(0.01)	(0.02)
Top grades from high school	−0.034**	−0.035	−0.052*
	(0.01)	(0.02)	(0.02)
Teacher training and pedagogy	0.002	0.117***	0.101***
	(0.01)	(0.01)	(0.01)
Social sciences and law	0.021	0.012*	0.023*
	(0.01)	(0.00)	(0.01)
Business and administration	0.081**	−0.033*	0.018
	(0.02)	(0.01)	(0.02)
Natural sciences, vocational and technical subjects	0.040	−0.095***	−0.056*
	(0.02)	(0.01)	(0.02)
Health, welfare and sport	0.110***	0.114***	0.146***
	(0.02)	(0.01)	(0.01)
Primary industries	−0.035	0.020*	0.007
	(0.02)	(0.01)	(0.01)
Transport and communications, safety and security and other services	0.267***	0.217**	0.279***
	(0.03)	(0.04)	(0.05)
Modern university	0.000	0.053*	0.049
	(0.04)	(0.02)	(0.03)
University college	−0.006	0.059	0.051
	(0.07)	(0.04)	(0.06)
Specialised university	0.000	0.051	0.048**
	(0.04)	(0.03)	(0.01)
Constant	0.204	0.432**	0.504**
	(0.12)	(0.11)	(0.12)
R-squared	0.054	0.052	0.061
N	1000	1171	1281

Note: Students are considered as 'Strongly pushed' if their main motivation for master's degree studies was 'Problems with finding a relevant job after I completed my study programme in the spring of 2020′, answer 4 in Table 8, and 'Moderately pushed' if their main motivation was 'Wished to improve my opportunities in the labour market', answer 3 in Table 8. Students are considered 'Not pushed' if their main motivation for master's degree enrolment was 'Had previously planned to take a higher-level education after the one I completed in the spring of 2020′, answer 1 in Table 8, or 'Increased interest in the subject led me to continue', answer 2 in Table 8. The indicator variable strongly pushed equals one if the students was strongly pushed, and zero if the student was not pushed, moderately pushed are excluded. The indicator variable moderately pushed equals one if the student was moderately pushed and zero if the student was not pushed, strongly pushed is excluded. The indicator variable pushed equals one if the student was either strongly pushed or moderately pushed and zero otherwise. 'Humanities and arts' is the excluded field category. 'Traditional university' is the excluded category for type of institution. *$p<0.05$,** $p<0.01$,***$p<0.001$.

C Questions from the survey of recent graduates and the Covid-19 recession in 2020

1 During the week November 9–15, 2020, were you engaged in further studies?
- Yes
- No

2 What kind of education / at what level is this education?
- PhD/Specialization (for instance to become a specialist in psychology)
- Teacher training program (PPU)
- Education at master level/graduate level
- Other education at bachelor level
- Education at a lower level than bachelor (study programme lasting one year, post-secondary non-tertiary education, upper secondary education, `folk high school')

3 During the week November 9–15, 2020, did you consider yourself as primary being …
- Employed
- Student/pupil
- Unemployed
- Other

4 What was the most important reason for your being engaged in this education?
- Had previously planned to take a higher-level education after the one I completed in the spring of 2020
- Increased interest in the subject led me to continue
- Wished to improve my opportunities in the labour market
- Problems with finding a relevant job after I completed my study programme in the spring of 2020
- Other

5 To what extent do you agree or disagree with the following statements?

Scale: Strongly agree – Strongly disagree (5 categories)

a The Covid-19 pandemic has weakened my career prospects
b The Covid-19 pandemic has made me consider a different career path

1 If considering the education you completed during the spring of 2020, do you agree or disagree with the following statements?

Scale: Strongly disagree – Strongly agree (5 categories)

a) If I were to choose again I would choose the same education
b) I regret the education I chose
c) The education was not right for me

1 If you were to give an overall assessment, how satisfied are you with the education you completed?

Scale: Very dissatisfied – Very satisfied (5 categories)

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