COVID-19 and Income Inequality: Evidence from Administrative Tax Registers*

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Abstract

We measure the distributional impact of the COVID-19 pandemic using newly released population register data in Sweden. The main finding is that the pandemic has led to higher income inequality before and after taxes and also after the government's COVID-19 support policies. The key driver is income losses among low-paid individuals through lower wages and higher unemployment, while middle- and high-income earners are almost unaffected. We identify larger impacts on private-sector workers and on women. Capital incomes decreased overall during 2020, but they increased among top income earners through large capital gains realizations. The government's COVID-19 support to firms and individuals significantly dampened, but did not fully offset, the income inequality increase during the pandemic.

Keywords: Pandemic, Income inequality, Earnings, Government policy
JEL codes: H21, H24, J22, J24

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1 Introduction

The negative impact of the COVID-19 pandemic on most countries' economies has been widely recognized around the world. However, how these detrimental effects have been distributed among households is still largely unknown. Some early studies have analyzed either simulated datasets or swiftly collected household surveys to shed light on the effects on income inequality. Their findings, though preliminary, suggest that the pandemic has decreased income inequality, primarily because of the massive government transfers without which inequality would probably have increased due to job losses among low-paid workers.[1]

In this study, we exploit administrative tax and income registers at the Swedish Tax Agency to estimate how income inequality in Sweden is affected by the COVID-19 pandemic. We use a new monthly payroll register, created in January 2019, that covers monthly wages and salaries to all working individuals. Since this register is updated continuously, it offers a virtual real-time source of measuring the evolution of earnings and earnings inequality (our latest observation is March 2021). In addition, we employ the full-population tax-return register, which shows annual incomes filed in May-June after the income year. While it offers less precision with respect to analyzing the pandemic since it broke out a few months into 2020, this register comprises the entire population and all the incomes from labor, self-employment, and capital, and also these incomes both before and after all taxes and taxable transfers.

Our identification strategy for assessing the impact of the COVID-19 pandemic rests on two complementary approaches. In a descriptive before-after analysis, incomes and inequality levels are compared across the same calendar months before and after the outbreak of the pandemic in early 2020. The other approach estimates the pandemic effect in difference-in-differences regressions using both within-year and across-year data variation. Unconditional quantile regressions (Firpo et al. 2008) are used to measure the effect across different segments of the earnings distribution. Both regression specifications include analyses of the role of background variables such as employment in private or public sectors, age, and gender.

The paper's final analysis is an evaluation of the distributional impact of the government's COVID-19 policies during 2020. We access administrative registers over the two largest government support programs, Short-Time Work Allowance ("korttidsstöd") and Reorientation Support ("omställningsstöd"), which report firm- and individual-level support take-up. To assess the distributional impact of the support, we subtract the support payments from the earnings of employees and then recalculate the inequality outcomes. While this exercise is static and cannot capture all behavioral responses, it

[1] See, for example, Blundell et al. (2020), O'Donoghue et al. (2020), Almeida et al. (2021), Clark et al. (2021), and Stantcheva (2021).

spans a relatively short time period (at most nine months during March-December 2020) which should limit general equilibrium effects.

Few socioeconomic variables are available in the tax registers. We observe data on age, gender, region and employer characteristics (sector, geographic location), but not household links, education or country of birth. We observe incomes from labor, self-employment and capital, including taxable transfers in the form of unemployment and sickness insurance and all taxes paid, but we have no information about untaxed transfers such as child or housing allowances or social assistance to the poorest. This means that our inequality measures will not be based on disposable income or adjustments for household size as standard inequality measures. Using individuals instead of equivalized households will unambiguously increase the level of inequality, but whether also inequality trends are affected is less clear.[2]

Our main finding is that income inequality has increased during the COVID-19 pandemic in Sweden. The increase is moderate when looking at monthly pre-tax earnings, at roughly 2.5 percent of the Gini-coefficient. When we instead account for market income inequality effects, that is, using yearly data which includes capital income and income from own businesses (sole proprietorships), we find a larger effect: the Gini-coefficient increased with 4.6% and 3.9% pre- and post-tax, respectively.

A recurrent result, irrespective of data source or outcome variable, is that the increased income disparities during the pandemic are mainly driven by considerable income decreases in the lower tail of the distribution and not by rising top earnings or capital incomes. Depending on the data source, the exposed low-income group consists either of low-income individuals or those who might be far from the labor market altogether. Using monthly earnings data, we see both a decrease in average earnings among low-paid, part-time workers (conditional on having positive earnings during our observation window) and an increase in the likelihood, especially among young adults, of having zero earnings (which is the closest to a measure of unemployment we can get with our data). By contrast, middle- and high-income earners did not experience almost any earnings change during the pandemic. When zooming in on the circa 500 individuals in the top 0.01 percentile of the earnings distribution, we find little evidence of an economic downturn and even a marked increase in variable remuneration and bonus payments in March 2021, being 50 percent above the levels in March 2019 and 2020. Looking at the yearly data, we see that the bottom quartile group in 2020 does not only consist of young workers but also self-employed aged 50-64 reporting substantial losses during the pandemic.

The policy analysis shows that the government's COVID-19 policies, which in structure resembled the income support seen in most Western countries, significantly affected

[2]There is a surprisingly scant literature on the role of income units for estimated inequality trends, but Gottschalk and Smeeding 2000 refer to evidence suggesting relatively small effects.

income inequality. Two different counterfactual scenarios are estimated, one projecting the crisis as sustained employment but fewer hours worked and the other as sustained full-time jobs but higher unemployment. The first of these scenarios is close to a German, "Hartz IV", labor-market model of tackling crises whereas the second corresponds to the traditional adjustment mechanism in the Swedish labor market. Using register data on actual support take-up of individuals and firms, we show that the Gini-coefficient in earnings would have increased between four and six percent (around one Gini-point) without the government support, that is, two-three times more than what actually happened.[3] Why post-support inequality increased in Sweden and decreased in other Western economies (O'Donoghue et al. 2020, Almeida et al. 2021 and Clark et al. 2021) is still unclear.

In addition to these main findings, our analysis of the new monthly earnings data reveals some startling new facts about the generation of income in a modern economy and its contribution to overall income inequality. For example, among workers as a whole, average earnings spikes in two months of the year: June and December. The June spike is driven by middle-income earners and reflects the payout of holiday reimbursement accrued over the year. The December spike is driven by high-income self-employed individuals who fine-tune their December wage income to maximize low-tax dividend payouts in the subsequent year. While the June spike is not seen in the Gini coefficient, the December spike has a clear, increasing effect. Another example is the recurrent March spike in the Gini coefficient, which is not visible in overall average earnings but confined to earnings in the absolute top of distribution as it reflects the executive reimbursements of last year's variable pay.[4]

There is a rapidly growing research literature on the distributional impact of the COVID-19 pandemic and the government support policies to which our paper connects.[5] For example, Almeida et al. (2021) use the EUROMOD microsimulation model to study EU countries and find, interestingly, quite diverse impacts of both the pandemic shock itself and of the policy responses on the inequality of household disposable incomes. The pandemic increased inequality in nine countries, lowered it in seven countries, and had no significant impact in ten countries. The policies had a mostly muting effect on inequality, but the sign of this muting also varies across countries. O'Donoghue et al. (2020) also apply microsimulation methods onto European data and find that the pandemic has substantially increased income inequality but that redistribution (not necessarily only COVID-19-specific) effectively reversed the outcome to land at a decreased inequality.

[3] It should be noticed that we only consider the explicit COVID-19 policy packages and not the many other social insurance policies embedded in the Swedish economy, which include both non-taxable benefits and in-kind transfers coming through subsidized public welfare services.

[4] The corporate board meetings in February decide on the annual income report and on variable reimbursements to CEO and other executives, which typically is paid out the month after.

[5] See Stantcheva (2021) for a recent summary and discussion.

Clark et al. (2021) use newly assembled cross-country survey data and find overall quite small effects on disposable income inequality, with an initial increase followed by a larger decrease. Interestingly, one of their surveyed countries is Sweden, for which they find a clear decrease in inequality during 2020.

In the remainder of the paper, we first present the data used in section 2 and then continue with analyzing the effects of the pandemic on monthly earnings inequality in section 3. Section 4 presents the policy evaluation and section 5 examines some key driving factors behind the results. Section 6 analyzes the impact on annual market income inequality, and section 7 concludes.

2 Data

We use data from two population-wide registers held by the Swedish Tax Agency (Skatteverket): the monthly payroll tax register and the annual personal tax return register. The monthly payroll tax register is our main data source. It was launched in January 2019 and consists of monthly pre-tax wages and salaries of all employed individuals in the country regardless of size of earnings or length of employment contract. Before 2019, this register was annual but otherwise similar in the kind of variables (pre-tax earnings, preliminary income tax payments etc.). Since we access data directly from the Swedish Tax Agency, we can analyze the reported earnings almost exactly when they are submitted to the authorities. This immediacy in data access implies that we observe outcomes almost in real time, which by itself appears to be a unique contribution to the literature. The population covered in these monthly earnings data are all individuals with non-zero earnings during at least one month during our observation period (January 2019 to March 2021). There is a considerable amount of individuals with zero earnings and who are therefore not employed. We do not have any additional information on these individuals other than the fact that they had zero earnings during a particular month. In lack of a better measure, we use zero earnings during a particular period as a measure of unemployment, fully aware that this definition poorly corresponds with the standard definition of unemployment, especially in a welfare-state as Sweden.

The annual tax return register is used mainly for reference as it also contains capital income and all income taxes paid.[6] Its problem for our purposes is that the full-year income statement blurs the pandemic impact since 2020 contains both pre-pandemic and pandemic months. The final deadline for handing in tax returns for income year 2020 was as late as May 3, 2021, and because of delayed submissions we do not observe all tax returns. However, we collect data after the main extra deadline (June 1) and make simi-

[6]The monthly payroll register only reports preliminary taxes paid and thus disregards the substantial earned income tax credit which is subtracted retroactively in next year's tax return.

lar restrictions in data collection for earlier years to make data comparable.[7] Tables A1 and A2 in Appendix A provide a short description of the monthly payroll tax register and the annual tax return register, respectively. Among others figures, percentile thresholds used throughout the paper are presented there.

A general caveat with these tax register databases is that they contain limited information about household composition and socioeconomic characteristics.[8] The analyses are therefore mainly conducted on adult taxpayers, which means salaried individuals 18-64 years old in the monthly payroll register and adult individuals 18 years old and above in the annual tax return register.

Data on government COVID-19 support policies are accessed at firm- and individual levels for the two largest policies. The largest package is the Short-Term Wage Allowance (STWA, or "korttidsstöd" in Swedish), which is an indvidualized wage support, paid to firms but also recorded for the final individual recipients. Data on the STWA is collected by the responsible agency, Swedish Agency for Economic and Regional Growth (Tillväxtverket), and also available at the Swedish Tax Agency. The second-largest support package, the Reorientation Support (RS, "omställningsstöd"), is directed to mainly small- and medium-sized firms and is paid out roughly in proportion to their reported turnover loss during the pandemic. We only observe payments to firms in the register set up by the responsible authority, the Swedish Tax Agency, but since we also know the individuals working in these firms, we can allocate the support to them after making certain assumptions about capital and labor shares of income (see further section 4).

3 Earnings inequality during the pandemic

This section analyzes earnings inequality trends in Sweden during the COVID-19 pandemic in 2020 and early 2021. We first study monthly pre-tax earnings between 2019 and March 2021, and follow their levels, dispersion and some important channels through which these outcomes are realized. We then analyze annual incomes in 2020 to examine

[7]Officially, the final date for filing the personal tax returns was May 3, 2021, but under special circumstances, some taxpayers are allowed to file their tax returns later. The data in this section covers tax returns retrieved from the tax register on June 3, 2021. The latest filing date in the data is June 2, 2021, and according to our assessment based on previous tax years, about 400,000-450,000 more individuals should be expected to file their taxes during the coming months. To make the data for 2020 comparable to previous years, we have applied the same data restriction for 2018 and 2019. In other words, we have removed observations for individuals who filed their taxes after June 2. As the selection of those who file their taxes late may have changed as a consequence of the pandemic, we ran a robustness analysis covering all the relevant results the paper. In the robustness check, we used a balanced panel, or in other words, we only used observations for individuals who had filed their personal taxes each year, and in addition, had filed them before June 3 each year. The results from this balanced panel are qualitatively very similar to the results presented in the paper, meaning that the main changes we observe in 2020 are not driven by selection. The results for the balanced panel are available upon request from the authors.

[8]For legal reasons, the Swedish Tax Agency is not free to combine their tax registers with registers from other public authorities covering, for example, household characteristics, transfers received, or educational attainment.

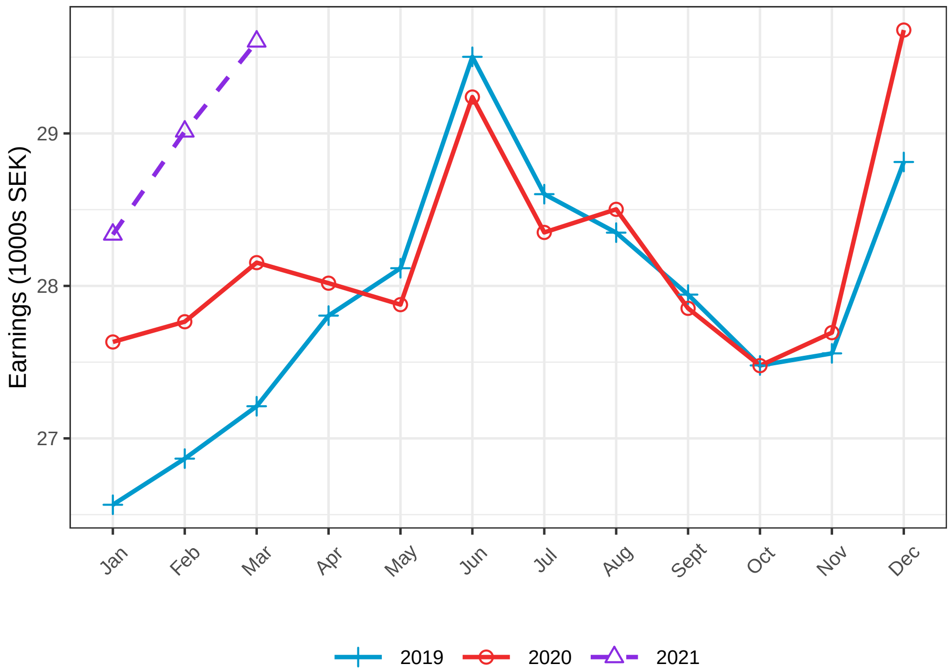
the role of capital income and taxes for inequality during the first year of the pandemic.

3.1 The level of earnings

Figure 1 displays the evolution of average monthly pre-tax wages and salaries among all working individuals in Sweden from January 2019 to March 2021. Comparing the earnings development between January-February 2019 with the same months during 2020, that is, the pre-pandemic period in both years, with March-December in pre-pandemic 2019 and pandemic 2020, shows that average total earnings in the working population was clearly affected by the COVID-19 pandemic. While earnings between January-February 2019 and 2020 increased by 3.5 percent, they were virtually unchanged in level between the latter parts of the two years, indicating an overall decrease by 3.5 percent. However, looking at January-March 2021, earnings are 2.5–3.5 percent higher than in the same months a year before, which suggests a rebound of the Swedish labor market. The figure also shows interesting monthly variation patterns in the aggregate earnings which are new to the literature due to these new monthly administrative earnings data. Two large monthly spikes stand out, one in June and one in December. In order to explain them, we need to look closer at the earnings patterns in different parts of the earnings distribution.

Figure 2 presents average earnings trends in earnings quantile groups of the working population: bottom quartile (P0-25), second quartile (P25-50), third quartile (P50-75),

Figure 1: Average earnings, monthly among all income earners



Note: The figure shows the average monthly pre-tax earnings in the working population 18-64 years old.

fourth quartile less the top decile (P75-90), the top decile less the top percentile (P90-99), and the top percentile (P99-100). The figure shows that there are stark differences between these groups in terms of earnings levels, variation and also the effect of the COVID-19 pandemic.

The bottom quartile consists of workers with either zero or close-to-zero earnings and their average monthly earnings is therefore quite low, 2,000–7,000 SEK (circa 200–700 EUR). This group has an earnings spike in August, which most likely reflects a seasonal employment effect. Comparing pandemic and pre-pandemic periods shows a drop in earnings by around 10-15 percent during 2020 and a much higher drop in early 2021. The second, third and fourth quartiles (less the top decile), that is mainly full-time workers between the 25th and 90th earnings percentiles, follow a quite similar pattern during the studied period. These groups exhibit the earnings spikes in June and December as we saw in the overall aggregate earnings above. The spike in June reflects an extra holiday reimbursement to employees paid out when going on summer vacation. The spike in December 2020 in the second and third quartiles is largely due to a one-time pay to broad employee groups in 2020 as part of a new collective wage agreement between employers and trade unions.[9] In the fourth quartile this spike additionally reflects a supplementary wage payment made by owners of closely held corporations to themselves in order to maximize the amount of low-tax dividend payouts that they can make in the following year.[10] The pandemic impact on all of these groups is also similar in that the pre-pandemic increase is not observed during the rest of 2020, but there is a notable increase in 2021.

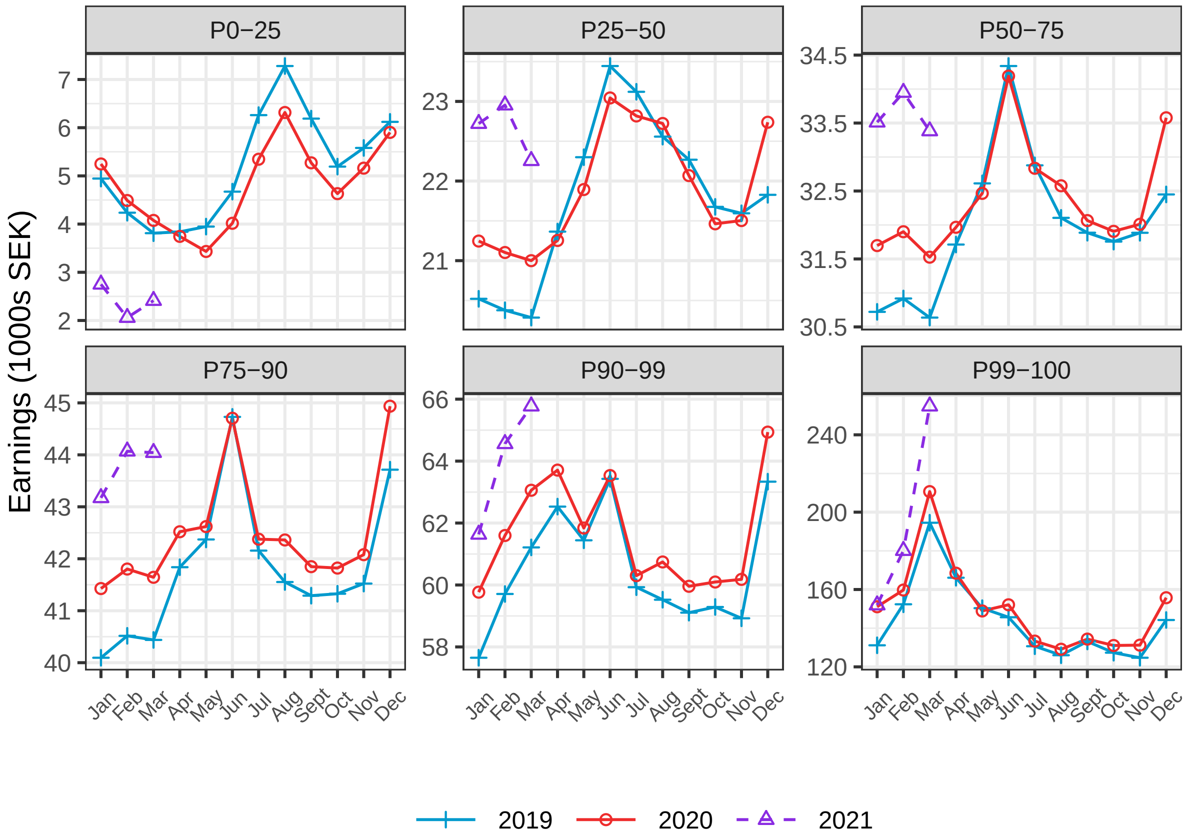
The top decile differs from the rest of the population, and this is especially true for the top percentile. The bottom nine-tenths (P90-99) exhibit earnings spikes in June (smaller) and December (larger), which confirms the established notion that this groups consists of a larger share of self-employed individuals than the lower groups. The top percentile is quite different, not only in the level of earnings but also with a notable earnings spike in March. This spike reflects the extra payments to corporate executives referring to variable remuneration (bonuses and other gratifications).[11] As for the experiences of the pandemic shock, it is difficult to draw firm conclusions from simple inspection, but it

[9]The one-time pay supplement to workers in the public-sector services union (Kommunal), the one-time payment in 2020 was 5,500 SEK (https://www.kommunal.se/fragor-och-svar-om-kollektivavtalet-dig-som-arbetar-inom-kommuner-eller-regioner)

[10]In the Swedish dual income tax system, labor and capital income is taxed according to separate tax schedules. Owners of closely held corporations with few owners (fåmansbolag) are allowed to a specifically low tax rate if they can show that they have payed out wages in the year before. This rule is well-known and accountancy firms help owners to calculate their December wage payment so that it comes as close as possible to maximizing the amount of low-tax dividend payouts the next year would the company decide to make such payouts.(https://blogg.pwc.se/taxmatters/loneuttag-2020-famansforetag).

[11]The timing is explained by the fact that most companies have their annual meetings in March, and the board therefore finalizes the annual report and decides on variable pay to executives in February that is generally paid out the following month. There is some degree of variation, which explains that also April exhibits higher earnings in the top quantile group.

Figure 2: Average monthly earnings across the earnings distribution, 2019 - 2021



Note: The figure shows the average monthly pre-tax earnings in the working population 18-64 years old. Individuals are categorized in earnings quantile groups based on their full-year income.

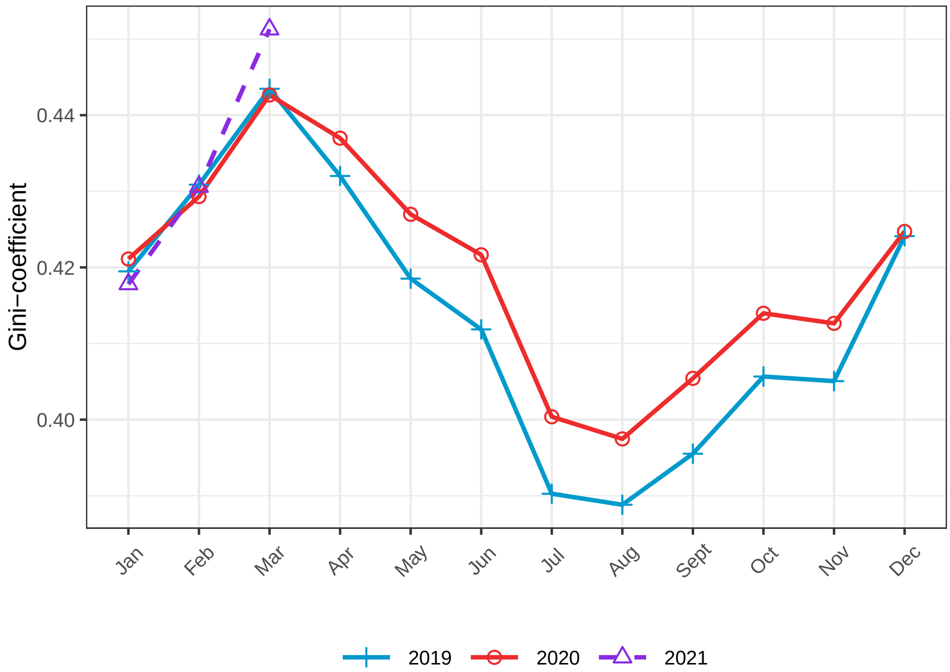
seems as if the top decile has on the whole experienced relatively small negative effects so far. In fact, the earnings spike in March 2021 in the top percentile is an order of magnitude larger than the same spikes in 2019 and 2020.

3.2 The inequality of earnings

How has earnings inequality evolved during the COVID-19 pandemic? Figure 3 presents the Gini coefficient of monthly pre-tax labor earnings among Swedish working adults 18-64 years old. Before analyzing how the crisis has influenced inequality, let us briefly discuss some stylized patterns in the monthly Gini variation, which, to the best of our knowledge, are new to the scientific literature concerning administrative full-population data. A first observation is that the monthly Gini variation is strikingly large as year-to-year Gini changes rarely exceed one–two percent. During the severe economic crisis of the early 1990s in Sweden, the earnings Gini among full-time employed increased by five percent. Here, we observe a monthly Gini span within a single year of about five Gini points, or more than ten percent. A second observation is that the Gini exhibits two marked monthly spikes: March and December. Referring to our previous section, both of these spikes reflect the earnings hikes observed among top earners (see figure 2). It is not the first documentation of such a large impact of top tail variations on the Gini coefficient (see, for example, Alvaredo (2011)), but it has not been done in this manner at the monthly level and linking it to specific earnings patterns in the population.

Turning to the inequality effects, figure 3 documents a clear increase in the Gini going from the pre-pandemic to the pandemic periods. In 2019, the Gini varied between 0.39 and 0.44, and in the pandemic period it has varied between 0.40 and 0.45. The increase is thus about one Gini point, which represents a 1.0–2.5% higher Gini coefficient. That this increase is associated with the onset of the pandemic in April 2020 appears clear. The increase has also lasted almost unchanged, with the exception for December when there is no discernible difference between the years.

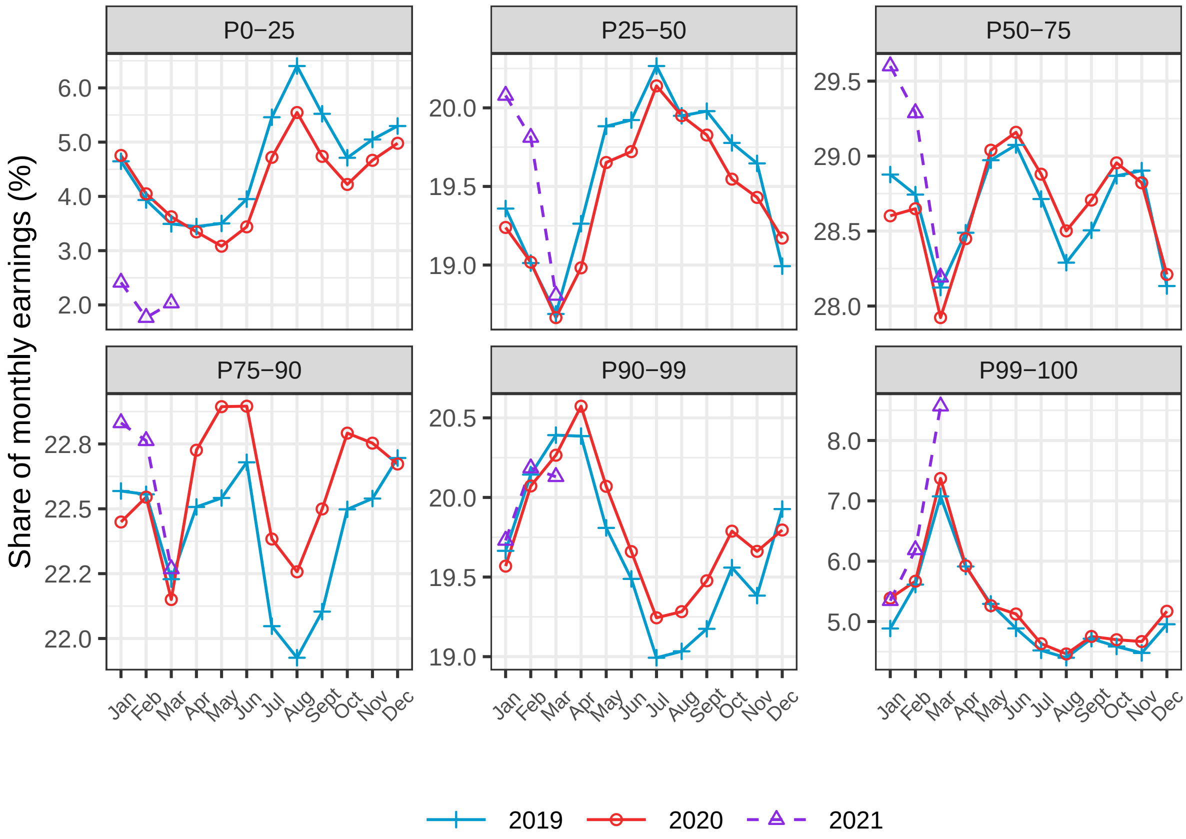
Figure 3: Inequality of monthly pre-tax labor earnings: Gini coefficient, 2019–2021



Note: The figure shows the Gini-coefficient in monthly pre-tax earnings in the individual working population aged 18-64.

Earnings shares among bottom, middle and top groups in the pre-tax earnings distribution are shown in figure 4. These shares complement the inequality analysis of the Gini coefficient by presenting a finer picture of where in the distribution that the overall inequality patterns emerge. Looking first at the bottom half of the distribution, we can see that it experienced lower earnings shares at the time of the outbreak of the pandemic in March-April 2020. The decrease was largest, in relative terms, in the bottom quartile where the earnings share decreased by one-tenth in 2020 relative to 2019. In the upper half, earnings shares instead increased during the pandemic. The relative effect was quite similar across the quantile groups within the upper half, around one-two percent

Figure 4: Earnings shares across the earnings distribution, 2019 –2021



Note: The figure shows the average monthly earnings in the working population 18-64 years old. Individuals are categorized in earnings quantile groups based on their full-year income.

increases. Thus, the analysis of earnings shares confirm the results from the analysis of average earnings and the Gini coefficient in showing the clearly regressive nature of the pandemic shock to labor earnings.

4 Government COVID-19 policies and inequality effects: A simulation analysis

The Swedish government launched during 2020 and 2021 a series of COVID-19 policies containing income support to employees and firms that experienced negative shocks during the pandemic. In this section, we analyze the distributional impact among working-age individuals of the two single largest policy packages: the Short-Term Work Allowance (STWA) and the Reorientation Support (RS). The work allowance package amounts to 50 billion SEK (circa 5 billion EUR) and the reorientation support package to 39 billion SEK (3.9 billion EUR) in the budget year 2020-2021 and represents approximately one-fourth of the government's total COVID-19 support budget. The total budgeted government COVID-19 support was 389 billion SEK, with the STWA and RS as the single largest policies.[12] In comparison with other countries, the size of the fiscal support in response to COVID-19 during 2020–2021 has been relatively samll in Sweden, about half the size of the average support in advanced economies (**?**).

The work-allowance support is directed to employees, allowing them to reduce their work-hours up to 80% without losing more than 12 % of their earnings. While employers pay for the actual work time (plus a small extra charge), the government tops up the salary to almost the full contracted amount.[13] The reorientation support goes directly to firms that have experienced falling sales during the pandemic. Although it is handed out to firms and not to employees directly, we interpret the support as being shared between owners and employees, assuming a factor-share division of 70% to labor and 30% to capital. Thereafter, we allocate the support money to each worker in proportion to their reported individual earnings.

Data on individual- and firm-level support are retrieved from registers kept by the responsible authorities Tillväxtverket (STWA) and the National Tax Agency (RS). STWA-data is available also at the National Tax Agency. To observe the exact amounts handed out offers the analysis a unique degree of accurately in its estimation of the distributional policy impact. We observe the work-allowance support during April-November 2020. We observe the support distributed in April-June 2020, but the application period for later months in 2020 and 2021 are still pending.

We estimate distributional effects of the two support policies in two *counterfactual simulations* where we subtract the observed support money from the observed earnings. In *Policy Simulation 1* (PS1), we let each employee keep the job but subtract the individually observed (STWA) or estimated (RS) support from the employee's salary and thereafter recalculate the inequality of earnings exclusive of the support. In *Policy Simulation 2* (PS2), we instead let employees keep their salary but reduce the number of employees so that the firms' total wage bills equal their wage costs net of the government support. We do this by removing workers from the bottom of the within-firm earnings distributions (acknowledging the established "last in-first out" rule in the Swedish labor market) until we get enough workers to cover the support money.[14]

Notice that the difference between PS1 and PS2 corresponds to an institutional difference across European labor markets. The PS1 variant with "reduced hours, fixed employment" is close to a German, "Hartz IV", labor-market model, in which a crisis is

[12]Other policies include reduced social security contributions, government coverage of all sick-leave pay, more generous allowances for health insurance, parental leave and so forth.

[13]See appendix table A3 for the scheme over alternative work-time reductions, effects on earnings and on contributions by employers and government.

[14]We typically get integer effects for the last worker, such that keeping that worker would make the firm run a loss while firing the worker would result in a net surplus. In these cases, we opt for letting the worker keep the job and the firm run a loss. While this is not an equilibrium for the firm, if one also acknowledges firing costs and expectations of a recovery within a not too distant future, keeping the worker may actually be optimal for the firm.

tackled by allowing for a reduction of work-hours and earnings while keeping employment intact. By contrast, the PS2 variant with ”fixed hours, reduced employment” is closer to a traditional Swedish labor-market model, where Swedish central wage agreements stipulate full-time jobs and full-time pay as the baseline and unemployed individuals get coverage from the government-backed unemployment insurance. The fact that the STWA has been implemented in Sweden thus represents a large-scale deviation from the traditional strategy.[15]

4.1 Policy simulation results

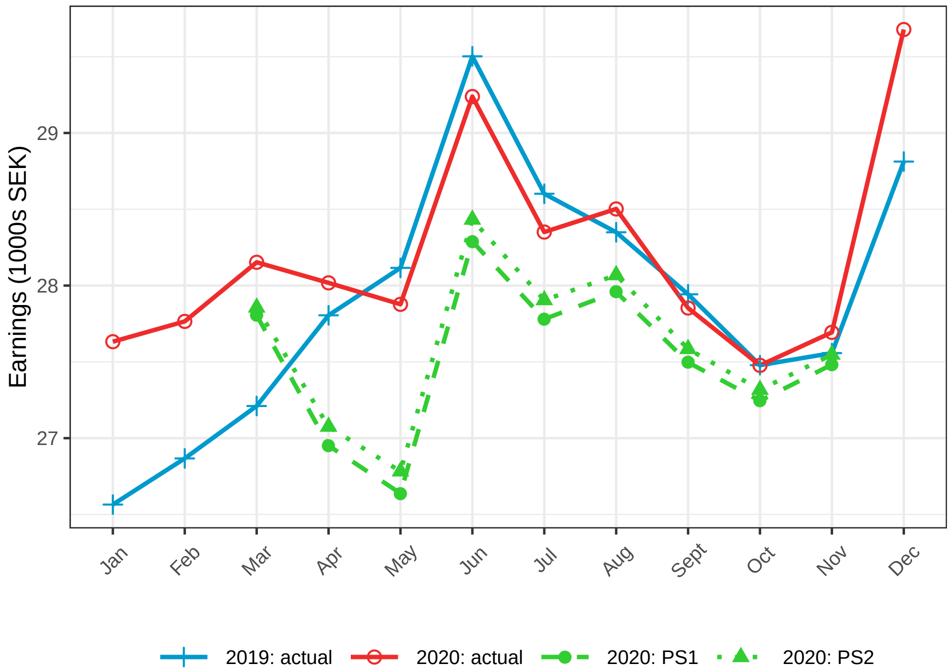
We first inspect how the COVID-19 policy has affected average earnings in the whole population and across quantile groups, and thereafter calculate its impact on the Gini coefficient and earnings shares.

Figure 5 compares the aggregate average earnings in the actual outcomes with those in the counterfactual case without any policy support, assuming that all else is being equal. This shows that average earnings without support would be around four percent lower in April-June, two percent lower in July-August and one percent lower in September-November. In other words, the policy had initially a relatively large muting effect on the crisis, but that it decreased later in the pandemic.[16] To assess the crisis effect on earnings, one would also need to consider that average earnings increased by more than three percent in the pre-pandemic era between January-February 2019 and the same months in 2020. Assuming such earnings increase over the whole 2020, the total pandemic impact on average earnings in Sweden was a drop of seven percent in April-June and four-five percent in the second half of 2020.

[15]During the crisis in 2008-2009, there was a partial trial with short-term wage support in the Swedish metal industry following a bilateral agreement between employers and the Metal workers’ trade union.

[16]Note that our support money is not the final total for all the support due to considerable lags in the support programs. By May 2021, it was still possible for firms to apply for SWTA support covering December 2020 and RS support covering July-December 2020.

Figure 5: Population average earnings with and without COVID-19 support



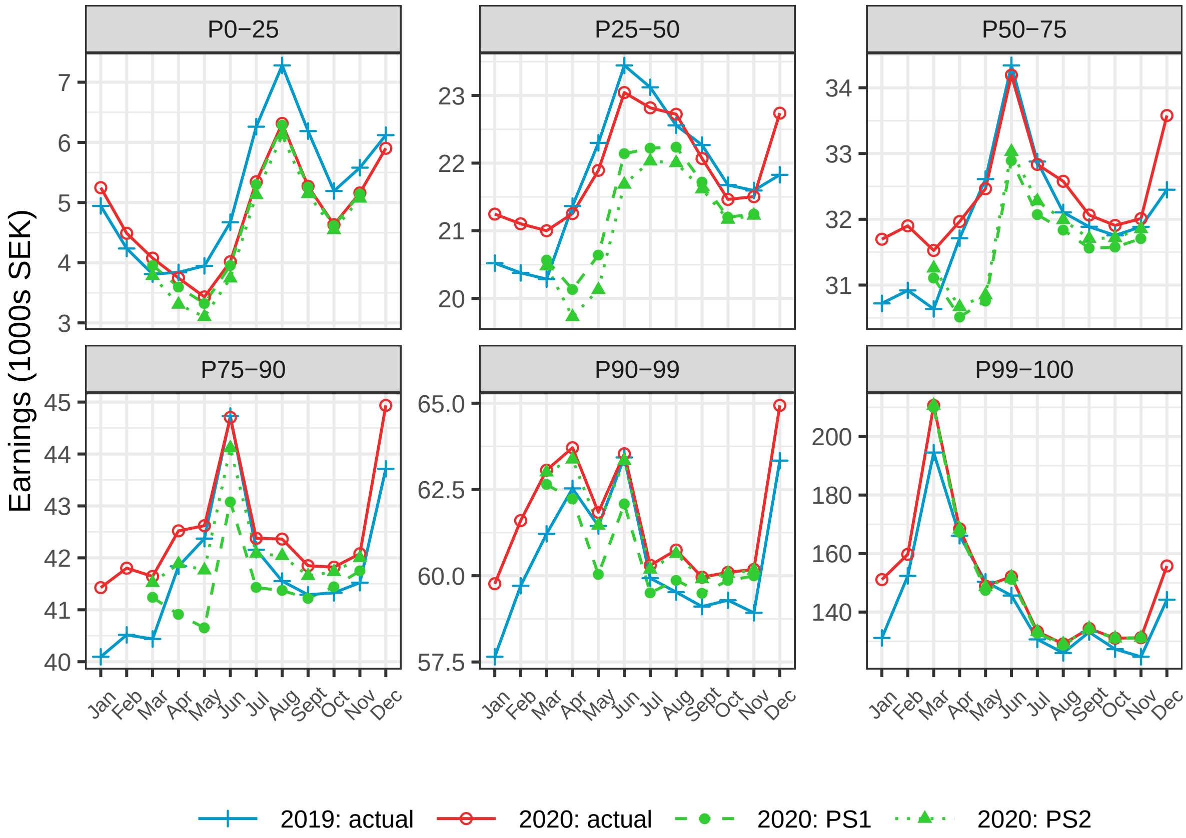
Note: The figure shows tha average earnings among all working individuals. "Actual" denotes earnings as recorded in the payroll register, after the payments of government support money. The amount of government COVID-19 policy support equals the sum of paid out Short-Term Wage Allowance (STWA) and Reorientation Support (RS). Two presumed scenarios are applied to allocate the support money: sustained employment but fewer hours worked (PS1) or sustained full-time jobs but higher unemployment (PS2). Note that we do not observe support payments in December 2020. See text for further details.

Turning to the distributional impact of the government's COVID-19 policy, we begin with presenting the effects on average earnings in different quantiles and thereafter on the Gini coefficient and income shares.

Figure 6 presents earnings effects across quantile groups in the two counterfactual scenarios. In the PS1 scenario ("hours reduced, employment fixed"), the bottom quartile is almost unaffected by the crisis but in the second and third quartiles, earnings drops by 2–5% over the course of 2020, with the impact being the largest in April and then gradually decreasing. The fourth quartile also experiences lower earnings due to the crisis, but the effect is both lower in the latter part of 2020 and smaller the higher up in the distribution one gets. In P75-90, earnings drop 1–4%, in P90–99 earnings drops 1–2% and in the top percentile there is almost no crisis effect at all. In the PS2 scenario ("employment reduced, hours fixed"), the effects of the crisis are quite differently distributed as compared to PS1. The bottom quartile experiences a drop of 2–10%, which is relatively large but still small in nominal terms. The second quartile earnings drops 2–7%, the third quartile earnings by 1–4% and the fourth quartile drops less, around 1% among those below the 90th percentile and around 0.5% percent in the top decile.

Comparing the two scenarios generates an interesting picture. While the PS1 allocates most of the crisis impact in the form of lower earnings to the upper half of the distribution, the PS2 allocates most the crisis effect to the lower half of the distribution. This pattern is explained by the fact that PS1 reduces earnings among all the workers who have received support and PS2 instead directs the shock mainly to low-paid, less experienced workers who become unemployed. The government support, defined as the difference between the projected counterfactual and actual outcomes, has had the opposite effect on earnings. In the PS1 scenario, the government support is directed more to groups in the middle and upper levels of the earnings distribution and in the PS2 scenario, funds are channeled disproportionately to the lower parts of the distribution.

Figure 6: Average earnings in quantile groups with and without COVID-19 policy support

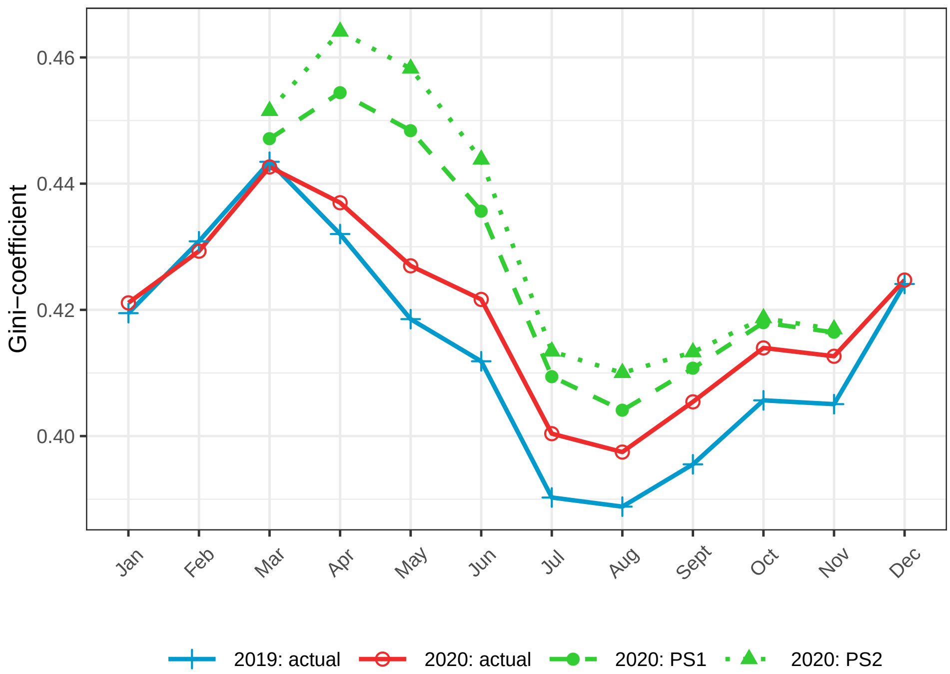


Note: The figure shows the average monthly earnings in the working population 18-64 years old. Individuals are categorized in earnings quantile groups based on their full-year income. ”Actual” outcomes denotes the earnings dispersion as recorded in the monthly payroll register. The COVID-19 policy support payments, the sum of Short-Term Work Allowance and Reorientation Support, is subtracted from each individual’s earnings following two presumed scenarios: sustained employment but fewer hours worked (PS1) or sustained full-time jobs but higher unemployment (PS2). Note that we do not observe support payments in December 2020.

Figure 7 presents Gini coefficients to assess the distributional impact of the government support. Both counterfactual scenarios of PS1 and PS2 result in higher Gini coefficients than in the actual 2020 baseline. When comparing to the 2019 level, the PS1 Gini coefficient is 5–7% higher in April-June and 3–5% higher in July-November. The

PS2 Gini coefficient is 7–10% above the baseline in April-June and 3–6% higher in July-November. This means that without the government support, Sweden would in the first three months of the pandemic have experienced an increase in the earnings inequality that would have been two–four times larger than what actually happened had the country practiced a German-like labor market model where all workers retain their job but at fewer hours and less pay (PS1). However, had Sweden instead had a Swedish-like model where some workers retain their job and their pre-pandemic salary while some would have lost their job (PS2), earnings inequality would have increased between three and six times more than what actually happened. In the second half of 2020, the inequality increase without government support is smaller in both scenarios, but still with the PS2 scenario resulting in higher inequality than the PS1 scenario.

Figure 7: Inequality effect of COVID-19 policy support



Note: The figure shows the Gini-coefficient of monthly earnings in the working population 18-64 years old (see figure 3). ”Actual” outcomes denotes the earnings dispersion as recorded in the monthly payroll registr. The COVID-19 policy support payments, the sum of Short-Term Work Allowance and Reorientation Support, is subtracted from each individual's earnings following two presumed scenarios: sustained employment but fewer hours worked (PS1) or sustained full-time jobs but higher unemployment (PS2). Note that we do not observe support payments in December 2020.

5 Driving factors: Unemployment, top earners, sector and gender

In this section, we examine the role of some specific channels through which the pandemic crisis may influence earnings inequality. Focus lies on three pathways that our data allow us to address: unemployment, public-private sector reallocation, and gender differences.

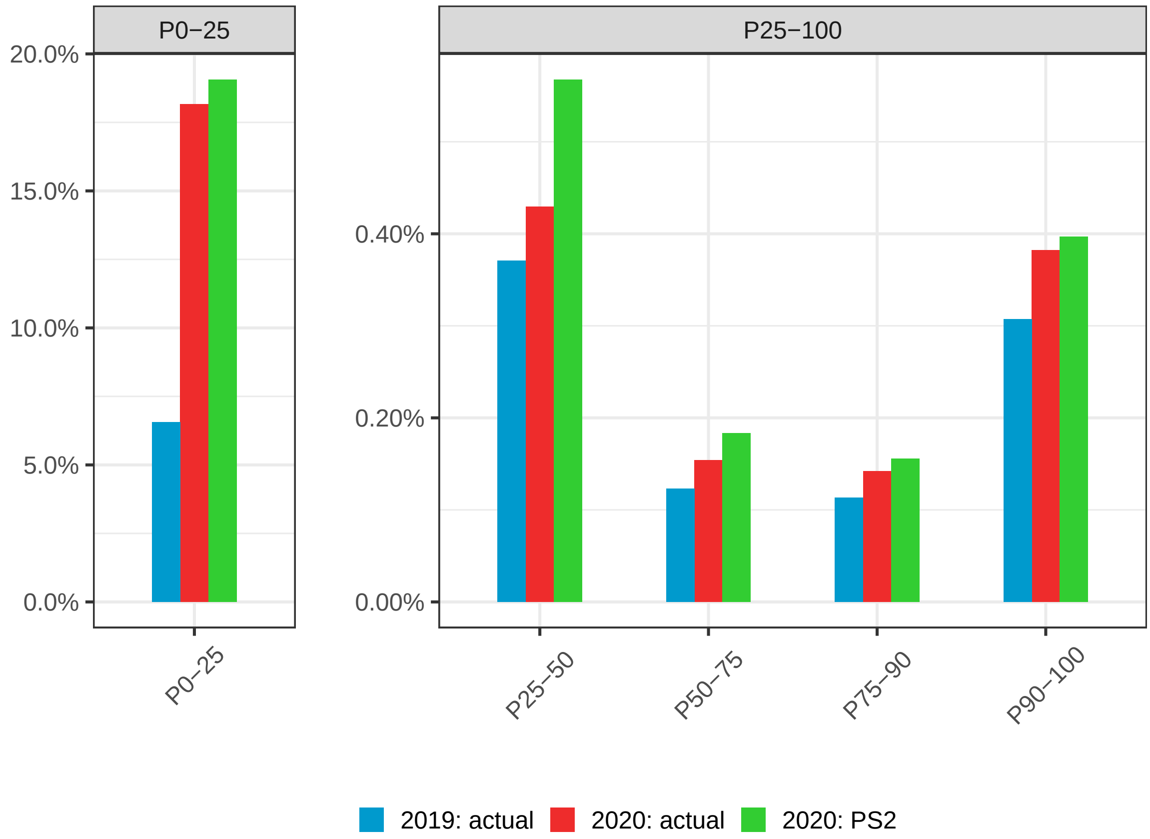
5.1 Unemployment effects

The unemployment effects of the pandemic are studied in Figure 8. The figure displays the share of worker in different quantile groups who had non-zero earnings (i.e., were employed) during January-February 2019 and 2020, and that were later unemployed in the year during March-December. A worker is defined as unemployed when he or she has zero earnings during all months in the relevant period. In 2019, about 6.5 percent of the bottom quartile workers during January-February were unemployed during March-December, while among employees in all the other quantile groups together there were only one percent who became unemployed later in 2019 (between 0.1–0.35 percent across groups). In 2020, the share of bottom quartile workers as of pre-pandemic January-February that was unemployed through March-December had increased to 18 percent, a threefold increase. By contrast, the unemployment among the higher-earnings groups changed only marginally, to 1.3 percent (0.15–0.40 percent across groups) in 2020.

The figure also shows counterfactual unemployment estimates, based on our simulations (PS2) in the previous section where we assumed that some workers had to leave their firms if these would not have received any government support money (we assumed that it was the less educated and lower paid workers who had to go). This simulation shows that an additional 1.2 percent of workers would have become unemployed, with about one percent extra from the bottom quartile and the remaining extra 0.2 percent mostly coming from the second quartile workers.

Altogether, the results show that the pandemic crisis has increased unemployment in the Swedish labor market, and that this increase was disproportionately allocated to low-income, presumably part-time workers in the bottom earnings quartile. We also find that without the government support, unemployment would have increased even more, mainly in the bottom earnings quartile, but this impact is still relatively small in comparison with the main unemployment effect of the pandemic itself. All this points to the relevance of extensive-margin effects for the observed changes in earnings inequality during the COVID-19 pandemic.

Figure 8: Unemployment shocks during the pandemic across the distribution



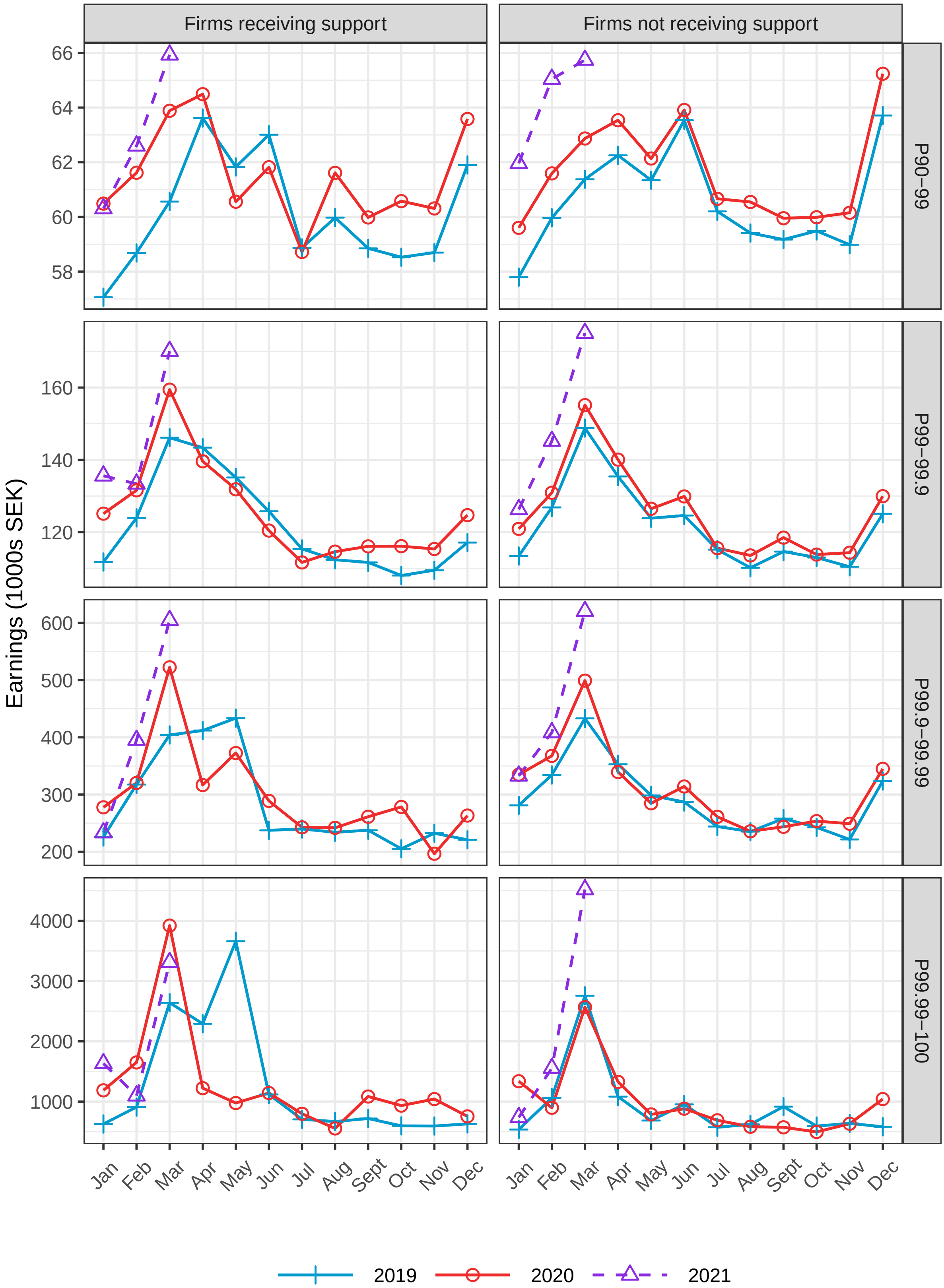
Note: The figure shows the share of earners in different earnings quantile groups during January-February in 2019 and 2020 that had zero earnings in March-December the same year.

5.2 Top earnings

To better understand how top earnings have evolved during the pandemic, we split up the top percentile into smaller groups, P99-99.9, P99.9-99.99 and P99.99-100. Furthermore, we separate top earners working in firms receiving government COVID-19 support and firms that did not. It is interesting to follow the remuneration to top executives in these firms, not least because this issue has been highlighted in the political debate about the COVID-19 policies. Since we observe earnings in March 2021, we capture the variable remuneration related to the first COVID-19 year, 2020.

Figure 9 presents average earnings across top groups where we have divided the firms in two groups: firms that did and did not receive support. The results show that the pandemic struck harder on top earners in firms receiving support, with April-July earnings being at or below in 2020 compared to 2019. However, it is noticeable that the top earners' pay increased significantly in early 2021, and that the remuneration in March 2021 was substantially higher than in March 2020. In the March 2019 and 2020, the monthly earnings in the top 0.01 percent was 2.7 million SEK (roughly 270,000 EUR), and in March 2021, it was almost 4.5 million SEK (450,000 EUR).

Figure 9: Top earnings and government COVID-19 support



Note: Average monthly pre-tax earnings in quantile groups that are defined according to full-year earnings. Firms are divided into those receiving government COVID-19 support (see section 4) and those not receiving any such support (this group includes all public-sector employees).

5.3 Sector decomposition and gender effects

Next, we examine two other channels through which the pandemic may influence earnings inequality: through differential earnings impacts on the private- and public-sector workers and on men and women. To analyze this, we run regression analysis of two variants. First, we run difference-in-difference regressions where we estimate effects of the pandemic on average earnings in the different groups, holding the influence from average yearly effects and within-year trends constant. Second, we run unconditional quantile regressions (Firpo et al. 2008, 2018) that estimate quantile-specific effects for the entire working population but also within sectors and gender (with quantiles still defined over the whole population).

Our chosen estimator utilizes within-year variation over two different calendar years to estimate the impact of the pandemic. To fix ideas, let Y_{ipt} denote the outcome variable (monthly earnings or a dummy for positive earnings) for individual i during the period January-February ($p = 1$) or March-December ($p = 2$) measured in year $t = 2019$ or 2020. Furthermore, let $D_t = \mathbf{1}[t = 2020]$ where $\mathbf{1}[\cdot]$ is the indicator function taking the value one if the expression within brackets is true and zero otherwise, and $S_p = \mathbf{1}[p = 2]$. In the empirical analysis to follow, we will use monthly data. In order to convey the main ideas, it is useful to disregard the monthly dimension for now and take $p = 1,2$ as our within-year observation frequency. Keeping that in mind, consider the following model:

$$Y_{ipt} = \delta + \theta_1 D_t + \theta_2 S_p + \theta_3 D_t S_p + u_{ipt}, \tag{1}$$

where u_{ipt} is an error term. Let $\bar{Y}_{pt} = 1/N_{pt} \sum_i Y_{ipt}$ (N_{pt} being the number of observations during period p and calendar year t) and finally, $\Delta Y_t = \bar{Y}_{2t} - \bar{Y}_{1t}$. Using a random sample of the population (recall that we have the complete population), the parameter of interest θ_3 identifies

$$E(\Delta Y_{2020} - \Delta Y_{2019}). \tag{2}$$

In a companion paper, we discuss identification issues in this setting (Angelov and Waldenström, 2021) albeit for firm-level data. The main identification assumption in that paper as well as here is analogous to the parallel-trends assumption in a standard DD-setting. Formally, for effect identification, we need

$$E\left(\Delta Y^0_{2020} - \Delta Y^0_{2019}\right) = 0, \tag{3}$$

where we use the potential outcomes framework such that ΔY^0_t is defined as the within-year difference during year t under the assumption that there was no pandemic during year t. In Angelov and Waldenström (2021), we discuss and run several placebo effect estimations in order to informally test 3 indirectly. Unfortunately, the monthly earnings data used in this paper start in 2019 meaning that it is unfeasible to run placebos. As it is impossible to empirically assess the parallel trends assumption using the monthly earnings data, we proceed by stating the empirical specification below and go on to discuss the results, noting that we cannot exclude the possibility that an ongoing pre-COVID negative within-year trend in wages or employment could potentially distort the presented effect estimates.

We start by estimating a version of (1) on monthly data. The empirical specification is the following:

$$Y_{imt} = \delta_0 + \theta_1 D_t + \theta_2 S_m + \theta_3 D_t S_m + u_{imt}, \tag{4}$$

where $m = 1,2,\ldots,12$ denotes month, $S_m = \mathbf{1}[m \geq 3]$, and D_t is defined as previously. For inference, we use standard errors clustered at the individual level. As the effect is essentially identified at group level and pre-covid observations of treated taxpayers to a large extent act as their own controls, individual fixed effects are not needed for identification. We get very similar results when we add individual-fixed effects.

Table 1 presents the difference-in-difference estimation results for two dependent variables: log earnings (columns 1 and 2) and employment (columns 3 and 4, defining employment as having positive earnings). A first result is that the pandemic crisis reduced average pre-tax earnings by 3.8 percent in its first year, accounting for time trends and within-year fluctuations (column 1). Looking at effects across sectors, the results show that public-sector workers experienced a 1.2 percent larger-in-magnitude negative earnings shock in comparison to private-sector workers (column 2). The relative effect for women in the private sector (relative to men in the private sector) shows that women were hit harder by the pandemic (–0.8 percent). We do not find evidence of any additional effect of being a woman employed in the public sector (column 2, insignificant point estimate of 0.3 percent).

Turning to the employment effects, we see that the pandemic resulted in a 1.4 percent reduction in overall employment in our population of individuals having at least one month with earnings between January 2019 and March 2021 (column 3).[17] However, public-sector employment actually expanded during the pandemic: the relative effect for men in the public sector compared to men in the private sector is 2.9 percent, implying an employment increase of about 0.9 percent in the public sector (column 4). The relative effect on employment among women in the private sector compared to men in the private sector is negative (-1.2 percent), and thus women were affected more negatively than men also with regards to employment. In the public sector, there is an additional positive relative effect on employment for women of about 0.4 percent (column 4). Summing up the results, we fund that the entire employment reduction during the pandemic took place in the private sector. Combining the lower earnings but larger employment among public-sector female employees indicates an expansion of low-earnings jobs, either in the

[17]Note however that the model is estimated on data for 2019 and 2020 solely.

Table 1: Effect of the COVID-19-impact on monthly wages: Varying specifications

	Dependent variable:			
	log(w)	log(w)	1[w>0]	1[w>0]
	(1)	(2)	(3)	(4)
$Covid\ impact$	−0.038***	−0.025***	−0.014***	−0.020***
	(0.0005)	(0.001)	(0.0003)	(0.001)
$Impact \times Woman$		−0.008***		−0.012***
		(0.001)		(0.001)
$Impact \times Public\ employer$		−0.012***		0.029***
		(0.002)		(0.001)
$Impact \times Woman \times Public\ employer$		−0.003		0.004*
		(0.002)		(0.002)
$Year\ 2020$	0.062***	0.055***	0.002***	0.005***
	(0.0005)	(0.001)	(0.0004)	(0.001)
$March-Dec$	0.049***	0.051***	0.023***	0.027***
	(0.0003)	(0.0005)	(0.0002)	(0.0004)
$Woman$		−0.192***		−0.004***
		(0.002)		(0.001)
$Public\ employer$		−0.106***		−0.024***
		(0.002)		(0.001)
$Woman \times Public\ employer$		0.063***		0.034***
		(0.003)		(0.001)
$Year\ 2020 \times Woman$		0.024***		0.001
		(0.001)		(0.001)
$Year\ 2020 \times Public\ employer$		−0.012***		−0.009***
		(0.002)		(0.001)
$Year\ 2020 \times Woman \times Public\ employer$		−0.004		0.002
		(0.002)		(0.002)
$March-Dec \times Woman$		0.006***		−0.002*
		(0.001)		(0.001)
$March-Dec \times Public\ employer$		−0.021***		−0.010***
		(0.001)		(0.001)
$March-Dec \times Woman \times Public\ employer$		0.010***		0.0004
		(0.002)		(0.001)
$Intercept$	3.446***	3.563***	0.820***	0.822***
	(0.001)	(0.001)	(0.0004)	(0.001)
Observations	14,486,400	14,486,400	25,913,805	25,913,805
R^2	0.002	0.041	0.0004	0.001
Adjusted R^2	0.002	0.041	0.0004	0.001

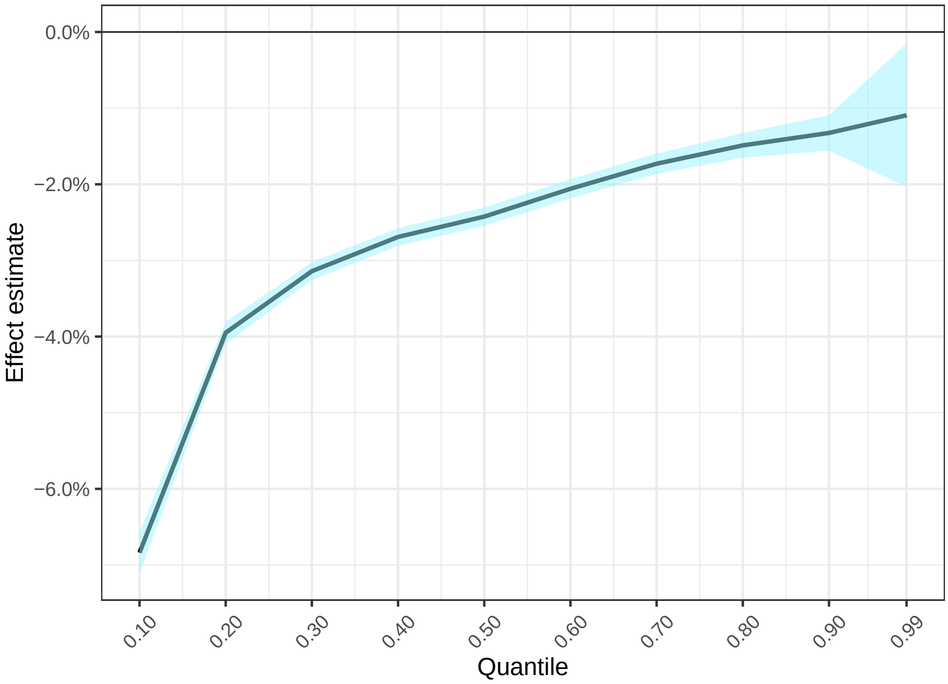
Note: $^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$.

form of full-pay temporary jobs or long-term low-pay jobs. We cannot separate between these two in our data as we do not observe hours or hourly wages.

The unconditional quantile regression results in figure 10 present graphically how the pandemic has affected earnings differentially across the distribution. The strong negative gradient reported in the previous section when analyzing average earnings and inequality outcomes is confirmed by the quantile regressions. The largest decreases are recorded in the bottom of the distribution and the top of the distribution is almost unaffected by the pandemic in terms of its earnings level. Marginal effects vary from –0.068

in the 10th quantile to –0.012 in the 99th quantile. The effects are precisely estimated with exception for the 99th quantile, which is probably explained by a smaller number of observations and also higher variance of earnings at the specific threshold. This said, there is a striking monotonicity in the crisis effect difference across quantiles, confirming the regressive nature of the COVID-19 pandemic seen in previous sections.

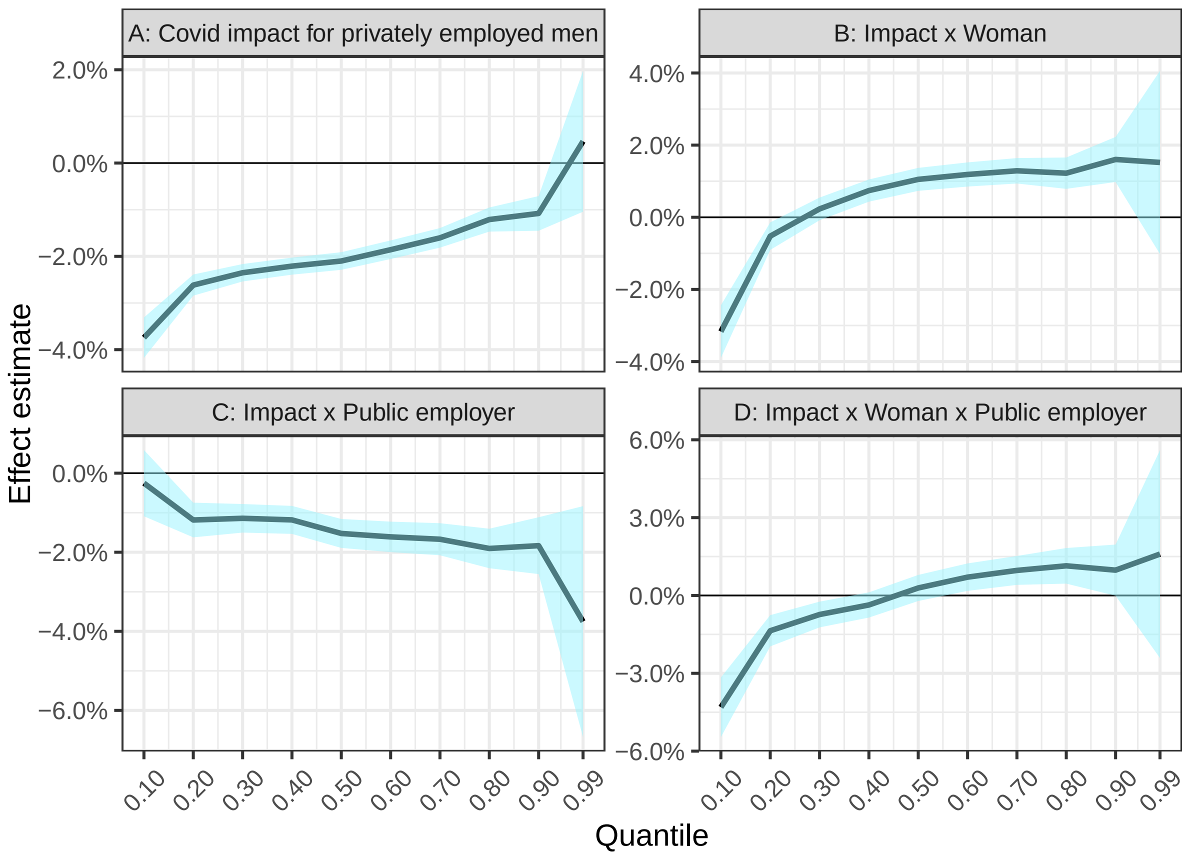
Figure 10: Non-linear earnings effects of the pandemic



Note: Unconditional quantile regression estimation using the method of Firpo et al. (2008, 2018).

In figure 11, we run the unconditional quantile regressions across public-/private-sector and male/female employees (but with quantiles defined over the entire population). In the reference category (panel A), men in the private sector, we find the monotonically decreasing negative impact of the pandemic over the earnings distribution. Panel B shows the relative effect of women in the private sector compared with men in the private sector. At a particular quantile, a negative value in panel B means that the effect among women is lower than among men. While the relative impact on women is negative in the lower part of the distribution, the effect varies in earnings and actually turns out to be positive for women in the 40–90 quantile. Among men employed in the public sector (panel C), the relative crisis effect is negative compared to the effect among men in the private sector for all except the 10th quantile, where it is not statistically different from zero. Finally, among women in the public sector (panel E), the relative effect shows considerable heterogeneity across the earnings distribution: it is strongly negative in the first quartile up to the 30th quantile, positive between the 60th and 80th percentiles, and virtually zero elsewhere in the distribution. Taken together, these results indicate

Figure 11: Non-linear pandemic effects: Group-specific patterns



Note: Unconditional quantile regression estimation using the method of Firpo et al. (2008, 2018).

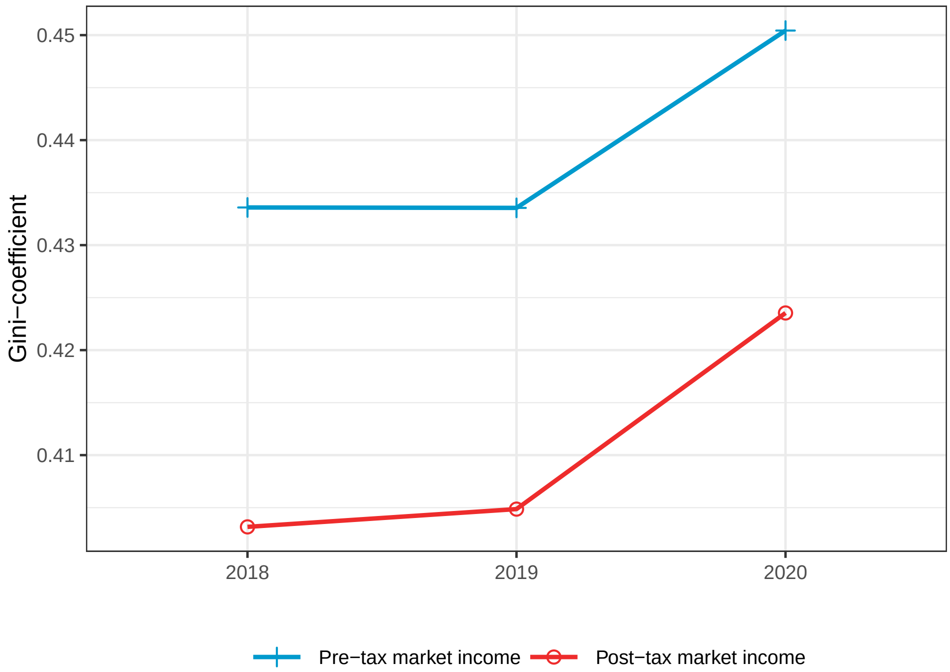
notable non-linearities in the earnings impact of the pandemic and considerable effect heterogeneity with respect to sectors and gender.

6 Market income inequality during the pandemic

This section shifts focus from monthly earnings in the working population to annual incomes in the entire adult population. Instead of analyzing pre-tax wages and salaries, we now analyze the sum of labor income, pensions, other taxable transfers (unemployment and sickness insurance income), self-employment income and capital income (interests, dividends, realized capital gains), everything either before or after subtracting all taxes paid. Standard terminology denotes this income concept *market income* and we compute its distributional characteristics in the individual adult (18+) population.

Figure 12 shows how the pre- and post-tax Gini-coefficient has changed over the period 2018–2020. The pre-tax values have been calculated on market income, and the post-tax values on market income minus the indivuduals' final tax amount for the income year. The results for market income confirm the previously shown results for monthly labor earnings (Figure 3): the Gini-coefficient has increased in 2020. In percentage terms,

Figure 12: Gini-coefficient based on market income



Note: Market income includes labor earnings and pension, income from own businesses (i.e., sole proprietorships), and capital income.

the post-tax Gini has increased more than the pre-tax value (increases with 4.6% and 3.9%, respectively). One reason for this difference might be a income tax policy change which was effectual starting from the income year of 2020, whereby a previously existing state income tax of 5% above a certain income threshold was removed.[18]

In order to see whether the Gini-coefficient increase is primarily driven by income changes at the top or in the lower tail of the distribution, in Figure 13, we show how the average market income has changed over time by percentile group. This figure also shows a decomposition of market income into income from labor, business and capital income (interest and dividends, and realized capital gains). From this picture, it is clear that the Gini-coefficient increase is primarily driven by a considerable drop in market income at the bottom: for individuals below the lower quartile, market income was stable at about 50,000 SEK (about 5,000 EUR) during 2018 and 2019 and fell dramatically to about 30,000 SEK (3,000 EUR) in 2020. As this group comprises a quarter of the population, this market income drop of about 40% is clearly the main mechanism behind the large increase in the Gini-coefficient. In the top one percent, average market income increased by about 3%, through increased labor income and capital gains, but the relatively small increase and the tiny population share means that this contributes marginally to the overall inequality increase.

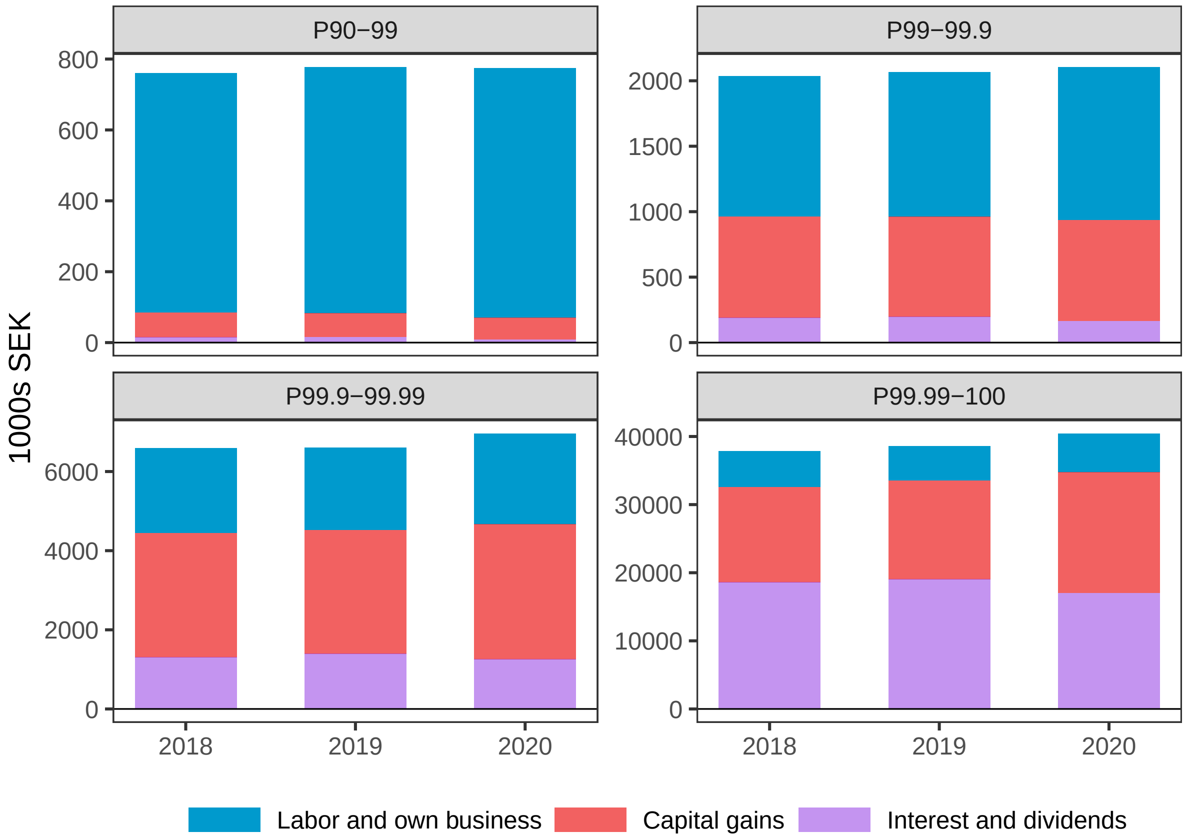
[18]In 2019, the threshold was in effect 703,000 SEK or about 7,030 EUR.

Figure 13: Annual market income and its composition, 2018–2020

Note: Market income includes labor earnings and pension, income from own businesses (sole proprietorships), and capital income.

In Figure 14, we zoom in at the top in order to investigate whether there is evidence that the 3%-increase is driven by a few extreme incomes at the very top, or by a general increase in the entire top one percent. The evidence from the figure points to a general market income increase in all sub-populations of the top percent, including P99-P99.9. However, the nature of the increase differs between the groups. While the lower nine-tenths of the top percentile exhibits mainly a labor income increase, the top 0.1 percentile group has its increase coming from increased realized capital gains.

Figure 14: Annual market income at the top of the market income distribution



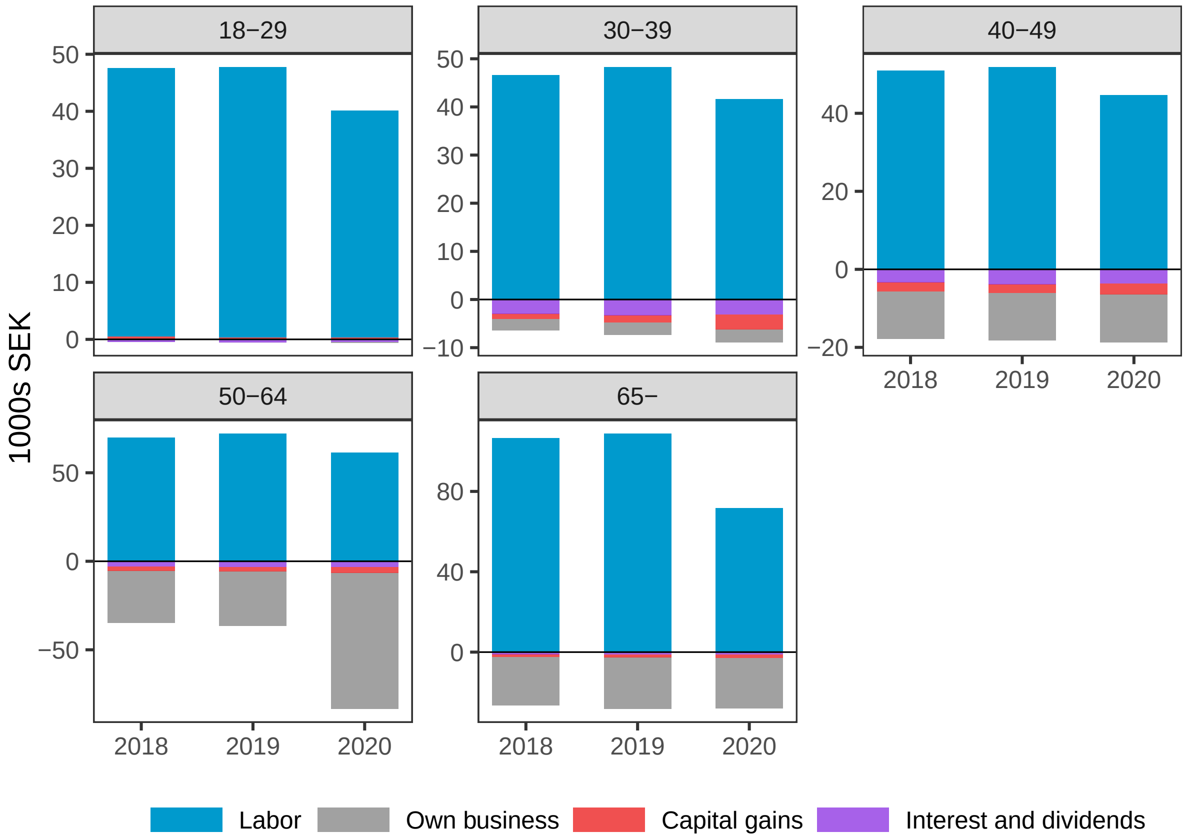
Note: Market income includes labor earnings and pension, income from own businesses (i.e., sole proprietorships), and capital income.

6.1 What is going on in the lower tail?

Repeatedly throughout this study, we have found evidence showing that individuals in the lower end of the income distribution were those hit most severely by the pandemic crisis. Looking back at the previous figures, this was true for average monthly earnings (top left panel of Figure 2), the unemployment shock (left panel in Figure 8), and yearly market income (top left panel in Figure 13). Although these separate analyses have been broadly consistent, it is hard drawing conclusions about potential mechanisms from each analysis separately. In this subsection, we bring together these findings and attempt to distinguish between different potential mechanisms using some additional results. To this end, we investigate individuals with income below the lower quartile along two dimensions: age (for all outcomes) and income source (for market income). Broadly speaking, we attempt to answer the following question: Which age groups were hit the most, and how – via increased unemployment or an income loss conditional on having a job?

We start with annual market income. Figure 15 shows the various income sources of market income for individuals below the lower quartile (P0–25) by age group. The figure does not show any considerable within-group changes between 2018 and 2019. During

Figure 15: Annual market income across age groups in the bottom quartile (P0–25).



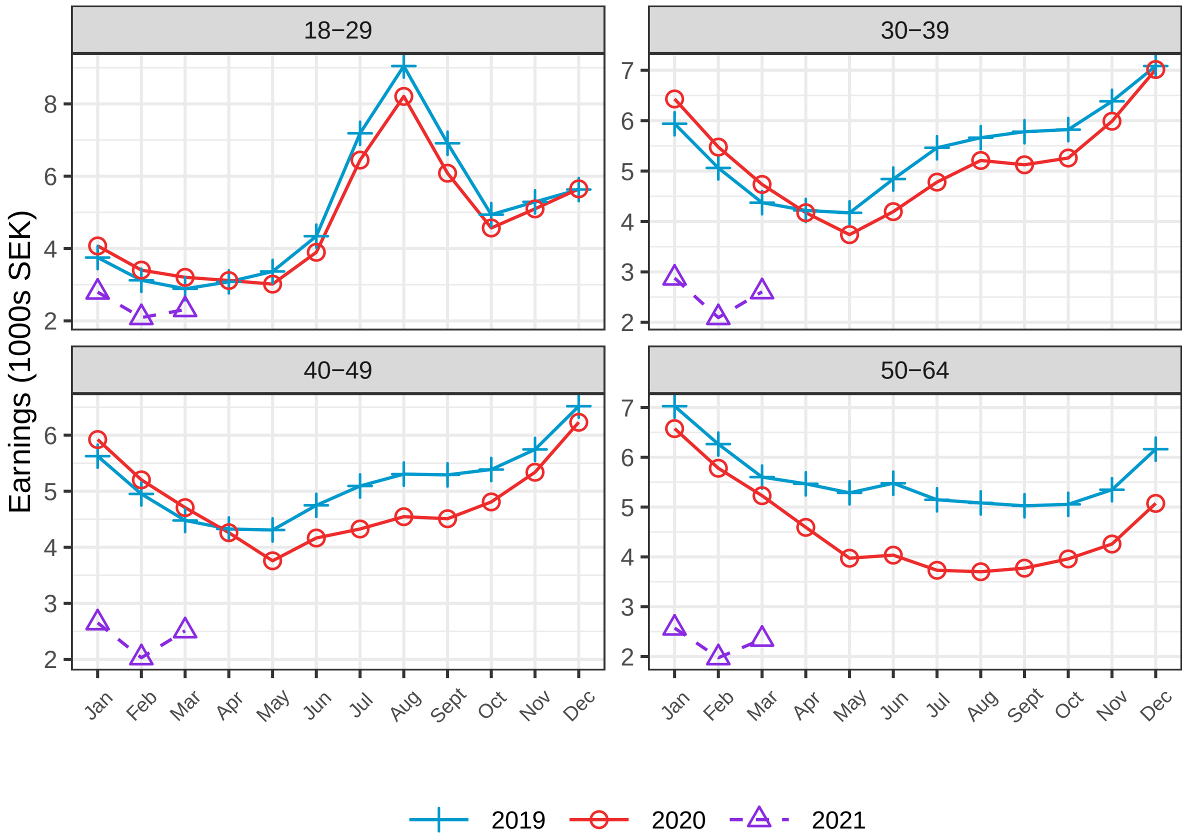
Note: The figure shows P0–25 in the pre-tax market income distribution. Market income includes labor earnings and pension, income from own businesses (sole proprietorships), and capital income (realized capital gains, interest and dividends).

2020, two things seem to happen: labor and pension earnings drop for all groups and most for the youngest and oldest, and the negative net income from own businesses more than doubles in the age group 50 to 64. This large drop in is not unexpected during an year of crisis, but we find it intriguing that it is so clearly concentrated in this particular age group. Although there is an under-representation of those in the age group 50 to 64 relative to the young and elderly[19], they still constitute 13% of the total number of individuals in P0–25. The large drop in income from own businesses thus remains an important explanation for the market income drop in P0–25 during the pandemic.

The fall in annual labor income reported on tax returns could be due to unemployment, fewer work hours, or a drop in the wage rate for instance due to a new lower-paid job. Unfortunately, the structure of these data does not allow us to observe these factors directly. Instead, we turn back to the monthly earnings dataset, and split up the lowest earnings quartile group into the same age groups as above. Figure 16 shows that earnings decreased in all age groups during 2020. The largest drop is found among the

[19]In terms of number of individuals, the relative sizes of the groups starting from the youngest and finishing with the oldest are 36%, 15%, 10%, 13% and 26%, respectively.

Figure 16: Monthly labor earnings across age groups in the bottom quartile (P0–25).



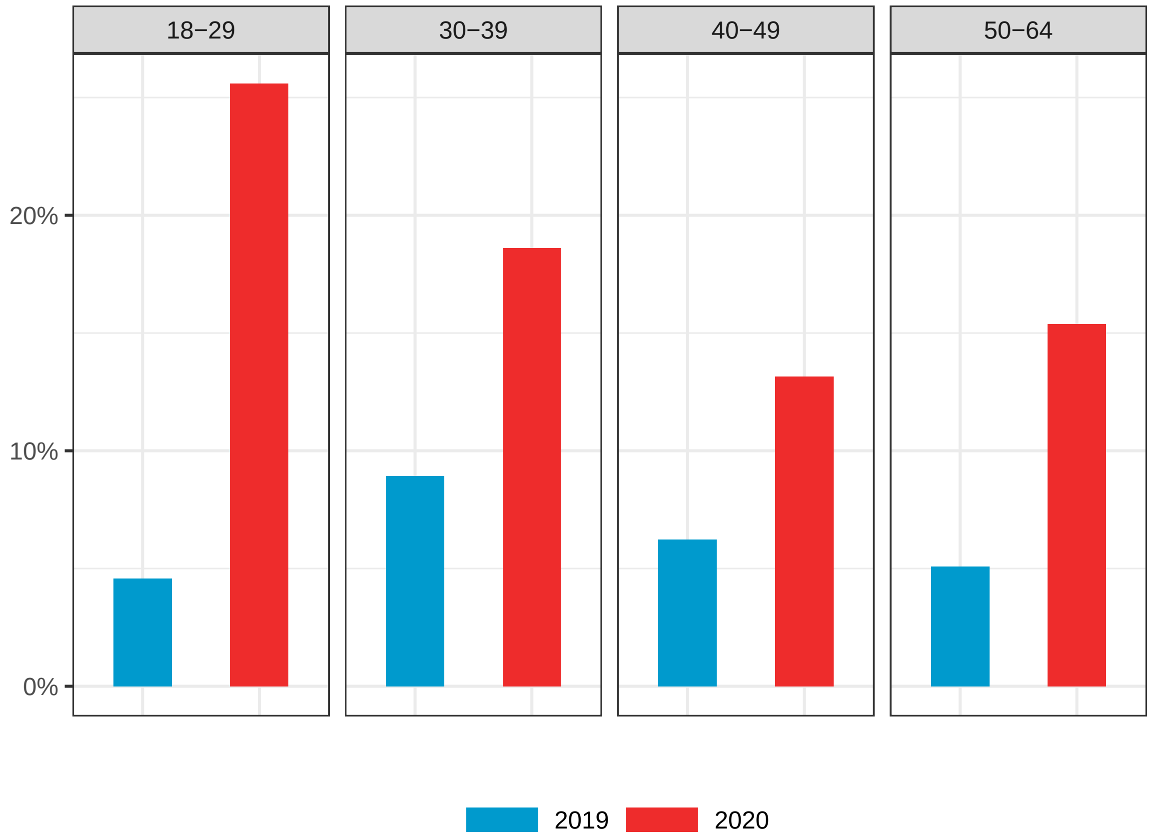
Note: The figure shows individuals in the P0–25 group in the monthly earnings distribution.

50–64 year-old, which is also the age group that was hit hardest with respect to income from own business in Figure 15.[20] Furthermore, for this group, we see a downward income shift also before COVID-19, that is, already in January and February 2020.

As a final analysis, we examine the large unemployment shocks among workers in the P0–P25 quantile group to see how it is distributed across the age groups. This is reported in Figure 17. Starting with the share of individuals with positive earnings during January-February 2019 but who were unemployed (that is, had zero earnings) during March-December the same year, we see some variation across age groups. The shares are about 5% among the youngest and oldest, 6% among those between 40 and 49 years old and 9% in the 30-39-group. Looking at the corresponding numbers for 2020 clearly shows that the youngest group has been hit hardest by the pandemic: the share without any earnings during March-December 2020 who had earnings during January-February is above 25%, which is more than five times as high as during the pre-COVID year. The second-highest share of unemployed can be found among the oldest group (just above 15%).

[20] It should be kept in mind that the percentile thresholds in both figures are from different distributions.

Figure 17: Unemployment shocks across age groups in the bottom quartile (P0–25).



Note: The figure shows the share of individuals in the P0–25 group in the monthly earnings distribution that went from being employed during January-February to being unemployed during March-December in 2019 and 2020, respectively.

Summing up the analysis of bottom incomes with respect to age patterns, a relatively clear picture emerges. A main finding of the paper is that the increased income disparities during the pandemic are mainly driven by a considerable income drop in the lower tail of the distribution. Within this tail, we find that labor earnings dropped in all age groups (but possibly the most among people above 50), that unemployment has increased in all age groups (but clearly most among the youngest), and that income from own businesses has contributed to the income fall (but the losses are confined to the 50-64-group).

7 Concluding remarks

We have used Swedish full-population register data to measure the distributional impact of the COVID-19 pandemic. The registers cover monthly labor earnings, annual incomes and the individual records of government COVID-19 support money. Combining these population-wide registers with almost real-time updating appears to be a unique contribution to the rapidly growing literature analyzing the real and distributional effects of the COVID-19 pandemic.

Our main finding is that the pandemic has increased income inequality among individuals. Even though personal labor earnings as a whole contracted by 3–4 percent, most of this contraction was concentrated to the lower half of the earnings distribution. The main channel for this seems to be a cancellation of short-term, low-paying private-sector jobs; we record a threefold increase in unemployment among these workers after the outbreak of the pandemic.

The Swedish government COVID-19 support was paid out to 80,000 firms and more than half a million workers. We find that without the government support, total earnings would have dropped by 5–7 percent, almost twice as much, during the pandemic, and earnings inequality would have increased up to three times as much as what actually happened.

Comparing the Swedish results with previous findings for other countries, an interesting difference arises. The other studies find that the effect of the pandemic on income inequality switches sign after the government support is accounted for. While the "pure" pandemic effect as such is to increase inequality, the progressive profile of the support money makes inequality decrease as a whole. Exactly why these findings differ from ours is yet to be explored.

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A Appendix

Table A1: The distribution of monthly pre-tax earnings in Sweden 2020

Threshold	Monthly income level	Fractile	Number of taxpayers	Average monthly income
		P0-100	5,400,470	28.2
		P0-25	1,353,910	4.8
P25	13.8	P25-50	1,350,720	21.9
P50	27.8	P50-75	1,345,975	32.4
P75	37.6	P75-90	808,315	42.5
P90	49.3	P90-99	488,375	61.6
P99	95.9	P99-99.9	47,860	125.7
P99.9	220.0	P99.9-99.99	4,835	309.1
P99.99	592.0	P99.99-100	480	1,019.9

Notes: Earnings are expressed in 1000s SEK. *Source*: The monthly payroll tax register at the Swedish Tax Agency.

Table A2: The distribution of annual pre-tax market income in Sweden 2020

Threshold	Yearly market income	Fractile	Number of taxpayers	Average yearly market income
		P0-100	8,280,140	316.6
		P0-25	2,070,033	30.1
P25	137.9	P25-50	2,070,037	207.8
P50	276.1	P50-75	2,070,031	343.5
P75	415.2	P75-90	1,242,023	481.9
P90	576.4	P90-99	745,214	774.9
P99	1,410.1	P99-99.9	74,521	2,103.5
P99.9	4,369.4	P99.9-99.99	7,452	6,959.5
P99.99	16,233.2	P99.99-100	829	40,427.5

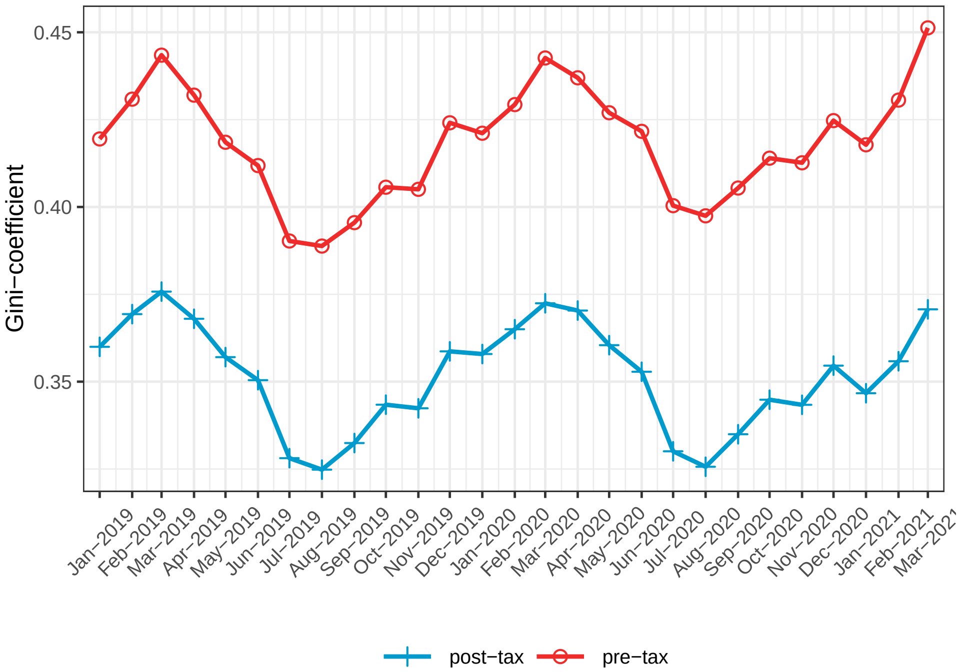
Notes: Market income is expressed in 1000s SEK and consists of labor income, income from own businesses, and capital income before taxes. *Source*: The annual personal tax return register at the Swedish Tax Agency.

Table A3: Short-term Work Allowance (STWA): Distribution of the costs borne for the work-time reduction

		Costs borne:		
Level	Reduction in work time	Workers (reduced salary)	Firms (extra wage cost)	Government (STWA)
1	20%	4%	1%	15%
2	40%	6%	4%	30%
3	60%	7.5%	7.5%	45%
4	80%	12%	8%	60%

Note: The table shows the statutory rules in 2020 for work-time reduction and costs for this borne by employees, employers and the government within the STWA support policy. The 80% work-time reductions (Level 4) were only available in May-July 2020.

Figure A1: Pre- and post-tax Gini-coefficient



Note: Post-tax earnings is calculated as the difference between pre-tax labor earnings and the amount of withheld tax. This amount can in some cases be negative since withheld tax is paid also for other income sources than labor earnings. Negative calculated values of post-tax income (approximately 5 % of the observations) have been removed in the calculation of the Gini-coefficient.

Table A4: Effect estimates of COVID-19 effects on monthly wages: Various specifications

	Dependent variable:							
	log(w)	log(w)	log(w)	log(w)	1[w>0]	1[w>0]	1[w>0]	1[w>0]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Covid impact	−0.038***	−0.033***	−0.026***	−0.025***	−0.014***	−0.013***	−0.024***	−0.020***
	(0.0005)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0005)	(0.0004)	(0.001)
Impact × Woman		−0.010***		−0.008***		−0.001		−0.012***
		(0.001)		(0.001)		(0.001)		(0.001)
Impact × Public			−0.016***	−0.012***			0.028***	0.029***
			(0.001)	(0.002)			(0.001)	(0.001)
Impact × Woman × Public				−0.003				0.004*
				(0.002)				(0.002)
Year 2020	0.062***	0.053***	0.064***	0.055***	0.002***	0.003***	0.005***	0.005***
	(0.0005)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0005)	(0.0004)	(0.001)
Mar–Dec	0.049***	0.047***	0.053***	0.051***	0.023***	0.025***	0.026***	0.027***
	(0.0003)	(0.0004)	(0.0004)	(0.0005)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
Woman		−0.188***		−0.192***		0.007***		−0.004***
		(0.001)		(0.002)		(0.001)		(0.001)
Public employer			−0.122***	−0.106***			−0.003***	−0.024***
			(0.001)	(0.002)			(0.001)	(0.001)
Woman × Public				0.063***				0.034***
				(0.003)				(0.001)
2020 × *Woman*		0.019***		0.024***		−0.001		0.001
		(0.001)		(0.001)		(0.001)		(0.001)
2020 × *Public*			−0.006***	−0.012***			−0.008***	−0.009***
			(0.001)	(0.002)			(0.001)	(0.001)
2020 × *Woman × Public*				−0.004				0.002
				(0.002)				(0.002)
Mar–Dec×Woman		0.005***		0.006***		−0.004***		−0.002*
		(0.001)		(0.001)		(0.0005)		(0.001)
Mar–Dec×Public			−0.013***	−0.021***			−0.010***	−0.010***
			(0.001)	(0.001)			(0.0005)	(0.001)
Mar–Dec×Woman × Public				0.010***				0.0004
				(0.002)				(0.001)
Intercept	3.446***	3.534***	3.495***	3.563***	0.820***	0.816***	0.821***	0.822***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0005)	(0.0004)	(0.001)
Observations	14,486,400	14,486,400	14,486,400	14,486,400	25,913,805	25,913,805	25,913,805	25,913,805
Adjusted R^2	0.002	0.032	0.021	0.041	0.0004	0.0005	0.001	0.001

Note: *p<0.05; **p<0.01; ***p<0.001.