The rise and fall - labor demand during COVID-19

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WORK IN PROGRESS

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Abstract

With a focus on jobs for youth, this paper analyses the development of job postings in Norway during the first 26 weeks of 2020. Jobs for youth are defined by the top 20 3-digit occupations for young workers. Job postings in these occupations took a larger hit than other jobs. We also identify the top 20 occupations for entrants right after completed highest education. Separate analyses by education reveal that entry jobs for young people with lower education declined the most during the pandemic. Using a difference in difference framework with 2018 and 2019 as reference years, we show that the decline started before "lock-down" policies were in place, but that the decline was even larger during the lock-down. Concurrent with re-opening phases in the economy, job posting rates improved, but did not reach by the summer the levels comparable to those in 2018 and 2019.

Keywords: Coronavirus, labor demand shock, job postings, young workers

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1. Introduction

The health crisis caused by the outbreak of the COVID-19 virus has led to one of the largest economic crises in modern times. As the virus spread across countries and within communities, unemployment rates surged and vacancy postings dropped. The exceptional circumstance of this economic crisis is that it follows from a global pandemic where non-pharmaceutical measures, such as administrative closures, social distancing, travel bans together with general hygiene advisories, are the best available treatment (yet) in mitigating the spread of the virus. These measures also affect employment and the creation of new jobs. Even if the COVID-19 pandemic is likely to end within a reasonably short time, it may still have deep and lasting effects on the labor market.

With a focus on jobs for youth, we investigate in this paper how the COVID-19 outbreak and the subsequent policy measures affected job postings in Norway. Studies of COVID-19, focussing especially on young workers, are few. One recent example, however, is Major et al (2020), who label the cohorts entering the labor market this year the "Generation Covid". Using UK survey data they find that young individuals (those aged 16-25) has experienced worse labor market outcomes in terms of job loss, not working and earnings losses during and after the COVID lockdown. Those aged 16-25 were more than twice as likely as older workers to have experienced job loss, with more than one in ten losing their job. They do not, however, provide evidence on vacancies available for younger workers. Young workers are typically newcomers in the labor market. For youth job creation and gross hires constitute the most important margin for the determination of future employment, and job postings that we study in this paper is a key indicator of what is available for newcomers.

A focus on jobs for youths is pertinent. Earlier studies have shown that young workers face larger labor marked losses than other workers in the aftermath of economic crises. Young workers bear the consequences for a long period, affecting both their prospects in the labor market, in terms of higher risk of long-term unemployment, weaker wage growth and career prospects, and their health outcomes and well-being (Rothstein 2020, Kahn 2010, Oreopolous et al. 2012, Schwandt and von Wacter 2019, and Raaum and Røed 2006). Rothstein (2020) studies cohort patterns in the labor market outcomes of recent college graduates, examining changes around the Great Recession. Recession entrants have lower wages and employment compared to earlier cohorts. He relates these changes to "scarring" effects of initial conditions. He shows that adverse early conditions permanently reduce new entrants' employment probabilities. Similarly, Kahn (2010), and Oreopolous et al. (2012) both analyse short and long term effects of graduating from college when the economy is bad. Using US and Canadian data respectively, they find large, negative earnings effects of graduating in a worse economy, which persist over a long period of time. Schwandt and von Wacter (2019) analyse the persistent effects of entering the labor market in a recession on a broad range of socioeconomic outcomes for all young workers who entered the labor market in the United States from 1976 to 2015. They find persistent earnings and wage reductions. The effects are particularly large for two groups: non-whites and high school dropouts. Using Norwegian data for the period 1993-2000, Røed and Raaum (2006) show that individuals who face particularly difficult local labor markets when they graduate from secondary education, experience relatively high rates of non-employment during their whole prime-age career.

The empirical analyses in this paper is based on near real-time data on the universe of job postings from the Norwegian Welfare Administration (NAV). We combine these data with group-level information from administrative registers as well. Job postings data have several advantages over survey or administrative data when the situation requires high-frequency data on the labor market.

Hiring new workers and generating new jobs is a costly investments for employers, and their decision to curtail or accelerate hiring, reflects expectations for the future in a firm.

Our results show a dramatic decline in postings immediately after the COVID-19 outbreak and a slow but not full recovery after the reopening. The average overall differences-in-differences (DD)-results using 2019 as control year, show a reduction in job postings equal to 25 per cent, measured over the whole post-period (week 9-26), with a negative peak during the lockdown in March and April with a reduction of approximately 40 per cent. The overall size of the relative fall in labor demand are almost on par with recent international evidence from the US and Sweden (Hensvik at el., 2020, Forsythe et al., 2020). We find that jobs for younger workers were hit harder than other jobs. Entry jobs for youth with lower education, typically the first job after completed education, were hit the hardest. Entry jobs for youth with higher education were also hit, but with a smaller decline than lower skilled jobs. Jobs for prime age workers were less affected by COVID, again with an educational difference, with jobs for prime age workers with higher education being the type of jobs that experience the smallest decline.

We contribute to the recent and growing literature on how the COVID-19 crisis has affected labor demand. Forsythe et al. (2020) use US job vacancy data collected in real time, as well as unemployment insurance (UI) initial claims and Bureau of Labor Statistics (BLS) employment data to analyse the impact of COVID-19 on the labor market. They find that job vacancies fell dramatically in the second half of March. By late April, they had fallen by over 40%. The reduction was broad, hitting all U.S. states. Nearly all industries and occupations saw reductions in postings and increases in UI claims, irrespective of whether they were deemed essential and had work-from-home capability. Campello et al. (2020) use another source of data on job-vacancy postings to analyse the impact of COVID-19 on the U.S. job market. Results show that high-skill jobs were more severely hit than low-skill jobs, and the reductions were deeper in unionized industries and in non-tradable sector. Hensvik et al. (2020) study the job-search responses to the COVID-19 pandemic using real time data on vacancy postings and ad views on Sweden's largest online job board. They find that the labor demand shock in Sweden is as large as in the US, and affects industries and occupations heterogeneously. Finally, we also relate to Holgersen et al., (2020); a Norwegian study using similar vacancy posting data to study the impact of Covid-19 crisis on labor demand in Norway. They find that the postings from late February to the end of June in 2020 declined by around 27% relative to the same period in 2019. The reduction in labor demand is rather broad. Almost all industry and occupations experienced sizable drops, regardless whether they are considered to be feasible to be performed remotely. An important contribution of our paper is to provide analyses of impacts for groups of workers, in particular for young and low educated workers.

The paper proceeds as follows: We describe the Norwegian context and institutional background in section 2. In section 3, we describe the data, some descriptive analyses and provide evidence on job posting dynamic across groups. In section 4, we present the main results, in general and for young workers in particular. In section 5 we conclude.

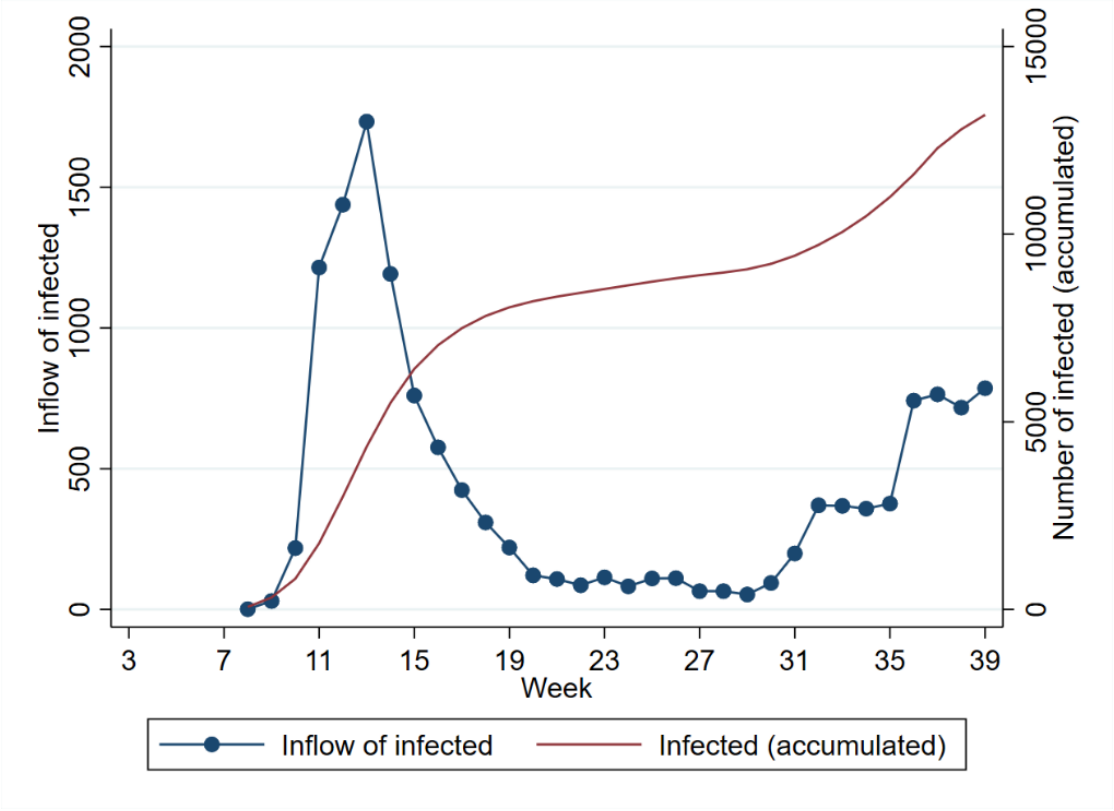
2. Background: COVID-19 infection rates, mobility, jobs and vacancy postings.

2.1 The dynamics of the virus

The first case of COVID-19 was confirmed Februar 26th 2020 in the city of Tromsø from a patient travelling from China. March 10th the first case of community spread was detected and the government immediately ordered businesses to facilitate remote work and the population to maintain social distance. March 12th, the Norwegian government announced drastic measures of social distancing and administrative closings of certain categories of establishments: Schools and universities closed, cultural and sporting events were prohibited, gyms and pools, hairdressers and other personal and beauty salons closed. Bars, cafes and restaurants were ordered to close unless they were able to maintain the required distance between their guests. At the same time, the Norwegian government took several measures to protect workers and jobs. On the firm side, they reduced the period from announcement to furlough from 14 to two days, reduced the days where employers have to pay wages to their furloughed workers from 15 to two, in addition to delays of several tax payments and direct cash benefits to firms. On the worker side, they extended unemployment insurance coverage and increase benefit levels. The drop in employment after the lockdown took effect in week 12 was dramatic. Four weeks after the lockdown, nearly 310 000 *new* individuals filed unemployment benefit claims (Gjerde, Jensen & Sørbø 2020; Alstadsæter et al 2020).

The scope of the COVID-19 outbreak, measured by the inflow of new infections, has been moderate in Norway overall compared to both Sweden and Denmark. But infections has been concentrated in certain regions and communities, and the variation in infection rates within and across municipalities has been substantial. After the outbreak in week 9-10, the number of registered infected grew fast until week 15, after which the curve flattened until week 31. As for many other countries, in the initial phase, a smaller share of the infected were in fact tested and registered which makes comparison across time less informative. Additionally, vulnerable groups were exposed, such as elderly homes, and the rate of hospitalized and intensive care patients grew fast. The initial lock-down after week 12 was successful in containing the virus, as is seen in Figure 1, but in line with the development in other European countries, infection rates increased after the summer holiday, and we are now facing infection rates at the same level and even higher than April 2020. Opposite to the situation in April though, hospitalizations and deaths at the outset of the second wave was not increasing at the same rate as infections (shown in figure A1 in the appendix), which was related to the higher share of registered infections among younger individuals. The total number of COVID-related deaths was 274 by week 39, corresponding to 50.7 per million inhabitants. In comparison, Sweden had 574.8 COVID-deaths per million, Denmark 111.8, UK 630 and the US 622.2 deaths per million inhabitants.
(https://www.fhi.no/contentassets/8a971e7b0a3c4a06bdbf381ab52e6157/vedlegg/andre-halvar-2020/2020.09.30-ukerapport-39-covid-19.pdf)

Figure 1. Number of confirmed infected individuals in Norway by week of testing (2020).



Note The first confirmed case of COVID-19 was tested in week 8 and announced February 26th (week 9). On March 12th the government launched their strict social distancing measures (= Week 11: March 9th-15th) which took effect in week 12 (March 16th-March 22nd). The Easter holiday was in week 15 in 2020, in week 16 pre-schools reopened, in week 17 1-4th grade of elementary schools opened, in week 20 school opened for all students. By week 25 most of the society was open, with group size limitations, hygiene and distance restrictions to limit the spread of the virus. Schools started summer break in week 26, which marks the start of summer holidays in Norway. In week 32, the government announced a halt in the reopening of society. The new school year started in week 34.

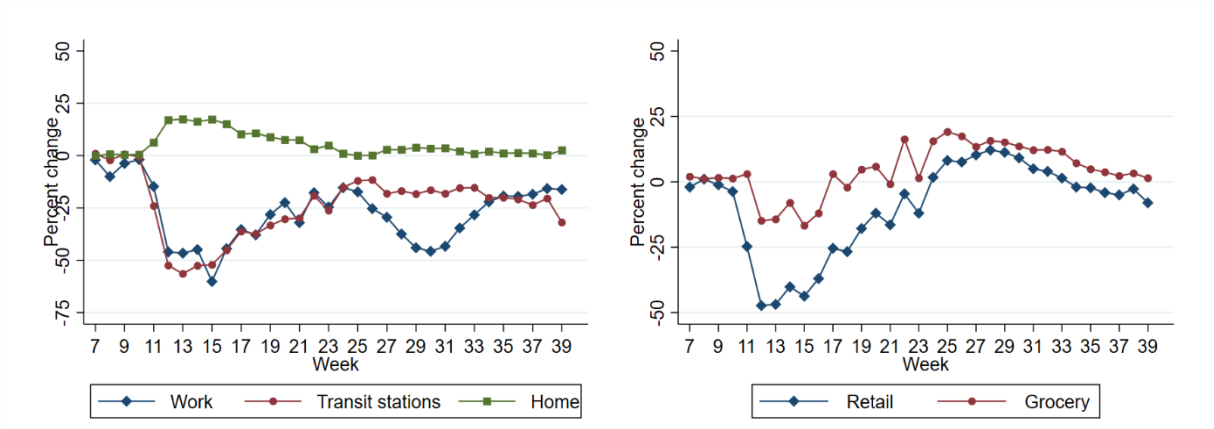
2.2 Social distancing and community mobility

Given that we do not (yet) have access to adequate medical treatments or vaccines, non-pharmaceutical interventions (NPIs) such as social distancing, widespread testing and quarantine, is the best tool to reduce the spread and death toll of the virus. In order to achieve that, authorities around the world have been willing to extend coverage and increase unemployment- and sickness benefits, in addition to widespread information campaigns, advise, regulations or restrictions (and in some cases prohibitions). Data confirm that the Norwegian population complied with the social distancing advices. In figure 2, we show a significant drop in time spent at workplaces, at transit stations, in retail- and grocery stores and more time at home immediately after the outbreak in Norway using Google's COVID-19 Mobility Reports. In the appendix figures A2 and A3, we also show that these mobility trends are consistent throughout all regions.

In mid-April, reopening of the society started. At first, in week 16 and 17, pre-schools and 1st to 4th grade of elementary schools reopened with somewhat limited opening hours, smaller groups sizes and measures to limit the spread and transmission of the virus. Restrictions were relieved at a slow pace. By week 20 all schools from pre-school to high-school were open, and by week 25 (June 15th)

most of the businesses that were forced to close was open, some with social distance restrictions, for instance bars and restaurants, pools and sport arenas. The reopening is also easily seen in Figure 1, as mobility trends are increasing and time spend at home is decreasing. These trends also reflect some seasonality. The summer holiday affect mobility to work, retail and grocery stores, between weeks 26-33. However, time spent at work after week 34 is not back to the same level as in January, neither the mobility to transit stations, and we have a marked decline in mobility to retail and grocery stores. Although we cannot distinguish the seasonality from the COVID-19-related reduction in mobility we note that these trends coincide in time with the increase in registered COVID-19 infections, presented in figure 1. We treat the period after week 8 as our post COVID-19 period based on the fact that week 9 marks the first confirmed case and that there were an increase in the population's awareness of the virus, illustrated by the Google Trends analytics in figure A4 in the appendix.

Figure 2. Percent change in the time spent at work, transit stations, home, retail and grocery stores in Norway.



Note: The data is provided by Google's COVID-19 Community Mobility Report and include users who have opted-in to Location History for their Google Account. Baseline is the median value for the corresponding day of the week during the period Januar 3rd – February 6th. These figures show mobility trends as an average of each day of the week for (1) work, (2) transit stations, like subway-, bus-, and train stations, and (3) place of residence (4) places of retail and recreation, such as shopping centers, museums, libraries, theaters, movie theaters, bars, cafes and restaurants, (5) grocery stores, food warehouses, food markets and specialty food shops and pharmacies. More information can be found at: https://www.google.com/covid19/mobility/ (Uploaded 06-10-2020).

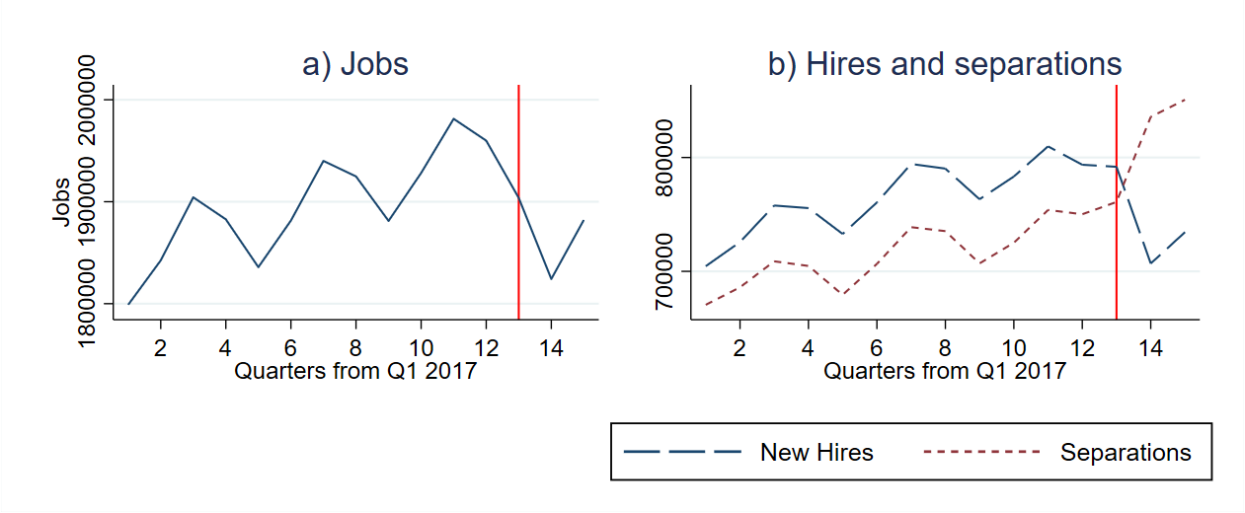
2.3 Jobs, vacancies and unemployment

The outbreak of COVID-19 in week 9 and the lockdown order that took effect in week 12 had an immediate effect on the labor market. First, we show in figure 3, that the number of jobs[2] declined during the two first quarters of 2020 (left panel). The pattern of increasing number of jobs during quarter 1 and 2, observed from 2017 to 2019 was broken in 2020 as the number of jobs kept on falling, and the increase from 2 to 3 appear to have been smaller than what was the experience the previous years. The right panel of figure 3 shows the underlying process: the number of exits

[2] The number of jobs is larger than the number of employees in the economy since many workers may hold multiple jobs.

appeared to explode during the first half of 2020, while at the same time the number of hires dropped dramatically. The analysis in this paper concerns the process *preceding* the number of hires: the number of job postings that the firm advertise to fill their vacancies.

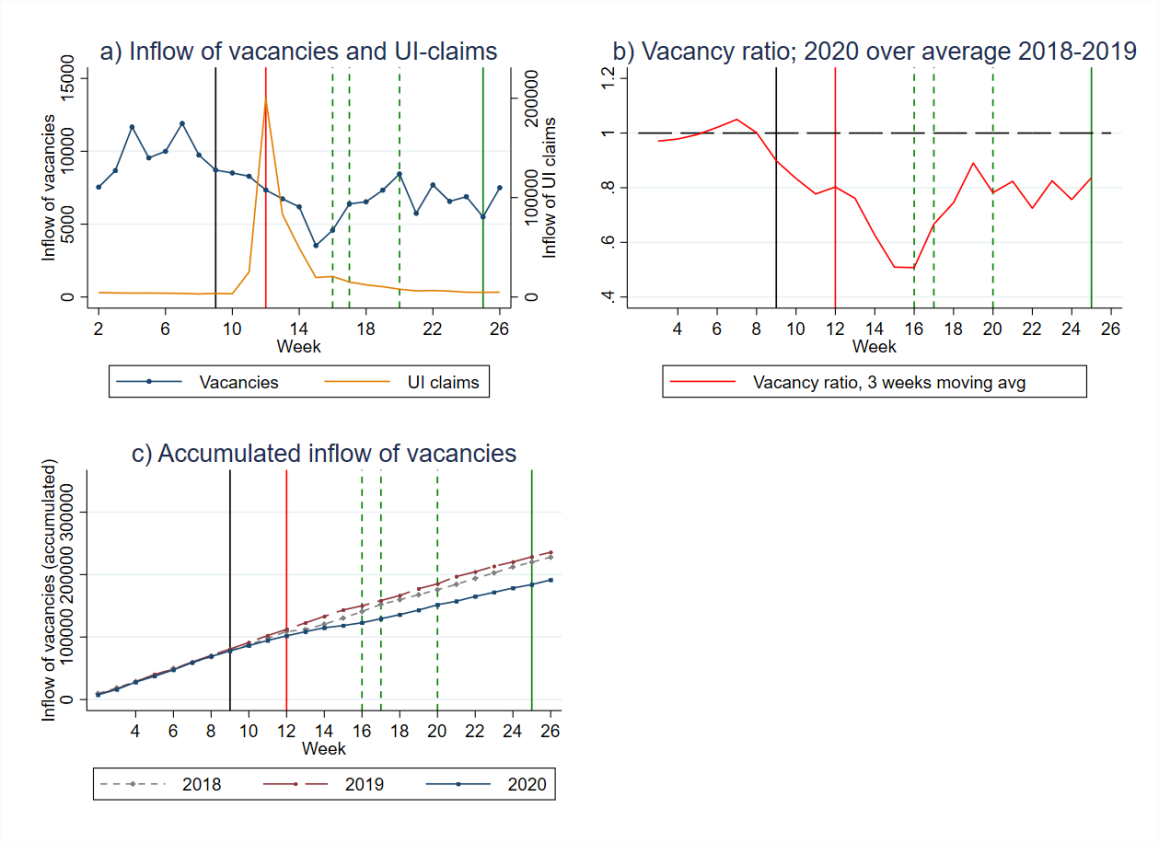
Figure 3. Jobs, Hires and Separations 2017Q1-2020Q3



Note: The figure reports the number of jobs (panel a)) and number of hires and separations (panel b)) for quarters in 2017-2020. The values of the x-axis denotes quarters from Q1 in 2017: *Q5*= Q1 in 2018, *Q9* = Q1 in 2019 and *Q13* =Q1 in 2020.
Source: Statistics Norway's table 11653 and 12820.

Second, as shown in figure 4, the drop in vacancies was dramatic. This drop was coupled by a historic increase in the inflow in unemployment insurance claims after week 10. In week 12 there were 26 000 new unemployment insurance claims on average each day, also counting weekends. This corresponds to an average of 18 registered claims per minute. Panel a) of figure 4 shows the evolution of the weekly inflow of new vacancies in 2020 (left y-axis) and weekly daily inflow of new unemployment insurance claims (right y-axis). In panel b) we compare the average vacancy inflows in 2018 and 2019 to the weekly inflow in 2020 expressed by the vacancy-ratio, while the accumulated vacancies per week in 2018, 2019 and 2020 are presented in the lower left quadrant (panel c). In April 2020, we had 14 000 fewer job postings than in April 2019, which is nearly half of normal inflow. As presented in panel b) of figure 4, the vacancy ratio of 2020 was at its lowest in week 15 and 16, after which it increased nearly as fast as it dropped. After the lockdown, when the spread of the virus was under control and pre-schools and schools opened again, job posting rates started to increase again, but remained 20 percent below the average vacancy inflow in 2018 and 2019. There are signs of recovery, but we have not picked up all the lost postings. Panel c) presents the accumulated inflow over our observation period and shows a clear break of the trend in 2020 compared to 2018 and 2019. The gap between accumulated inflow of vacancies in 2019 and 2020 is increasing post COVID-19, and there is no sign of a rebound in our period of observation.

Figure 4. Inflow of vacancies and unemployment insurance claims per week.



Note: This figure plots a) the average daily inflow of vacancies and the average daily inflows of unemployment benefit claims per week in 2020 and b) vacancy ratio (3 week moving averages) compared to the mean of 2018 and 2019, and c) accumulated inflow of vacancies. On February 26th Norway had the first registered positive COVID-19 case in Norway (= Week 9: February 24th to March 1st). On March 12th the government launched their strict social distancing measures (= Week 11: March 9th-15th) which took effect in week 12 (March 16th-March 22nd). The Easter holiday was in week 15 in 2020, in week 16 pre-schools reopened, in week 17 1-4th grade of elementary schools opened, in week 20 school opened for all students. By week 25 most of the society was open, with group size limitations, hygiene and distance restrictions to limit the spread of the virus. Schools started summer break in week 26, which marks the start of summer holidays in Norway.

3. Data

The data used in this analysis consists of all posted job listings in Norway-[3] Job postings are collected from Arbeidsplassen.no (arbeidsplassen.nav.no), which is a digital self-service portal for employers and job-seekers, owned by the Norwegian Welfare Administration. Postings in Norway are collected in this portal from all the large private and public job boards in Norway, in addition to postings that are registered at NAV directly, announced in newspapers and journals etc. Firms can post vacancies and screen applicants, while job seekers can search and view ads and apply to posted vacancies through the portal.

[3] These data are posted as a public-use file on the National Welfare Administration's portal.

Our vacancy data comprise the universe of postings in 2018, 2019 and up to week 26 in 2020. We aggregate the data on weekly basis and only include full weeks (leaving out week 1 and 40). We restrict our attention to postings of jobs located in Norway. Our working dataset contains 350 000 postings over the 26 first weeks in 2018, 2019 and 2020.

We have a wide range of information on each posting, such as geographical location, occupation (4 digit ISCO-08) and industry (NACE 07), number of positions posted, the date of publication, which is the first day the public can view the ad. We do not have information on wages or skill requirements from the vacancies, as they normally are not posted. Therefore we assign occupation specific information from other data sources. We collect employment shares in 2019 for each 3-digit occupation by demographic groups using administrative employer-employee register data from Statistics Norway, combined with administrative data on demographics and education. From the Labor Force Survey (LFS) we identify entry-level jobs and we use information from O*NET[4] to identify the required skill-level/level of preparation in occupations. We also use O*NET to identify remote/telework occupations. Additionally, we compare our job posting data with aggregate data on jobs, hires and separations. These data are extracted from official statistics from Statistics Norway, specifically table 12316: Jobs, job decreases and job increases, by industry division and table 12820: Jobs, hirings and terminated hirings, by sex, age and educational level.[5]

3.1 Variables and definitions

Our main variable of interest is new job postings. It measures total number of postings in a given week. Additionally, we are interested in the dynamics of job postings within and across specific groups based on industry and occupation, age group, educational level and skill requirements.

We define essential occupations and industries as closely as possible to the definitions used by the Norwegian government at the outset of the pandemic. These include: health- and social services, defence, justice and juridical activities, public order and safety, fire service activities, ICT- provision and security, environmental emergency preparedness including meteorological services, supply of essential commodities, electricity and water, and financial services (The Norwegian Directorate for Civil Protection 2017).

Whether an occupation is classified as a remote/telework work occupation – meaning that workers can perform the job from a home office – is based on the recent classification from Dingel and Neiman (2020). They use a range of criteria from O*NET to classify occupations where telework is very likely or not possible. We use their definition and apply them to our data using a crosswalk on occupational codes from SOC to STYRK08 (the Norwegian standard of occupational classification).

Furthermore, we categorize occupations by their educational- and skills requirements. Firstly, we use the first digit in the occupational code to classify whether occupations require education from college/university or higher (1-3) or high school or less (4-9). Secondly, we group occupations into categories based on their skill requirements. We use job-zones from O*NET who group occupations into five categories based on the level of education, experience and training necessary to perform the job. We collapse the two lowest categories “Little or no preparation needed” and “Some preparation needed” and se four different categories: i) Few or no skill requirements, ii) Medium skill requirements, iii) Substantial skill requirements, and iv) Extensive skill requirements.

[4] O*NET: https://www.onetonline.org/
[5] https://www.ssb.no/en/statbank/list/arblonn/

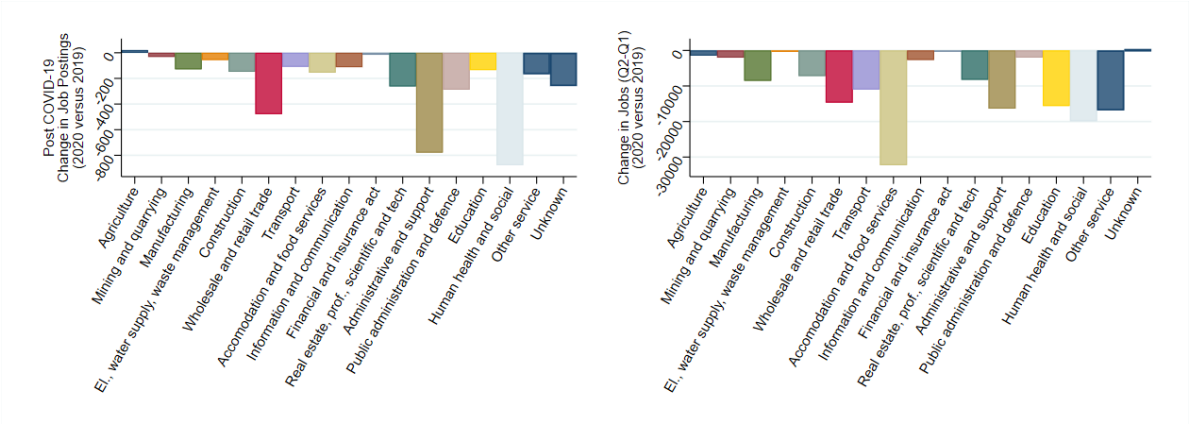
Finally, we define entry-level occupations as the 20 largest and most common occupations among young employees (aged 16-25 years) using the Labor Force Survey and the employer- employee register in 2019. These 20 occupations account for more than 70 percent of the employed in this age-group.[6]

3.2 Data validation

Our data is representative for available official postings for job seekers. However, not all new jobs are new job creations. Job openings are also replacement hiring following quits. In recessions, fewer quit their jobs and fewer job opportunities arise, disrupting the vacancy chain and reducing the opportunities available to unemployed (Mercan & Shoefer 2020). We investigate the validity and relevance of our job posting data as a preview of the state of the labor market, by comparing postings with jobs and hires.

In figure 5 we compare the post COVID-19 change in job postings by industry to the change in number of jobs in these industries using data from Statistics Norway's quarterly employment statistic on jobs, hires and separations. It is clear from the graphs that the post COVID-19 change in postings follows the post COVID-19 decline in jobs closely. One exception is in Accomodation and food services, where the decline in jobs relative to other industries by far exceeds the decline in postings relative to other industries.

Figure 5. Industry distribution of Post COVID-19 declines in job postings and jobs.

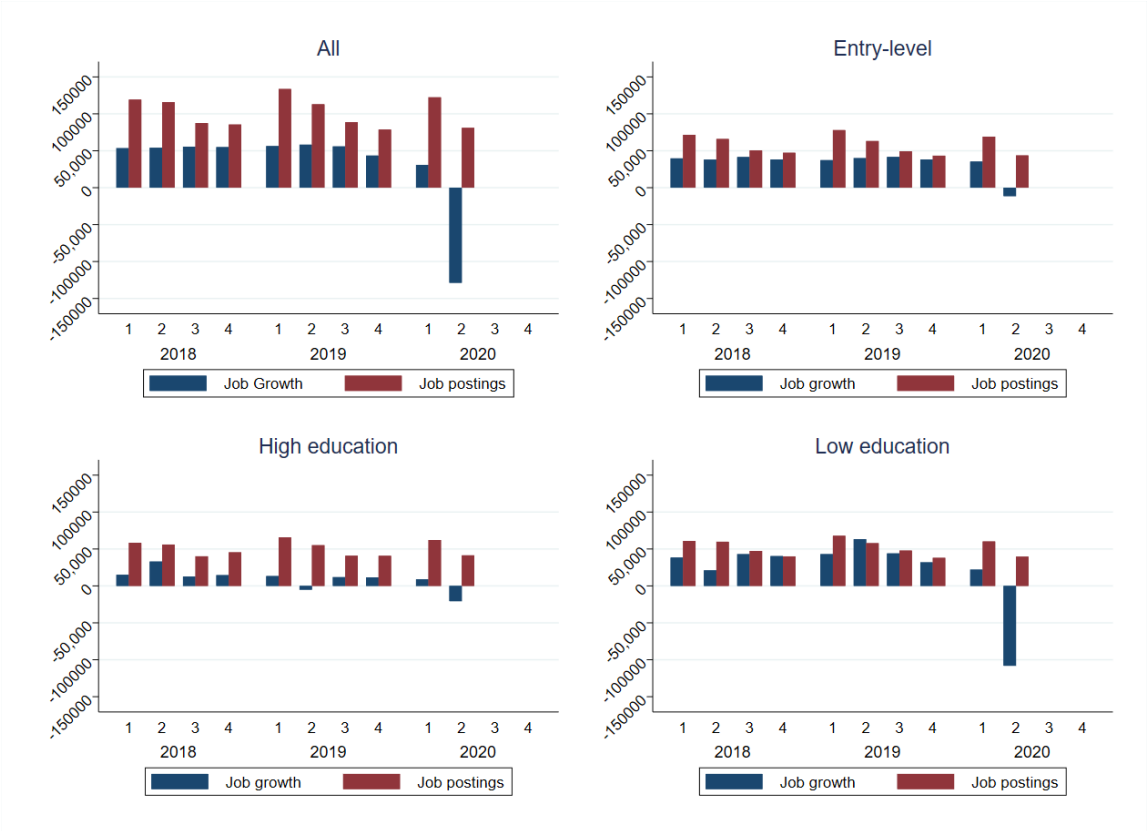


Note: The figure reports difference- in- difference estimates from the following model: $\ln(inflow_{iwt}) = \theta_i Treat \times Post + \gamma_y Treat + \gamma_{iw} + u_{iwt}$. In the specification with job postings, the post-period is defined as week 9-26. The job data is only available on quarterly basis, h-data we only have quarterly data, the post period is defined as but as postings are a predecessor of actual new jobs, the comparison is reasonable despite the small discrepancy in timing. Source: own calculations on data from Statistics Norway table 12316: Jobs, job decreases and job increases, by industry

[6] According to the Labor Force survey of 2019, the 20 largest occupations among 16-25 year olds are: Shops salesperson (522), Personal care workers (532), Child care workers and teachers (531), Waiters and bartenders (513), Electrical and electronics equipment trade workers (741), Nursing and midwifery professionals (222), Building and related trades workers (711), Domestic, hotel and office cleaners (911), Machinery mechanics and repairers (723), Sport and fitness workers (342), Primary school and early childhood teachers (234), Other sales workers (524), Mobile plant operators (834), Material recording and transport clerks (432), Client information workers (422), Protective service workers (541), Cooks (512), Physical and engineering science technicians (311), Software and applications developers and analyst (251), General office clerks (411).

In figure 6 we compare job growth with postings each quarter of each year for four groups in the labor market: among young individuals (under 25 years) and postings in entry-level occupations, job creation among low- and high-skilled individuals and postings in low- and high-skilled occupations. Job growth is defined as total hires minus total separations in each quarter. In our view, the trend in job postings corresponds well to overall job growth for most groups pre COVID-19, except among high skilled. In this group, nearly 75 percent of all hires and separations are job-to-job pre COVID-19, and it is more likely that quitters in this group leave productive jobs that remain open for replacement hires. This indicates that job postings are more likely to be replacements rather than creation of new jobs per se. Among low skilled, nearly 50 percent of all hires and separations were entry or exits to the labor market pre COVID-19. It is more likely that a separation is in fact a destruction of a job, and that a hire is creation of a new job, rather than being reallocation in this group of workers. Therefore, it seems reasonable to view the change in job postings post COVID-19 as a good proxy for labor market growth and future employment possibilities.

Figure 6. Job growth and job postings, per quarter and year.



Note: The figure reports the number of new jobs and new job postings for groups of workers and occupations. Job growth is defined as total hires minus total separations in each quarter. Source: Own calculations on data from Statistics Norway's table 12820: Jobs, hirings and terminated hirings, by sex, age and educational level.

3.3 Summary statistics and descriptive evidence

Table 1 reports descriptive statistics from our dataset from week 2-26 in 2018, 2019 and 2020. The number of postings and posted jobs are lower in 2020 than the two preceding years. The number of low-skilled jobs is slightly higher than the number of high-skilled jobs in a normal year, but in the first half of 2020 the ratio exceed 1 which means that the number of posted high-skilled jobs exceed that of low-skilled.

Table 1: Summary statistics job-postings (week 2-26, 2018-2020)

	2018	**2019**	**2020**
New postings	127 437	133 499	103 205
New posted jobs	227 862	235 790	191 546
Average posted jobs per week	9 494	9 825	7 981
New jobs per posting	1.79	1.77	1.86
High-skilled jobs posted	111 023	115 405	96 763
Low skilled jobs posted	116 839	120 385	94 783
High-to-low-skills posting ratio	0.95	0.96	1.02

Note: Summary statistics are based on new jobs posted in week 2-26. Source: Own calculations on data from NAV.

In order to describe consequences of the COVID-19 outbreak on job postings, we first apply a simple difference in differences regression framework (see e.g., Hensvik et al. 2020, for a similar approach). The unit of observation is week in year. We study job postings in week 2-26 (January through June) in 2020. This is the treatment group, while job postings in the same weeks for 2019 provide the control group.

In our first specification, we implement one post period: After week 8. Then we split the post period into four phases: The first, *pre-lockdown* is from week 8 through week 11. This is the period after the first COVID19 case appeared in Norway until the lock down took effect in week 12. The second period, *lockdown*, goes from the lock down, week 12 through week 16. The third period, reopening phase 1 is weeks 17 through week 20, and the fourth period, reopening phase 2 is the period from week 21 onward.

We estimate variants of equation (1):

$$(1) \qquad \ln(inflow_{wt}) = \sum_{\tau=1}^{4} \theta_\tau Treat \times \tau + \gamma_y Treat + \gamma_w + u_{wt}$$

where *ln(inflow*$_{wt}$) measures log of number of postings per week. Treat is a dummy variable taking the value 1 if the year is 2020, and 0 if it is 2019. Time varies from 0 (pre-COVID) to 4 (re-opening phase 2). The coefficient of main interest is θ_τ, which is the DiD-coefficient measuring the change in posting from pre-COVID to the respective period post COVID, in 2020, compared to 2019.

The results from this exercise are reported in in Table 2 and 3. We document a substantial drop in vacancy posting after the COVID-19 outbreak. The first column in table 2 shows the DiD-result when we compare the differences pre and post the outbreak in week 9 with the differences in 2019. The

DiD-coefficient suggests a reduction in average daily postings of -28.3 log points, or 25 percent. In terms of absolute numbers, the reduction in vacancies amounts to 2352 fewer postings per week in 2020 than in 2019. Colum 2-6 show DiD-coefficients by different periods after the outbreak, all compared to weeks 2-8. During the pre-lockdown period, the reduction was –19.9 log points or 18 percent, during the lockdown period in weeks 12-16, the decline was –51.3 log points or 40 percent, and during the two reopening phases, the decline was 22 and 15 percent, compared to weeks 2-8. Labor demand is slowly recovering towards the summer as schools open, but here is no sign of a boost in job-postings, and we are far from catching up the vacancies lost.

Table 2. The consequences of the pandemic on the daily inflow of vacancies. Difference- in differences estimates

		Phases of the Post COVID-19 period			
	Post COVID-19 (Week 9-26)	**Pre lockdown** (9-11)	**Lockdown** (12-16)	**Reopening, phase 1** (17-20)	**Reopening, phase 2** (21-26)
DiD-estimate	-0.283**	-0.199	-0.513***	-0.251	-0.160
	(0.12)	(0.17)	(0.14)	(0.17)	(0.13)
R-squared	0.45	0.62			
Observations	50	50			

Note: This table reports the DiD-estimates from two sets of regressions. Colum 1 reports the DiD-estimate on the change in vacancy postings after week 9 in 2020, compared to the change in vacancy postings after week 8 in 2019. In column 2-4 we report DiD-coefficients for 4 periods: pre lockdown, lockdown, reopening phase 1 (when pre-schools and 1-4 grades in primary schools opened) and reopening phase 2 (when all schools were open). Pre-COVID-19 (week 2-8) is the pre-period. Significance:* p<0.1 **p<0.05 ***p<0.01

3.4 Job Posting Dynamics by Groups

We know that the pandemic has affected local labor markets differently. Some was impacted directly by lockdown, which reduced product and service demand and thus labor demand for that specific period, while others have been impacted by travel bans and the prevailing social distancing guidelines and still face restrictions in their production of goods and services (restaurants and bars, entertainment and amusement parks, for instance). More indirect effects of the pandemic work through the overall global economic uncertainty, disrupted supply chains and shifts in consumption, for instance among suppliers to industries that are directly affected or as exporters to economies more heavily affected by the pandemic. Additionally, oil production and the supply industry was affected by the economic crisis, the instability in the global economy and declining oil price.

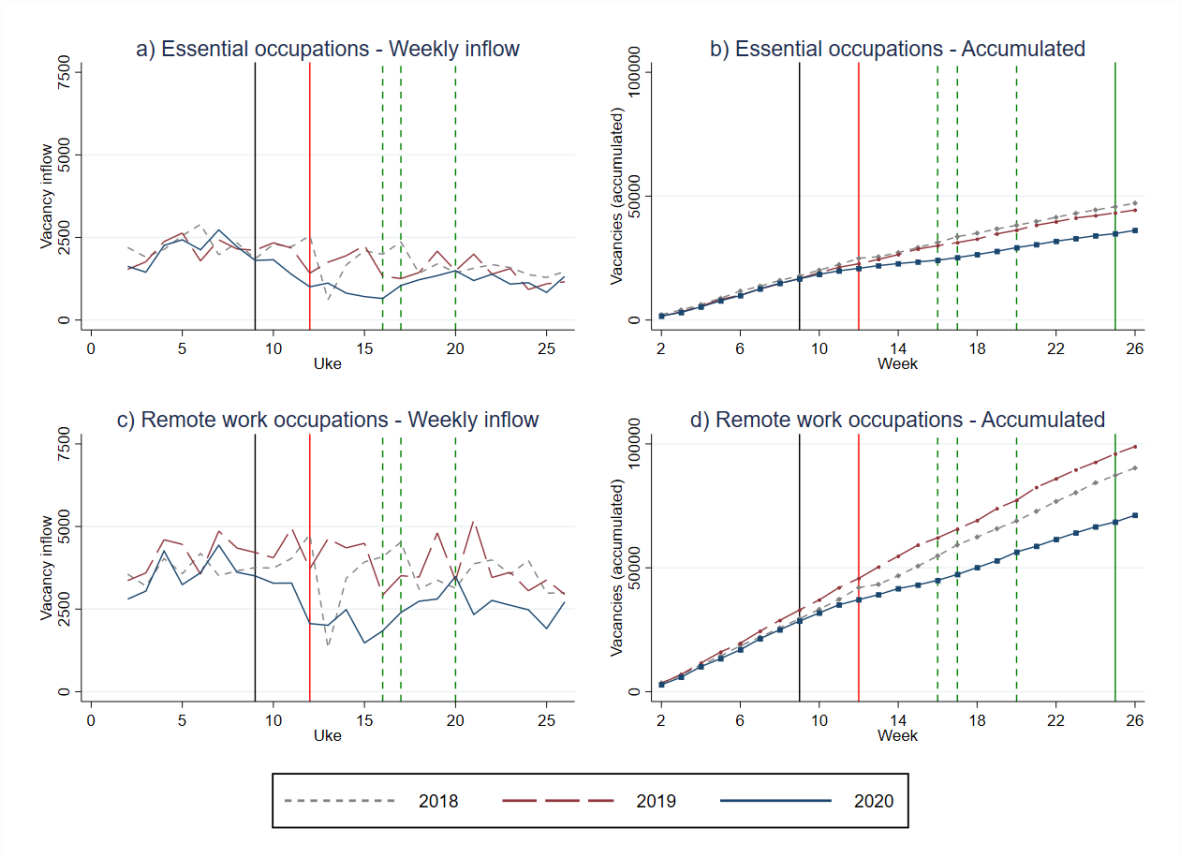
As reported in figure 5 above, all industries except Agriculture, had a decline in number of postings post COVID-19. Travel bans, social distancing and the lockdown hit businesses such as hotels, restaurants and bars, arts and entertainment, and recreation hard. As reported in table A.1 in the appendix, the Accommodation industry had 85 percent decline in job postings after COVID-19, while Wholesale trade had 80 percent decline. These were among the most vulnerable industries post COVID, together with Sports and recreational activities and Advertising and market research. Furthermore, among the most vulnerable occupations we find Hotel and restaurant managers, Waiters and bartenders and Travel attendants. These faced a 65-75 percent decline in job postings

post COVID. The most resilient occupations are Painters, Metal workers and Building workers, Teachers and Gardeners and crop growers. These report an increase in vacancies in the range of 10-70 percent. In terms of absolute number of vacancies, employment agencies[7] is among the industries with the largest decline. As jobs in employment agencies have traditionally been a stepping-stone into employment among young and vulnerable groups of workers (von Simson 2016). The decline in this sector will likely affect these groups in particular.

We showcase the heterogeneity by investigating the job posting dynamics by occupational characteristics. Firstly, certain occupations were deemed essential by the government and others could perform their jobs form home (Dingel and Neiman 2020). Both groups were more protected from a reduction in activity post COVID-19. Figure 7 reports the weekly inflow of job postings in weeks 2-16 in 2018, 2019 and 2020 and the accumulated inflow of job postings in the same period for essential occupations and remote work occupations respectively. Both groups faced a reduction in the inflow of vacancies post COVID-19 and an increase in job postings after the reopening. Remote work occupations are still below the level of job postings in 2018 and 2019, but essential occupations have recovered to nearly the same level as in 2018 and 2019. However, the accumulated numbers reveal that job postings have not rebounded: we had 8 000 fewer postings in essential occupations post COVID-19 in 2020 compared to the same period in 2019, while remote work had 23 000 fewer job postings over the same period. Although remote work occupations to some extent are less exposed to the consequences of the pandemic, a fall in labor demand could reflect the general uncertainty in the economy.

[7] This fall is particularly large among construction workers, who already have a decline in vacancies of nearly 50 percent.

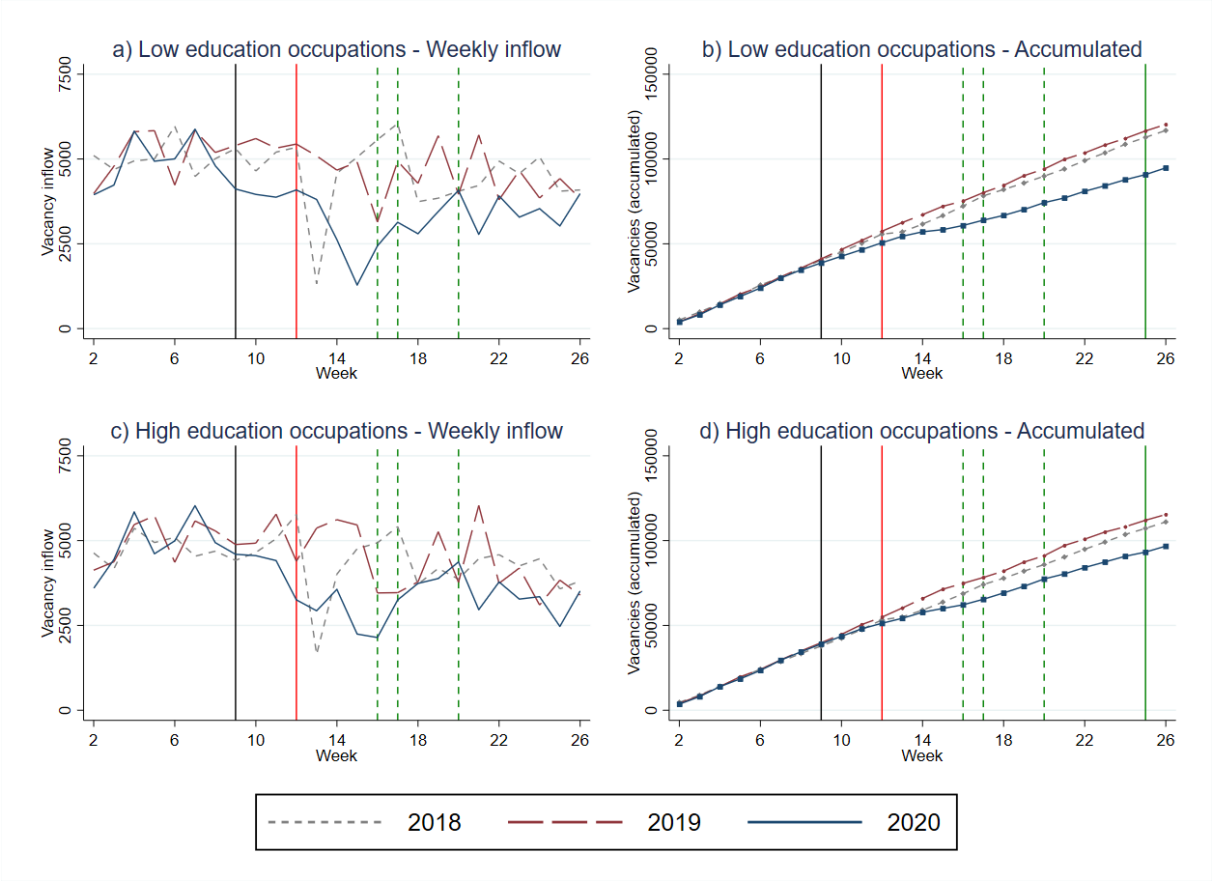
Figure 7. Job Posting Dynamics by Essential and Remote occupations. Weekly inflow and accumulated vacancies.



Note: The figure reports weekly inflow of posting and accumulated job postings for essential occupations defined by the announcement made by the government at the outset of the pandemic, and remote work occupations as defined by Dingel and Neuman (2020).

In figure 8 we split the sample by education. The two upper panels show job posting dynamics for occupations that require education below college level, and the two lower panels for occupations requiring college or higher. Already from the pre-lockdown period we see that vacancies for occupations with lower educational requirements declined much more that the vacancies for occupations requiring higher education. It is also clear that postings for low educated workers declined more during the lockdown period, than postings for higher education. These differences are clearly visible in the graphs displaying accumulated job postings over the whole time period

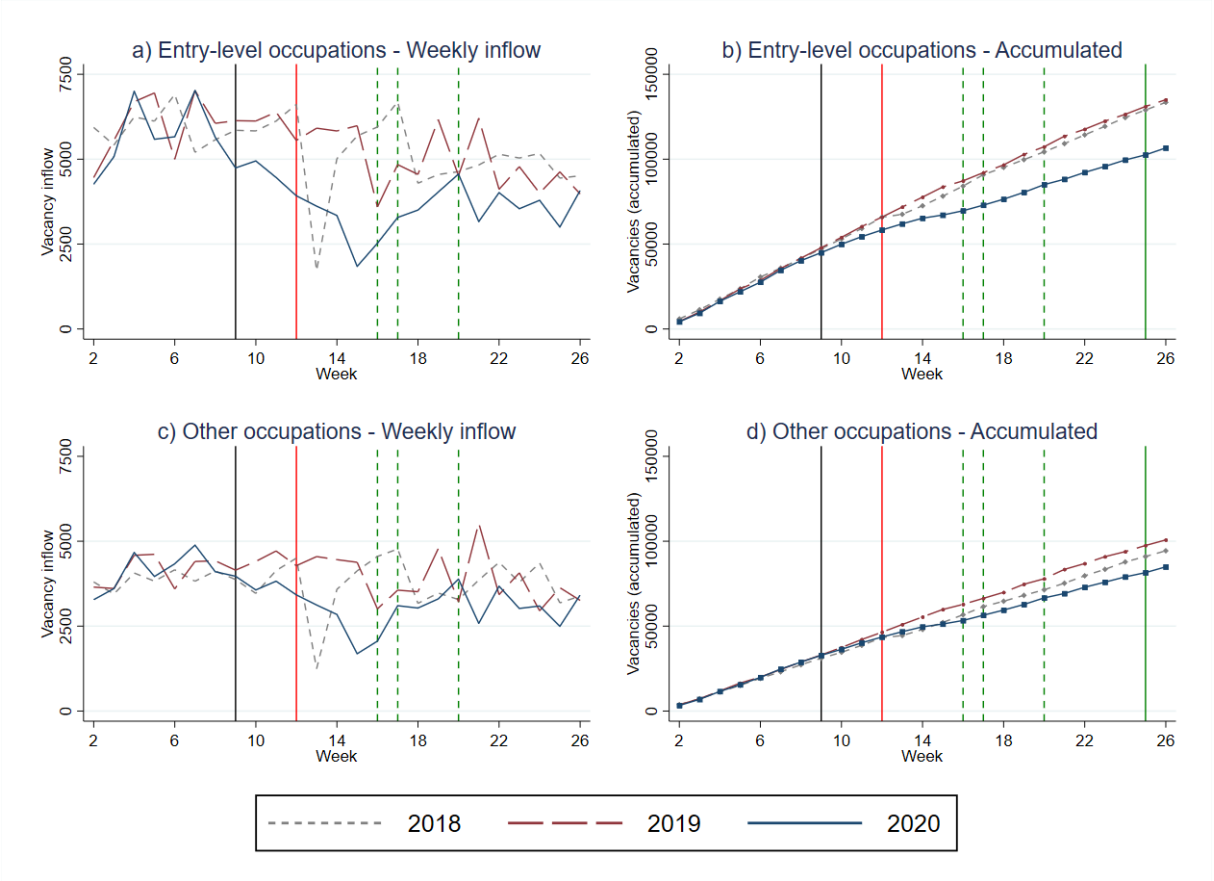
Figure 8. Job Posting Dynamics by Educational Level. Weekly inflow and accumulated vacancies.



Note: The figure reports weekly inflow of posting and accumulated job postings for occupations requiring less than college or college or more, based on the first digit of the occupational code (Low= 4-9, High= 1-3).

Previous studies have shown that young workers are particularly vulnerable to recessions and unemployment (Rothstein 2020, Kahn 2010, Oreopolous et al. 2012, Schwandt and von Wacter 2019, and Raaum and Røed 2006). Next, we consider entry- level occupations, defined as the 20 largest occupations among young workers aged 16-25 years. Already from week 9, post COVID but pre lockdown, we see that vacancies in entry-level occupations are in decline. The reduction in stronger than in other occupations: The post-COVID decline in entry-level occupations is 28 percent, while other occupations declined by 24 percent. When we exclude occupations in health- and care services, the decline in entry-level occupations is at 42 percent (results not shown).

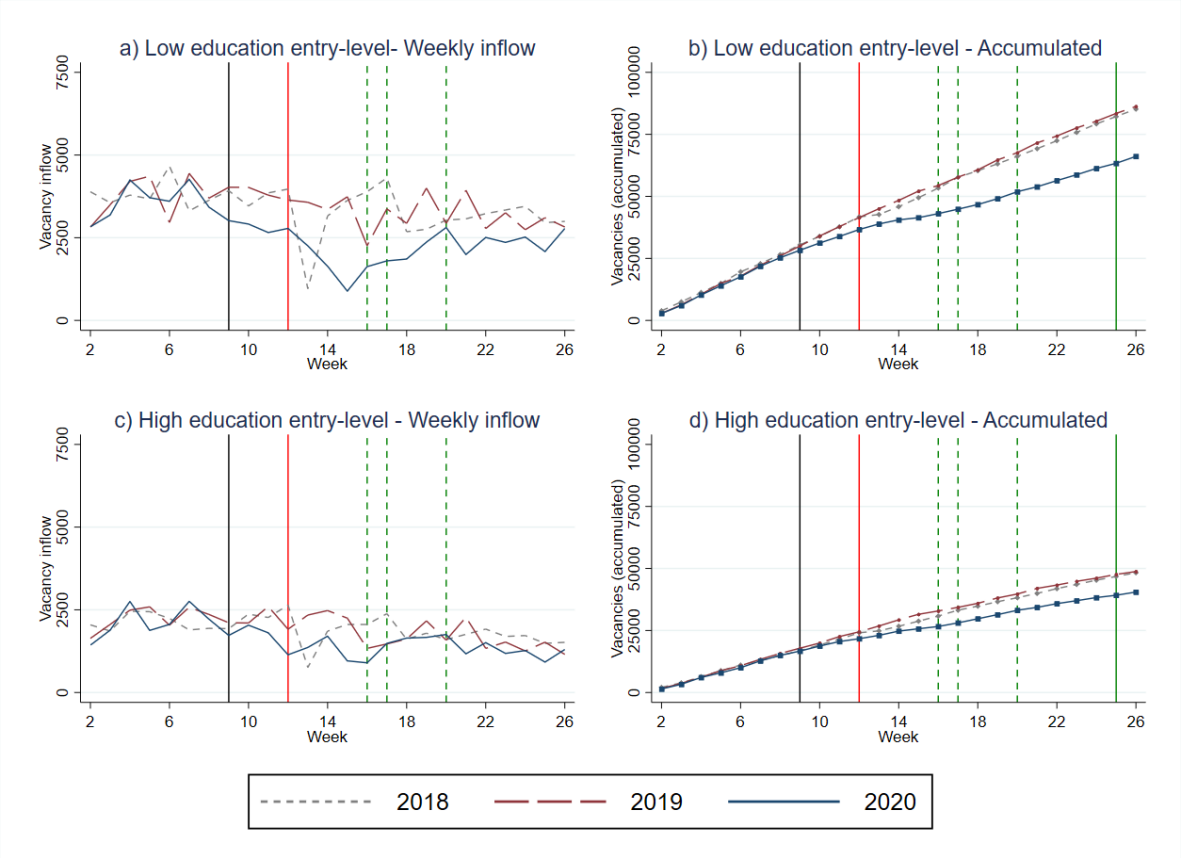
Figure 9. Job Posting Dynamics for Entry Level Occupations. Weekly inflow and accumulated vacancies.



Note: The figure reports weekly inflow of posting and accumulated job postings for occupations at entry-level and other occupations.

In Figure 10, we split the sample of entry-level occupations into those requiring lower education and those requiring higher education. The pattern is clear. Entry occupations requiring lower education took the greatest hit during the first phase of the pandemic.

Figure 10. Job Posting Dynamics for Entry Level Occupations by Educational level. Weekly inflow and accumulated vacancies.

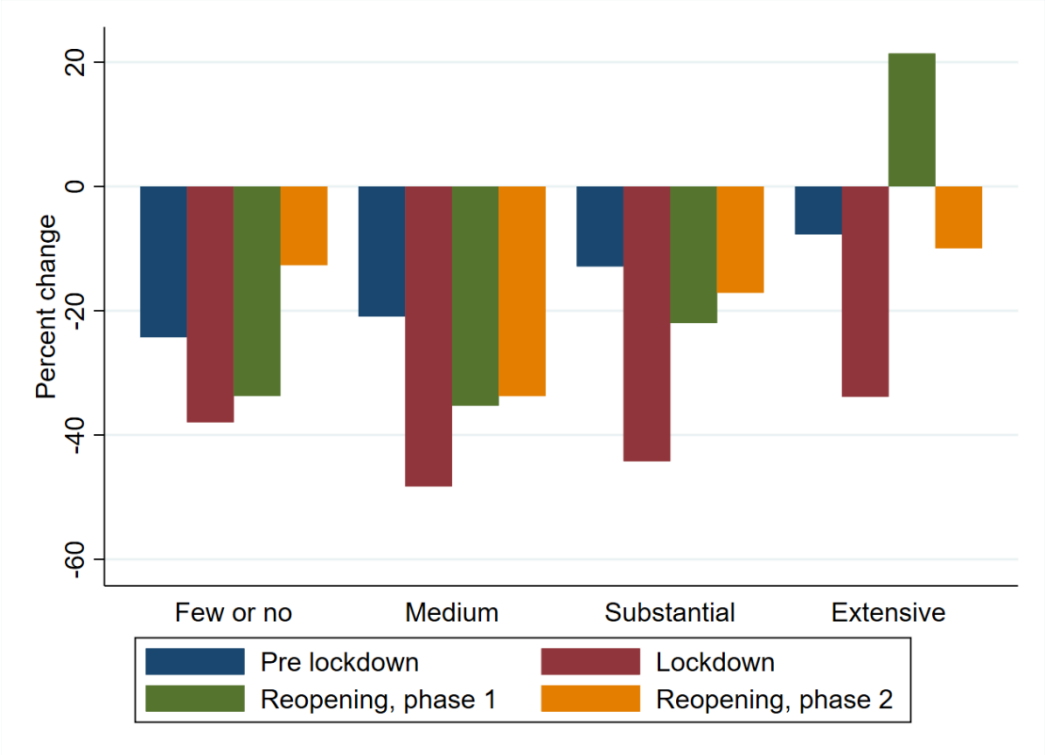


Note: The figure reports weekly inflow of posting and accumulated job postings for entry-level occupations requiring less than college or college or more, based on the first digit of the occupational code (Low= 4-9, High= 1-3).

Occupations that require lower educational levels have a larger decline in job postings than occupations that require high education. Level of education does not necessarily provide us with the information needed in terms of skills and training needed to do the jobs. Following Costa Dias, Keiller, Postel-Vinay and Xu (2020), we use O*NETs classification of job zones as an index of the amount of training a person would need to switch into that occupation. The level of skill requirement on job postings provides us with information on the barriers of employment in the short run for a random unemployed person.

Figure 11 reports the percent change in job posting in the different phases post COVID-19 by skill-group. Three distinct patterns arise. First, occupations with lower or medium skill requirements experience the sharpest decline in job postings after COVID-19. Second, the initial decline is clearly lower in occupations that require substantial or extensive skills, such Teachers or Database and network professionals or Nurses and Medical Doctors. Third, the drop in job postings is concentrated in the weeks of lockdown, but in both phases of reopening, low and medium skilled have the strongest decline in postings. In fact, occupations requiring extensive skills experience an increase in postings (although not significant in this model), which suggests that part of the decline in job postings during the lockdown was in fact postponed and put out on the market after reopening. Our results correspond to evidence from the UK (Costa Dias et al. 2020).

Figure 11. The consequences of the pandemic on the daily inflow of vacancies by skill requirement.



Note: Estimates presented in appendix table A2.

These descriptive evidence point to a heterogeneous impact of COVID-19 on labor demand, where low-educated, low-skilled and young workers and new entrants are facing a less fortunate labor market conditions, which also may have long-run consequences on labor market careers. The rest of the paper focus on the consequences of the COVID-19 pandemic on job opportunities for young workers and workers at entry-level.

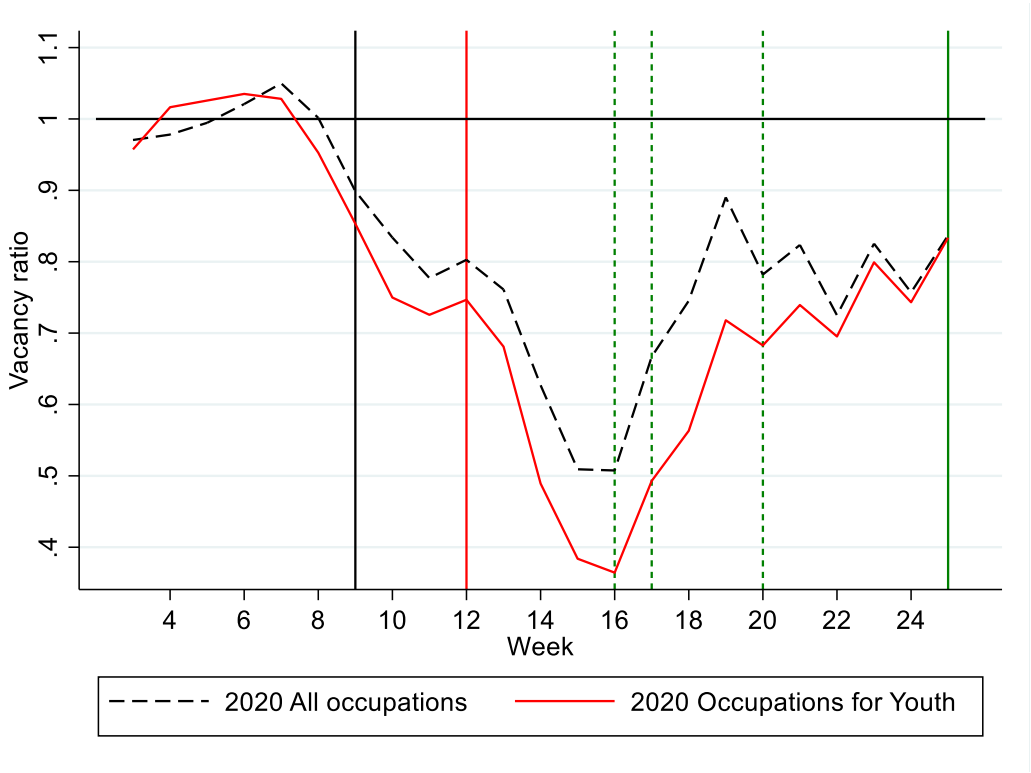
4. Consequences of COVID-19 on young workers and entry-level occupations

In this section, we focus on young workers and entry-level occupations. Both groups are potentially more vulnerable groups, as shown in our initial investigations. Table A3 in the appendix describes the 20 top occupations for workers below 26 years of age, measured in May 2019. The table shows both how important each occupation is for youth employment (employment share among youth), and how important young workers are for each occupation (the share of young in occupation). 76 percent of workers below 26 years of age are employed in these 20 occupations (3-digit level). The largest groups are Shop salespersons, with 23 percent employment share among youth, Health care assistants (11 percent), Pre-school assistants (6 percent), and Waiters and bartenders (4 percent). Young workers comprise 28 percent of Shop salespersons and Other sales, and 27 percent of all Waiters and bartenders.

We illustrate the development of vacancies for young workers by adding up the vacancies in the 20 top occupations for youth, multiplied with the share of young workers in each occupation in 2019, and calculate weekly number of vacancies directed towards young workers as the 3 weeks moving average of the weighted sum. We then calculate the ratio of these vacancies in 2020 compared to the average levels of 2018 and 2019 in the same week.

Figure 12 shows the vacancy ratio for the jobs for youth (red solid line) compared to the vacancy ratio for all occupations (black dashed line). The vacancy ratio is normalized for both groups to the same average pre-pandemic level (weeks 2-8) for 2020 as in the same weeks in 2018 and 2019. The decline in the vacancy ratio from week 8 through week 16 is dramatic. Between 16 and week 19 the vacancy ratio increases and seem to level off at a level of about 0.8 compared to 2018 and 2019 from week 20 onwards. Vacancies in jobs for youth declined substantially more between weeks 8-11 and 12-20 relative to 2018 and 2019, than vacancies for all jobs.

Figure 12. Vacancy ratios. 2020 over 2018 and 2019. Jobs for youth and all occupations.



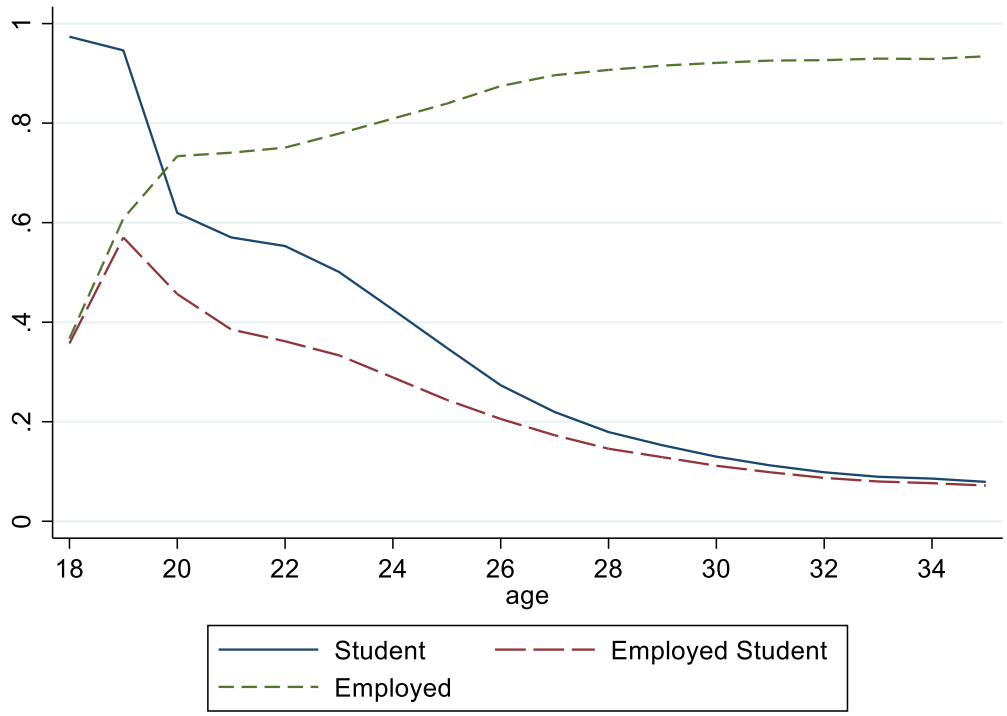
Note: The ratio of weekly vacancies (3 weeks moving average) in 2020 over the average weekly number of vacancies in 2018 and 2019. Normalized by average ratio in weeks 2-8 (pre-pandemic). Occupations for Youth are the top 20 occupations in terms employment share among youth. Vacancies for youth are calculated as the job postings for the top 20 youth multiplied with the share of youth in each occupation.

4.1 Entry-level jobs versus student jobs

In Norway, as in other Nordic countries, young people are likely to work even if their main activity is being a student. Jobs for youth thus comprise both pre- and post graduation jobs. In figure 13 the dashed green line shows the employment rate in the population by age for the population below 26 years of age during May 2019. The solid blue line shows the share of population who were registered as students in October 2018. The red long-dashed line shows the share of the population who were

both employed and students. Even if some of the students may have dropped out between October 2018 and May 2019, the figure clearly shows that a majority of students are also employed.

Figure 13. Employment ratios, students, and employed students by age.



Note: Employment is registered employment during May 2019, while student status is registered status as a student per the 10 th of October 2018. Calculated on register data.

To sort out the impact of the pandemic on student jobs and post-graduate jobs for those with college or more and for those without college, as their highest attained education, we pick the top 20 jobs for each group as we did for youth, and present similar calculations for each group.

In tables A4-A6 in the appendix shows both how important each occupation is for youth employment (employment share among each group), and how important each group is for each occupation (the share of each group in the occupation).

Consider students first. The occupations they work in are similar to the occupations for all youth. At the top we find 27 percent of the students as shop salespersons, 14 as health care assistants, and 5 percent as pre-school assistants. Students make up more than 20 percent of the workforce among shop salespersons and waiters and bartenders.

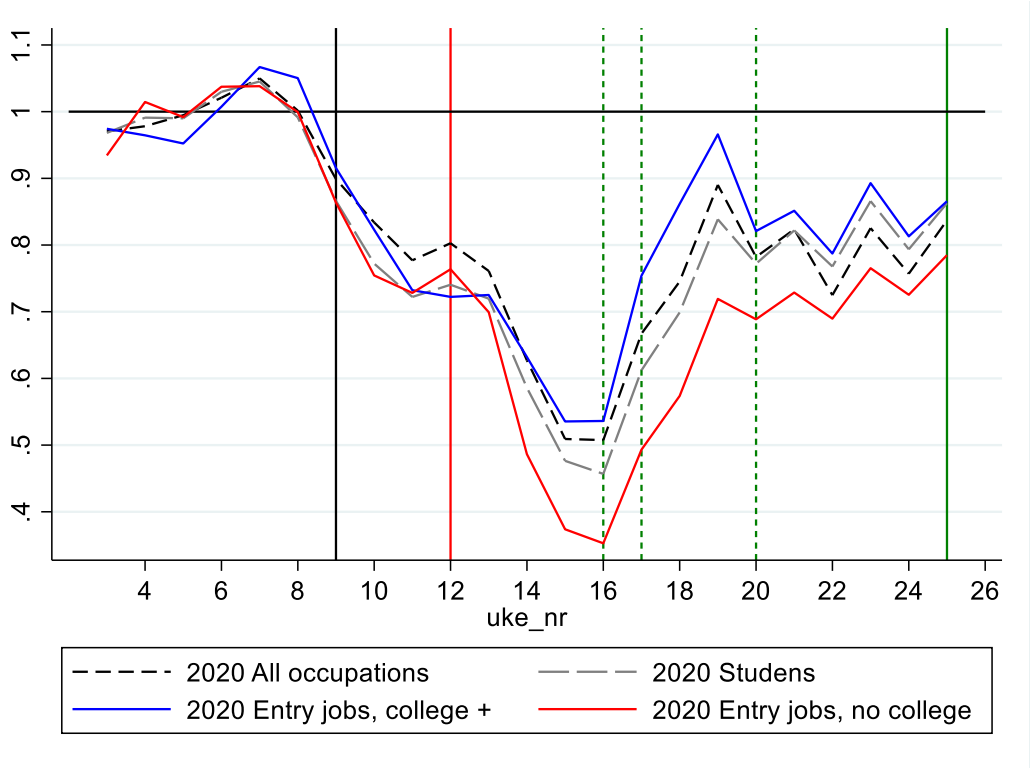
For individuals without a college degree, a similar pattern emerges for their *entry jobs* - defined as *the main job in May 2019 for those who graduated in 2018*. Table A5 shows that 15 percent of the first jobs after graduation are as shop salespersons, 8 percent both for health care workers and for building frame workers. Entrants with lower education comprise a smaller part of the workforce than students. Top occupations are other sales and shop salesperson, with 5-6 percent new entrants.

Entrants with a college degree or more are in a different set of occupations. The largest occupations in terms of employment share are primary school teachers and nurses, plus the two large groups for

all youth: shop sales persons and health care assistants (7 and 6 percent). Entrants comprise 29 percent of the workforce among university teachers, and 22 percent of shop salespersons and waiters and bartenders.

Figure 14 shows the vacancy ratio during the pandemic for all three types of jobs: Student jobs, and entry jobs for non-college and entry-jobs for college- and university graduates. The picture is clear. Entrants without a college degree (red solid line) were hit harder, then come students (grey long-dashed line), while entry jobs for graduates from college or university (blue solid line) were less affected than the average job posting in the economy (black dashed line).

Figure 14. Vacancy ratios Students and Entry Jobs (first job after graduation).



Note: The ratio of weekly vacancies (3 weeks moving average) in 2020 over the average weekly number of vacancies in 2018 and 2019. Normalized by average ratio in weeks 2-8 (pre-pandemic). Student occupations are the top 20 occupations in May 2019 for those who were registered as student in October 2018. Entry jobs are the top 20 occupations in terms employment share among the first job after graduation for individuals in 2019 who graduated in 2018.

4.2 Prime age workers

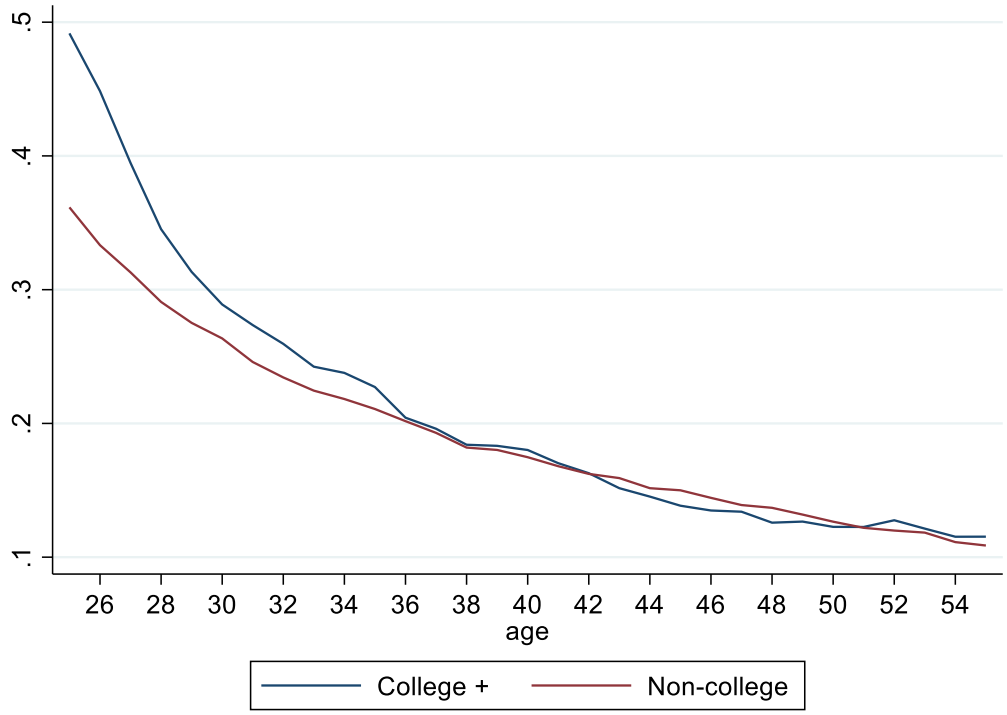
Consider next prime age workers (age 25-54). We split the population in two by highest attained level of education: Those with college or university education versus those without. Table A6 in the appendix shows top 20 occupations for prime age workers with less than college education. Also for this group, health care assistants, shop salespersons, and pre-school assistant are at the very top, but for prime age workers they comprise only 7, 6 and 5 percent of all jobs that are available. Prime age workers are more dispersed across occupations, and while the top 20 occupations for youth covers 76 percent of all youth employment, the top 20 occupations for prime age workers with lower

education covers 58 percent of total employment. Since this group of workers is large, it covers a large share of employment in each occupation, above 50 percent for a majority.

The top 20 occupations for prime age workers with higher education is presented in Table A7 in the appendix. The top three are primary school teachers, nurses, and administration professionals, covering 9, 9, and 7 percent of all jobs available. The top 20 occupations covers 68 percent of all available jobs.

We know that prime age workers have more stable jobs and do less job-to-job transitions than younger workers. They are thus less vulnerable to the demands in the labor market. Figure 15 shows the share of prime age workers who got a new job between 2018 and 2019, measured as workers in May 2019 who were not employed with the same employer in May 2018. The share of workers who are in a new job declines dramatically between 25 and 35 years of age, with those workers who most recently finished their education (College +) with the larger share, and declines slowly but steadily towards the age of 55. Table A5 and A6 shows the share of workers in the top prime age occupations who are newcomers, and thus most recently were in the labor market.

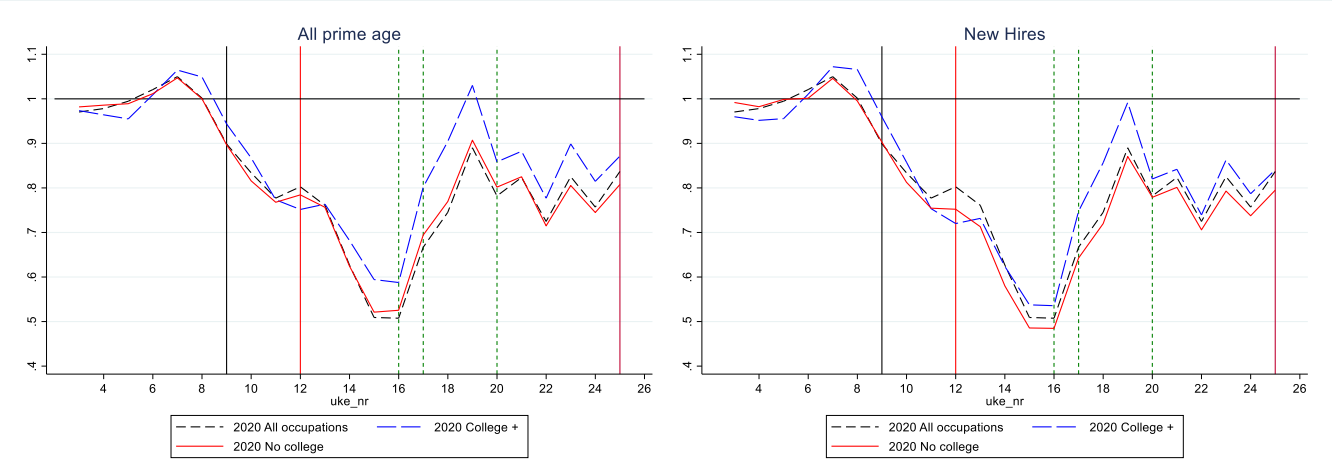
Figure 15. New Hires by Age and Education



Note: Share of employees in May 2019 not employed by the same employer in May 2018.

We have calculated the occupations for prime age newcomers in the same way as for the other groups, and show the development of these jobs in the right panel of Figure 16. The left panel shows the development of the vacancy ratio for prime age workers.

Figure 16. Jobs for Prime Age Workers. All Prime Age and New Hires by Education.



Note: Vacancy ratios in 2020 for the top 20 occupations for Prime Age workers (25-55) and top 20 for prime age workers not employed with the same employer one year before. Occupations for prime age workers are the top 20 occupations in terms employment share among prime age workers. Vacancies are calculated as the job postings for the top 20 primary jobs multiplied with the share of prime age workers in each occupation. New jobs are defined as jobs in May 2019 for prime age workers who were not employed by the same employer in 2018, and top 20 occupations and vacancy postings are calculated in the same manner as for prime age workers.

Two observations stand out. First, jobs for prime age workers were less hit than the average workers, in particular the high educated workers saw a smaller decline. This observation is consistent with the previous observation that young workers were harder hit. Second, jobs for new hires among prime age workers saw a very similar development as jobs for all prime age workers.

4.3 Effects on occupations for youth, entrants, prime age workers, and newcomers

In this section we report difference in difference estimates of the effects of the pandemic on occupations relevant for different groups of workers. The unit of observation is occupation times week. Again, we study job postings in week 2-26 (January through June) in 2020, while job postings in the same weeks for 2018 and 2019 provide our reference group.

We add up the inflow of new job postings per occupation and week. For each group, for instance young workers, we multiply the number of job postings in a particular occupation $(inflow_{\omega t})$, with the employment share of young workers within that occupation in 2019, $\alpha_{g\omega}$, so that the inflow of job postings for each group g from occupation ω in week t is calculated as $J_{g\omega t} = \alpha_{gw} inflow_{\omega t}$.

Job vacancies in 2020 is the treatment group (Treat). We let the post period consist of four periods: The first, *pre-lockdown* (Treat1) is from week 8 through week 11 during 2020. This is the period after the first COVID19 case appeared in Norway until the lock down took effect in week 12. The second period, *lockdown (*Treat2), goes from the lock down until the end of reopening of 1-4th grade classes and pre-schools, weeks 12 through week 16. The third period, reopening phase 1 (Treat3) is weeks 17 through week 20, and the fourth period, reopening phase 2 (Treat4) is the period from week 21 onward, after the opening of upper secondary schooling as well. We consider the difference between

the treatment periods and the *pre-pandemic* period, weeks 2-7, and compare it to the same difference in 2018 and 2019, allowing for common week and (moving) holiday effects.

The specification is run separately for each group, and take the following form: (2)

$$\ln(J_{\omega t}) = \sum_{\tau=1}^{4} \theta_\tau Treat\tau + \gamma_y Treat + \gamma_w + \gamma_m + b_\omega + u_{\omega t}$$

The coefficients of main interest are θ_τ, which are the DiD-coefficients measuring the difference in posting from weeks 2-7 to the treatment periods in 2020, compared to 2018 and 2019. Since the treatment periods encompass all weeks after week 8, γ_y captures the difference in the pre-pandemic period in 2020 relative to the same period of the reference years, γ_w and γ_m represent common week effects for each week 2-26, and moving holiday effects, where we distinguish between the easter-week and other single moving holidays, whereas b_ω represents fixed occupation effects.

Table 3. Job postings, all occupations and occupations for youth and students. Diff-in-diff estimates.

	All Occupations	Youth	Students
Pre-lockdown (weeks 9-11)	-0.121**	-0.224***	-0.153*
	(0.048)	(0.082)	(0.092)
Lockdown (weeks 12-16)	-0.512***	-0.865***	-0.731***
	(0.041)	(0.070)	(0.078)
Reopening Phase 1 (weeks 17-20)	-0.441***	-0.691***	-0.615***
	(0.045)	(0.077)	(0.087)
Reopening Phase 2 (weeks 21-26)	-0.250***	-0.343***	-0.348***
	(0.039)	(0.063)	(0.071)
Moving Holidays	-0.298***	-0.258***	-0.236***
	(0.025)	(0.043)	(0.048)
Easter Holiday	-0.705***	-1.007***	-0.933***
	(0.041)	(0.070)	(0.079)
Year 2020 (*pre pandemic* weeks 2-8)	0.034	-0.071	0.007
	(0.026)	(0.044)	(0.050)
No Observations	8403	1499	1496

Note: Coefficients from Model (2) above. The models also include a dummy for each week and occupation fixed effects. Student and Youth are defined as top 20 occupations for each group, weighted by the share of each group in each occupation. Significance *** p<0.01, ** p<0.05, * p<0.1

The decline in job postings started at once when the pandemic struck. Column 1 of Table 3 shows that for all occupations, job postings saw an excess decline in job postings of 11.4 percent (-12.1 log points) during the *pre-lockdown* weeks since the *pre pandemic* weeks of 2020, compared to the same

weeks in 2018 and 2019. During the lock down weeks, the excess decline in job postings was 40 percent (-51.2 log points), while during the subsequent reopening phases it was 36 and 22 percent (-44.1 and -25 log points).

Jobs for youth were hit harder. All treatment periods show larger declines. During the lockdown period, excess decline in jobs for youth was 58 percent (-86.5 log points), and during the reopening phases it remained higher at 50 and 29 percent. The picture for student jobs shows a similar picture as for jobs for youth.

The results in Table 3 shows the average decline during the different pandemic periods of 2020. To show the underlying pattern and development over time "hidden" in the average treatment effects, we have also run specifications with indicators per week into 2020. Appendix Figures A4a-c display the estimated coefficients for each week throughout 2020. The reference period (the 0 line) is the average pre-pandemic level of weeks 2-8, adjusted to align with the average levels of 2018 and 2019. The pattern aligns with the pattern displayed for the moving averages above. The decline starts from week 8 to week 9 and continues to fall dramatically to week 16 after which it start picking up again, and then levelling out after week 20. Adjustments for holidays and weekly patterns did not change this picture, and the effects appear even more dramatic in these pictures compared to the moving averages of displayed above.

Consider next the entry jobs in table 4. These are the top 20 occupations for the first job after graduation of the highest attained level of education. Entry jobs were hit more than all jobs. The decline for entry jobs for low education is somewhat larger than the decline for higher education, 56 versus 54 percent during the lockdown period, and 49 versus 38 percent during the first reopening phase.

Table 4. Job postings. Entry jobs (first job after completed highest education). Diff-in-diff estimates.

	Less than college	College +
Pre-lockdown (weeks 9-11)	-0.239***	-0.181***
	(0.077)	(0.063)
Lockdown (weeks 12-16)	-0.827***	-0.767***
	(0.065)	(0.054)
Reopening Phase 1 (weeks 17-20)	-0.675***	-0.484***
	(0.073)	(0.060)
Reopening Phase 2 (weeks 21-26)	-0.310***	-0.353***
	(0.059)	(0.048)
Moving Holidays	-0.295***	-0.284***
	(0.040)	(0.033)
Eastern Holiday	-1.011***	-0.737***
	(0.065)	(0.054)
Year 2020 (i.e. weeks 2-8)	-0.095**	-0.004
	(0.041)	(0.034)
Observations	1499	1500

Note: Coefficients from Model (2) above. The models also include a dummy for each week and occupation fixed effects. Entry jobs are defined as the top 20 entry occupations (main job in May the year following graduation) for each education group, weighted by the share of each group in each occupation. Significance *** p<0.01, ** p<0.05, * p<0.1

The results for prime age workers in table 5 show considerably smaller declines, and with a higher skills-divide across occupations for different levels of education. Occupations for prime age workers with education below college (college +) saw an excess decline of 44 (39) percent during the lock down period, and an excess decline of 30 (21) during the lats phase of reopening. Again, the average pattern for the two treatment periods hides a steady decline from week 8 onwards through week 16, rises somewhat again, and levels off after week 20 (appendix figure A6b)).

New jobs, however, the top occupations for job-changers, were hit harder than all jobs for prime age workers, with a decline of 50 and 43 percent during the lockdown period, depending on the level of education.

Table 5. Job postings. Prime age occupations and new jobs by education. Diff-in-diff estimates.

	Education less than college		College +	
	All Prime age	New jobs	All Prime age	New jobs
Pre-lockdown (weeks 9-11)	-0.189***	-0.196***	-0.160**	-0.164***
	(0.059)	(0.066)	(0.065)	(0.060)
Lockdown (weeks 12-16)	-0.585***	-0.689***	-0.490***	-0.567***
	(0.050)	(0.056)	(0.055)	(0.051)
Reopening Phase 1 (weeks 17-20)	-0.385***	-0.502***	-0.298***	-0.316***
	(0.056)	(0.063)	(0.061)	(0.056)
Reopening Phase 2 (weeks 21-26)	-0.352***	-0.373***	-0.241***	-0.254***
	(0.045)	(0.051)	(0.050)	(0.046)
Moving Holidays	-0.272***	-0.290***	-0.306***	-0.292***
	(0.031)	(0.035)	(0.034)	(0.031)
Eastern Holiday	-0.771***	-0.782***	-0.675***	-0.707***
	(0.050)	(0.056)	(0.055)	(0.051)
Year 2020 (i.e. weeks 2-8)	-0.046	0.010	-0.047	-0.004
	(0.032)	(0.036)	(0.035)	(0.032)
Observations	1500	1500	1500	1500

Note: Coefficients from Model (2) above. The models also include a dummy for each week and occupation fixed effects. New jobs are defined as workers in one year (May) who were not employed by the same employer in May the previous year. Prime age jobs for each group are weighted by the share of each group in each occupation. Significance *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion

The number of job postings fell dramatically after the introduction of lock down policies on March 12th. The number of job postings declined by 40 percent during the lock-down period from week 12 to week 16, compared to the number of job postings in the pre-pandemic period (weeks 2-8). However, there were strong signs of a decline starting already when the pandemic reached Norway, with a decline of 11 percent in weeks 9-11 compared to the pre-pandemic period. During the two re-opening phases in the spring of 2020, the number of job postings remained at -22 and -15 percent of the pre-pandemic level.

The number of job postings declined even in essential occupations during the lock down period, but the essential occupations eventually reached a level close to its pre-pandemic level during the reopening phases. Remote work occupations, on the other hand, were hit more severely, and did not recover during the re-opening phases.

In the short run, fewer new jobs also means that workers and the unemployed get fewer opportunities and have bleaker prospects, and this may induce more caution in consumer spending, possibly adding to the recession. New hires fulfil at least two roles. On the one hand, it is the key ingredient in net job creation and a recovery of the economy. On the other hand, it is a key ingredient to job-to-job flows that allows workers to advance their career or re-bounce after a negative shock and firms to shrink, expand, and reallocate their labor. Job-to-job flows is an important part of the "greasing of the wheel" in the economy and smooths reallocation towards productivity growth and structural change.

There are systematic differences in the education and skills requirements of occupations that were more or less affected by the crisis. Even if the decline in job postings hit both occupations requiring higher and lower levels of education, the decline was much more dramatic among occupations that do not require higher education. Also, jobs with fewer qualification and trainings requirements were hit harder than jobs with higher qualification and training requirements. This implies that jobs with lower barriers to entry have become scarcer, potentially detrimental for young people, and then particularly for young people with lower education.

A key result in this study is that jobs for the young were hit harder than other jobs. This is particularly unfortunate since the well-established "scarring effect" implies that youth entering the labor market under less fortunate conditions may face negative consequences in the labor market also in the long run. During the lockdown period, the decline in job postings for youth was 45 percent higher than for all occupations (58 versus 40 percent of pre-pandemic levels) for all occupations, and during the reopening phases it was 39 (50 vs. 36) and 32 (29 vs. 22) percent higher. The accumulated number of vacancies lost remains high. Similar numbers are obtained for jobs for students, which comprise a large part of the jobs for youth.

The first job after completed education is of special importance. This is the entry to their future careers. Entry jobs were hit particularly hard during the pandemic. We split the sample into entry jobs for youth who did not go on to college or university versus entry jobs for youth who completed college or more. Entry jobs for low education graduates took the largest hit. During the pre-lockdown period, job postings in these occupations dropped by 21 percent, and during the lockdown period the decline was 56 percent, while during re-opening phase 1 it was 49 percent. For entry jobs for college or university graduates, the pre-lock down decline was 17 percent and in the following two pandemic periods it was 54 and 38 percent respectively.

Jobs for prime age workers were less affected by the pandemic, again with an educational divide to the advantage of high education. However, new jobs also for prime age workers, measured as typical jobs with less than one year of seniority, were hit more severely than all jobs for prime age workers.

The fact that low-skilled jobs and new jobs take a higher toll, tends to increase inequality. Unfortunately, since jobs for young people, and in particular entry jobs after graduation for youth with lower education, takes the highest toll, the COVID-19 pandemic may have long lasting effects for the cohorts affected. How detrimental this eventually turns out, will depend on the implementation of successful policies targeting these worker groups.

References

Alstadsæter, A., B. Bratsberg G Eielsen, W Kopczuk, S Markussen, O Raaum, Knut Røed (2020) The first weeks of the corona virus crises: Who got hit, when and why? Evidence from Norway NBER Working Paper 27131

Campello, M., Kankanhalli, G., Muthukrishnan, P. (2020), Corporate hiring under COVID-19: labor market concentration, downskilling, and income inequality. Working Paper 27208. National Bureau of Economic Research.

Costa, M. D., Keiller, A.N., Postel-Vinay, F. & Xu, X. (2020). *Job vacancies during the Covid-19 pandemic.* IFS Briefing Note BN 289. The Institute for Fiscal Studies.

Dingel, J.I. & Neiman, B. (2020). *How Many Jobs Can be Done at Home? Journal of Public Economics*, 189, doi: https://doi.org/10.1016/j.jpubeco.2020.104235.

Forsythe, E., Kahn, L.B., Lange, F., & Wiczer D. (2020). Labor demand in the time of COVID-19: Evidence from vacancy postings and UI claims. *Journal of Public Economics*, vol (189), doi: https://doi.org/10.1016/j.jpubeco.2020.104238.

Gjerde, A., M Engel Jensen, J Sørbø (2020), Den store nedstengningen. Arbeidsmarkedet gjennom koronakrisen og scenarier for utviklingen fremover, Arbeid og velferd nr.2-2020

Hensvik, L., Barbanchon, T. L. & Rathelot, R. (2020). *Job Search during the COVID-19 Crisis.* IZA DP No. 13237.

Holgersen, H., Jia, Z, & Svenkerud, S. (2020). *Labor Demand During the COVID-19 Crisis in Norway: Evidence From Vacancy Posting Data* (Working Paper, July 29, 2020). Tilgjengelig på SSRN: https://ssrn.com/abstract=3663479 or http://dx.doi.org/10.2139/ssrn.3663479

Kahn, L B (2010), "The Long-term Labor Market Consequences of Graduating from College in a Bad Economy", *Labor Economics* 17(2): 303-316.

Major, L. E., A Eyles, S Machin (2020), Generation COVID: Emerging work and education inequalities. Centre for Economic performance (Paper No.011)

Mercan, Y and B Shoefer 2020 "Jobs and matches: Quits, replacement hiring, and vacancy chains" *American Economic Review: Insights*, Vol(2):101-124

OECD (2016), *Society at a glance*, OECD, Paris.

Oreopoulos, P, T von Wachter, and A Heisz (2012), "The Short-and Long-term Career Effects of Graduating in a Recession", *American Economic Journal: Applied Economics* 4(1): 1-29.

Raaum, O and K Røed (2006)., “Do Business Cycle Conditions at the Time of Labor Market Entry Affect Future Employment Prospects?”, *The Review of Economics and Statistic*s 88(2): 193-210.

Rothstein, (2020), The lost generation? Labor market outcomes for post great recession entrants. NBER WP 27516.

Schwandt, H., and T von Wachtel (2019), Unlucky Cohorts: Estimating the Long-Term Effects of Entering the Labor Market in a Recession in Large Cross-Sectional Data Sets. Journal of Labor Economics, 37: S162-S198.

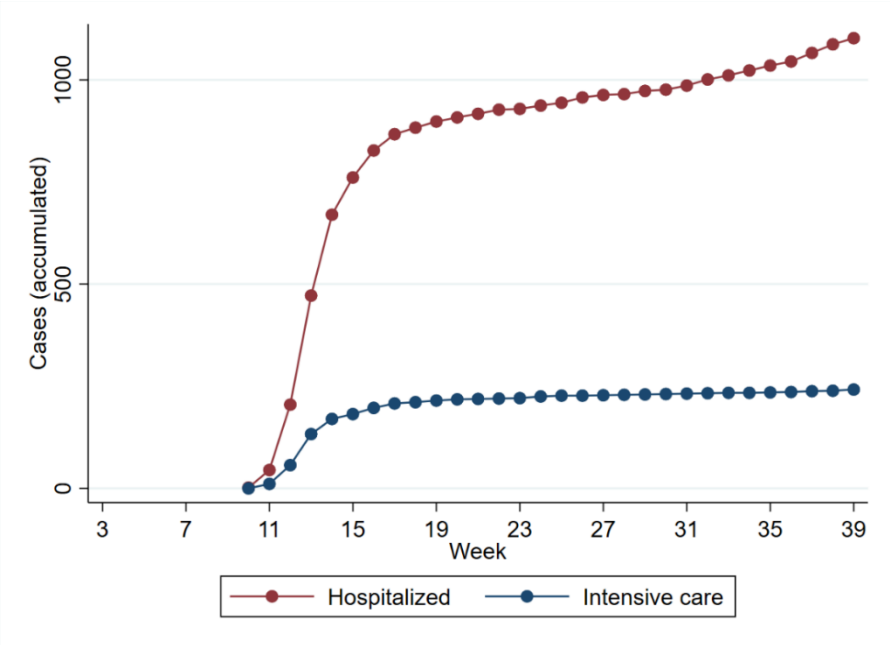
The Norwegian Directorate for Civil Protection (2017). *Vital functions in society*.https://www.dsb.no/rapporter-og-evalueringer/vital-functions-in-society/

von Simson, K. (2016). Effekten av arbeidsmarkedstiltak og vikarbyråarbeid på overgang til jobb og utdanning for arbeidsledig ungdom uten fullført videregående skole. *Søkelys på arbeidslivet*. *33*(3), s 247- 268 .doi: 10.18261/issn.1504-7989-2016-03-04

Appendix

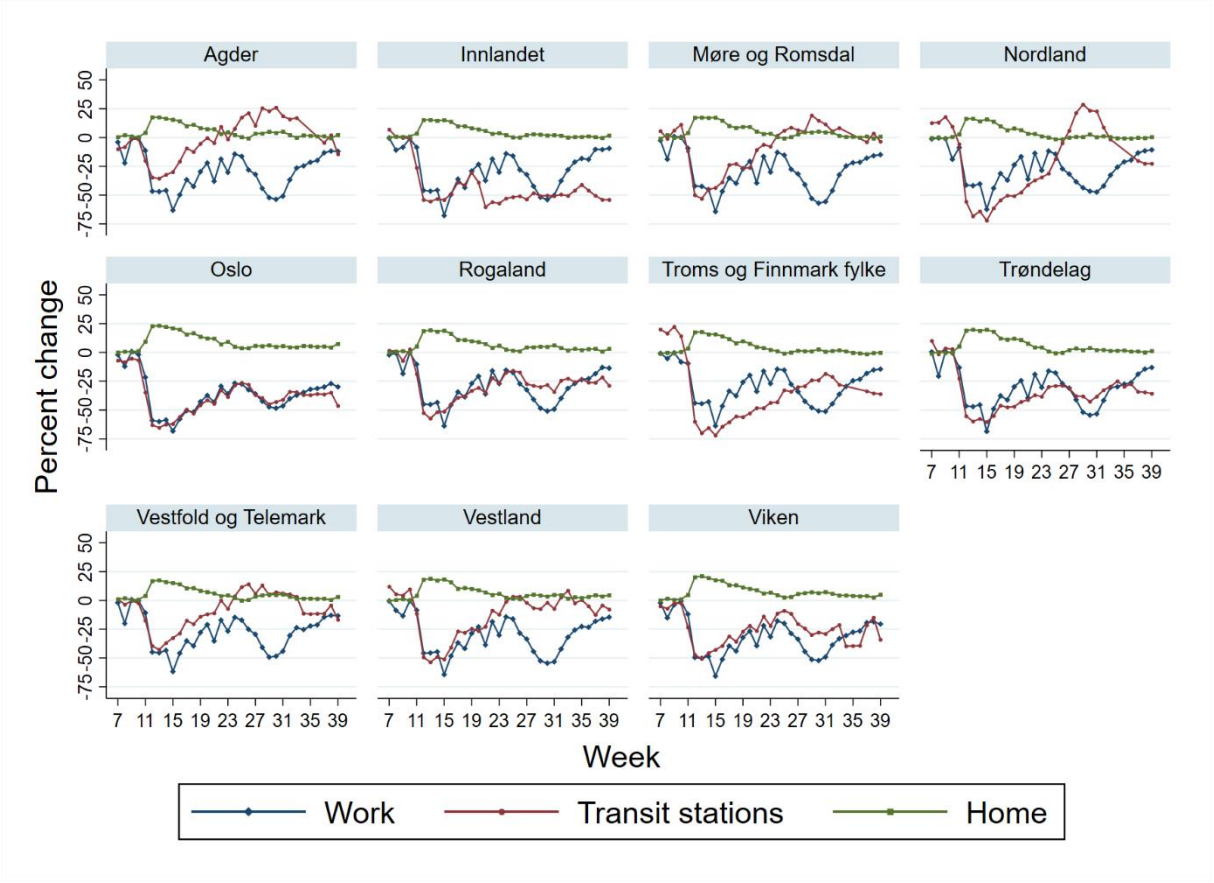
A.1. COVID-19 infection rates, mobility, jobs and job postings.

Figure A1. Number of hospitalizations and intensive care patients in Norway by week of testing (2020).



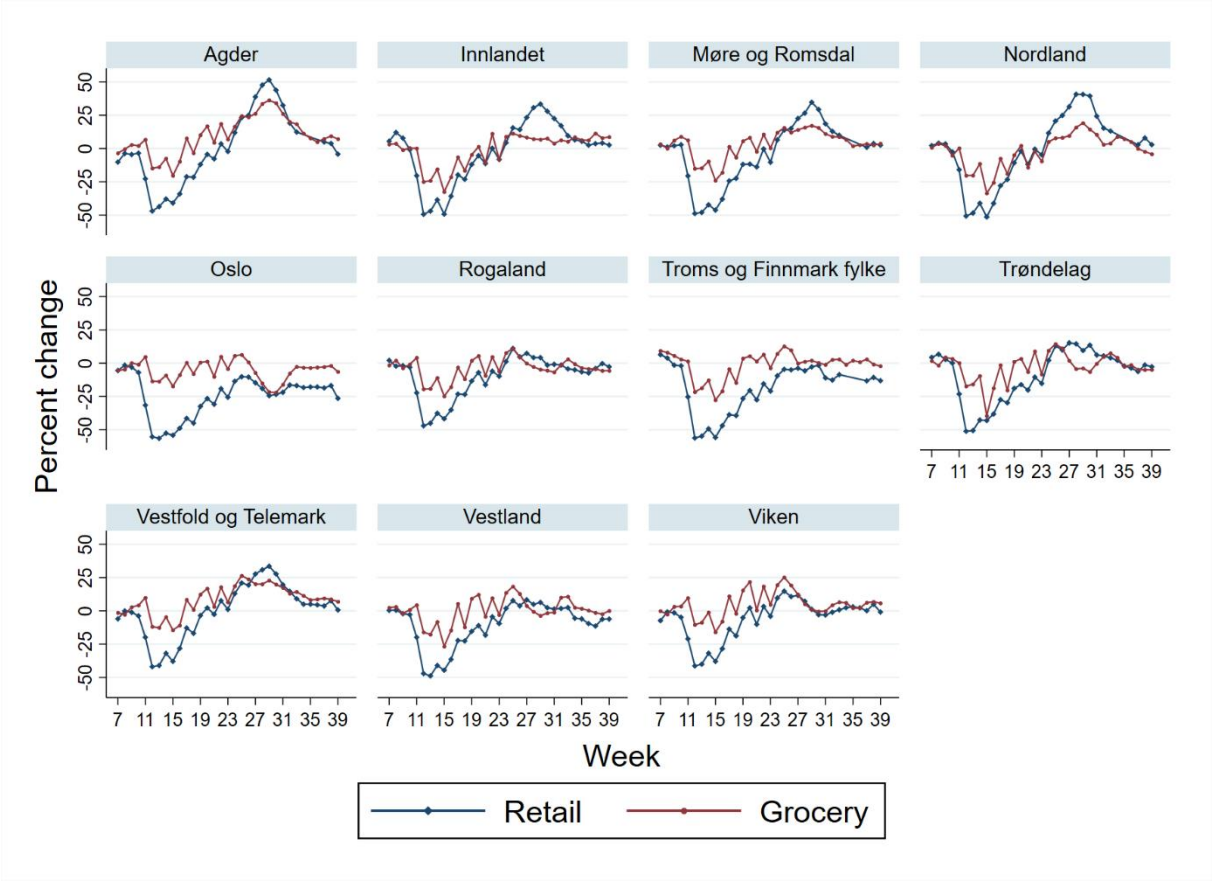
Note The first confirmed case of COVID-19 was tested in week 8 and announced February 26th (week 9). On March 12th the government launched their strict social distancing measures (= Week 11: March 9th-15th) which took effect in week 12 (March 16th-March 22nd). The Easter holiday was in week 15 in 2020, in week 16 pre-schools reopened, in week 17 1-4th grade of elementary schools opened, in week 20 school opened for all students. By week 25 most of the society was open, with group size limitations, hygiene and distance restrictions to limit the spread of the virus. Schools started summer break in week 26, which marks the start of summer holidays in Norway. In week 32, the government announced a halt in the reopening of society. The new school year started in week 34.

Figure A2. Percent change in the time spent at work, transit stations and home in Norway, by region.



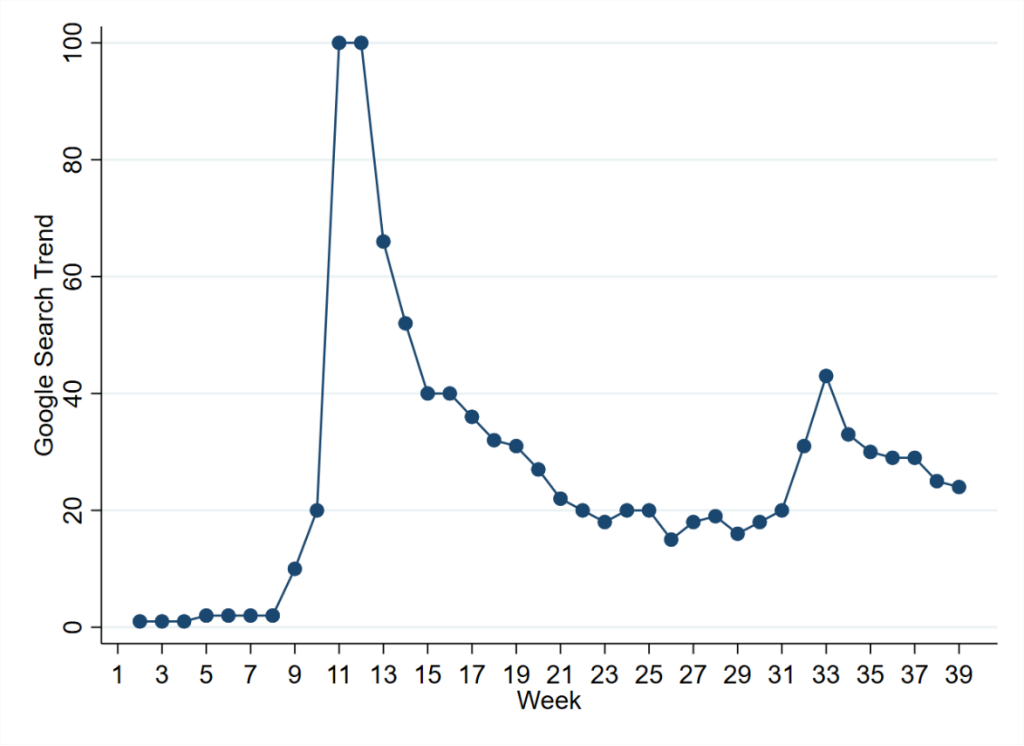
Note: The data is provided by Google's COVID-19 Community Mobility Report. The data includes users who have opted-in to Location History for their Google Account. Baseline is the median value for the corresponding day of the week suring the period Januar 3rd – February 6th. These figures show mobility trends as an average of each day of the week for (1) work, (2) transit stations, like subway-, bus-, and train stations, and (3) place of residence (4) places of retail and recreation, such as shopping centers, museums, libraries, theathers, movie theathers, bars, cafes and restaurants, (5) grocery stores, food warehouses, food markets and specialty food shops and pharmacies, and (6) parks, like local parks, national parks, public beaches and gardens. More information can be found at: https://www.google.com/covid19/mobility/

Figure A3. Percent change in the time spent in retail, grocery and parks in Norway, by region.



Note: The data is provided by Google's COVID-19 Community Mobility Report. The data includes users who have opted-in to Location History for their Google Account. Baseline is the median value for the corresponding day of the week suring the period Januar 3rd – February 6th. These figures show mobility trends as an average of each day of the week for (1) work, (2) transit stations, like subway-, bus-, and train stations, and (3) place of residence (4) places of retail and recreation, such as shopping centers, museums, libraries, theathers, movie theathers, bars, cafes and restaurants, (5) grocery stores, food warehouses, food markets and specialty food shops and pharmacies, and (6) parks, like local parks, national parks, public beaches and gardens. More information can be found at: https://www.google.com/covid19/mobility/

Figure A4. Google search trend for "Korona (Corona)" in Norway 2020,



A.2. Job posting activity: labor demand drop in local labor markets.

Table A1. Top 5 most resilient and most vulnerable industries and occupations (Difference -in-difference estimate)

Top five most resilient	Post COVID change in job-postings. (DiD-coefficient)	Top five most vulnerable	Post COVID change in job-postings. (DiD-coefficient)
Industries		***Industries***	
Manufacture of basic metals	-0.1150	Accommodation	-1.9236
Postal and courier activities	-0.1207	Sports activities and amusement and recreation activities	-1.6597
Telecommunications	-0.1627	Advertising and market research	-1.6422
Information and service activities	-0.2551	Wholesale trade	-1.6137
Electricity, gas, steam and air condition supply	-0.2921	Public administration and defence	-1.5253
Occupations		***Occupations***	
Painters and related workers	0.5370	Hotel and restaurant managers	-1.3378
Sheet and structural metal workers, moulders and welders etc.	0.4315	Waiters and bartenders	-1.3148
Building and related trades workers, excl. electricians	0.1756	Travel attendants, conductors and guides	-1.1141
Secondary education teachers	0.11033	Electrical equipment installers and repairers	-1.0066
Market gardeners and crop growers	0.1102	Mining and mineral processing plant operators	-0.9551

Note: The table presents coefficients from separate difference in differences regression by 2-digit industries and 3-digit occupation. We limit our focus to industries and occupations with at least 0.2 percent vacancy-share in 2019 to in order to make the rank meaningful and limit the role of small changes in small cells.

Table A2. The consequences of the pandemic on the daily inflow of vacancies by skill requirement. Difference- in differences estimates.

		Phases of the Post COVID-19 period			
	Post COVID-19 (Week 9-26)	**Pre lockdown** (9-11)	**Lockdown** (12-16)	**Reopening, phase 1** (17-20)	**Reopening, phase 2** (21-26)
Few or no skill requirements	-0.29**	-0.28	-0.48***	-0.41*	-0.10
	(0.14)	(0.21)	(0.17)	(0.20)	(0.16)
Medium skill requirements	-0.44**	-0.23	-0.66***	-0.44**	-0.37**
	(0.14)	(0.19)	(0.16)	(0.19)	(0.15)
Substantial skill requirements	-0.28**	-0.14	-0.58***	-0.25	-0.14
	(0.13)	(0.18)	(0.15)	(0.18)	(0.14)
Extensive skill requirements	-0.13	-0.08	-0.41**	0.19	-0.08
	(0.14)	(0.183)	(0.16)	(0.18)	(0.14)
Observations	50	50			

Note: This table reports the DiD-estimates from two sets of regressions. Colum 1 reports the DiD-estimate on the change in vacancy postings after week 8 in 2020, compared to the change in vacancy postings after week 8 in 2019 for four sets of occupations based on skill requirements. In column 2-4 we report DiD-coefficients for 4 periods: pre lockdown, lockdown, reopening phase 1 (when pre-schools and 1-4 grades in primary schools opened) and reopening phase 2 (when all schools were open). Pre-COVID-19 (week 2-8) is the pre-period. Significance:* p<0.1 **p<0.05 ***p<0.01

A.3 Diff in diff estimates for different groups.

Figure A5a Diff-in-diff estimates per week during 2020.

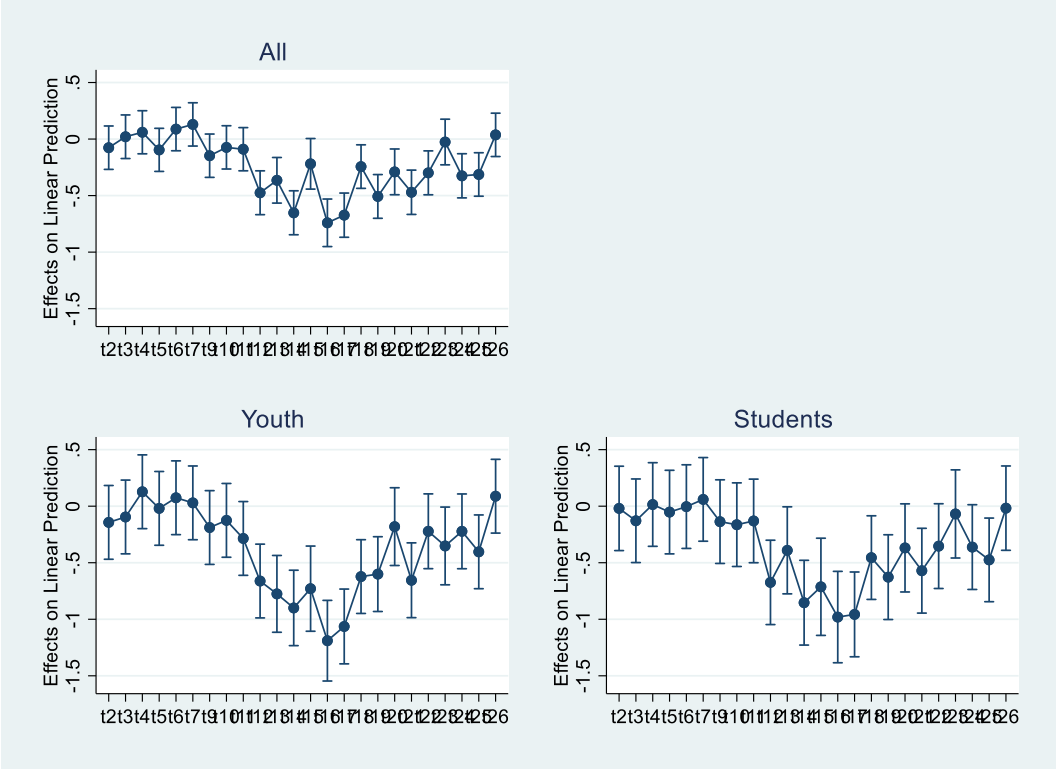


Figure A5b Diff-in-diff estimates per week during 2020

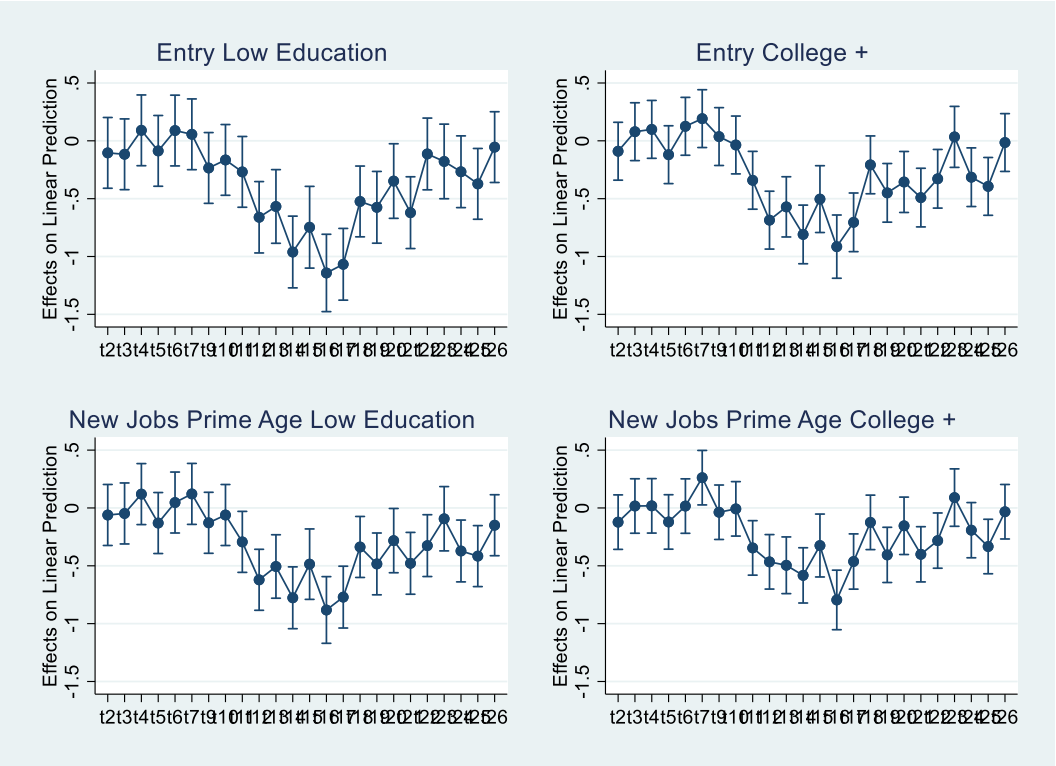
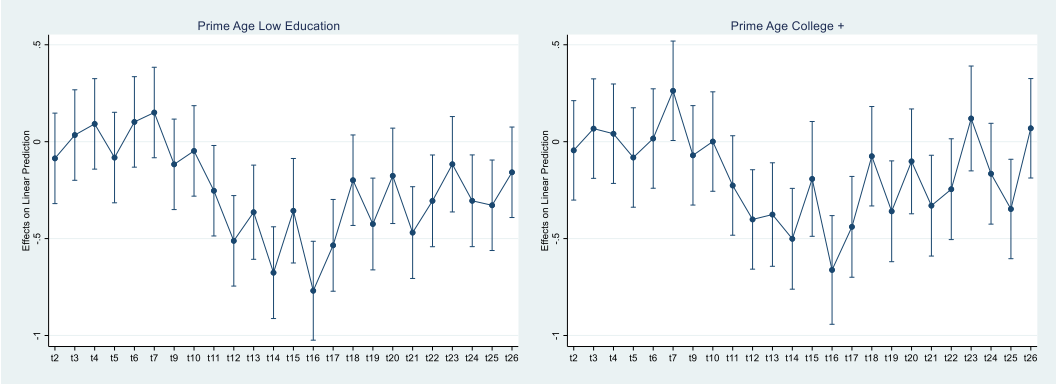


Figure A5c Diff-in-diff estimates per week during 2020



A.4 Top 20 occupations for different groups

To identify occupations for youth, we sample all employed persons below 26 years of age in 2019 and record the occupation of their highest paid job during May 2019. The occupations are then sorted by the employment share among youth, and the top 20 occupations are kept. As recorded in column 2 in Table A1, a total of 76 percent of all jobs for youth were within one of these occupations.

To identify typical student-jobs, we sample all persons of 27 and 30 years of age in 2020, and sample the years between 2003 and 2018 when they were enrolled in education in October, and pick the occupation of the highest paying job that year[1].

Table A3. Jobs for Youth 2019. Top 20 occupations

Occupation (3 digit ISCO 08)	Employment share among youth	Accumulated employment share	Youth share of employment	Students share of youth
Shop salesperson	0.231	0.231	0.276	0.547
Health care assistant	0.112	0.343	0.133	0.617
Pre school assisant	0.063	0.406	0.113	0.377
Waiters and bartenders	0.035	0.441	0.266	0.508
Electrical equipment installers	0.032	0.473	0.244	0.626
Other sales	0.032	0.505	0.282	0.496
Building frame workers	0.028	0.534	0.126	0.501
Mechanics	0.024	0.557	0.169	0.478
Food preparation assistants	0.023	0.580	0.143	0.549
Sports and Fitness workers	0.022	0.602	0.194	0.530
Reseptionists	0.021	0.623	0.125	0.523
Office clerks	0.021	0.645	0.052	0.571
Cleaners	0.021	0.666	0.029	0.437
Warehouse and transport	0.021	0.687	0.090	0.399
Mining and constr. laborers	0.017	0.704	0.180	0.461
Teachers, primary school	0.014	0.717	0.022	0.363
Cooks	0.013	0.731	0.170	0.562
Security personell	0.011	0.742	0.117	0.419
Sales and purchasing agents	0.010	0.752	0.031	0.358
Building finishers	0.009	0.761	0.118	0.535

Note: Data from administrative registers of all employment 16-74 of age in May 2019 with valid non-military occupational code and earnings above NOK 8300 per month (1G/12).

[1] Because of a change in the administrative records from 2015 onwards ("A-ordningen"), we record the main job as the highest paid job during the year for the years between 2004-2014, and the highest paid job registered May for the years after 2014.

Table A4. Jobs for students 2019. Top 20 occupations.

Occupation (3 digit ISCO 08)	Employment share of students	Accumulated employment share	Students share of employment
Shop salesperson	0.267	0.267	0.207
Health care assistant	0.139	0.406	0.172
Pre school assisant	0.047	0.453	0.104
Other sales	0.036	0.489	0.195
Waiters and bartenders	0.030	0.520	0.223
Building frame workers	0.029	0.549	0.085
Electrical equipment installers	0.029	0.578	0.196
Cleaners	0.025	0.603	0.038
Office clerks	0.025	0.628	0.076
Reseptionists	0.021	0.649	0.123
Food preparation assistants	0.020	0.669	0.131
Warehouse and transport	0.019	0.688	0.063
Teachers, primary school	0.018	0.706	0.145
Mechanics	0.014	0.720	0.096
Other elementary workers	0.013	0.733	0.111
Security personell	0.013	0.745	0.127
Cooks	0.011	0.756	0.127
Nursing and midwife	0.010	0.766	0.088
University teachers	0.010	0.776	0.289
Manufacturing laborers	0.009	0.786	0.118

Note: Data from administrative registers of all employment 16-74 of age in May 2019 with valid non-military occupational code and earnings above NOK 8300 per month (1G/12).

To identify typical entry-jobs (the first job after graduation), we sample all persons of 27 and 30 years of age in 2020, observe the year of graduation from their highest level of attained education (2003-2018), split the sample by level of education (non-college and college+) and pick the occupation of the highest paying job during the first year following graduation[1].

[1] Because of a change in the administrative records from 2015 onwards ("A-ordningen"), we record the main job as the highest paid job during the year for the years between 2004-2014, and the highest paid job registered May for the years after 2014.

Table A5. Entry jobs after completed education, less than college education

Occupation (3 digit ISCO 08)	Employment share of entrants	Accumulated employment share	Entry jobs share of employment
Shop salesperson	0.151	0.151	0.053
Health care assistant	0.083	0.234	0.036
Building frame workers	0.077	0.311	0.021
Electrical equipment installers	0.063	0.374	0.048
Pre school assisant	0.060	0.434	0.035
Mechanics	0.051	0.486	0.032
Other sales	0.031	0.517	0.057
Hairdressers and beauticians	0.026	0.542	0.032
Building finishers	0.026	0.568	0.023
Cleaners	0.023	0.592	0.015
Warehouse and transport	0.023	0.615	0.018
Cooks	0.021	0.636	0.034
Waiters and bartenders	0.020	0.655	0.046
Mobile plant operators	0.017	0.673	0.022
Office clerks	0.017	0.689	0.010
Engineering technicians	0.016	0.706	0.007
Metal workers	0.016	0.722	0.023
Mining and construction laborers	0.015	0.737	0.024
Food preparation assistants	0.014	0.751	0.034
Receptionists	0.014	0.765	0.019

Table A6 Entry jobs after completed education, college +

Occupation (3 digit ISCO 08)	Employment share of entrants	Accumulated employment share	Entry jobs share of employment
Teachers, primary school	0.108	0.108	0.145
Nursing and midwife	0.107	0.215	0.088
Shop salesperson	0.065	0.279	0.207
Health care assistant	0.055	0.334	0.172
Engineering technicians	0.048	0.382	0.037
Pre school assistant	0.039	0.421	0.104
Office clerks	0.028	0.449	0.076
Administration professionals	0.026	0.476	0.064
Medical and pharma. technicians	0.026	0.502	0.061
Engineering professionals	0.025	0.526	0.032
Software analysts and developers	0.024	0.551	0.043
Medical doctors	0.024	0.574	0.067
Sales and purchasing agents	0.023	0.597	0.037
University teachers	0.022	0.619	0.289
Finance professionals	0.021	0.640	0.042
Numerical clerks	0.019	0.659	0.060
Business service agents	0.018	0.678	0.092
Other health professionals	0.017	0.695	0.072
Receptionists	0.017	0.712	0.123
Waiters and bartenders	0.015	0.727	0.223

To identify occupations for prime age workers, we sample all employed persons between 25 and 54 years of age in 2019 and record the occupation of their highest paid job during May 2019. To identify new hires, we record only jobs for persons who were not employed by the same employer in May 2018.

Table A7. Top 20 Occupations. Prime Age Workers, No College.

Occupation (3 digit ISCO 08)	Employment share	Accumulated employment share	Prime-Age No-College share of employment	New Hires share of employment
Health care assistant	0.074	0.074	0.532	0.211
Shop salesperson	0.060	0.134	0.515	0.234
Pre school assisant	0.050	0.184	0.598	0.242
Teachers, primary school	0.040	0.224	0.437	0.176
Engineering technicians	0.035	0.259	0.523	0.187
Nursing and midwife	0.033	0.292	0.389	0.145
Administration professionals	0.029	0.320	0.395	0.222
Sales and purchasing agents	0.028	0.348	0.595	0.223
Office clerks	0.026	0.375	0.535	0.229
Building frame workers	0.026	0.401	0.524	0.228
Warehouse and transport	0.023	0.424	0.600	0.182
Cleaners	0.020	0.444	0.452	0.244
Mechanics	0.020	0.464	0.606	0.180
Electrical equipment installers	0.019	0.483	0.581	0.170
Truck and Bus Drivers	0.018	0.500	0.544	0.258
Manufacturing managers	0.017	0.517	0.527	0.169
Retail and wh.sale manageres	0.017	0.534	0.680	0.161
Software analysts and developers	0.017	0.551	0.474	0.246
Engineering professionals	0.015	0.567	0.418	0.184
Managing directors	0.015	0.581	0.453	0.204

Table A8. Top 20 Occupations. Prime Age College +.

Occupation (3 digit ISCO 08)	Employment share	Accumulated employment share	Prime-Age No-College share of employment	New Hires share of employment
Teachers, primary school	0.093	0.093	0.370	0.144
Nursing and midwife	0.092	0.185	0.393	0.131
Administration professionals	0.066	0.250	0.328	0.208
Engineering technicians	0.043	0.293	0.230	0.209
Software analysts and developers	0.033	0.326	0.338	0.246
Engineering professionals	0.033	0.359	0.323	0.159
Finance professionals	0.029	0.388	0.337	0.249
Health care assistant	0.029	0.417	0.070	0.275
University teachers	0.028	0.445	0.450	0.201
Professional service managers	0.027	0.472	0.313	0.115
Medical doctors	0.026	0.498	0.495	0.247
Business administration managers	0.025	0.523	0.275	0.212
Secondary education teachers	0.022	0.545	0.369	0.125
Sales and purchasing agents	0.021	0.567	0.164	0.226
Pre school assisant	0.021	0.588	0.087	0.324
Medical and pharma technicians	0.021	0.608	0.242	0.230
Shop salesperson	0.019	0.627	0.054	0.282
Government associate professionals	0.019	0.646	0.297	0.238
Social Professionals	0.018	0.664	0.430	0.195
Office clerks	0.017	0.681	0.122	0.297