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ABSTRACT

Social Gradients in Employment during and after the COVID-19 Pandemic*

We examine employment effects of the COVID-19 crisis in Norway during the initial lockdown, through the subsequent recovery, and after the dust had settled. While we identify large and socially skewed effects of the crisis through its early phases, we find no long-term effects on employees exposed to early risk of job loss. For those employed at the onset of the pandemic, both the level and the socioeconomic composition of employment quickly returned to normal. In contrast, we find considerable negative long-term employment effects on people who were non-employed when the crisis hit. We argue that these patterns can be explained by social insurance policies that gave priority to protecting existing jobs and to distribute benefits to those who were temporarily laid off. Given the extreme increase in the social insurance caseload, an almost unavoidable side-effect was reduced capacity for providing services to the already non-employed.

JEL Classification: E24, J2, J4, J6, J11

Keywords: labor demand shock, COVID-19, employment, social gradient

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1 Introduction

The economic crisis triggered by the COVID-19 pandemic gave rise to major labor market disruptions and caused unemployment and underemployment to rise at unprecedented rates, especially for lower socio-economic groups.[1] National support programs were partly motivated by a concern that the crisis would give rise to hysteresis, both through individual scarring effects and through disproportionate job loss for workers with poor re-employment prospects. In the present paper, we draw on population registers from Norway and examine how the pandemic affected the "social gradient" in employment and pay, where the social gradient is defined as the relationship between past earnings rank and the patterns of employment and pay through the crisis. Studies of employment loss during the pandemic have typically focused on inequalities during the lockdown phase. Evidence on longer-term consequences is sparse. In the present paper, we examine the social gradient in employment through three phases: The shock period (April-June 2020), the unstable recovery period during the next 12 months, and the post-crisis labor market boom from summer of 2021 through June 2022.

The official unemployment rate based on Norwegian labor force surveys (LFS) rose by only 1.0 percentage point from the first to the second quarter of 2020 (Statistics Norway, 2022), illustrating that LFS statistics fail to capture the drop in labor input during shocks with extensive furlough or job retention programs. In order to identify the scale of lost hours and employment, information on actual hours worked is preferable to data on contracted hours. We exploit administrative micro data with monthly pay records for the full population of employees. Comparing outcomes of the pandemic cohorts with data constructed the exact same way for recent pre-crisis cohorts, we can obtain a rough characterization of the scale of the crisis in terms of lost labor input. Our data indicate that the COVID crisis caused a decline in total labor input of 7.7% from February to April 2020.

The pandemic hit the whole economy, but effects were far from uniformly distributed across the labor market. In the present paper, we examine how the crisis affected individuals differently depending on their initial labor market position and their pre-crisis economic status. We measure economic status in terms of gender-specific earnings rank within complete birth

[1] See, for instance, Chetty et al. (2020) for the US, Alstadsæter et al. (2020) for Norway, Adams-Prassl et al. (2021) for the UK, US, and Germany, Crossley et al. (2021) for the UK, Zimpelmann et al. (2021) for the Netherlands, Åkerman et al (2022), Angelov and Waldenström (2023) for Sweden and Stantcheva (2022) for a recent overview.

cohorts, using the three highest annual earnings obtained over the last 10 years. Our intention is to arrive at an earnings rank measure that not only captures access to economic resources per se, but also reflects socioeconomic position and long-term economic prospects more broadly. Equipped with this measure, we study how the crisis affected the social gradient in employment and pay, operationalized as the empirical association between past earnings rank and employment and pay at different stages of the crisis and its subsequent recovery. Since measurement of earnings rank requires data on individuals' pre-crisis labor market performance, the analysis includes persons aged 30 or more at the onset of the pandemic. We expect the consequences of the crisis to depend critically on initial labor market position and divide this population into three groups depending on their status and age in February 2020: i) Prime-aged employees (age 30-61), ii) Senior employees (age 62-67), iii) Unemployed and persons outside the labor force (age 30-61). We examine the month-by-month developments of employment and pay for each group over a 41-month period: the 14 months leading up to the pandemic and the 27-month period following the initial pandemic lockdown (March 2020 through June 2022). The age split is motivated by different employment dynamics for elderly employees compared to the prime-aged, with the extensive margin playing a more central role due the option of early retirement (Goda et al. 2021).

To isolate the effects of the COVID-19 crisis, we use a simple difference-in-differences strategy, where we study employment and pay during the pandemic for cohorts observed in February 2020 compared with data constructed in the exact same fashion for cohorts observed three years earlier, i.e., in February 2017. By going back to 2017, we prevent the 27-month post-sampling outcome period of the comparison group from stretching into the pandemic. Our data cover a full cycle, including the initial and unprecedentedly large drop in economic activity, the feeble recovery period with some setbacks due to new rounds of lockdown, and the post-crisis economic boost caused by aggressive demand policies. The data thus offer a unique opportunity to examine the distributional aspects of the crisis from a dynamic perspective. The existing literature has revealed that job loss during economic crises may have scarring effects that leave individuals more exposed to future unemployment (Mousteri et al. 2018; Pieh et al. 2020), hence, from a policy perspective, it is important to identify those that were left behind during and after the recovery.

Encrypted identification numbers enable us to link complete payroll data to other administrative registers that include demographic characteristics, educational attainment, occupation, labor market status, and employer characteristics. This facilitates an examination

of the sources behind observed changes in the social gradients, and also to distinguish mechanisms related to job or firm characteristics from those related to individual characteristics.

For prime-aged employees, we show that the crisis caused an immediate 4% drop in employment and a 7% drop in total labor input, followed by a quick recovery towards pre-crisis levels during the fall of 2020. A new short decline followed from a second wave of pandemic-related restrictions during the winter months of 2020/2021, yet by October 2021, employment was back to the pre-crisis trend. For senior workers, eligible for early retirement pensions, the negative employment effects appear to have been of a more lasting nature, but only for women. In May 2022, the employment of female seniors remained 2 percentage points (pp) below the pre-crisis comparison group. For persons that were non-employed at the onset of the crisis, we identify much larger and more lasting impacts. The immediate drop in the hiring rate of 6 pp among men turned out to be permanent. For non-employed women the initial drop was similar as for men but converged toward more normal levels over time. After 27 months the employment level was just 2 pp lower than for the comparison cohort. In short, whereas the crisis largely had a temporary negative effect on average employment and pay for adults that were employed at the onset of the pandemic, it had a considerable lasting (possibly permanent) negative effect on people outside of employment at the onset of the crisis.

To assess the crisis' influence on social gradients in employment over time, we examine the three phases (shock, recovery, and post) of the crisis separately, and show how the relationship between past earnings rank and employment outcomes developed compared to the comparison group from 2017. For employees, our findings indicate that the social gradient steepened considerably during the shock period; i.e., workers with low earnings rank were much harder hit by the crisis than workers with high earnings rank. The steeper social gradient was partly explained by personal characteristics and the types of jobs held by persons with different ranks, but it remained significantly steeper even within occupations, industries, and firms. During the recovery period, however, the social gradients returned toward their pre-crisis patterns. In the post-crisis period, the social gradients were almost indistinguishable from those observed in the control period.

For those who were non-employed at the start of the crisis, we document a different pattern. While the social gradient was steeper for both genders during the shock period, over time it returned to pre-pandemic steepness for women. For non-employed men, however, the

pandemic impacts on the social gradient flipped sign, such that the gradient turned *less* steep in the post-pandemic period. Whereas non-employed men of low rank had largely the same or similar (low) employment prospects as in the pre-crisis comparison period, employment rates dropped considerably for non-employed men with high earnings rank. Hence, for the non-employed, the crisis appears to have had a sort of indiscriminate component with respect to economic status, such that the normally quite steep social gradient in employment outcomes was slightly levelled.

2 The course of the COVID-19 induced crisis in Norway – An overview

In Norway, the COVID-19 crisis hit the labor market with full force on March 12, 2020. Strict, and largely unexpected, regulations on social distancing led to an immediate and massive reduction in economic activity, and during the following few weeks 360,000 people (approximately 12% of the labor force) signed up for unemployment benefits (Alstadsæter et al. 2020). Approximately 90 percent of the layoffs during the initial stages of the crisis were temporary, however, and many of them were "partial," in the sense that employment continued with reduced work hours. This means that most workers directly affected by layoffs retained their employment relationship. A few days into the crisis (on March 16), the Norwegian parliament agreed to temporary changes in the unemployment insurance program with increased replacement rates, an extended maximum duration, and lighter eligibility requirements. As in other countries, the lockdown was later followed up by a wide range of stimulus packages, including generous cash support to firms with sufficiently large, documented reductions in sales (compared to the previous year).

The analysis in this paper is based on encrypted administrative registers providing monthly records of actual wage payments from all employers (including the public sector) to all employees, from January 2016 and currently up to and including June 2022. As the pay records are directly reported by firms and used for administrative tax purposes and for computation of social insurance entitlements, they are highly reliable. Given that hourly wages typically are adjusted only once a year, and then only moderately, the short-term fluctuations in individual earnings almost exclusively reflect fluctuations in labor input (with some caveats related to bonuses and holiday pay). Hence, for the period covered in this paper, they offer an extremely good insight into the individual labor market effects of the COVID-19 pandemic, including entry into and exit out of employment. The generous unemployment insurance implies that the earnings losses examined in this paper do not automatically translate into losses of individual

income. The purpose of this study, however, is to describe the fluctuations in total labor input over time and across groups – and not to examine the individual consequences for economic welfare.

The data cover all residents in Norway. Based on encrypted identification numbers, we merge the payroll data with administrative registers containing information about demographic characteristics (sex, birth-year, and, for immigrants, country of origin), own earnings history (annual earnings during the past 10 years), educational attainment, occupation, industry, firm identity, and labor market status.

To examine the overall labor market impacts of the crisis, Figure 1 shows how the number of employed workers and the total real wages for all employees aged 16-72 in Norway developed month-by-month from January 2016 through May 2022; with both series normalized to 100 in January 2016. Employment is defined as having positive contractual hours and a monthly pay above a time-varying threshold corresponding to approximately 17% of average fulltime monthly earnings.[2] The graphs illustrate the strong seasonal pattern in employment and wages, as well as the fact that Norway was on a steady path of economic growth when the crisis hit in March 2020. The growth paths are visualized by linear trend lines, estimated on the pre-crisis data (January 2016 - February 2020). The graphs also indicate the scale of the crisis, as reflected by the considerable drops in employment and total wages from February to April 2020. To illustrate, between February and April 2020 the total wage index in Panel B fell from 115.2 to 108.1, a decline of 6.2%. In all other years in the figure, total wages *increased* between February and April. Taking the increase of 1.5% in 2017 as representative, the implication is that the pandemic caused an immediate decline in total labor input of 7.7%. However, viewed with hindsight from a longer-term perspective, the Norwegian COVID-19 crisis stands out more as a story of delayed employment growth than a story of a serious recession, and in the wake of the second (and more moderate) lockdown during the winter of 2020/2021, employment and total wages rapidly approached the extrapolated pre-crisis trend lines.

[2] The threshold is defined as G/12, where G is the Basic amount of the Norwegian national social insurance program, adjusted annually in line with average wage growth. As of June 2023, G is set to NOK 118,620 (approximately € 10,000).

Figure 1. Total monthly employment and real wages, January 2016-May 2022

Note: Population consists of all wage earners aged 16-72 in monthly payroll data. Wages are inflated to June 2022 currency using the CPI. Employment counts the number of individuals with monthly pay exceeding G/12, where G is the base unit of the national social insurance program. Series are indexed to their January 2016 value (= 100). Employment in January 2016 was 2.2 million; total wage bill was 111.0 billion NOK (June 2022 currency). Vertical dashed lines mark February 2017 and February 2020. Figure omits month of June. Solid red line is the linear trend though February 2020 and dashed red line the extension of the pre-pandemic linear trend.

To zoom in on the consequences of the COVID crisis, we focus on employment fluctuations after February 2020, compared to corresponding developments from February 2017, and identify crisis effects based on a difference-in-differences strategy. The choice of February 2017 as the base of the control period is of course somewhat arbitrary. A practical reason for not using, e.g., the period after February 2018 as the counterfactual period is that the last months of our 27-month outcome period would fall after the onset of the pandemic. While the employment patterns after February 2017 do not stand out as particularly different from neighboring years in Figure 1, we also perform a placebo test where we replace employment patterns of the February 2020 cohort with those of 2016 and 2018 as "treatment" cohorts. As Figure A1 in the appendix shows, there are only minor differences in employment rates of the 2017 and the placebo cohorts from March onwards. In other words, our assessments of COVID effects are not driven by the choice of the 2017 cohort as a counterfactual. With the counterfactual, we use the exogenous and unexpected adverse labor market shock of unusual magnitude triggered by the pandemic to learn more about the vulnerability of different groups distinguished by their initial labor market state and socioeconomic status.

We study the consequences of the COVID crisis for three different groups, distinguished by their labor market state in February 2020; i) employed prime age workers (age 30-61), ii) employed senior workers (age 62-67), and iii) non-employed non-disabled persons (age 30-61). The reason why we concentrate on adults (above age 29) is that our analysis of social gradients requires information on socioeconomic status, which we identify from past labor market performance. In the main part of the analysis, we focus on the dichotomous employment outcome (the left-hand panel of Figure 1) rather than on the continuous pay outcome. The motivation for this choice is that monthly pay exhibits large high-frequency movements due to seasonal effects that are likely to vary from year to year, and that payments are not always fully aligned with hours worked at the monthly level. In particular, there are bonuses and holiday payments that relate to work performed in previous periods. Still, we show the main descriptive patterns and estimation result based on pay in appendix.

For each of the three groups, and separately by gender, the upper panels of Figure 2 show employment rates month-by-month from 14 months before to 27 months after the first lockdown as well as for the corresponding period using February 2017 as the base month. The lower panels then show the differences between the employment rates for the 2017 and 2020 cohorts, and these differences are what we interpret as effects of the COVID pandemic.

The dynamic pattern of the crisis as depicted in Figure 2 indicates three phases: The immediate *shock* (April-June 2020), ii) the unstable *recovery* period (July 2020-June 2021), and iii) the *post*-crisis labor market boost (July 2021-June 2022). Table 1 provides descriptive statistics for the three samples used in our analysis, including average employment rates for each of the three periods.

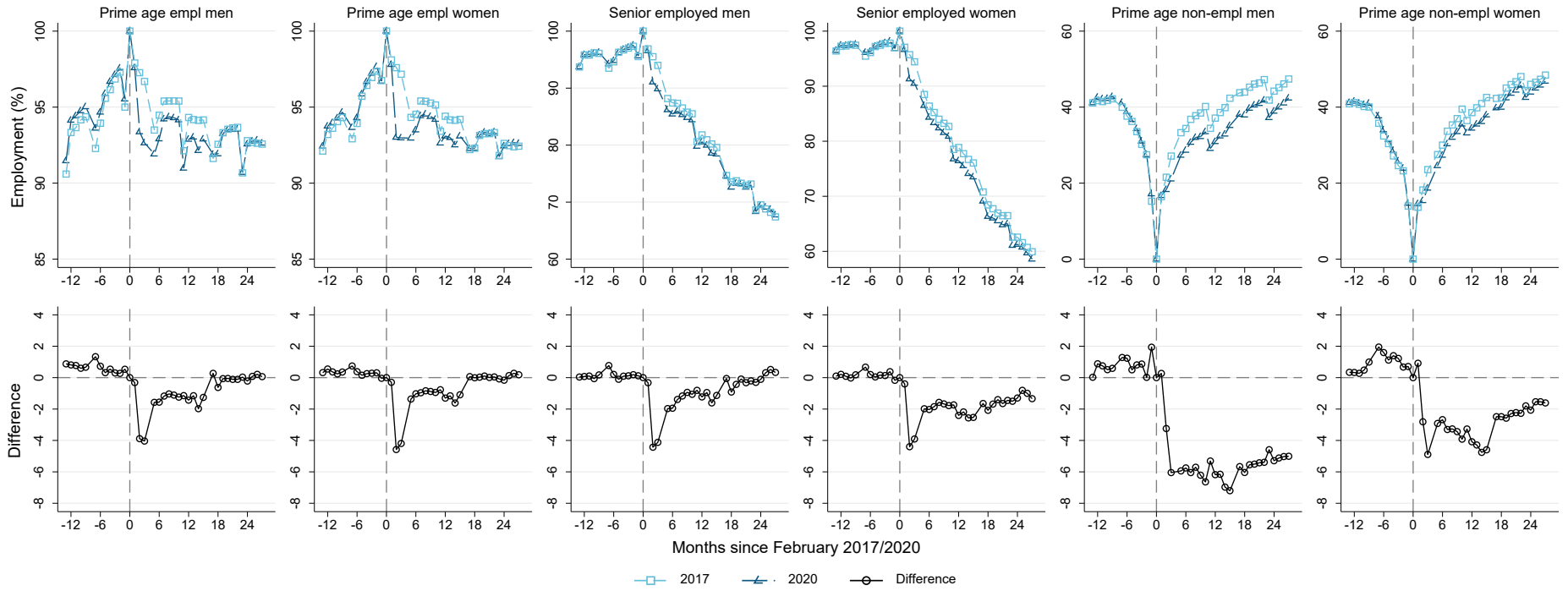

Figure 2. Trends in employment. Prime-aged (age 30-61) wage earners, senior (age 62-67) employees, and non-employed (age 30-61) as of February 2017 and 2020.

Note: Prime-aged, employed samples restricted to wage earners aged 30-61 in February 2017/2020; senior samples to wage earners aged 62-67. Wage-earner samples further restricted to individuals with non-zero hours worked and pay exceeding G/12 in base month. Non-employed samples consist of individuals aged 30-61 and neither employed nor disability insurance claimant in the base month but with at least one year of employment during past ten years.

Table 1. Descriptive statistics, analysis samples.

	Prime age, employed (30-61)		Seniors, employed (62-67)		Prime age, non-employed (30-61)	
	2017	2020	2017	2020	2017	2020
	(1)	(2)	(3)	(4)	(5)	(6)
Employment (%)						
Shock (April-June)	96.9	93.4	94.6	91.1	27.2	23.2
Recovery (next 12 months)	94.5	93.3	82.6	81.0	38.9	34.2
Post (next 12 months)	92.6	92.7	68.0	67.4	46.0	44.1
Female (%)	48.4	48.0	48.4	47.3	46.0	46.9
Age	45.2	45.1	64.0	64.0	42.2	42.1
Earnings rank	58.5	58.6	63.6	63.6	38.4	35.1
Years of schooling	14.3	14.5	13.6	13.7	13.2	13.2
Immigrant group (%)						
Low-income country	7.4	8.9	2.2	3.1	21.3	24.5
Old EU	3.9	4.1	2.8	3.0	5.3	5.6
New EU	5.0	5.5	0.9	1.3	13.6	15.3
Observations	1,597,560	1,686,153	150,305	164,163	178,069	167,020

Note: Employed samples are drawn from February 2017 and 2020 payroll files and are restricted to individuals with pay of at least G/12 in the base month. Samples of non-employed consist of persons who did not have sufficient earnings to be defined as employed and did not receive any disability insurance benefits in the base month. Non-employed samples are further restricted to those either registered unemployed in the base month or with employment during past ten years; those with self-employment income in the prior calendar year are dropped from sample. Immigrants are defined as foreign-born with two foreign-born parents, all others are included with natives. The Old EU category adds immigrants from the US, Canada, Australia, and New Zealand; New EU consists of new member countries since 2004; and the low-income country category covers immigrants from all other countries. Main countries of birth in the prime-aged wage earner sample are Sweden (27%), Germany (17%), and Denmark (11%) in the OldEU group, Poland (54%), Lithuania (20%), and Romania (7%) in the NewEU group, and the Philippines (7%), Thailand (6%), Russia (5%), Iran (5%), Bosnia (5%), Vietnam (5%), Pakistan (4%), Eritrea (4%), and Iraq (4%) in the low-income group.

Since we follow individuals from an initial condition of being employed (or not), employment rates are bound to drop (or increase). Under normal macroeconomic conditions, like from 2017 to 2019, the employment among the prime-aged employed gradually dropped by about 7.4 percentage points over the 27-month post-sampling period. For senior employees, close to one in three was not employed. All senior workers aged 62 or more (with sufficient work experience) are entitled to old age pension, and the major difference in transitions out of employment is explained by retirement. Among the non-employed, the (re-)employment rate is gradually increasing and about 45.8% of the 2017 cohort received a monthly pay above our employment threshold after 27 months.

As our identification strategy relies on the 2017 cohort as a reasonable counterfactual, it is reassuring that the 2020-2017 employment differentials during the 12 months leading up to the

February baseline are all close to zero. Despite these parallel pre-trends, one might be concerned about differential composition. Table 1 reveals that gender composition, age, earnings rank, years of schooling and immigrant background are similar in 2017 and 2020 for both prime-aged and senior employees. Among the non-employed, the native share and past earnings rank are both slightly lower in 2020.

Figure 2 shows that the adverse effects of the crisis peaked already in April-June 2020, with a total employment loss for both prime-aged and senior men and women close to 4 percentage points. As many workers continued in employment with reduced hours, the total earnings loss was bigger – close to 7%; see Appendix Figure A1. The large employment (and earnings) losses were quickly reversed, however, and already in the summer of 2020, the negative employment effect had been cut to 1-2 percentage points. After a small setback during the winter months of 2021, the recovery gained speed, and by summer and fall of 2021, it was no longer possible to see any employment effects of the pandemic, with a notable exception for senior women. Otherwise, the pattern is strikingly similar for men and women. In contrast to some other countries, for prime-aged workers the figure gives no indication of a "she-cession" whereby women were disproportionally affected by the crisis (Adams-Prassl et al. 2020; Albanesi and Kim 2021; Alon et al. 2021). For senior workers, the negative employment shock persisted only for women, likely operating through early retirement.

Vacancies dropped in response to the pandemic (Barth et al. 2021) and did not match the qualifications offered by the unemployed very well. We therefore expect that the pandemic also hit the non-employed in the form of delayed transitions into employment. Figure 2 confirms this prediction, as the re-employment rates are systematically lower for the COVID-19 cohort compared to those non-employed three years earlier. When the crisis hit, the male employment propensity dropped almost immediately by approximately 6 pp, and the effect remained at about the same level for 27 months. For non-employed women, the immediate effects were less dramatic (4 pp), with a clearer tendency for attenuation over time ending up at a reduced employment of about 2 pp.

3 Social gradients

Even if the lockdown and the countermeasures impacted employment throughout the economy, it disproportionally affected workers in low skilled occupations and industries, as typically observed during economic crises (e.g., Hoynes et al. 2012; Chetty et al. 2020). Immigrants were hit harder than natives (Alstadsæter et al., 2020), as expected from previous studies of

economic fluctuations and immigrant labor market outcomes (Dustmann et al. 2010; Bratsberg et al. 2010; 2018).

We use the term "social gradient" to describe the relationship between socioeconomic status and the employment losses during and after the crisis. This relationship is important from a policy perspective, as it helps identifying short- and long-term distributional labor market consequences of the crisis.

Socioeconomic status is by no means uniquely defined, and can be measured in several ways, the most common being based on earnings, education, occupation, or family background. Our preferred metric is based on earnings over the preceding 10 years. More specifically, we use the highest three out of the past ten years of annual earnings as the foundation for ranking and assign each person a rank (on a 1-100 scale) within the complete gender-specific annual birth cohort. As a result, we obtain an earnings rank measure that arguably comes close to characterizing individual earnings potentials (permanent income), which is likely to be highly correlated not only with current economic resources, but also with education, future economic prospects, and social/occupational status.

A distinguishing feature of the labor market shock created by COVID-19 is that it initially hit complete industries in a rather non-discriminatory fashion, with no obvious elements of (within-industry) skill-biasedness or social class structure. A social gradient in its consequences may nevertheless arise both due to the non-random sorting into the most exposed industries and firms, and because the same individual shock (say, in terms of job loss) may have very different consequences over time for different persons. It is thus important to distinguish the immediate impacts of the crisis from its longer-term consequences. Therefore, we examine how the social gradient in employment patterns developed through the three phases of the crisis identified in the previous section, i.e., the initial shock period (first three months), the feeble recovery period (next 12 months) and the post-pandemic economic boost. The inclusion of the latter period represents an attempt to identify the lasting influences of a big, but strictly temporary, negative shock to aggregate employment.

To motivate our choice of empirical model, Figure 3 displays binned scatter plots of the key relationship under study, with each sub-population split into ten equally sized bins. The figure panels show average employment during the three phases of the crisis by individual earnings rank for those who were employed at the start of the crisis, with the February 2017 cohort included for comparison. For prime-aged employees, future employment rates are increasing

in past earnings rank in "normal" times (as represented by the 2017 cohort) as well as in crisis times, but the differences across deciles are modest above median earnings rank. The decreasing marginal "returns" to rank means that the relationship between future employment and past earnings rank cannot be properly specified as being linear. The implication is that our measure of social gradient—the association between past earnings rank and future employment—varies across the earnings distribution. In particular, during the first three months following the base month (i.e., the top panels of Figure 3), the social gradient is steeper for those with low than those with high earnings rank. During the initial phase of the pandemic employment dropped for all earning ranks, but much more for those with lowest rank. Over the next 12 months, the employment rates of the COVID-19 cohort converged towards those experienced by the 2017 cohort (see recovery, second row). In the post-period (third row), the two cohorts were almost indistinguishable. With a notable exception for senior women, there are apparently no visible longer-term traces of the crisis for those who were employed at its onset, neither with respect to the overall employment level, nor with respect to its social gradient.

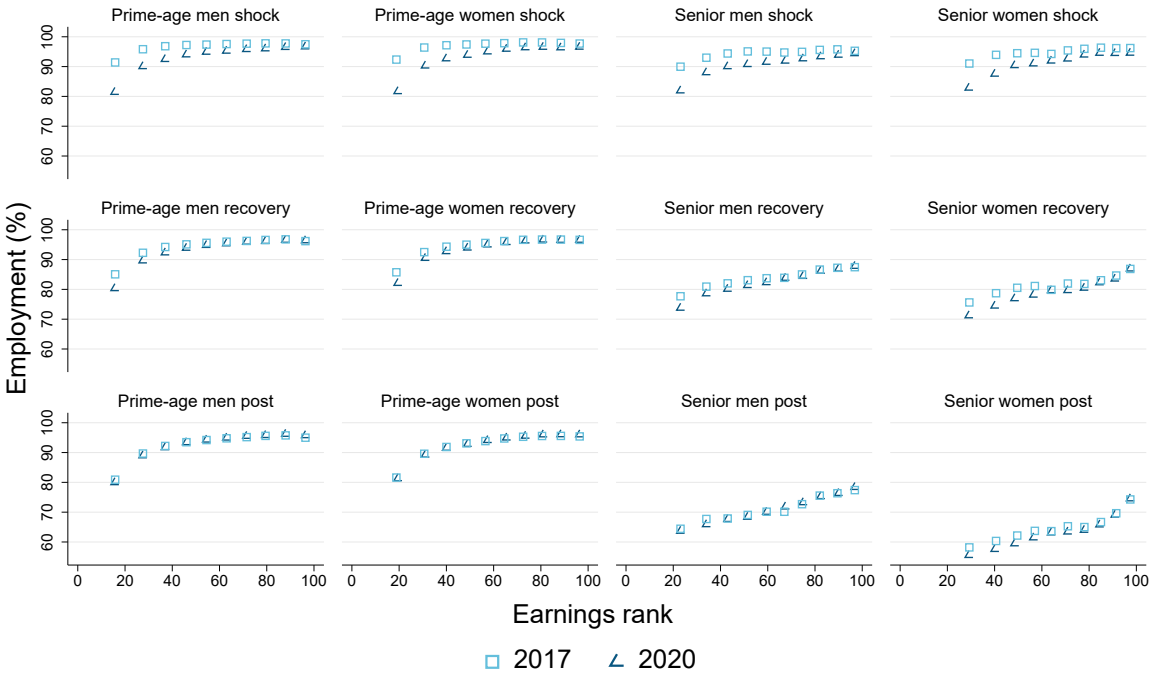

Figure 4: Earnings rank and employment. By gender, period and cohort. Prime-aged and senior workers.

Note: The scatter points report average employment rates in each of the three periods by previous earnings rank percentile, without control variables. Samples consist of wage earners as of February 2017/2020. Each scatter point captures ten percent of the underlying sample.

In Appendix Figure A3, we show a version of Figure 4 with percentage change in monthly pay relative to the average over the six-month period leading up to the base-month (February 2017/2020) as the outcome. The differences between the two cohorts display a pattern similar to that in Figure 4. However, the "normal-times" relationship between past earnings rank and future earnings *changes* displays a more u-shaped pattern, as there is a considerable element of regression-to-the-mean in monthly pay, particularly in the tails of the past earnings rank distribution.

Turning to the non-employed in February 2020 (2017), Figure 4 displays binned scatter plots of employment rates by earnings rank. As for the employed, there is a clear social gradient. Regardless of period, employment rates of those with high earnings rank are about three times those of the lowest rank. During the shock period the social gradient appears somewhat steeper than in the same months of 2017. After that, it is hard to see any differential steepness of the employment profile during and after the pandemic. As we have already seen in Figure 2, however, overall employment seems to have settled at a lower level in the aftermath of the crisis for those who were initially non-employed. Viewed in light of the corresponding patters observed for the initially employed, a possible interpretation is that whereas the extensive furlough and unemployment insurance programs were successful in protecting employees from the longer-term consequences of the crisis, they did not protect the already non-employed to the same extent. However, as we also saw in Table 1, among the non-employed the initial distribution of earnings rank was not exactly the same for the COVID and the control cohorts. In Figure 5, this can be seen by the marked leftwards movement of the binned scatter points, particularly among females.

Figure 5: Earnings rank and (re-) employment. By gender, period, and cohort. Non-employed.

Note: The scatter points show average employment rates by previous earnings rank percentile, without control variables. Samples consist of non-employed individuals aged 30-61 as of February 2017/2020, and omit those with disability benefits and those without employment during the past ten years. Each scatter point captures ten percent of the underlying sample.

The empirical model

We now turn to a more formal statistical analysis of how the social gradient in employment was affected by the crisis during its different phases. We are then both interested in examining the extent to which the social gradient did become steeper, and in investigating the mechanisms behind any such changes in terms of individual or job characteristics. To answer these questions, we use a simple difference-in-differences strategy, where we compare the future outcomes for the two cohorts. The employment profiles in Figures 4 and 5 suggest that our empirical model should allow for a non-linear association with earnings rank, such that any impact of the pandemic on the social gradient can be evaluated at different rank percentiles. The model is estimated by period and employment status, with all coefficients of interest allowed to vary by gender and (for employed workers) age group. The estimated model for employed worker i belonging to gender and age group a in firm f in period t is specified as

$$(1)\quad Y_{ift} = \alpha + \sum_{a=1}^{4}(f_{at}(Rank) + g_{at}(Rank)COVID + \delta_{at}X_i + \theta_{at}X_iCOVID) + \zeta_{ft} + \eta_{ft}COVID + \mu_{ift,}$$

Where group *a=prime age men, prime age women, senior men, and senior women* and *t* = shock period, recovery period, and post-COVID period as in Figure 4. The employment rate (Y_{ift}) is measured in percentage (0-100). COVID equals 1(0) for those sampled in February 2020 (2017). The individual controls (X_i) include age, immigrant status, educational attainment, 4-digit occupation, 4-digit industry, and tenure. All controls are included as fixed effects. Firm fixed effects are captured by ξ_{fi} and $\eta_{ft,}$ where the latter captures the extra crisis effects. Note that the firm fixed effects are the only variables that are common for all four age-gender groups, as many small firms have too few employees in some of the groups to make a separate estimation meaningful. For the social gradient, we use a quadratic functional form and our main parameters of interest are the $g_{at}(Rank)$. Note that all controls are interacted with the COVID-cohort dummy. In the full model, the excess social gradient will be net of changes in the effect of, say, industry and occupation during the COVID periods. The empirical model is estimated separately for each of the three periods.

For the non-employed, we have no workplace-related information (occupation, industry, or firm) and replace these characteristics with municipality of residence.

For easy access to our main results, we report the point estimates in a set of figures. In Figure 6, each panel displays the differential (excess) coefficient for marginal effects of past earnings rank for six different sets of control variables. For each combination of age, initial employment status, gender, and period, we report the excess marginal rank effect in the COVID-cohort across the rank distribution (25th, 50th, and 75th percentiles) based on the estimated interaction term ($g_{at}(Rank)$). In the figure, a positive estimate means that the social gradient became steeper during and after the COVID-19 pandemic, while any negative value implies a reduction of the social gradient in employment.

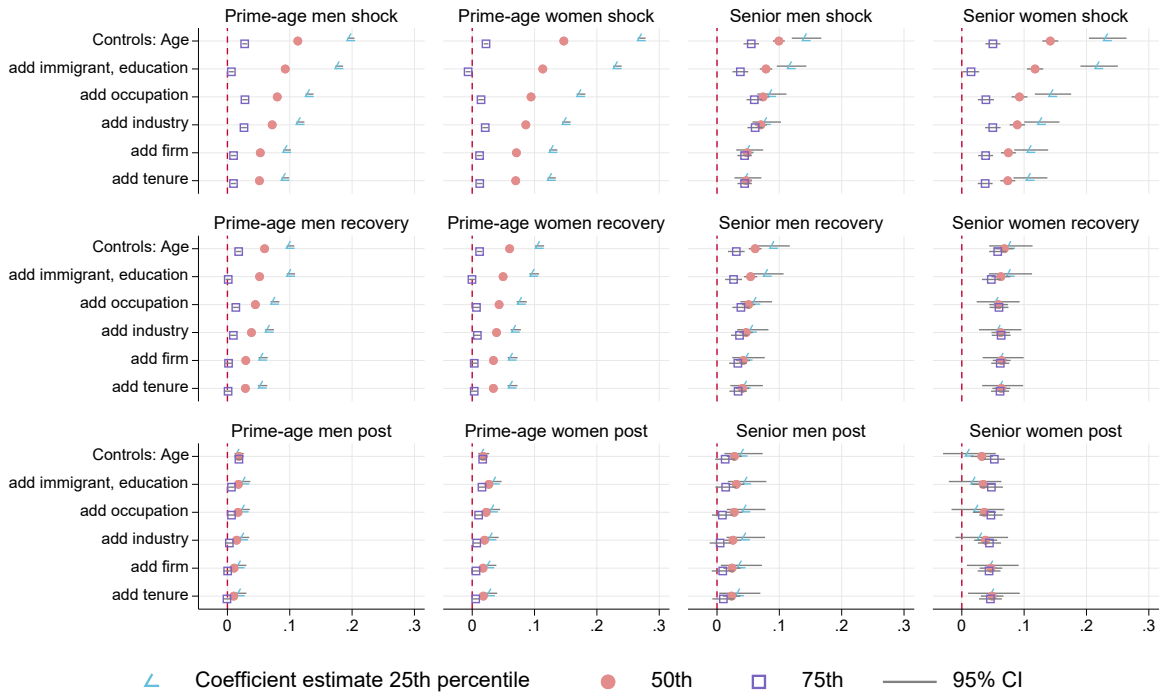

Figure 6. Prime-aged and senior workers. Estimate of excess social gradient in employment during the shock (April-June 2020), recovery (July 2020-June 2021), and post-crisis (July 2021-June 2022) periods.

Note: Estimates show the excess marginal rank effects during COVID $g_{at}(Rank)$, evaluated at the 25th, 50th, and 75th percentiles of the earnings rank distribution, with 95% confidence interval.

The first row in Figure 6 reports the results for the April-June 2020 period (with April-June 2017 used as control period). Looking, for example, at the estimated shock effect for prime-age men at the 25th rank percentile in the model without other controls than age (the estimate indicated by the triangle in the top row of the upper left panel), the point estimate of 0.2 means that, when evaluated at the 25th percentile, the impact of a 1 percentile difference in the past earnings rank on employment was 0.2 percentage points (pp) larger during the COVID shock than in the control period. Moving down across model specifications in the same panel, we note that a considerable part of this effect was explained by occupation and industry/firm. When we control for both occupation and firm, the steepening of the gradient at the 25th percentile is cut by half, i.e., to 0.1 pp.

Viewed as a whole, the pandemic had minimal implications for the social gradient in the upper part of the rank distribution, at least for the prime-aged workers. For the median and low-rank employees, however, the steepness of the employment profile was significantly larger for the COVID-19 cohort, both during the shock and through the recovery period. Most of this

steepening was explained by job characteristics. Yet, for prime-aged workers, the steeper gradient prevailed through the recovery even within occupations and firms.

In the overview section, we showed that employment was back to normal in the post-pandemic period (Figure 2). The same holds for the social gradient. Even without controls, Figure 6 shows that the rank gradient coefficient is just slightly larger for the COVID-19 cohort. The return to the normal gradient happened for both genders and age groups, with one exception. Among senior women, there is some indication of an increased social gradient in the post-COVID period. Although not shown here, these changes are related to a slight increase in retirements observed for senior women.

For the non-employed, there is a strong earnings rank gradient in the return to employment (Figure 5). The higher the rank based on past earnings, the faster is the return to employment. In contrast to what was just shown for the employed, there is no consistent pattern when it comes to the effect of COVID on the social gradient for those not employed at the onset of the pandemic (Figure 7). While low rank non-employed men were particularly affected during the shock period, this is fully explained by education and immigrant status. For women, we find an indication of a steeper gradient present in the upper part of the rank distribution, but not in the post-pandemic period. Finally, we see that the gradient is flatter (and not steeper as for the employed) for men in the post-COVID-period when we control for differences in education and immigrant status in the two non-employed cohorts.

Appendix Figures A5 and A6 show results from analyses where percent change in pay (wage earners in base month) and change in pay (non-employed in base month) replace employment as the dependent variable. For male wage earners, the pay-based results largely replicate those for the employment outcome: the social gradient became much steeper during the shock period, particularly in the lower half of the earnings distribution, but returned to normal over time. For female prime-age wage earners, the social gradient in pay steepened among low earners during the shock period, while the post-crisis period saw some reduction in the social gradient among low earners, largely accounted for by industry of employment. For the non-employed, the social gradient in pay was significantly reduced during the post-crisis period, reflecting the worsened outcomes among the non-employed with high prior earnings rank.

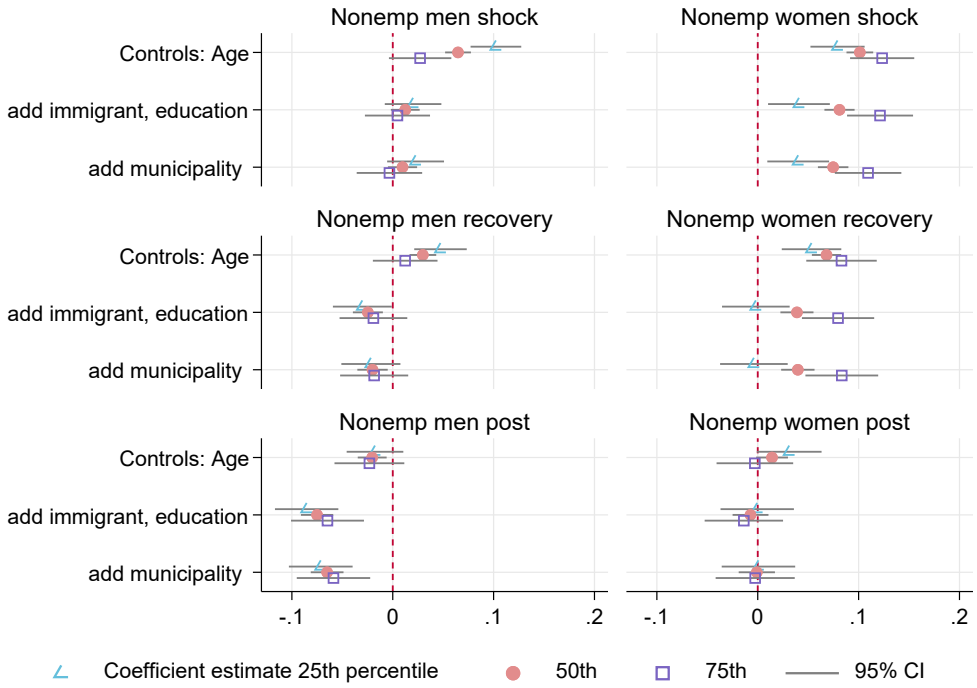

Figure 7: Non-employed. Estimate of excess social gradient in employment during the shock (April-June 2020), recovery (July 2020-June 2021), and post-crisis (July 2021-June 2022) periods.

Note: Estimates show the excess marginal rank effects during COVID $g_{at}(Rank)$, evaluated at the 25th, 50th, and 75th percentiles of the earnings rank distribution, with 95% confidence interval.

4 Concluding remarks

Based on administrative register data containing monthly pay for all employees in Norway, we have evaluated the overall labor market impacts of the COVID-19 pandemic, from its start in March 2020 through June 2022. The impacts are identified with a difference-in-differences approach, using patterns observed for cohorts observed just before the COVID lockdown to establish counterfactual outcomes. To study the social gradient of the crisis, we have ranked all individuals (above 30 years of age) based on their earnings over the past 10 years. We study how the social gradient evolved during three phases of the crisis: the initial shock, the recovery period, and the post-pandemic economic boom. We emphasize three takeaways from our analysis.

The first is that although the lockdown led to a massive increase in unemployment and underemployment during the crisis, we find no long-term effects on either prime-aged men or women or on senior men that were employed at the onset of the crisis. For senior female

employees, we identify a lasting effect in terms of a 2 percentage points increase in early retirement when compared to the control period.

The second takeaway is that the employment prospects appear to have deteriorated more permanently for persons who were non-employed at the onset of the crisis. Not even a post-crisis labor market boom was sufficient for bringing this group up to more "normal" employment levels. We identify a lasting negative employment effect of around 5 percentage points for men and 2 percentage points for women.

Finally, we show that whereas the crisis initially had a socially skewed impact on employment propensities – in the sense that employees with low past earnings were much harder hit than those with high earnings – the social gradient quickly returned to normal once the crisis was over. In contrast to widespread concerns during the initial phases of the crisis, we do not identify any tendency that the crisis led to out-sorting of employees with particularly poor re-employment prospects.

These findings must be interpreted in light of the crisis policies that were pursued in Norway. The unemployment insurance system was immediately expanded in order to cover a larger fraction of employees and to give higher and more lasting benefit entitlements. The furlough scheme was extended, such that almost the entire increase in unemployment was accounted for by persons who actually maintained their employment contract. At the same time, the most hardly hit firms received additional cash support. As a result of these (and other) policies, the level of shutdowns and bankruptcies actually declined during the crisis, and most of the initially unemployed workers could return to their original job after the initial shock period.

For those that were non- or unemployed when the crisis hit, the policy changes may have had a different impact. First, the mere fact that the social insurance administration suddenly had to deal with a caseload of unprecedented size implied that the capacity to provide help and support to long-term unemployed and people with health problems was severely limited. Activation strategies were largely put on hold, both due to capacity constraints and social distancing concerns. Whereas the prolongation of maximum benefit periods served to save existing jobs, it may simply have extended the (inactive) non-employment duration for those without a job, potentially adding to scarring and discouraged worker effects.

References

Adams-Prassl, A., T. Boneva, M. Golin, and C. Rauh (2020): Inequality in the impact of the coronavirus shock: Evidence from real time surveys. *Journal of Public Economics* 189, 104245.

Albanesi, S. and J. Kim (2021): "Effects of the COVID-19 recession on the US labor market: Occupation, family, and gender." *Journal of Economic Perspectives* 35(3): 3-24

Alon, T., S. Coskun, M. Doepke, D. Koll, and M. Tertilt (2021): From Mancession to Shecession: Women's Employment in Regular and Pandemic Recessions. NBER Macroeconomics Annual, forthcoming.

Alstadsæter, A., B. Bratsberg, G. Eielsen, W. Kopczuk, S. Markussen, O. Raaum, and K. Røed (2020): The First Weeks of the Coronavirus Crisis: Who Got Hit, When and Why? Evidence from Norway. NBER Working Paper No. 27131.

Angelov, N. and D. Waldenström (2023): COVID-19 and Income Inequality: Evidence from Monthly Population Registers, forthcoming *Journal of Economic Inequality.*

Barth, E., H. Dale-Olsen, P. Schøne, and K.M. Østbakken (2021): Chutes and Ladders? Job Opportunities for Generation COVID. IZA Discussion Paper No. 14530.

Bratsberg, B., O. Raaum, and K. Røed (2010): When Minority Labor Migrants Meet the Welfare State. *Journal of Labor Economics* 28(3), 633-676.

Bratsberg, B., O. Raaum, and K. Røed (2018): Job Loss and Immigrant Labor Market Performance. *Economica* 85, 124–151.

Chatterji, P. and Y. Li (2021): Recovery from the COVID-19 Recession: Uneven Effects among Young Workers? NBER Working Paper No. 29307.

Chetty, R., J.N. Friedman, N. Hendren, and M. Stepner (2020): the Economic Impacts of COVID-19: Evidence from a New Public Database Built Using Private Sector Data. NBER Working Paper No. 27431.

Crossley, T.F., P. Fisher, and H. Low (2021): The heterogeneous and regressive consequences of COVID-19: Evidence from high quality panel data. *Journal of Public Economics* 193, 104334.

Dustmann, C., A. Glitz, and T. Vogel (2010): Employment, Wages, and the Economic Cycle: Differences between Immigrants and Natives. European Economic Review 54(1), 1-17.

Goda, G.S., E. Jackson, L.N, Hersch, and S. Stith (2021): The Impact of Covid-19 on Older Workers' Employment and Social Security Spillovers. NBER Working Paper No. 29083.

Guo, A., Krolikowski, P. and M. Yang (2023): Displaced workers and the pandemic recession, *Economics Letters*, Vol 226, https://doi.org/10.1016/j.econlet.2023.111071.

Hoynes, H., D.L. Miller, and J. Schaller (2012): Who Suffers During Recessions? *Journal of Economic Perspectives* 26(3), 27–48.

Markussen, S. and K. Røed (2020): Economic Mobility Under Pressure. *Journal of the European Economic Association* 18(4), 1844–1885.

Mousteri, V., M. Daly, L. Delaney (2018): The scarring effect of unemployment on psychological well-being across Europe, *Social Science Resear*ch 72, 146-169.

Pieh, C., S. Budimir, and T. Probst (2020): The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. *Journal of Psychosomatic Research* 136, 110186.

Stantcheva, S. (2022): Inequalities in the Times of a Pandemic. NBER Working Paper No. 29657.

OECD Employment Outlook 2021: Navigating the COVID-19 Crisis and Recovery, OECD Publishing, Paris.

Zimpelmann, C., H.-M. v. Gaudecker, R. Holler, L. Janys, and B. Siflinger (2021): Hours and income dynamics during the Covid-19 pandemic: The case of the Netherlands. *Labour Economics* 73, 102055.

Appendix

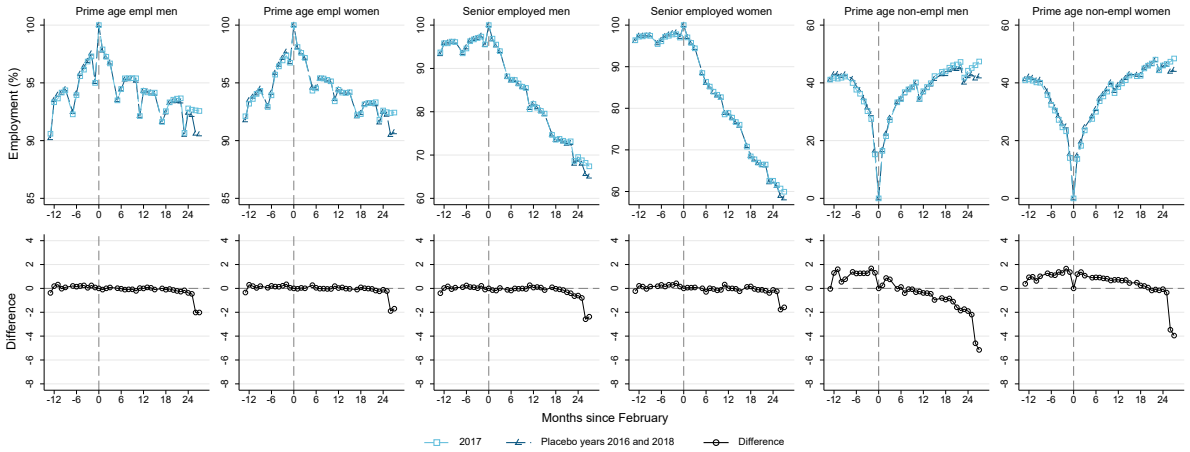

Figure A1. Placebo employment effects. February 2016/2018 vs 2017.

Note: Prime-aged, employed samples restricted to wage earners aged 30-61 in February 2017 vs February 2016 and 2018; senior samples to wage earners aged 62-67. Wage-earner samples further restricted to individuals with non-zero hours worked and pay exceeding G/12 in base month. Non-employed samples consist of individuals aged 30-61 and neither employed nor disability insurance claimant in the base month but with at least one year of employment during past ten years. Note that the last observations of the placebo cohorts are affected by the pandemic.

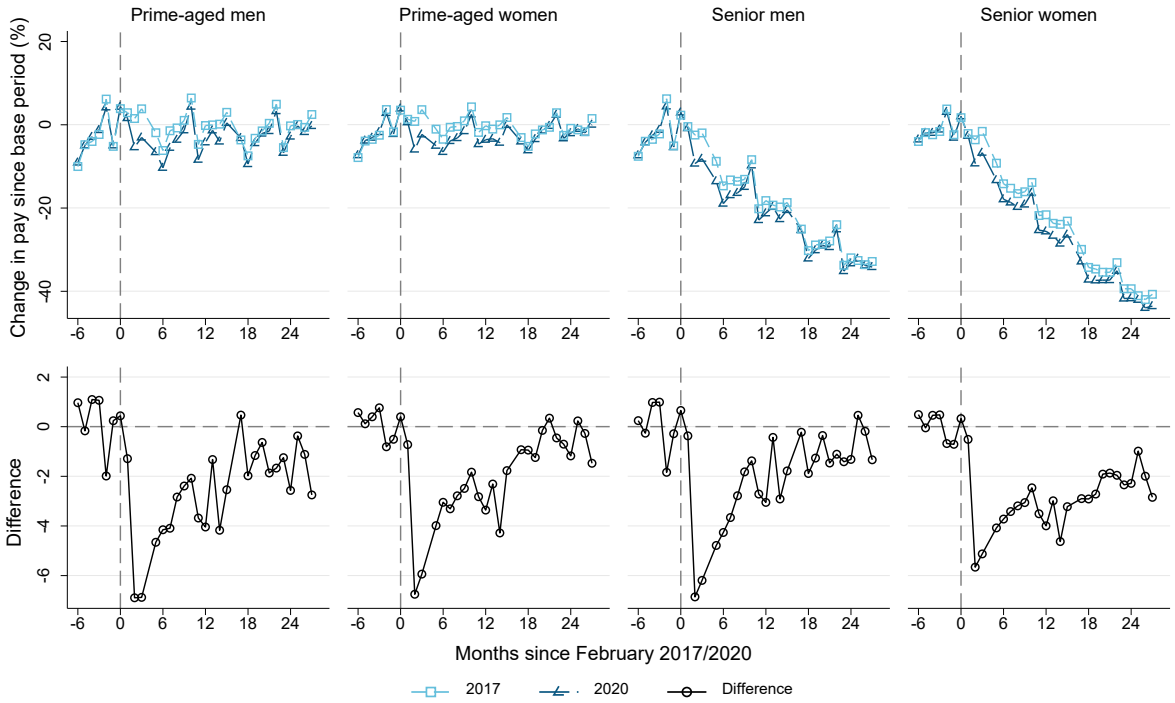

Figure A2. Trends in total monthly pay. Prime-aged (age 30-61) and senior (age 62-67) wage earners as of February 2017 and 2020.

Note: Populations consist of wage earners in February 2017/2020. Prime-aged samples restricted to ages 30-61, senior samples to ages 62-67. Samples further restricted to individuals with non-zero hours worked and pay exceeding G/12 in base month. Base pay period covers the six-month period ending with the base month.

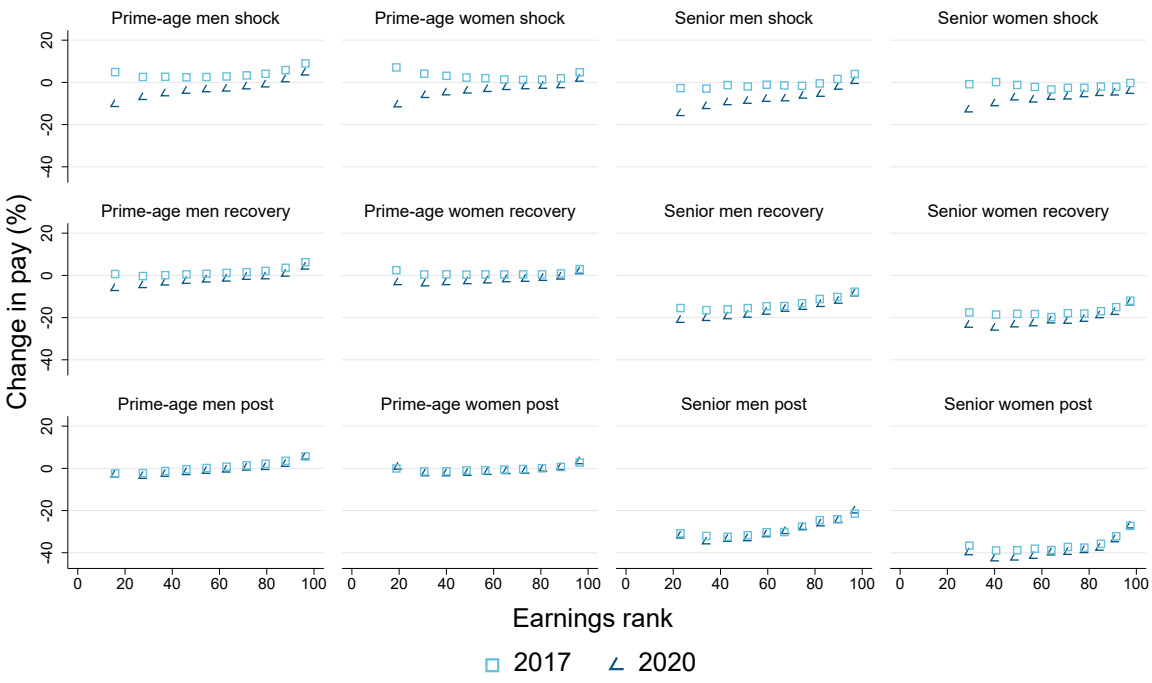

Figure A3. Earnings rank and percentage change in monthly pay relative to a base period. By gender, period, and cohort. Prime-aged and senior workers.

Note: The data points report percentage change in average monthly pay compared to average pay in the six-month period leading up to February 2017/2020. By previous earnings rank percentile, without control variables. Each scatter point captures ten percent of the underlying sample.

Figure A4. Earnings rank and absolute change in monthly pay compared to a base period. By gender, period, and cohort. Non-employed.

Note: The data points report absolute change in average monthly pay compared to average pay in the six-month period leading up to February 2017/2020. We prefer absolute rather than percentage change in this graph, as many of the non-employed had zero wages in the base period. By previous earnings rank percentile, without control variables. Each scatter point captures ten percent of the underlying sample.

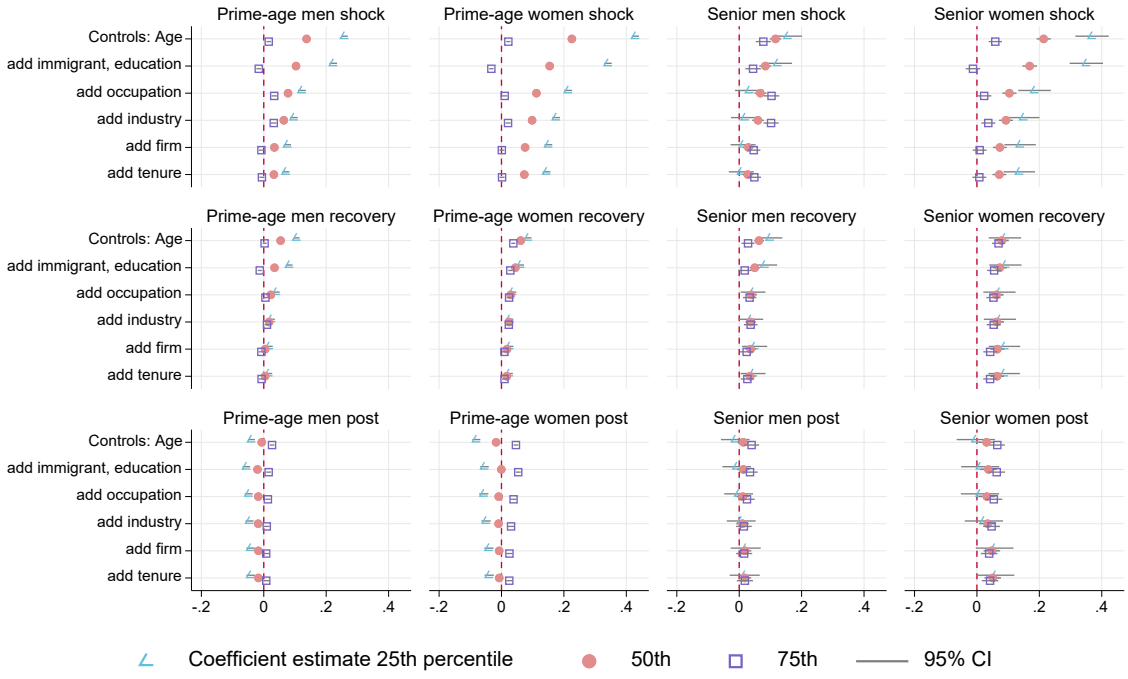

Figure A5. Prime-aged and senior workers. Estimate of excess social gradient in employment during and after COVID based on percentage change in pay as outcome.

Note: Estimates show the excess marginal rank effects during COVID, $g_{at}(Rank)$, evaluated at the 25th, 50th, and 75th percentiles of the earnings rank distribution, with 95% confidence interval.

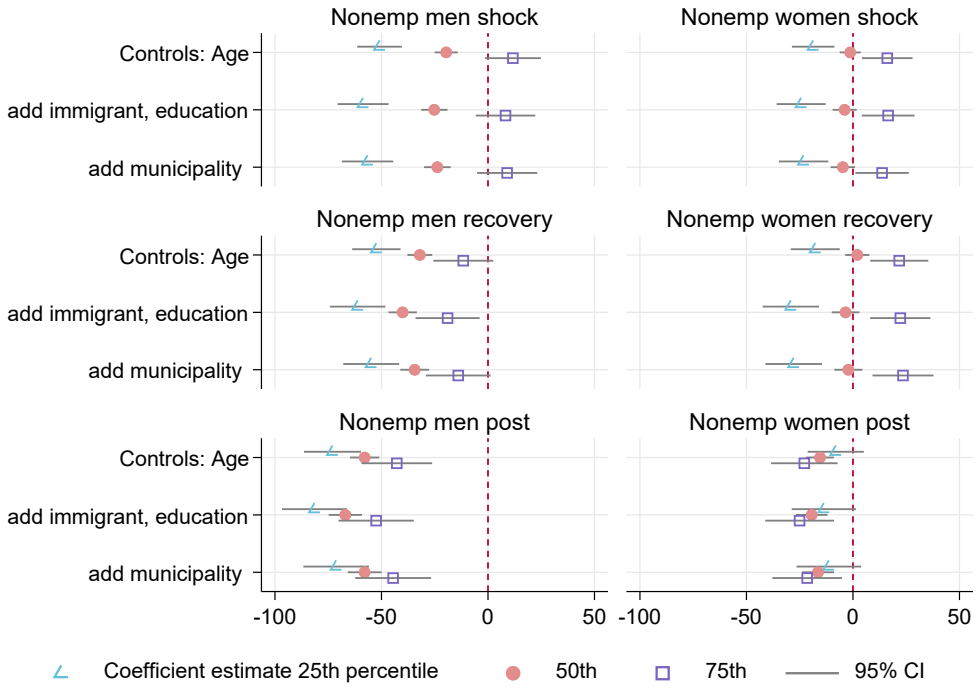

Figure A6. Non-employed. Estimate of excess social gradient during and after COVID based on change in pay as outcome.

Note: Estimates show the excess marginal rank effects during COVID, $g_{at}(Rank)$, evaluated at the 25th, 50th, and 75th percentiles of the earnings rank distribution, with 95% confidence interval.