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A lost generation?

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Abstract

We estimate the effect of graduating during a recession on the early careers of high educated graduates in the Netherlands between 1996 and 2012. Exploiting field-specific differences in unemployment rates, we find that graduates on average suffer a 2.3% lower wage in a typical recession in their first year. The wage loss fades out four years after graduation. Employment probabilities are hardly affected. We find that women suffer larger wage losses than men. Poor entry conditions are associated with an increased probability of employment at lower quality employers. The primary mechanism through which graduates catch up to their luckier counterparts is mobility across jobs and sectors to better paying employers. We show that those who graduate during a recession are more likely to switch jobs earlier, and less likely to switch jobs later in their career. This suggests an intertemporal shift in job-search effort. While both men and women who graduate during a recession are more likely to switch employers in the short-run, the average returns to successful job search are much higher for men than for women.

Keywords: Entry conditions, Wages, Job mobility
JEL codes: J23 J31 I26

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1 Introduction

Youth unemployment is a cause for concern in many countries. Especially in the Great Recession, with youth unemployment rates rising quickly in many OECD countries, there have been widespread worries about unemployment disrupting young people's lives and giving them a false start on the labour market. While short-term negative effects of entering the labour market in a recession are to be expected, some worry that young people will suffer long-lasting negative effects. If true, this type of hysteresis could lead to a lost generation of young workers who will be stuck in mismatches and low-paying jobs.

Furthermore, in many OECD countries labour demand shifts towards high skilled workers. This means that human capital becomes more important for acquiring a position in the labour market. The causes for this shift in labour demand include new technology substituting for low and middle-skilled workers but complementing high-skilled workers, such as ICT and robots, but also increased trade with low income countries (Autor and Dorn, 2013; Goos et al., 2014; Michaels et al., 2014). From a policy perspective, these developments mean that it is important that investments in human capital are effective and that the acquired human capital is put to good use. If graduates who start in a recession have difficulty finding a job that fits their qualifications, investments in human capital might be partly lost. Similar considerations apply when we take a micro perspective. Young workers have invested a significant amount of time in acquiring a degree, and hence have a financial investment of foregone earnings over and above tuition fees and other costs for higher education. If it takes a substantial amount of time for them to find a good match, their investments might not pay off.

Several papers have found that people who enter the labour market during a recession indeed suffer lower wages up to ten years or longer (Kahn, 2010; Oreopoulos et al., 2012; Brunner and Kuhn, 2014). This suggests that hysteresis might be a real problem, although more recent papers, covering both Europe and the US, find smaller losses for high-educated graduates that disappear after about three to five years on the labour market (Altonji et al., 2016; Cockx and Ghirelli, 2016; Liu et al., 2016).[1] The different findings could be explained by differences between cohorts, education level and institutional differences between countries. For example, the cohort graduating during the recession following the oil crisis in the 1980s seems to have been hit harder than more recent cohorts.

In this paper we add to these findings by considering the effects of labour market conditions at the moment of graduation on the early careers of high educated graduates in the Netherlands. We use administrative matched employer-employee data on graduates from 1996 to 2012. Our data allow us to follow graduates on the labour market for up to seven years after graduation. We include both graduates from universities and higher vocational education, who take a more vocationally oriented track. The advantage of using only higher educated graduates is that most of them enter the labour market after graduation, so there is relatively little selection bias. This contrasts with lower educated graduates, who frequently pursue a degree at a higher level and this decision could be correlated with

[1] There is also a small Dutch literature on this topic. Van Ours (2009) and Fouarge (2009) show that there are no long-term differences in unemployment rates between cohorts entering the labour market in the recession of the 1980s and cohorts who entered just before. Wolbers (2014) uses repeated cross-sections covering 1993 - 2011 and finds only short-term negative effects of entering the labour market during a recession on employment and job level. Limitations of this literature are that they use cross-section data, that they don't consider effects on wages and that they don't take into account possible selection bias due to people adjusting their moment of labour market entry to the labour market conditions.

the labour market conditions at graduation. Moreover, sufficient data on lower educated graduates are lacking for the Netherlands.

The literature shows that the effects of graduating during a recession are highly heterogeneous between different fields of study (Altonji et al., 2016; Liu et al., 2016). This means that it is important to take into account that graduates acquire different sets of skills from their fields of study and end up with quite different labour market opportunities. This is especially true for a higher education system like that in many European countries, including the Netherlands. In the Dutch system, students pick a field of study at the start of their higher education career and there is relatively little overlap in the courses students in different fields of study take. We use this feature of the Dutch institutional setting and construct specific unemployment rates for a large set of fields of study as our main proxy for labour market conditions at graduation.

We have to take into account that the timing of labour market entry could be endogenous. Students could for example take up an internship, travel abroad or do an additional study instead of entering the labour market. Similarly, students could leave their studies earlier because they already received a job offer in a tight labour market. We deal with this possible source of endogeneity in three ways. First, we estimate a duration model relating the duration of the study to the labour market conditions. We find no evidence that students postpone graduation in a bad labour market. Second, we employ an instrumental variables strategy where we instrument the unemployment rate at the actual moment of graduation with the unemployment rate at the predicted moment of graduation using the nominal study duration. The resulting IV estimates are similar to the OLS estimates. Third, we show that students are not more likely to obtain an additional degree if they graduated in a bad labour market.

We find that students who graduate during a recession on average suffer an initial wage penalty of 1.2% per percentage point increase in the field-specific unemployment rate at graduation. The effect increases to 1.5% in the first year after graduation and then steadily declines, until it fades out in the fourth year after graduation. In a typical recession, the average unemployment rate for higher educated increases by about 2 percentage points compared to the lowest point in a typical boom. This means that graduates entering at the height of a recession suffer a 2.4% lower wage in their first year compared to their luckier counterparts. The mechanism behind the initial losses and rather quick catch-up seems to be that workers initially start at lower quality employers, but, gradually move to better paying employers. We find that students who graduate during a recession more frequently start working at employers who pay lower wages. Job mobility to higher paying employers leads to a relatively fast recovery.

Our study contributes to the literature in three ways. First, our rich administrative data allow us to examine in detail the mechanisms that lead to short-term losses and the rather quick catch-up of students graduating in a recession in the Netherlands. A key question is whether those who graduated during a recession work in similar jobs as those who graduated in a boom, but at a lower wage or, whether they work more often in low quality jobs. We examine a diverse set of measures of job quality and show that they are consistently more likely to start working at lower quality employers. This provides a stronger incentive for job search, and hence they are more likely to switch jobs at the start of their career than those who start in good times. However, possibly due to early investments in job search, in the medium to long-run they end up working at higher quality firms that those who entered

the labour market during a boom, and are less likely to switch jobs. This suggests an intertemporal shift in job search effort due to graduating in a recession.

Second, contrary to most of the literature, we explicitly focus on the differential impact of graduating during a recession for men and women.[2] Since women are in many countries becoming the largest group of students in higher education, this is highly relevant. And while wage differences between highly educated men and women are small at entry, they increase over time, at least partly due to women working in part-time jobs and substituting paid work with family work. Women's different choices in the labour market might also make them respond differently to exogenous shocks, such as starting their career in a recession. Indeed, we show that women's initial wage losses are up to 40% larger than for men. Similar to men, women who graduate during a recession are more likely to look for another job early in their career compared to those who graduate during a boom. However, on average the returns to successful job search are much smaller for women than for men. This finding is consistent with Del Bono and Vuri (2011). We do find that women who graduate during a recession have higher returns to job mobility than women who graduate during a boom. This, in addition to the increased frequency of job switches, allows them to catch up. We find no differential effects on the returns to mobility for men.

Third, we identify the effect of graduating during a recession using variation in the field-specific unemployment rate. Using detailed microdata, we construct an unemployment rate for each of 29 combinations of education level (higher vocational education and university) and fields of study, and use the variation within fields and levels to identify the effect of the unemployment rate at graduation. This measure is closer to the labour market that is actually relevant for recent graduates than the average unemployment rate used in most studies. A causal effect of the unemployment rate at graduation on later outcomes is only identified if students don't adjust their timing of graduation to labour market conditions. We provide more extensive analyses than most other papers in this literature to show that this is not the case for our sample.

The paper proceeds as follows. In section 2 we discuss the Dutch education system, our data, the selections we make on the sample and the variables we use. In section 3 we present our empirical strategy. Our main results are presented in section 4. We discuss several ways of dealing with possible sources of selection bias in section 5. In section 6 we go into the mechanisms behind catching up, and section 7 concludes.

2 Data and sample selection

In this section we discuss the Dutch education system, our data sources, the selections we make to create a homogeneous sample and some descriptive statistics.

[2] E.g. Kahn (2010); Genda et al. (2010); Oreopoulos et al. (2012); Brunner and Kuhn (2014); Cockx and Ghirelli (2016) only include males. Altonji et al. (2016) and Liu et al. (2016) do include females in their sample, but don't discuss differential effects between males and females. An exception is a recent analysis by Kondo (2015), whose estimates using the NSLY79 suggest that the negative effects of entering the labour market during a recession for women in the US are weaker than for men.

2.1 The Dutch education system

At the start of high school, Dutch students are tracked in three levels. Only the highest two give direct access to higher education. The second track (HAVO) takes five years and gives direct access to higher vocational education (*hoger beroepsonderwijs*, hbo).[3] The highest high school track (VWO) takes six years and gives direct access to university.

Higher vocational education typically takes four years to complete, while university studies take four to six years, depending on the field of study.[4] Contrary to the US, but similar to most other European countries, Dutch students immediately choose a field of study when they start higher education. In principle each field is open to each student, although some technical studies require students to take additional courses in mathematics before they are allowed to enroll. Some fields of study (e.g. medicine) use a lottery because enrollment is larger than the number of available places. There is little overlap in the courses between the different fields, except for some common courses like basic statistics. This means that students graduating from different fields have acquired very different skill sets.

There are two main differences between higher vocational education and university. First, higher vocational education has a strong vocational component, while university is mostly academic. Higher vocational education prepares for so-called 'professional' jobs, such as nurses or teachers at the primary or secondary level. Second, higher vocational education graduates finish with a bachelor's degree, while most university students finish with a master's degree. While it is possible for university students to enter the labour market after obtaining their bachelor's degree, this rarely happens. A minority of higher vocational students continue to university to obtain a master's degree, usually after taking a bridge year to catch up with their academic skills. About 90% of both higher vocational education and university graduates enter the labour market after finishing their degree. About 10% of higher vocational education graduates pursue a university degree.[5]

2.2 Data sources

We use administrative data from Statistics Netherlands on enrollment and graduation for all graduates in higher education from 1996 to 2012. The data contain detailed information on the type of programme followed - field of study and level - and the exact date of enrollment and graduation. We have no information on grades.[6]

These data can be merged at the individual level to other datasets using a coded social security number.[7] We merge administrative data on labour market status from 1999 to 2015 obtained from tax filings of employers. These contain the yearly gross wage and the number of days worked, which allows us to calculate the gross daily wage, one of our main dependent variables. The data also

[3] Students in the lowest track in high school have the opportunity to go to higher vocational education if they finish their vocational degree (MBO) first. This takes a total of seven or eight years. We exclude these students from our analysis, so we won't discuss them here.

[4] The official term for higher vocational education is 'universities of applied sciences'. They are similar to e.g. the Fachhochschule in Germany.

[5] These numbers are based on public data from Statistics Netherlands.

[6] The graduation data are available from 1986 onwards, but we have no individual-level labour market data before 1999 and we can't construct field-specific unemployment rates before 1996.

[7] The data are available via a secure connection to Statistics Netherlands for researchers who sign a confidentiality agreement.

contain information on sector and an employer identifier. We use these to identify when workers switch employer and sector, and to calculate the median wage paid by an employer. This is one of our measures of employer quality. We obtain demographic characteristics by merging our data with municipal registries (GBA), which are available from 1995 onwards. These include personal characteristics, such as age, gender and ethnicity. We also add information on social security claims and whether graduates work as self-employed (also available from 1999 - 2015). We don't have information on the level of the social security claims or the income earned as self-employed. Table A8 in the Appendix shows a detailed list of the variables we use.

We construct a field-specific unemployment rate as our proxy for labour market conditions at graduation (see also Del Bono and Morando (2016) for a very similar measure).[8] We use micro data from the Labour Force Survey (LFS) which is available from 1996 to 2012 and contains detailed information on education level and the field of study. We limit the LFS data to all people with a higher education degree, and distinguish between people with a higher vocational or with a university degree. Then we construct an unemployment rate for each of 29 different combinations of field of study and education level. Our level of detail is limited by the number of observations available in the LFS for each field of study in each year. Table A7 in the Appendix shows a list of the fields of study and descriptive statistics on the unemployment rate of each field.

2.3 Sample selection

To obtain a sample of typical students, we restrict our sample in the following ways. First, we exclude students who first obtained a vocational (MBO) degree or a foreign degree before starting their higher education career. Second, we only include bachelor's, master's and equivalent degrees. This means we exclude PhD's and other postgraduate degrees. Third, we exclude everyone who graduated before the age of 20 or after the age of 30. Fourth, we exclude everyone who took shorter than three years or longer than seven years to obtain their degree. Finally, we assume that students enter the labour market if they haven't been enrolled for at least 400 days.[9]

2.4 Descriptive statistics

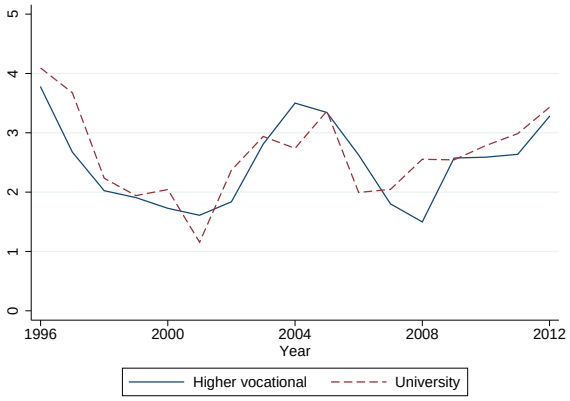
Table 1 gives descriptive statistics for our outcome and control variables. The sample consists of more than 3.6 million observations of 557,234 unique individuals. Since we have 18 cohorts, this amounts to an average of 30,957 individuals per cohort. 39% of the sample consists of university graduates, and 61% are higher vocational graduates. The average age at graduation is close to 24 years and 59% of our sample is female. There are few immigrants or people with immigrant parents in the sample.

Figure 1 shows the average unemployment rates for higher vocational and university educated workers. We use variation introduced by three recessions: the recession ending around 1996, the

[8] Altonji et al. (2016) also construct a major specific unemployment rate, but they use variation at the sector-occupation level.

[9] This assumption is necessary to define labour market entry, and hence employment status. If graduates are not working and not enrolled for an additional degree, we don't observe them in the data. Hence, we assume that they are looking for a job during this period if it lasts for at least a year. The results don't depend on the exact length of this period.

Figure 1: Average unemployment rates by education level.



Source: Own calculations based on registration data from Statistics Netherlands.

"dot-com" bubble in the early 2000s and the Great Recession starting in 2009.[10]

While the unemployment rate for all fields of study moves in line with the average, there is substantial variation. Table A7 in the Appendix shows in more detail the average unemployment rates and standard deviations for each field of study. At the higher vocational level, the standard deviations are highest for agriculture-related fields of study and social sciences, art and facility management. They are lowest for medical and social work. The means vary substantially as well, between 1.3% for medical studies to 4.2% for social sciences. At the university level we also find that health care has both the lowest average unemployment rate and the lowest standard deviation. This is probably related to restrictions on the number of students as we discussed earlier. Other fields of study with a low mean unemployment rate are engineering and economics. Fields of study with high unemployment rates are mostly in the humanities, such as arts and language. High standard deviations are found for natural sciences and ICT - probably related to the dot-com crisis which figures prominently in our sample - and social sciences. Overall, the pattern seems to be in line with expectations.

Figure 2 show the wage-experience profiles for our cohorts for university graduates, higher vocational graduates and male and female graduates. Starting wages (the dotted black line) differ quite strongly in line with the business cycle. At five years of experience (the black line with squares), the differences in wages between cohorts are much smaller for all groups. Indeed, wages seem to converge in the long-run. For both university and male graduates average wages end up about 0.3 log points higher than for the other two groups.[11]

[10] Perhaps somewhat surprisingly, the unemployment rate for all high educated workers (not shown in the figures) was higher at the highest point in the dot-com crisis (3.8% in 2005) than for any other year in our sample. This means that we don't just rely on the Great Recession as our primary source of variation. In section A.2 in the Appendix we present separate analyses for those graduating during the Great Recession and those graduating during the dot-com crisis.

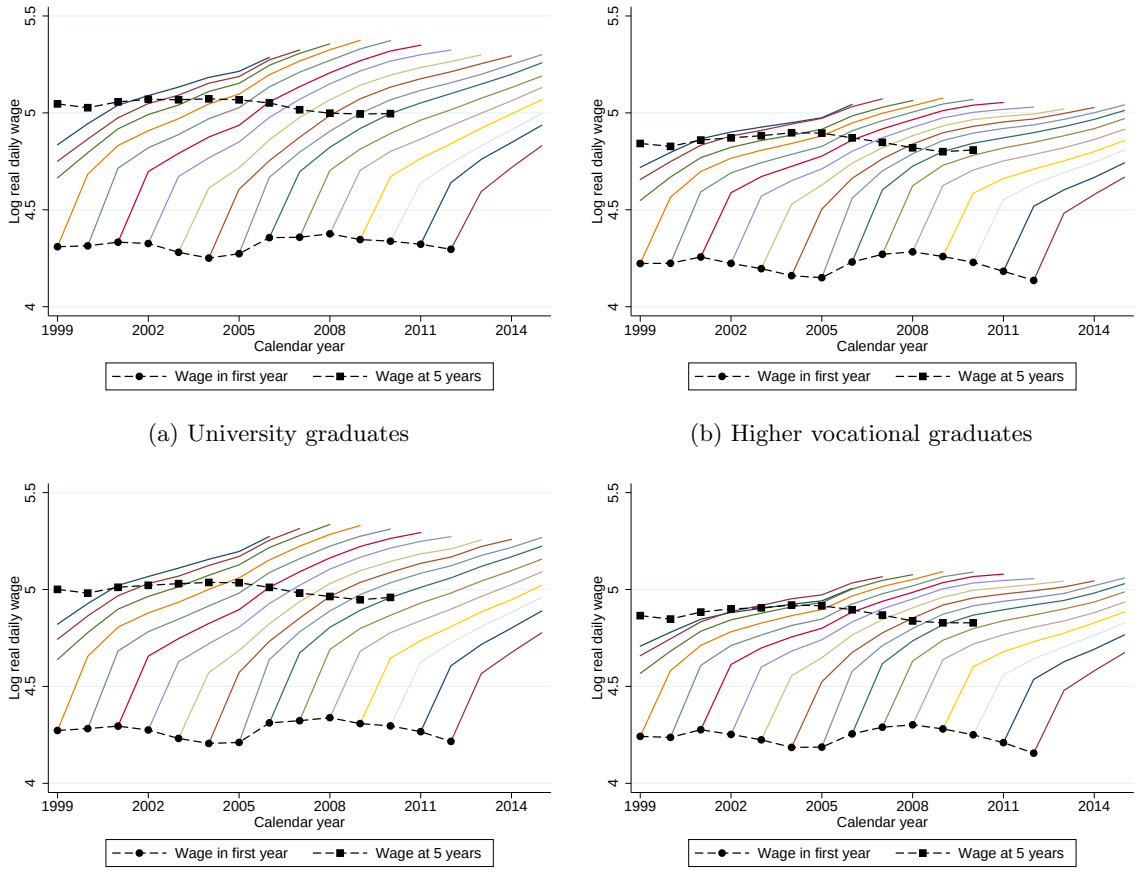
[11] Note that this is not because most university graduates are male. In contrast, about 55% of university graduates in our sample are female.

Table 1: Descriptive statistics for all outcome and control variables.

	Mean	SD
Panel A. Outcome variables		
ln(daily wage)	4.77	0.41
Employed	0.88	0.32
Self-employed	0.04	0.19
On benefits	0.06	0.32
Change job	0.25	0.43
Change sector	0.18	0.38
Firm level variables		
Median ln(yearly wage)	9.91	0.81
ln(daily wage)	4.17	0.44
Wage growth	0.11	0.27
Share of higher educated	0.58	0.25
ln(firm size)	6.46	2.49
Panel B. Control variables		
Age at graduation	23.78	1.81
Female	0.59	0.49
University level	0.39	0.49
Native	0.96	0.20
Western immigrant	0.02	0.12
Non-western immigrant	0.02	0.16
Number of unique persons	557,234	
Number of observations	3,688,298	

Source: Own calculations based on registration data from Statistics Netherlands.

Figure 2: Experience profiles in log daily wage for recent graduates and mature workers.



(a) University graduates

(b) Higher vocational graduates

(c) Male graduates

(d) Female graduates

Notes: The black dots give the wage for the cohort corresponding to each calendar year in the first year on the labour market. The black squares give the wage for the cohort corresponding to the calendar year int he fifth year on the labour market.
Source: Own calculations based on registration data from Statistics Netherlands.

3 Empirical approach

In this section we describe our empirical approach to identify the effects of graduating during a recession on the early careers of higher-educated graduates. We estimate the following model

$$Y_{itcf} = \alpha + \beta_e e_{it} * u_{cf} + \zeta X_i + \delta_e + \phi_c + \mu_f + \tau_t + \varepsilon_{it}, \tag{1}$$

where Y is the outcome variable (wage, employment status or some other outcome) for individual i observed in year t who graduated in cohort c in field of study f. We control for a full set of potential experience fixed effects δ_e (defined as years since graduation), cohort fixed effects ϕ, calendar year fixed effects τ and field of study fixed effects μ. In X_i we include a small set of time-constant individual control variables: age at graduation, gender and ethnicity. The coefficients of interest are the β_e's which describe the change in the experience profiles caused by a one percentage point change in the field-specific unemployment rate U_{cf} at graduation.[12] We allow the effect to differ for each year of potential experience.[13] For example, β_0 describes the effect of the unemployment rate at graduation in the year of graduation, while β_1 describes the effect of the unemployment rate at graduation in the first year after graduation. We estimate the effect for the first 8 years after students obtain a degree, so for $e = 0$ until $e = 7$.[14]

We take the moment of graduation of a student's highest degree as their point of entry into the labour market. If students haven't been enrolled for at least a full year before obtaining their highest degree, we assume they entered the labour market after obtaining their previous degree (see section 2.3). Our experience fixed effects pick up the average increases in our outcome variable, such as wage, with experience. The year fixed effects control for any variation in labour market conditions or other year effects that might affect wages apart from the unemployment rate at graduation or experience. The cohort fixed effects pick up any changes at the cohort level that might affect labour market outcomes, such as the increased participation rate in higher education or changes in financing.[15] Finally, field of study fixed effects control for any average differences in the labour market opportunities of students with different fields of study. To take into account that individuals from the same cohort might have experienced similar shocks - e.g. changes in the education system - we cluster standard errors at the level of the graduation cohort and field of study.[16]

The advantage of using the field-specific unemployment rate compared to the national unemployment rate is that it is a more relevant measure for the labour market that higher educated graduates enter. The field-specific unemployment rate takes into account that in some occupations (e.g. medical doctors) there is hardly any unemployment, while employment opportunities with other fields of study

[12] Note that since we calculate the unemployment rate from a sample of Dutch citizens, rather than the full population, it might be measured with error. Insofar as this is the case, our results will be biased to zero.

[13] We have also experimented with more restricted functions for experience, such as a quadratic or cubic. The results are quite similar to the more flexible version we use here.

[14] For some cohorts (e.g. from 1999 until 2007) we observe more than 7 years, while for others (2009 - 2012 and 1996 - 1998) we observe somewhat less than 7 years on the labour market. We always observe at least 4 years for each cohort. We have also tried extending the analysis to 10 years. The results are overall very similar for the 10th year as for the 7th year.

[15] Since cohort, potential experience and year fixed effects can't be identified at the same time, we have to impose another restriction. We follow the literature and impose that one additional year effect is zero (Oreopoulos et al., 2012; Cockx and Ghirelli, 2016).

[16] We have also tried clustering at the graduation cohort, and the results remain similar.

(e.g. humanities or management) depend more on the state of the business cycle.

Our main effects are identified using variation in the field-specific unemployment rate. Selection bias could be introduced if students adjust their timing of graduation to the labour market situation. For example, students could postpone graduating to prevent graduating during a recession. Or, students could leave school earlier during a boom if they already found a job. OLS estimation of equation 1 doesn't take this into account. In section 5 we present several analyses designed to deal with this problem. We employ an instrumental variables strategy where we use the unemployment rate at the expected moment of graduation, rather than the actual moment of graduation. We also estimate a duration model that relates the timing of graduation to the unemployment rate. And, finally, we examine whether people who graduate during a recession are more likely to obtain a higher degree.

Another source of selection bias could be introduced when students start their higher education career. Before entering higher education, students choose a field of study. Their choice might be influenced by the labour market conditions at the moment of choosing their field, which is usually up to six months before finishing secondary school. For example, if students make their choice of field during a recession, they might be more likely to pick a field with more secure or higher labour market returns than during a boom. It goes beyond the scope of this paper to examine in detail how labour market conditions at the end of secondary school affect student's choice for post-secondary education. However, note that those who move into a field of study they would not have chosen if economic conditions at entry were better, are likely to be the lower-skilled students in that field of study. If they enter the labour market four or five years later, which is then often a period with lower unemployment rates, they will earn less than the average student within that field of study. Hence, this type of selection will cause our estimates to be a lower-bound of the actual effect of graduating in a recession. As a further check on our results, we also present estimates using the national unemployment rate as our indicator for labour market conditions. The results turn out to be similar to using the field-specific unemployment rates.

Many papers in the literature use variation in the unemployment rate at a regional level, such as states in the US (Kahn, 2010) or provinces in Canada, Austria or Belgium (Oreopoulos et al., 2012; Brunner and Kuhn, 2014; Cockx and Ghirelli, 2016). However, the Netherlands is a small country and the labour market for graduates is primarily a national labour market (with most graduates working in the Randstad area around Amsterdam - Utrecht - The Hague - Rotterdam). This means that local labour market conditions at graduation are not relevant for a large group of students, so we think that such a strategy is not warranted in this case.

4 Wage and employment effects of graduating during a recession

We begin this section by presenting the short and long-term effects of graduating in a recession on wage, employment status and other labour market outcomes in the Netherlands. We then continue to examine differential effects across gender.

4.1 Main results

Table 2 reports the estimation results on several labour market outcomes. We report effects at each year of potential experience, defined as years since graduation. Year 0 is the year of graduation.

Column (1) shows the results from estimates with log daily wage as the outcome variable. The estimates show that in the year of graduation, on average, a one percentage point increase in the unemployment rate leads to a 1.15% lower daily wage. The effect actually increases somewhat to 1.5% for the first year after graduation, and then declines to 0.9% in the second year and fades out after the third year on the labour market. In a typical recession, the unemployment rate increases by about 2 percentage point on average (from through to peak), so the average initial effect on wage is about 2.3%. However, for some fields of study, the unemployment rate increases more sharply, so the wage effects are larger, while for others the increase is smaller than average.[17]

Labour market conditions at graduation might also affect labour supply decisions. And if worse workers are more likely to quit looking for a job in a recession, we might underestimate the effect of the unemployment rate at graduation on wages. It is therefore instructive to also consider effects on employment and other labour market outcomes. Column (2) shows the effects on the probability to be employed. We find negative estimates for the first couple of years, but they are only statistically significant for the second year. The estimates are small however. On average 88% is employed, so the percentage point change of -0.003 in the first year after graduation translates into an effect of -0.3%. Note that we can't rule out that our estimates for daily wage still (partly) reflect employment effects, because there might be adjustments along the intensive margin.

If it is difficult to find a job, graduates might substitute regular employment with self-employment. In addition, for some fields of study, such as arts, self-employment is very common. Column (3) shows the results on the probability to be self-employed. We find a negative, statistically significant estimate in the year of graduation, but no effects for later years. Finally, column (4) shows the results on the probability to be on benefits, including unemployment and sickness benefits and welfare. We find small positive effects in the first few years, only significant for the first year after graduation. Note that all estimates are very precise, so we can rule out large effects.[18] For most outcomes we find a larger effect in the first year after graduation than in the year of graduation. An explanation for this somewhat surprising finding is that students typically graduate in September, so the year of graduation is quite short. Most students, including those who graduate during a boom, would need

[17] Note that we identify the effects using variation in unemployment rates. However, a relatively high unemployment rate at graduation might have a different effect if it is followed by lower unemployment rates in the subsequent years (essentially an upturn) than if the unemployment rate increases in the following years (a downturn). In subsection A.3 in the Appendix we show that the results we find are driven by those graduating during a downturn, and that the effects for those graduating during an upturn are close to zero.

[18] In Table A5 in the Appendix we report results where we include missing wages as zero in the analysis. As expected, the negative estimates are larger for the first few years. However, standard errors increase substantially as well, leading to insignificant estimates for the year of graduation. Another way to to take into account selection into employment would be to estimate a Heckman selection model. However, we lack a good instrument to identify the effect on work separately from the effect on income. An additional potential issue is that employment, self-employment and receiving benefits are competing risks. In Table A6 in the Appendix we present estimates from a multinomial probit model that simultaneously models these outcomes (also including people without income) relative to being employed. We find that self-employment increases in the first few years relative to being employed, but declines in later years. For receiving benefits we find positive estimates for almost all years after graduation, suggesting that those who graduate during a recession are somewhat more likely to receive benefits relative to being employed. Finally, we first find small positive and later on in the career small negative effects for being without income.

Table 2: Effect of the field-specific unemployment rate at graduation on labour market outcomes at different years of potential experience (years after graduation).

	Ln(daily wage) (1)	Pr(employed) (2)	Pr(self-employed) (3)	Pr(on benefits) (4)
Effect at year of potential experience				
0	−0.0115***	−0.0002	−0.0029**	0.0009
	(0.0042)	(0.0022)	(0.0013)	(0.0023)
1	−0.0145***	−0.0031**	−0.0009	0.0035**
	(0.0026)	(0.0012)	(0.0009)	(0.0015)
2	−0.0086***	−0.0016	0.0001	0.0020
	(0.0022)	(0.0010)	(0.0007)	(0.0013)
3	−0.0045**	−0.0006	0.0008	0.0006
	(0.0019)	(0.0009)	(0.0006)	(0.0009)
4	−0.0010	0.0004	0.0005	0.0001
	(0.0017)	(0.0008)	(0.0005)	(0.0008)
5	0.0008	0.0005	0.0002	−0.0000
	(0.0018)	(0.0008)	(0.0006)	(0.0008)
6	0.0009	0.0010	−0.0002	0.0003
	(0.0023)	(0.0009)	(0.0008)	(0.0009)
7	0.0013	0.0011	−0.0006	−0.0005
	(0.0028)	(0.0010)	(0.0009)	(0.0010)
N	3,261,867	3,688,298	3,688,298	3,688,298

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

some time to find a job. This suggests that employment and wage effects are likely to show up after the year of graduation.

To sum up, graduating during a recession negatively affects wages until the third year after graduation. The effect is quite small, maximizing at about 1.5% for each percentage point increase in the unemployment rate. We find only small and very short-lasting negative effects on the probability to employed or self-employed. The probability to receive some form of benefits seems to increase slightly in the short-run, but there are no long-term effects either. These findings are in line with the recent literature. For example, Altonji et al. (2016) find that college graduates in the US suffer an initial decline in wages of about 2.5% for every percentage point increase in the unemployment rate at graduation and the effect fades out after three years. Liu et al. (2016) show short-term effects on wages about half the size of ours for high-educated graduates in Norway, but they do find a decline in employment rates lasting up to 8 years after graduation.

4.2 Heterogeneous effects

Wage differences between highly educated men and women in the Netherlands are small at entry. For all graduates from 1999 to 2012 men's daily wages are about 8.5 log points higher than women's at entry. At 7 years of potential experience, the differences increases to around 11 log points. After

controlling for field of study and education level, still 7 log points remain. This pattern is partly explained by the higher propensity of women to work part-time. In addition, women are more likely than men to substitute paid work with family investments. Due to these different labour market patterns, it is likely that men and women respond differently to exogenous shocks, such as entering the labour market at a time of high unemployment, as well.

Table 3 reports the results on wages and employment status for men and women separately. The estimates are obtained estimating the model in equation 1 separately for men and women. Column (1) shows the results for male graduates on their log daily wage. We find that for each percentage point increase in the unemployment rate, the daily wage declines by 0.8% in the year of graduation. The effect increases somewhat to 1.2% in year 1, but then quickly declines to 0.5% in year 3 and fades out to zero after that. For women (column (2)) we find substantially larger effects for the first few years on the labour market. For year 0 we find an effect of 1.5%, which is almost twice as large as that for men. For the first year after graduation we again find a substantially larger estimate at 1.7%. Then we observe a fading effect for women as well. We even find small positive effects in the long-run. Columns (3) and (4) report the results for employment status. We again find negative estimates for the first few years, but they are insignificant or barely significant at 10% for men. For women we find small positive effects in later years, but relative to the average employment rate 5 - 7 years after graduation (around 90%), the effects are very small.[19]

5 Selection

In section 3 we discussed that our OLS results might be biased if students adjust their timing of graduation to the labour market conditions. For example, students might postpone graduation in a slack labour market. In this section we use several methods to examine whether this is the case. First, we use an instrumental variables strategy. As an instrument we take the unemployment rate at the expected year of graduation rather than the actual year. Second, we examine whether the unemployment rate at graduation affects the probability that students obtain a higher degree. In the Appendix we show the results from estimating a duration model that directly investigates the link between the unemployment rate and study duration. The results from all three methods point in the same direction. There seems to be very little, if any, selection bias due to students adjusting their timing of graduation to labour market conditions.

5.1 Instrumental variables

We follow Oreopoulos et al. (2012) and use the unemployment rate at the predicted year of graduation as an instrument for the unemployment rate at graduation. We predict the year of graduation using the nominal duration of a particular study. In this setting we define a 'study' as a completed program in a particular field, such as a bachelor's in engineering or a master's in philosophy. If a student takes

[19] In Table A4 we present estimates using the national unemployment rate instead of the field-specific unemployment rate. The estimates are consistently somewhat larger than those obtained using the field-specific unemployment rate, but the overall pattern is very similar. Note that we can't include cohort fixed effects when estimating using the national unemployment rate. Instead, we use a quadratic cohort trend (cf. Oreopoulos et al. (2012)), but the results are very similar if we include a linear or no cohort trend.

Table 3: Effect of the field-specific unemployment rate at graduation on labour market outcomes at different years of potential experience (years after graduation) for male and female graduates.

	Ln(daily wage)		Pr(Employed)	
	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Effect at year of potential experience				
0	-0.0080^{**}	-0.0149^{***}	0.0003	-0.0010
	(0.0040)	(0.0044)	(0.0025)	(0.0023)
1	-0.0118^{***}	-0.0168^{***}	-0.0032^{*}	-0.0031^{**}
	(0.0025)	(0.0028)	(0.0016)	(0.0012)
2	-0.0072^{***}	-0.0098^{***}	-0.0018	-0.0014
	(0.0024)	(0.0023)	(0.0013)	(0.0011)
3	-0.0047^{**}	-0.0044^{**}	-0.0016	0.0003
	(0.0021)	(0.0020)	(0.0011)	(0.0010)
4	-0.0031	0.0010	-0.0006	0.0015^{*}
	(0.0021)	(0.0017)	(0.0010)	(0.0008)
5	-0.0028	0.0048^{**}	-0.0004	0.0018^{**}
	(0.0019)	(0.0019)	(0.0011)	(0.0008)
6	-0.0026	0.0063^{**}	0.0011	0.0020^{**}
	(0.0021)	(0.0025)	(0.0011)	(0.0010)
7	-0.0022	0.0080^{***}	0.0018	0.0022^{**}
	(0.0024)	(0.0030)	(0.0012)	(0.0010)
N	1,334,715	1,927,152	1,529,370	2,158,928

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own calculations based on registration data from Statistics Netherlands.

both a bachelor's and a master's, the total nominal duration of her study is the sum of the nominal duration of the respective bachelor's and master's program. We distinguish between 239 different studies. Note that the instrumented variable, the unemployment rate at graduation, is still defined at a higher level of aggregation. We merely allow for more heterogeneity in the nominal study duration.

The unemployment rate in the predicted year of graduation is a valid instrument if it is not related to labour market outcomes, except through the unemployment rate in the actual year of graduation. The instrument would be invalid if, at entry, students are able to predict the state of the labour market at their expected graduation date. Given the difficulty of predicting unemployment rates, this seems a plausible exclusion restriction.

Table 4 presents the estimated effects for log daily wage and employment. Column (1) reproduces the main OLS effects for log daily wage. Column (2) gives the effects obtained using IV where we instrument for the unemployment rate at graduation with the unemployment rate at the expected year of graduation using the nominal duration per study. As expected, the IV estimates are somewhat stronger than the OLS estimates. For the first year of graduation we find an effect of of -0.0190 compared to the -0.0115 estimate using OLS. Later years also show stronger coefficients. However, as might be expected due to the lower efficiency of 2SLS, the standard errors are quite large. As a result, most estimates are well within each other's confidence intervals. Column (4) gives the IV estimates for employment status, while column (3) reproduces the OLS results. As with wages, we find somewhat stronger coefficients from the IV estimates. But similar to the effects obtained from OLS, only the effect for the first year after graduation is significant.

In Table 5 we present results obtained from separately estimating our IV model for men and women. As with the average estimates, we find stronger effects for both men and women using IV than using OLS. For men, the estimated effect for the year of graduation is -0.0174 compared to the OLS estimate of -0.0080. For women, the estimated effect increases from -0.0149 to -0.0228. We observe similar shifts for later years, but again, the results are mostly within each other's confidence interval. The positive effects that we found for women in years 5 - 7 doesn't seem to be robust, as it disappears using IV.

5.2 Do students who graduate in a recession more often obtain a higher degree?

Another way in which students might select themselves onto the labour market is in their choice of obtaining a higher or additional degree. Students who graduate during a recession might face lower opportunity costs of staying in school and thus are more likely to obtain an additional degree. Table 6 shows the estimated relation between the unemployment rate at graduation (the first level mentioned in each column) and the probability to obtain an additional degree (the second level mentioned). We estimate a simple linear probability model that relates a dummy variable indicating whether a student pursued an additional degree to the unemployment rate measured at graduation of the first level and the same set of demographic and education control variables as included in our other specifications. Note that students with a higher vocational degree can pursue a master's degree at the higher vocational level, an additional bachelor's degree at the higher vocational level or a bachelor's or master's degree at the university level. University students can pursue an (additional) master's degree

Table 4: IV and OLS estimates of the effect of the field-specific unemployment rate at graduation on employment and wage.

	Wage		Employment	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Effect at year of potential experience				
0	-0.0115^{***}	-0.0190^{***}	-0.0002	0.0003
	(0.0042)	(0.0066)	(0.0022)	(0.0031)
1	-0.0145^{***}	-0.0218^{***}	-0.0031^{**}	-0.0046^{**}
	(0.0026)	(0.0045)	(0.0012)	(0.0022)
2	-0.0086^{***}	-0.0143^{***}	-0.0016	-0.0033
	(0.0022)	(0.0042)	(0.0010)	(0.0020)
3	-0.0045^{**}	-0.0088^{**}	-0.0006	-0.0022
	(0.0019)	(0.0038)	(0.0009)	(0.0018)
4	-0.0010	-0.0048	0.0004	-0.0013
	(0.0017)	(0.0037)	(0.0008)	(0.0016)
5	0.0008	-0.0016	0.0005	-0.0017
	(0.0018)	(0.0036)	(0.0008)	(0.0016)
6	0.0009	-0.0014	0.0010	-0.0014
	(0.0023)	(0.0039)	(0.0009)	(0.0017)
7	0.0013	-0.0009	0.0011	-0.0006
	(0.0028)	(0.0043)	(0.0010)	(0.0017)
N	3,261,867	3,261,867	3,688,298	3,688,298

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own calculations based on registration data from Statistics Netherlands.

Table 5: IV and OLS estimates of the field-specific unemployment rate at graduation on log daily wage at for male and female graduates.

	Male		Female	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Effect at year of potential experience				
0	-0.0080^{**}	-0.0174^{**}	-0.0149^{***}	-0.0228^{***}
	(0.0040)	(0.0083)	(0.0044)	(0.0062)
1	-0.0118^{***}	-0.0198^{***}	-0.0168^{***}	-0.0249^{***}
	(0.0025)	(0.0057)	(0.0028)	(0.0043)
2	-0.0072^{***}	-0.0136^{**}	-0.0098^{***}	-0.0161^{***}
	(0.0024)	(0.0060)	(0.0023)	(0.0038)
3	-0.0047^{**}	-0.0108^{*}	-0.0044^{**}	-0.0085^{**}
	(0.0021)	(0.0056)	(0.0020)	(0.0034)
4	-0.0031	-0.0095^{*}	0.0010	-0.0018
	(0.0021)	(0.0054)	(0.0017)	(0.0033)
5	-0.0028	-0.0074	0.0048^{**}	0.0031
	(0.0019)	(0.0049)	(0.0019)	(0.0034)
6	-0.0026	-0.0088^{*}	0.0063^{**}	0.0053
	(0.0021)	(0.0048)	(0.0025)	(0.0038)
7	-0.0022	-0.0079^{*}	0.0080^{***}	0.0063
	(0.0024)	(0.0048)	(0.0030)	(0.0043)
N	1,334,715	1,334,715	1,927,152	1,927,152

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own calculations based on registration data from Statistics Netherlands.

Table 6: Effect of the unemployment rate on the probability to obtain an additional or higher degree.

	(1) Higher vocational to higher vocational	(2) Higher vocational to university	(3) University to university
Unemployment rate	-0.0024^{***}	-0.0003	-0.0002
	(0.0008)	(0.0029)	(0.0010)
N	371,622	371,622	189,536

Notes: Standard errors clustered at the level of graduation cohort and field of study are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

at the university level. For two out of three groups we find no statistically significant relation between the unemployment rate at graduation and the probability to obtain a higher degree. Column (1) does show a small, but statistically significant effect of of the unemployment rate on the probability to obtain a higher degree. However, the estimate has the wrong sign. Students seem to be less likely to obtain an additional higher vocational degree if the unemployment rate is higher. This could be an issue if those higher vocational students are instead more likely to obtain a university degree, but column (2) shows that this isn't the case. We therefore conclude that students in our sample don't pursue an additional degree if the unemployment rate at graduation is higher.

6 Firm quality and job mobility

Above we showed that people who graduate during a recession suffer negative wage effects for the first four years on the labour market. We found initial effects that are about twice as large for women than for men. One explanation for the negative wage effects could be that students who graduate during a recession have less bargaining power, so they start with lower wages, but they do start in similar firms as those who graduate during a boom. Through the career ladder they eventually catch up to those who started in better times. Another explanation is that those who graduate during a recession start at lower quality firms, and, through continuing job search, gradually end up with better paying firms and in jobs that fit their qualifications. In this section we provide evidence to help us distinguish between these two explanations.

We start with an analysis of the "quality" of firms that workers start at and work at for the first ten years of their career. While firm quality obviously consists of many elements, such as the wages paid, the type of contract that is offered, but also training possibilities or flexibility of working hours, we focus on one measure: the wage that workers earn. This is one of the most important aspects of the quality of a firm, and likely to be highly correlated with many of the other elements that make up firm quality.

We start with an analysis of the median wage paid at a firm. Columns (1) and (2) of Table 7 reports results of regressions using our main model in equation 1, but with the log median wage at the firm-level as our dependent variable. This variable includes all workers, so not just higher educated workers. We find strong negative effects in the first few years for both men and women, indicating that

those who graduate during a recession are more likely to work at low-paying firms. Note that since we take the average median wage over the entire observation period, this pattern can't be explained by workers starting at the same firms as those who graduate during a boom, but that these firms simply pay lower wages during a recession than during a boom. This finding is consistent with evidence that high wage sectors and firms have more pro-cyclical hiring patterns than low wage sectors and firms (McLaughlin and Bils, 2001; Oreopoulos et al., 2012). In the long run we find positive effects on the average median wage, indicating that workers who started during a recession ultimately move to better paying employers than those who started in a boom. This already suggests that job mobility could be an important mechanism in catching up.

For recent graduates entering the labour market, the median wage paid by a firm might not be the most relevant measure. Instead, they often start in entry level jobs that have relatively low starting wages, but steep wage curves. One reason for such a pattern is that they pay for initial training through lower wages in the beginning, but if they complete the training their productivity rises and their wage increases substantially in response. Another reason could be a tournament setting, where the prize for winning the tournament is a steep wage increase. Column (3) reports results on the log of the average starting wage at a firm for men. We only define the starting wage for firms where we observe at least one worker starting their career between 1999 and 2015. In line with the results on the average median wage, we find negative effects in the first few years, and small positive effects in the long run. The results for women are similar to those for men, but we find larger positive effects in the long-run. Finally, columns (5) and (6) show results on average wage growth in a firm. This variable is only defined for firms where we observe at least one starting worker for two consecutive years. The coefficients are generally very small, and for men never statistically significant. For women we find small positive effects in years 3 - 5.

Young workers who graduate during a recession seem to catch up through steady improvements in the quality of firms they work at. This suggests that job mobility plays an important role in catching up. Indeed, there is substantial evidence that young workers benefit from job mobility. Topel and Ward (1992) show that about one third of the wage growth during the first ten years of young men's careers in the US can be attributed to job mobility and that they on average hold about seven jobs in the first ten years of their career, close to two thirds of their career total jobs.

To examine the role of job mobility, we start by documenting some descriptive evidence on the frequency of job changes. Table 8 shows for each potential experience year t how likely workers are to have switched jobs between year t and year $t-1$, separately for males and females and for those who graduated in a downturn and an upturn.[20] In year 1, about 41% of males have switched jobs compared to the previous year, compared to about 45% for females. The propensity to switch quickly declines to about 29% for males and 32% for females in year 2. In experience year 7, still about 15% of workers who have switched jobs compared to the previous year. Females are more likely to switch jobs in the beginning of their career. The table also shows that those who graduate during a downturn are more likely to switch jobs for the majority of their early career. We will present estimates of the direct effect of the unemployment rate at graduation on job mobility below. The final 4 columns show sector mobility with sectors defined at the 2-digit level. As expected, this is consistently lower than

[20] We define an upturn (downturn) as a year where the field-specific unemployment rate is higher (lower) than in the previous year. Also see section A.3.

Table 7: Effect of the field-specific unemployment rate at graduation on measures of firm quality for male and female graduates.

	Firm median wage		Firm start wage		Firm wage growth	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Effect at year of potential experience						
0	−0.0432***	−0.0615***	−0.0254***	−0.0192***	0.0007	0.0005
	(0.0066)	(0.0083)	(0.0036)	(0.0037)	(0.0014)	(0.0013)
1	−0.0384***	−0.0486***	−0.0146***	−0.0105***	−0.0013	0.0008
	(0.0052)	(0.0056)	(0.0029)	(0.0030)	(0.0014)	(0.0014)
2	−0.0205***	−0.0220***	−0.0064**	−0.0045*	−0.0006	0.0018
	(0.0039)	(0.0038)	(0.0027)	(0.0026)	(0.0013)	(0.0014)
3	−0.0053	−0.0067*	−0.0038	−0.0006	−0.0002	0.0034**
	(0.0036)	(0.0034)	(0.0027)	(0.0025)	(0.0013)	(0.0014)
4	0.0041	0.0096***	0.0003	0.0037	−0.0013	0.0023*
	(0.0033)	(0.0030)	(0.0025)	(0.0026)	(0.0010)	(0.0013)
5	0.0090**	0.0194***	0.0022	0.0082***	−0.0017	0.0019*
	(0.0035)	(0.0033)	(0.0023)	(0.0026)	(0.0011)	(0.0011)
6	0.0144***	0.0234***	0.0065***	0.0115***	−0.0006	0.0012
	(0.0040)	(0.0038)	(0.0024)	(0.0028)	(0.0009)	(0.0011)
7	0.0202***	0.0290***	0.0069***	0.0151***	−0.0010	−0.0000
	(0.0045)	(0.0043)	(0.0026)	(0.0030)	(0.0009)	(0.0010)
N	1,254,119	1,807,369	1,429,434	2,056,664	1,427,041	2,054,574

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

Table 8: Descriptive statistics on job mobility (in percentages).

	Job mobility				Sector mobility			
	Male		Female		Male		Female	
	Downturn	Upturn	Downturn	Upturn	Downturn	Upturn	Downturn	Upturn
At year of potential experience								
1	41.31	41.06	45.89	45.30	32.23	31.44	33.12	32.07
2	29.01	28.41	32.52	31.73	21.84	21.30	22.17	20.94
3	24.14	22.76	26.30	25.01	18.27	16.77	18.05	16.55
4	21.10	19.91	22.70	20.98	15.96	15.09	15.53	14.37
5	19.86	18.77	20.19	18.75	15.13	14.21	14.11	12.66
6	18.23	17.06	18.02	16.44	14.28	12.86	12.52	11.11
7	16.44	15.76	16.29	15.05	12.83	12.06	11.36	10.19

Source: Own calculations based on registration data from Statistics Netherlands.

job mobility. However, still about 70 to 80% of the job moves are also sector moves, with higher shares of sector mobility for men than for women.

We now continue to directly estimate the direct effect of graduating during a recession on the propensity to switch jobs. Column (1) in Table 9 shows the effect of the unemployment rate at graduation on the probability that a male worker switched jobs between year t and year $t-1$. Note that contrary to earlier tables, we don't report results for the year of graduation, because job moves are not defined for that year. We find positive effects for the first few years, but negative effects for later years. Column (2) reports similar effects for women, with even stronger negative effects in later years than for men. To get a sense of the size of the effects; for each percentage point increase in the unemployment rate at graduation, the propensity to move in the first year after graduation increases by almost 1.54 (1.45) percentage points for males (females), or about 3.8% (3.2%) of the average probability to move. In year 7, the effect is -5.2% (-5.3%) of the average probability to move for males (females). Columns (3) and (4) report results on 2-digit sector mobility. Similar to job mobility, sector mobility also increases at the start of the career for those who graduate during a recession, but is smaller in later years. Taken together, our estimates on job mobility show that workers who start in a period of high unemployment are more likely to search for jobs early, while those who start in better periods are more likely to switch jobs later in their career. This suggests that graduating during a recession leads to an intertemporal shift in job search effort. Workers who graduate during a recession start at lower-paying firms and earn lower wages themselves. Through increased job mobility, they move to higher-paying firms and catch up in terms of individual wages as well.

Another dimension of job mobility is mobility within a firm. Our data don't include function or rank within the firm, so we can't directly assess whether workers who graduate during a recession are more or less likely to be promoted. However, there is ample evidence that promotions are accompanied with large wage increases (see e.g. Booth et al. (2003); Van der Klaauw and Dias da Silva (2011)). As a proxy for promotions we therefore define a dummy variable that equals 1 if workers who stay within

Table 9: Effect of the field-specific unemployment rate at graduation on job mobility for male and female graduates.

	Job mobility		Sector mobility		$>15\%$ wage growth within firm	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Effect at year of potential experience						
1	0.0154***	0.0145***	0.0125***	0.0156***	−0.0178***	−0.0265***
	(0.0023)	(0.0027)	(0.0025)	(0.0028)	(0.0031)	(0.0047)
2	0.0093***	0.0060***	0.0082***	0.0096***	0.0019	0.0036**
	(0.0020)	(0.0017)	(0.0020)	(0.0014)	(0.0017)	(0.0016)
3	0.0041***	0.0036**	0.0055***	0.0049***	0.0042***	0.0053***
	(0.0013)	(0.0016)	(0.0014)	(0.0014)	(0.0014)	(0.0013)
4	0.0013	0.0005	0.0007	0.0009	0.0045***	0.0069***
	(0.0012)	(0.0014)	(0.0012)	(0.0014)	(0.0013)	(0.0012)
5	−0.0019	−0.0034**	−0.0016	−0.0043***	0.0029**	0.0050***
	(0.0014)	(0.0014)	(0.0012)	(0.0013)	(0.0013)	(0.0011)
6	−0.0043***	−0.0064***	−0.0029**	−0.0070***	0.0005	0.0024**
	(0.0014)	(0.0013)	(0.0012)	(0.0014)	(0.0013)	(0.0012)
7	−0.0083***	−0.0083***	−0.0053***	−0.0081***	0.0029**	0.0020*
	(0.0016)	(0.0013)	(0.0014)	(0.0012)	(0.0015)	(0.0012)
N	1,560,854	2,261,824	1,249,216	1,835,035	1,560,854	2,261,824

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

the same firm, experience a real wage increase from year-to-year of 15% or more.[21] On average, about 30% of workers experience such an increase in year 1, and the probability declines to 20% in year 2 and 10% in the long-run. In columns (5) and (6) we report the estimates. For males we find that they are less likely to experience a wage increase within the same firm in the year of graduation if they graduated during a recession. However, from year 3 onwards, the coefficients turn positive and this persists. For women we find similar, but stronger, results. This suggests that part of the catching-up occurs through stronger wage growth within the same firm.

Finally, to get a sense of the contribution of job mobility to catching up, we provide estimates of the return to job mobility. We augment our baseline model with a dummy variable for mover status ($Mover$) and interact it with the unemployment rate at graduation U_{cf} and estimate the effects on $\Delta ln(wage)_{it}$, with $\Delta ln(wage)_{it} = ln(wage)_{it} - ln(wage)_{it-1}$:

$$\Delta ln(wage)_{it} = \alpha + \beta_e e_{it} * u_{cf} + \gamma_1 Mover + \gamma_2 Mover * U_{cf} + \zeta X_i + \phi_c + \mu_f + \tau_t + \varepsilon_{it}, \quad (2)$$

where γ_1 gives an estimate of moving to another job on changes in log daily wage and γ_2 gives the differential effect of changing jobs due to the unemployment rate at graduation. If those who graduate

[21] We have tried using other proxies, such as an increase of 10% or 20%, but the results are similar.

during a recession have higher returns to job mobility than those who graduate during a boom, we would expect a positive estimate for γ_2. We estimate the model in equation 2 using OLS. Since job mobility is endogenous, these results might be biased. One way to partly deal with this is to include worker fixed effects, which controls for time-invariant individual factors (Von Wachter and Bender, 2006; Del Bono and Vuri, 2011). Nevertheless, the estimates presented here should be interpreted as descriptive. Panel A of Table 10 gives the estimates for γ_1 and γ_2 for job mobility, separately estimated for the full sample and for males and females. We present OLS and fixed effects estimates. Column (1) reports OLS estimates for the full sample. We find that job mobility is associated with a 2.1 log point increase in the daily wage. Using fixed effects we remove some of the bias due to the endogeneity of job mobility. Indeed, we find a smaller estimate of a 1.6 log point increase in the daily wage associated with job mobility. The estimates on the interaction between mover status and the unemployment rate at graduation are not statistically significant. Columns (3) and (4) report the results for males. We find substantially larger wage gains associated with job mobility than for the full sample, with close to 2.7 log points remaining in the FE estimates. Columns (5) and (6) report results on women, who show substantially smaller wage gains associated with job mobility. After controlling for fixed effects, women gain 0.7 log points at job mobility. This is less than a third the size of men. These findings are similar to Del Bono and Vuri (2011), who also find that women gain much less than men when they move jobs. However, we do find a differential effect of job mobility for those women who graduated during a recession. Indeed, for every percentage point increase in the unemployment rate at graduation, women who switch employers gain 0.2 log points in their daily wage. Panel B reports results on sector mobility. The pattern is very similar as for job mobility, but the estimates are somewhat smaller across the board.

A simple back of the envelop calculation suggests that job mobility on average contributes about 20% to catching up from the initial wage loss.[22] However, for men, due to the much higher return to job mobility, it contributes about 45%, while for women the contribution of mobility (at an increase of the unemployment rate at graduation of 2 percentage points) is only 10%.

To sum up, our results on job mobility and firm quality suggest that graduating in a recession leads to an intertemporal shift in young workers' search behaviour. Young workers who graduate during a recession start at lower quality employers. This provides an incentive for job search, leading to increased job mobility compared to those who started during a boom in the early career. Through a process of successful job moves, they gradually catch up to those who graduated during a boom and ultimately end up working at better paying firms. Note that since we found no long-run positive effects on individual wages (see Table 2) this suggests that these workers don't (yet) benefit from working at higher-paying firms. Job mobility then slows down in the medium to long-run, while those who started in good times become more mobile. Both men and women are more likely to start searching earlier if they graduated during a recession, but the overall returns to job mobility are much higher for men. This could partly account for the smaller wage losses for men, although it still doesn't account for the difference between men and women in the year of graduation.

[22] This is calculated using the 0.16 log point increase in wages at job mobility, the initial wage loss of 0.012 and the average increase in job mobility of about 0.016: $\frac{(0.15*0.016)}{0.012} = 0.2$.

Table 10: Effect of mover status on year-to-year log wage growth.

	Full sample		Male		Female	
	OLS	FE	OLS	FE	OLS	FE
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Job mobility						
Mover	0.0214***	0.0163***	0.0306***	0.0266***	0.0132***	0.0068**
	(0.0031)	(0.0031)	(0.0035)	(0.0037)	(0.0030)	(0.0030)
Mover $* U_{cf}$	0.0016	0.0012	0.0016	0.0013	0.0023**	0.0020**
	(0.0010)	(0.0010)	(0.0012)	(0.0013)	(0.0010)	(0.0010)
Panel B. Sector mobility						
Mover	0.0218***	0.0154***	0.0298***	0.0245***	0.0137***	0.0059*
	(0.0030)	(0.0032)	(0.0036)	(0.0039)	(0.0032)	(0.0033)
Mover $* U_{cf}$	0.0017*	0.0013	0.0020	0.0017	0.0023**	0.0021**
	(0.0009)	(0.0010)	(0.0012)	(0.0013)	(0.0010)	(0.0010)

Notes: The table reports estimates of the effect of mover status on year-to-year log wage growth. All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

7 Conclusion

In this paper we examined the early career effects of graduating in a recession using a sample of Dutch higher education graduates from 1996 to 2012. We find negative effects on wages which last up to three years after graduation, while employment probabilities are hardly affected. This shows that on average there is no lasting scar of starting in a recession. We do find much stronger effects in the short-run for women than for men, but no differences in the long-run.

The main mechanism contributing to catching up is job and sector mobility. Our results suggest that most young workers are highly mobile in the first few years of their career, but that workers who graduate during a recession start searching for a new job earlier than those who graduate during a boom. After about five years on the labour market, job mobility for those graduating during a recession is lower. The intertemporal shift in job mobility on average contributes about 20% to the recovery of the initial wage loss. For men the returns to job mobility are much higher than for women however.

Our results suggest that the labour market for young high-educated entrants in the Netherlands primarily accommodates shocks through lower wages and a higher share of jobs at lower-paying employers. The quick catch-up provides evidence that structural demand for graduates is high enough to prevent long-term wage losses due to bad starting conditions.

Our results and approach raise some further questions for research. First, it would be interesting to further examine whether low and middle-educated graduates suffer losses similar to the ones we find for high-educated graduates. Due to the lack of good data for this group, we haven't been able to include them, but they are at least half of the graduate population in the Netherlands. The sparse literature that compares higher educated with lower educated graduates finds that higher educated graduates lose more in terms of wages from graduating during a recession, but that lower educated have

lower job probabilities. Second, and related to the previous point, it would be very helpful to consider general equilibrium effects. It is for example possible that the effects on employment are small because higher educated graduates take jobs that are typically held by lower educated graduates. Indeed, the lower job quality is one of the drivers of the initial wage loss. This means that, by extension, lower educated graduates could be hurt in their employment chances.

Finally, our estimates should be interpreted as a lower bound on the effects of graduating during a recession. Due to the inclusion of time, cohort and field fixed effects, we only exploit the variation in the unemployment rate at graduation that arises between fields of study from the same cohort. This variation is generally smaller than the overall variation in the unemployment rate due to the business cycle.

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Table A1: Effect of the field-specific unemployment rate on the exit rate out of higher education.

	(1)
Unemployment rate	-0.0033
	(0.0111)
N	5,651,766

Notes: See text for more on the specification. Standard errors clustered at the level of starting cohort and field of study are in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

A Appendix

A.1 Do students postpone graduation if the unemployment rate is high?

Bad labour market conditions might induce people to stay in school longer than they would have been if labour market conditions had been better. We apply duration analysis to directly examine this question. We estimate a discrete time duration model, where we assume that students decide each year whether they will enroll for the next year or enter the labour market (see Cockx and Ghirelli (2016) for a similar application). In the sample we include all students who obtain a higher education degree at some point, but we don't apply any of the other sample restrictions on e.g. study duration outlined in section 2. This ensures that we don't a priori select a sample of students who are unlikely to have adjusted their timing of graduation. We apply a complementary log-log specification. The exit rate out of higher education is modeled as follows

$$\theta(t|x, u_{fy}) = 1 - \exp(-\exp(x'\beta + u'_{gy}\gamma) \tag{3}$$

where t is the time spent in higher education, counted in years from the first enrollment, x is a set of individual observable characteristics (the same as used in the main specification) and u_{fy} is the field of study specific unemployment rate in year y. In addition to our regular control variables (gender, age, ethnicity and field of study fixed effects) we include dummies for each year in education to model a flexible baseline hazard and calendar year and starting cohort fixed effects. Table A1 shows the results. The estimated coefficient on the unemployment rate is precisely estimated, but it is very small and not statistically significant. We conclude that there is no effect of the unemployment rate on the time people spend in higher education.

A.2 The Great Recession

Since we only find short-term effects on wages and employment status, one might be worried that our results are solely driven by cohorts graduating during the Great Recession, the 2008 - 2012 cohorts. On the other hand, as we already discussed in section 2, the unemployment rate for higher educated in the Netherlands increased most during the dot-com recession in the early 2000s. In this subsection

Table A2: Effect of the field-specific unemployment rate at graduation on ln(daily wage) for years after 2008 (the Great Recession) and years before 2005 (the dot-com recession).

	≥ 2008 (1)	< 2005 (2)
Effect at year of potential experience		
0	-0.0170^{***}	-0.0147^{***}
	(0.0048)	(0.0053)
1	-0.0214^{***}	-0.0149^{***}
	(0.0033)	(0.0033)
2	-0.0159^{***}	-0.0082^{***}
	(0.0029)	(0.0027)
3	-0.0115^{***}	-0.0036
	(0.0026)	(0.0022)
4	-0.0081^{***}	-0.0004
	(0.0030)	(0.0021)
5	-0.0055	0.0012
	(0.0038)	(0.0020)
6	-0.0049	0.0007
	(0.0055)	(0.0025)
7	-0.0026	0.0011
	(0.0078)	(0.0032)
N	3,261,867	3,261,867

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

we present analyses where we restrict our sample to cohorts graduating during the Great Recession and during the dot-com crisis. Table A2 presents the results with log(daily wage) as the outcome variable. The estimates suggest that the negative short-term effects that we find are about 50% larger for the cohorts graduating after 2008 than the effects for all cohorts from 1996 to 2012. For cohorts graduating before 2005, the estimates are somewhat smaller. This suggests that the Great Recession has a larger impact than an average recession.

A.3 Upturns and downturns

We identify our main effects using variation in the unemployment rates. However, graduating in a period of relatively high unemployment, but going into an upturn might be different from graduating in a period of still relatively low unemployment, but going into a downturn. To distinguish between graduating in an upturn and downturn, we re-estimate our main analyses on wages and employment status but include an additional interaction between the unemployment rate at graduation, potential experience and a dummy indicating whether students graduate during an upturn. Hence, we estimate the following model

Table A3: Effect of the field-specific unemployment rate at graduation on ln(daily wage) for those graduating in a downturn.

	Full sample (1)	Male (2)	Female (3)
Effect at year of potential experience			
0	-0.0136^{***}	-0.0097^{**}	-0.0170^{***}
	(0.0042)	(0.0041)	(0.0044)
1	-0.0163^{***}	-0.0134^{***}	-0.0186^{***}
	(0.0028)	(0.0027)	(0.0030)
2	-0.0101^{***}	-0.0085^{***}	-0.0115^{***}
	(0.0024)	(0.0025)	(0.0026)
3	-0.0061^{***}	-0.0060^{***}	-0.0062^{***}
	(0.0021)	(0.0023)	(0.0024)
4	-0.0020	-0.0038	-0.0005
	(0.0020)	(0.0023)	(0.0021)
5	0.0005	-0.0033	0.0040^{*}
	(0.0020)	(0.0022)	(0.0022)
6	0.0009	-0.0029	0.0056^{**}
	(0.0025)	(0.0023)	(0.0027)
7	0.0021	-0.0022	0.0083^{***}
	(0.0029)	(0.0026)	(0.0031)
N	3,261,867	1,334,715	1,927,152

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

$$Y_{itcf} = \alpha + \beta_e e_{it} * u_{cf} + \gamma_e e_{it} * u_{cf} * Upturn_{cf} + \zeta X_i + \delta_e + \phi_c + \mu_f + \tau_t + \varepsilon_{it}, \tag{4}$$

where $upturn_{cf}$ is a dummy that equals 1 if graduation year c is an upturn for field-of-study f. Hence, the γ_e's give the effect of the unemployment rate at graduation when graduating during an upturn and the β_e's give the effect of the unemployment rate at graduation when graduating during a downturn. We define an upturn as any year where $u_{cf} < u_{c-1f}$, so where the field-specific unemployment rate in graduation year c is smaller than the field-specific unemployment rate in the previous graduation year $c-1$. We have no data on field-of-study specific unemployment rates before 1996, but average unemployment rates show that this year is an upturn. Hence, for graduation year 1996 we define $upturn = 1$. Table A3 shows the estimation results for students graduating in a downturn based on the β estimates from equation 4. We find effects that are slightly stronger than when we also include people graduating in an upturn. For example, our baseline estimate for year 0 is -0.0115, while for those graduating in a downturn it is -0.0136. Similar changes hold for the separate estimates for men and women. This means that the effect is driven by those graduating during a downturn, while a relatively high unemployment rate during an upturn has a negligible effect on wages.

Table A4: Estimates of the effect of the *national* unemployment rate at graduation on log daily wage
.

	Full sample (1)	Male (2)	Female (3)
Effect at year of potential experience			
0	-0.0159^{***}	-0.0102	-0.0195^{***}
	(0.0050)	(0.0061)	(0.0043)
1	-0.0151^{***}	-0.0122^{**}	-0.0170^{***}
	(0.0036)	(0.0044)	(0.0033)
2	-0.0106^{***}	-0.0099^{**}	-0.0114^{***}
	(0.0032)	(0.0041)	(0.0026)
3	-0.0059^{**}	-0.0064^{**}	-0.0062^{***}
	(0.0022)	(0.0029)	(0.0019)
4	-0.0023	-0.0020	-0.0027
	(0.0021)	(0.0027)	(0.0019)
5	-0.0008	-0.0004	-0.0008
	(0.0028)	(0.0035)	(0.0023)
6	0.0006	0.0013	0.0006
	(0.0036)	(0.0041)	(0.0031)
7	0.0026	0.0049	0.0018
	(0.0038)	(0.0037)	(0.0036)
N	3,261,867	1,334,715	1,927,152

Notes: All regressions include potential experience, calendar year and field of study fixed effects. We also include a quadratic cohort trend. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

Table A5: Estimates of the effect of the field-specific unemployment rate at graduation on log daily wage including zeros.

	Full sample (1)	Male (2)	Female (3)
Effect at year of potential experience			
0	0.0002	0.0065	−0.0068
	(0.0118)	(0.0137)	(0.0121)
1	−0.0254***	−0.0224**	−0.0278***
	(0.0070)	(0.0090)	(0.0064)
2	−0.0157***	−0.0148*	−0.0159***
	(0.0057)	(0.0075)	(0.0054)
3	−0.0085*	−0.0133**	−0.0043
	(0.0050)	(0.0065)	(0.0051)
4	−0.0013	−0.0086	0.0060
	(0.0045)	(0.0060)	(0.0045)
5	0.0005	−0.0080	0.0105**
	(0.0049)	(0.0061)	(0.0049)
6	0.0027	−0.0012	0.0130**
	(0.0057)	(0.0066)	(0.0058)
7	0.0038	0.0024	0.0155**
	(0.0064)	(0.0072)	(0.0060)
N	3,688,298	1,529,370	2,158,928

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own calculations based on registration data from Statistics Netherlands.

Table A6: Estimates from a multinomial probit model on the effect of the field-specific unemployment rate at graduation on employment outcomes. The reference category is being employed.

	Self-employed (1)	On benefits (2)	Without income (3)
Effect at year of potential experience			
0	−0.0044	−0.0359***	−0.0060
	(0.0125)	(0.0126)	(0.0090)
1	0.0207*	0.0202	0.0233***
	(0.0107)	(0.0133)	(0.0066)
2	0.0207**	0.0249*	0.0178***
	(0.0088)	(0.0129)	(0.0061)
3	0.0163**	0.0262***	0.0054
	(0.0075)	(0.0102)	(0.0064)
4	0.0016	0.0273***	−0.0006
	(0.0061)	(0.0097)	(0.0058)
5	−0.0084	0.0296***	−0.0063
	(0.0071)	(0.0094)	(0.0061)
6	−0.0170**	0.0380***	−0.0146**
	(0.0077)	(0.0100)	(0.0065)
7	−0.0224***	0.0402***	−0.0207***
	(0.0081)	(0.0114)	(0.0069)
N		3,688,298	

Notes: All regressions include potential experience, graduation year, calendar year and field of study fixed effects. Demographic controls are age at graduation, gender and ethnicity. Standard errors in parentheses are clustered at the level of graduation cohort and field of study. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own calculations based on registration data from Statistics Netherlands.

Table A7: Descriptive statistics on the unemployment rate at graduation for each field of study.

Field of study	Unemployment rate mean	std. dev.	min.	max.	Observations in graduate sample
Panel A: Higher vocational studies					
Teacher primary education	1.60	0.65	0.59	3.07	39,973
Teacher secondary education and sports	2.41	1.04	1.08	4.76	9,780
Teacher vocational education	2.60	1.07	1.06	4.78	10,972
Art	3.65	1.52	1.43	7.24	16,081
Marketing, business economics, transport and logistics	2.37	0.73	1.08	3.91	33,537
Accountancy and finance	1.51	1.14	0.10	4.62	5,007
Business studies, HRM and law	2.39	0.99	1.23	5.38	41,531
Facility management	3.27	1.57	0.00	6.38	26,396
ICT	1.96	1.20	0.39	4.45	15,493
Engineering	2.05	1.16	0.65	5.26	6,793
Chemistry and electro engineering	2.40	0.90	0.93	4.65	12,628
Architecture and civil engineering	1.50	0.97	0.21	3.36	13,110
Nature, environment and agriculture	1.82	1.82	0.00	7.72	6,737
Nursing and medical diagnosis	1.31	0.51	0.50	2.31	21,786
Physiotherapy	1.92	1.05	0.62	4.64	20,893
Social sciences, communication and journalism	4.18	1.64	0.95	7.47	21,005
Social work and pedagogy	3.28	0.57	2.24	5.07	36,241
Panel B: University studies					
Education	2.22	0.93	1.17	4.16	13,361
Art	4.18	1.26	1.89	6.81	5,389
Language, culture and journalism	3.91	1.24	1.50	5.83	14,042
Economics	1.89	0.88	0.67	3.81	15,212
Business studies, accountancy and finance	1.96	0.64	0.77	3.00	40,557
Law	2.33	0.86	0.85	4.03	24,220
Engineering	1.72	1.03	0.64	4.74	17,243
Biology, mathematics, agriculture and environment	3.15	1.26	0.74	5.42	9,463
Natural sciences and ICT	3.23	1.65	1.47	7.12	12,653
Health care	1.23	0.49	0.52	2.26	28,279
Social sciences	3.84	1.62	0.86	6.44	22,172
Psychology and social work	3.98	1.36	1.34	6.21	16,680
Total	2.49	1.38	0.00	7.72	557,234

Notes: The number of observations in the final column refers to the total number of graduates in that field in our sample.
Source: Own calculations based on registration data from Statistics Netherlands.

Table A8: Overview of variables.

Variable	Definition	Period observed	Units	Source
Potential experience	Number of years after graduation.	1999 - 2015	years	Higher education degrees
Unemployment rate	Unemployment according to the ILO definition, percentage of active population, defined separately by major.	1996 - 2015	percentage points	LFS microdata
Graduation year	Year in which a student finishes his/her study. See section for more extensive discussion.	1996 - 2012	years	Higher education degrees
ln(daily wage)	Log of total yearly earnings divided by days worked.	1999 - 2015	log of euros / day	Tax filings
Being employed	Main income is from being an employee, self-employed, director/major shareholder or otherwise active.	1999 - 2015	0/1 dummy	Socio-economic status
Self-employed	Main income is from entrepeneurship.	1999 - 2015	0/1 dummy	Socio-economic status
On benefits	Main income is from benefits.	1999 - 2015	0/1 dummy	Socio-economic status
Employer sector	Firm sector according to the 2008 Dutch SBI (Standaard Bedrijfsindeling), based on the NACE.	1999 - 2015	Categorical variable	Firm administration
ln(median firm wage)	Log of median daily wage for each firm across all years	1999 - 2015	log of euros / day	Firm administration
Age at graduation	Age at graduation.	1996 - 2012	in years	Municipal registry
Gender	Dummy if a person is female	1996 - 2015	0/1 dummy	Municipal registry
Ethnicity	Divided in native, western immigrant and non-western immigrant. Non-natives are all people for whom one parent is born in another country than the Netherlands.	1996 - 2015	Categorical variable.	Municipal registry
Field of study	see Table A7	1996 - 2012	Categorical variable	Higher education degrees
Level of study	Higher vocational education and university	1996 - 2012	0/1 dummy	Higher education degrees

Notes: All data, except for the unemployment series, are administrative. The source indicates which data file was used. The higher education degree data consists of two files. One file contains information from 1986 until 2007 (we use 1996 - 1999) and the other one contains information from 2000 - 2015 (we use data until 2012 to ensure that we observe at least 3 years on the labour market). The socio-economic status data contains an indicator for each person for their most important source of income, as defined by Statistics Netherlands.

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