Earnings losses and the role of the welfare state during the COVID-19 pandemic: evidence from Sweden*

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Abstract:

Many governments introduced temporary adjustments to counter the economic and health consequences of the COVID-19 pandemic. We study the importance of already existing government transfers and new pandemic measures to mitigate individual income losses during the onset of the pandemic in Sweden using a difference-in-differences approach and population-wide data on monthly earnings and government transfer payments. We find that labor earnings dropped by 2.7 percent in 2020. Existing transfers and new pandemic measures reduced earnings losses to 1.5 percent. These average effects mask considerable differences in earnings losses, which were, by and large, evened out by existing transfers and new pandemic measures.

Keywords: COVID-19, income inequality, government transfers, short-time work

JEL-codes: D31, E24, H20, H12, C23

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1 Introduction

In addition to being the most acute public health crisis in recent decades, the COVID-19 pandemic perturbed global supply chains (Bonadio et al., 2021) and drastically reduced economic activity. This led to rapid and substantial GDP losses in the second quarter of 2020: up to 9.1 percent for the US, 7.6 percent in Sweden, and 11.4 percent for the European Union overall, followed by a fast recovery by the third quarter of 2021 (OECD, 2020; Milesi-Ferretti, 2021). Judging that existing transfer systems, which are designed to mitigate income risks from adverse events such as unemployment and illness, would be inadequate in this pandemic, many governments saw a need to dampen the expected negative impact for individuals and businesses.

Similar to other countries, Sweden introduced new and substantial firm support measures, such as short-time work allowance (STW), to preserve employment relationships and save jobs (Giupponi and Landais, 2023) in addition to increasing the generosity and reach of government transfers to individuals. Understanding to what extent incomes were protected by the already existing transfer system during the pandemic and the role played by these new pandemic measures is of key interest for future policy development and, in particular, in building resilience to future economic and other crises. Earlier studies have highlighted the consequences of the pandemic itself for economic inequality (Angelov and Waldenström, 2023a; Clark et al., 2021; Stantcheva, 2022) and studied the role of existing transfers and new pandemic measures through cross-country simulation models (Almeida et al., 2021; Cantó et al., 2022). There is, however, far less empirical evidence on the relative importance of already existing transfers and new pandemic measures, and their ability to compensate earnings losses across the distribution and reduce the unequal impact of the pandemic on individual incomes.

The purpose of this paper is to assess how the COVID-19 pandemic affected labor earnings across the income distribution and for various groups on the labor market, and to analyze the degree to which already existing government transfer systems and new pandemic measures compensated for these earnings losses. To this end, we use monthly administrative data on labor earnings, social insurance benefits, and means-tested income transfers for the universe of the Swedish working age population, which includes 5.7 million individuals. We also use monthly individual employee-level data on STW transfers directed to firms. We focus primarily on the first year of the pandemic, i.e., 2020, when economic uncertainty was acute, and the government acted decisively to alleviate the crisis. To estimate causal effects of the pandemic, we use a difference-in-differences (DiD) model that compares the monthly changes in various incomes

during 2020 to monthly changes in previous years. This estimation framework results in comparable treatment and control groups (see, e.g., Hensvik et al., 2021) and controls for seasonal (monthly) variation in outcome variables. To shed light on the economic recovery from the pandemic, we also provide some suggestive results for 2021.

Our main findings can be summarized as follows: First, the pandemic decreased average labor earnings by 2.7 percent during 2020. These earnings losses, however, already include the STW allowance, which essentially kept many individuals in employment with only minor earnings reductions. Our estimates of the increase in STW suggest that earnings losses net of STW allowance amounted to 4.5 percent. Because all STW-recipients are unlikely to have lost their job without the STW allowance, this represents an upper bound of earnings losses in the absence of STW.

Second, the already existing transfer system and the new pandemic measures together replaced 43 percent of earnings losses in 2020, primarily through unemployment and sickness benefits. We further show that the new pandemic measures were almost as important for replacing earnings losses as the already existing transfer system. Disaggregating the different types of transfers, we find that, amongst pandemic measures, changes to unemployment benefits and sickness benefits affected incomes in 2020 the most.

Third, we analyze which groups suffered the most from earnings losses in 2020. We find that labor earnings at the lower end of the pre-pandemic income distribution were most heavily affected by the pandemic, and that losses were particularly large for young individuals, low-educated, foreign-born, and, most notably, for those working in the hospitality sector prior to the pandemic. While STW limited earnings losses in a similar fashion across the disposable income distribution, government transfers to individuals compensated those with the largest relative earnings losses the most and were largely able to even out differences across the income distribution.

While our main analysis focuses on the effects of the pandemic during 2020, we also provide some evidence for 2021. This analysis suggests that earnings losses in 2021, compared to pre-pandemic levels, were substantially smaller than those in 2020. Transfer payments, however, remained on a high level throughout 2021, leading to higher overall total income compared to pre-pandemic levels.

This paper contributes to the literature on the effects of the COVID-19 pandemic on inequality. Most closely, our paper complements Angelov and Waldenström (2023a), henceforth AW, who use monthly tax data from Sweden to study how labor earnings and earnings inequality were affected by the pandemic. In addition to documenting an increase in

inequality in labor earnings, they estimate a difference-in-differences model and find that the pandemic decreased pre-tax earnings by on average 3.8 percent. They also study two COVID-19 policies that were directed at firms — STW and reorientation support — and use simulations that suggest that overall inequality would have increased two to three times more absent these policies.

While there is some overlap between their paper and ours, there are also several important differences. First, the focus is different. AW are mainly interested in the impact of the first year of the pandemic on earnings inequality among workers. While we also study the effect of the pandemic on labor earnings, our main contribution is to document the effect of the pandemic on a broader income measure for the entire working age population. By including government transfers, we can show which parts of the economic safety-net were most important for different groups. We thus set out to document the full set of pandemic policy changes to the public safety net, including STW. In our study, we also provide evidence on the effects of the pandemic for 2021.

Second, our data sources differ. For the monthly data, AW are restricted to taxable earnings for individuals who had at least one month of non-zero earnings between January 2019 and March 2021. While AW define zero earnings as an indirect measure of unemployment, we observe the full population, including the unemployed and those out of the labor force. This likely explains why we find a slightly smaller average effect on labor earnings, 2.7 percent compared to AW's 3.8 percent. We further observe a whole range of additional income sources, including different types of unemployment benefits, sickness benefits, parental benefits, and income support, on a monthly basis. The great detail of our data allows us to decompose government transfers into existing transfers and new pandemic measures. In the annual income data, we observe both taxable and non-taxable transfers, while AW only observe taxable transfers.

Third, our analysis adds to the understanding of the economic consequences of the pandemic for different groups by providing results for a wider range of subgroups and across the full income distribution, including the very poorest groups. In terms of background characteristics, AW use age, gender, and working in the public or private sector. We provide evidence by education, industry, family structure (children in household, being married or cohabiting), being foreign born, and features of the occupation relevant to the pandemic (ability to work from home, working in a contact profession). There is also a small literature studying inequalities along other work-related dimensions using Swedish microdata. Campa et al. (2021) use individual-level data from the Swedish Public Employment Service to show that the pandemic

initially led to increased unemployment among young and foreign-born workers. Eliason (2021) finds similar patterns using aggregate data. Sjögren et al. (2021) use aggregate Labor Force Survey data to show that mothers with small children were harder hit than other parents.

Internationally, a number of studies have analyzed the effects of the pandemic on incomes and income inequality (see Stantcheva, 2022 for a recent overview). Using longitudinal survey data for Australia, Li et al. (2021) find that additional wage subsidies offset negative effects of increasing unemployment for income inequality. For the US, Han et al. (2020) show that policy measures were effective in reducing poverty during the start of the pandemic. In part, this is driven by generous unemployment insurance benefits often exceeding lost wages (Ganong et al., 2020; Matias and Eliza, 2023), and effectively reducing earnings losses for those in UI (Larrimore et al., 2022). Bargain et al. (2023), using social security data from Ecuador, find that while earnings fell for everyone during 2020, they recovered in 2021 for everyone except the top 1 percent of earners.

A large literature has used microsimulation methods to quantify the impact of the pandemic on individual incomes, and to analyze to what extent government policies manage to cushion the fall. These papers typically combine models of national tax and transfer systems with representative survey data from before the pandemic, allowing researchers to simulate the effects of macroeconomic changes and policy changes on the distribution of incomes. This approach has the advantage that it can be deployed very quickly, since it does not require the availability of up-to-date microdata. However, a drawback is that it relies heavily on modelling assumptions and macroeconomic forecasts. Furthermore, these models are typically static, and do not account for behavioral changes. This contrasts to our paper, which uses detailed administrative data capturing actual outcomes before and during the pandemic. Furthermore, while microsimulation studies tend to cover existing tax-and-transfer systems well (including existing short-time work schemes), there are some limitations in their coverage of new COVID-19 policies (see, e.g., Almeida et al., 2021; Cantó et al., 2022).

In general, these microsimulation studies have found that existing government transfers and new pandemic measures could be expected to reduce income losses by half or more in the EU and UK. For the EU as a whole, Almeida et al. (2021) estimate that disposable income would have fallen by over 9 percent absent discretionary fiscal policy changes, but that pandemic measures reduced this fall by half. Christl et al. (2021) estimate large drops in market incomes, hitting poorer households particularly hard. However, almost three fourths of this drop were absorbed by tax-and-transfer systems and around half came from discretionary policy measures. Cantó et al. (2022) estimate that household incomes would have dropped as much as 15-25

percent absent policy changes in Belgium, Italy, Spain, and the UK, but that fiscal policy dampened most of this, resulting in actual drops of 4-8 percent. In Germany and Ireland, COVID-19 policies even resulted in slightly increased incomes for people at the bottom of the income distribution (Bruckmeier et al., 2021; O'Donoghue et al., 2021). In Finland, the pandemic resulted in a 4.5 percent drop in market incomes, while disposable incomes only fell by 1.8 percent (Kyyrä et al., 2021). In contrast to these studies, we find that earnings losses are smaller (2.7 percent), but also that already existing government transfers and pandemic measures helped dampen these losses by 43 percent.

Other microsimulation studies for European countries which reach similar conclusions include Brewer and Tasseva (2021) for the UK; O'Donoghue et al. for (2020) Ireland; Brunori et al. (2021), Figari and Fiorio (2021), and Carta and Philippis (2021) for Italy; Christl, Poli, Hufkens, et al. (2021) for Germany; and Christl, De Poli, Kucsera, et al. (2022) for Austria. In Latin America, existing government transfer systems tended to protect the poorest, while discretionary COVID-19 policies tended to cushion the income drops higher up in the income distribution. This resulted in middle-income households experiencing the largest income losses (Avellaneda et al., 2021; Lustig et al., 2021). In Africa, where many work in the informal sector, the pandemic led to increases in both poverty and income inequality. Neither existing government transfer systems nor discretionary policies did much to counteract this (Lastunen et al., 2021).

A third strand of the literature uses real-time surveys that were conducted during the pandemic to analyze consequences of the pandemic. Unlike our study, these papers do not estimate causal effects of the pandemic but rather provide valuable descriptive evidence on the economic consequences. Using survey data from France, Germany, Italy, Spain, and Sweden, Menta (2021) finds that poverty increased sharply during the spring of 2020, and then decreased during the summer, with Italy being the most affected, and France the least. Young individuals and women were the most affected. Using the same data, Clark et al. (2021) show a similar time pattern of household disposable income inequality. Adams-Prassl et al. (2020) find that around one fifth of workers in the UK and US lost their jobs during spring 2020, compared to only around 5 percent in Germany. For Germany, Braband et al. (2022) highlight that part-time workers, low-educated workers and low income workers were particularly affected in terms of unemployment and income.

In the following section, we present a detailed account of the most important transfer types and pandemic measures that affected the working age population during the pandemic. In Section 3, we provide information on the data sources, the estimation framework, and

descriptive statistics. Section 4 presents the estimation results. In Section 5, we extend our analysis up until 2021. Section 6 concludes.

2 Background

Sweden has an extensive government transfer system with universal sickness and parental benefits with basic and income-related levels. Unemployment insurance is income-related for individuals who fulfill two conditions — a sufficiently long voluntary membership in an unemployment fund, and a work requirement — and has a basic level for those who only fulfill a work requirement (Landais et al., 2021). Social assistance and housing allowance are means-tested basic income support programs to guarantee a minimum level of living and housing standard for households with insufficient means – earnings, benefits, or assets – to support themselves.

As the COVID-19 pandemic hit Sweden in March 2020, the government introduced several pandemic measures – both in the form of changes to already existing government transfers and introduction of entirely new transfers. Early in the pandemic, a STW allowance was introduced to protect jobs and maintain employer-employee links. To increase insurance coverage, membership and work requirements in the unemployment insurance were eased, and to incentivize sick leave, the waiting day deduction in the sickness insurance was reimbursed by the government. Moreover, in July 2020 the housing allowance was raised to strengthen poor households and prevent evictions of families.

In the following, we first describe how COVID-19 affected both health outcomes and the Swedish economy. Thereafter, we present in detail both existing transfers and pandemic measures analyzed in this study: the introduction of the STW scheme, unemployment insurance, sickness insurance, parental benefits, and basic income support. Table A-1lists details on all pandemic measures introduced during the pandemic.

2.1 How was Sweden affected during the first year of the pandemic?

In many dimensions, the Swedish experience of the COVID-19 pandemic represents what happened in an average European country. The first wave of SARS-CoV-2 hit Sweden in March 2020. As a reaction to this first wave, there was a rapid decrease in individual mobility and economic activity. In contrast to many European countries, Sweden did not implement strict lockdowns. Instead, the Swedish Public Health Agency gave general advice and recommendations that workers should work from home if possible, remote learning should be introduced in high schools and universities, and people should avoid traveling and social

contacts outside the family. In addition, public gatherings and events were limited, and visitors were not allowed in hospitals and residential care facilities for older people. Distance learning was also introduced in upper secondary schools and higher education while primary and lower secondary schools mostly remained open during 2020.

Even though Sweden did not introduce severe pandemic restrictions, the pandemic affected the labor market. The employment rate decreased during 2020 for the first time since the financial crisis and did not fully return to pre-pandemic levels until the end of 2020. Similarly to its Scandinavian neighbors, the Swedish unemployment rate substantially increased in spring 2020 (Juranek et al., 2021), and started decreasing in June 2021. During the first pandemic wave in the spring of 2020, job vacancies dropped by 40 percent (Hensvik et al., 2021).

2.2 Government transfers before and during the pandemic

In the following, we present the regulations regarding different groups of government transfers before the pandemic and, if applicable, its changes during the pandemic. Table A-1 in the Appendix provides a detailed overview of all changes.

2.2.1 Short-time work

As it was clear that otherwise healthy and profitable businesses would be severely affected by the pandemic, a short-time work (STW) allowance was rapidly launched in response to the massive increase in advance notices of layoffs in March 2020. The aim was to protect jobs and maintain links between employers and employees. The STW scheme implied that employers could temporarily reduce employees' working hours by 20, 40, 60 or 80 percent. 75 percent of the corresponding earnings losses were covered by the government, and 10 percent were covered by the employer. 15 percent of the earnings losses were borne by the worker. This scheme implied that firms could reduce their wage costs by up to 72 percent while still maintaining employment of their workers. Workers on STW worked shorter hours, but retained much of their pay — e.g., a fulltime worker with working hours reduced by 80 percent only lost 12 percent of pre-tax earnings.

2.2.2 Unemployment insurance

Unemployed workers in Sweden are entitled to basic unemployment benefits while searching for a new job, conditional on fulfilling a work condition of having worked during six of the last 12 months and being registered as unemployed with the Swedish Public Employment Service (PES). The pre-pandemic basic UI benefit was 365 SEK per day, corresponding to 24 percent

of the median full-time equivalent (FTE) daily wage in 2019.[1] This amount was reduced proportionally for former part-time workers. Unemployed job seekers who have been members of an unemployment fund (a-kassan) for at least a year also fulfill the membership condition which qualifies them for income-related benefits. Fund membership coverage varies across industries, and is generally low for young workers, but also for workers in service jobs and industries with low unemployment risk or large shares of temporary workers. Before the pandemic, the income-related benefit replaced 80 percent of the previous labor earnings up to a ceiling of 910 SEK per day during the first 100 days of unemployment, and 70 percent of previous earnings with a ceiling of 760 SEK per day from day 101 for a maximum of 300 days of unemployment, and 450 days for parents with children under 18. Overall, about 10 percent of the total UI claims are basic UI claims.

Several reforms to the unemployment insurance system were implemented in the first half of 2020 to limit the adverse consequences of job-loss for incomes and consumption. In April, the basic benefit was raised from 365 to 510 SEK per day (from 24 percent to 34 percent of the median FTE daily wage), and a minimum compensation of 255 SEK per day was introduced (17 percent of the median FTE wage). For income-related unemployment insurance, the ceiling during the first 100 days was raised from 910 to 1,200 SEK per day (from 60 to 80 percent of the median wage). In late June, the ceiling after the first 100 days in the income-related benefit was increased from 760 to 1,000 SEK per day (from 50 to 66 percent of the median wage).

In addition to increased benefits levels, the requirements for fulfilling the membership condition and the work condition were eased. From March 2020 onwards, unemployed individuals could receive income-related unemployment benefits already after being a member of an unemployment fund for three (instead of 12) months. Before the pandemic, qualifying for income-related benefits was conditional on having worked either (1) for 80 hours per calendar month for six of the last 12 months; or (2) for 480 hours during a continuous six-month period during the last year, and for at least 50 hours during each calendar month. In late March 2020, the work requirements were relaxed to 60 hours per month in the first case, and 420 hours in total and 40 hours per month in the second case. In addition, the waiting period of six days for unemployed workers to become eligible for unemployment benefits was abolished.

Unemployed job seekers who participate in an active labor market policy (ALMP) program can receive a benefit called activity support. When participating in ALMP programs,

[1] In February 2020, 10 SEK correspond to 1.04 USD and 0.94 EUR, respectively. 1 USD (1 EUR) converted to 9.66 SEK (10.54 SEK). In 2019, the median full-time equivalent monthly wage was 31,700 SEK and the average number of working days per month was 21 (www.arbetstimmarpermanad.se and https://www.statistikdatabasen.scb.se, accessed 2022-09-08). Given these numbers, the median full-time equivalent daily wage was 1,510 SEK.

individuals receive benefits of the same size as those unemployed job seekers without ALMP participation.

2.2.3 Sickness insurance

Sweden has a universal, publicly administered sickness insurance. The central part of the insurance is sickness benefits compensating earnings losses, with an 80 percent replacement rate up to a ceiling, for employees whose work capacity is temporarily reduced due to sickness. A one-day waiting period implies that the worker is not compensated for earnings losses the first day of the sickness spell. Day 2-14 of a sickness spell, the employer period, the worker is compensated by the employer in the form of sick pay. Thereafter, the Social Insurance Agency (SIA) pays a sickness benefit. A doctor's certificate is required for sick spells longer than seven days.

In March 2020, the one-day waiting period in the sickness insurance became reimbursable from the SIA to encourage workers to stay home from work at the slightest symptom of illness. Initially, the maximum payment for the first sick day was set to 700 SEK, but it increased to 804 SEK in April 2020 (from 46 to 53 percent of the median wage). To further limit the spread of COVID-19, and ease the burden on the health care system, the requirement to have a doctor's certificate was postponed from day 8 to day 21, and later abolished altogether (see Table **A**-1 in the Appendix for details). Moreover, during the pandemic, employers were compensated for their sick pay costs by the government. The full cost was covered during April-July 2020, after which compensation was paid for above-normal costs according to a fixed schedule.

Because COVID-19 was classified as a public health hazard already in February of 2020, workers were also eligible for disease carrier's benefits, with an 80 percent replacement rate for earnings losses up to 804 SEK per day (equivalent to 53 percent of the median wage) if diagnosed with COVID-19 or for suspected COVID-19. In the summer of 2020, to protect vulnerable groups, the disease carrier's benefit was extended to individuals working closely with and to relatives of persons diagnosed with medical conditions deeming them vulnerable to severe COVID-19. Furthermore, a risk group compensation, targeting workers with these same medical conditions, who were unable to work from home, was introduced, with the same replacement rate as the disease carrier's benefits.

2.2.4 Parental benefits

Parents are eligible to 480 days of paid parental leave per child, to be used before the child turns 12; 390 days are income-related with a replacement rate of 80 percent up to a ceiling and 90 days have a low flat rate. For working parents of children below age 12, there is also a temporary

parental benefit, which compensates for earnings losses up to a ceiling for a maximum of 60 days per year and child when caring for a sick child. Before the pandemic, temporary parental leave when caring for a sick child required a doctor's certificate from day eight. This was postponed to day 22 during March-October of 2020. From April 2020 on, it was also possible for parents to take temporary parental leave during preschool or school closures, even if their own child was not sick. Note, however, that childcare facilities and compulsory schools (ages 6-16) generally remained open, unless hit by severe COVID-19 outbreaks. Otherwise, there were no changes to parental benefits during the pandemic.

2.2.5 Income support

Individuals who lack the means to financially support themselves are eligible for means-tested basic income support in the form of social assistance (SA) from their municipality of residence. Means-testing is at the household level and requires depletion of any savings or other assets (owned housing, cars etc.) before support is granted. Young adults and families with children may also be eligible for a housing allowance from the Social Insurance Agency. To further support poor families and prevent eviction of children, an additional housing allowance was introduced in the summer of 2020. It was targeted toward the families with children already receiving regular housing allowance and increased the total allowance by 25 percent, summing to a maximum of 1,335 SEK per month.

3 Data and empirical strategy

3.1 Data sources and outcome variables

The analysis is based on several administrative data sources collected within Stockholm University's Swedish Register-based Research Program on COVID-19 (SWECOV) program, containing information on the entire Swedish population from 2015 onwards. We analyze the impact of the COVID-19 pandemic on labor earnings and investigate to what extent different types of government transfers cushioned the potentially adverse effects on individual incomes during 2020. Although our focus is the income replacement offered by government transfers directed to individuals, we also study the role of the STW scheme introduced during the pandemic. This is motivated by the STW's direct impact on the earnings of the individual worker, who is the final recipient of short-time work pay. In addition to demographic and socio-economic information, the data include labor earnings and all payments from the major government transfer systems directed to individuals in Sweden, as well as short-time work pay.

In the main analysis, we analyze the impact of the pandemic on the following income sources:

Labor earnings: Payments of gross labor earnings from employers to employees, also including employers' sick pay during the 14-day employer period and short-time work pay to the individual for reducing hours worked during the pandemic (see Section 2 for details).

Labor earnings excluding STW: Labor earnings, as defined above, excluding short-time work pay.

Transfers: The sum of government transfers from the major transfer systems directed to individuals: unemployment benefits, sickness benefits, parental benefits, and means-tested income support. These include benefits in place before the pandemic as well as benefits introduced or changed during the pandemic.

Total income: The sum of labor earnings and the above-mentioned government transfers.

Data on labor earnings are provided by the Swedish Tax Authority from the monthly payroll tax register during 2019-2021 and the annual personal tax-return register during 2015-2018.[2] All government transfer payments are available on a monthly basis from 2015 onwards. Table A-2 provides a detailed overview of all transfers and its data sources.

We do not observe receipts of study allowance, i.e., student grants and loans, at a monthly level, and therefore do not include these in the main analysis. New enrollment in higher education increased by 13 percent in the fall of 2020, and by 28 percent among recent upper secondary school graduates.[3] We also disregard some transfers which mainly respond to slow-moving demographic changes, and thus are unlikely to have been impacted by the pandemic during 2020.[4]

3.2 Decomposing existing transfers and pandemic measures

In our definition of pandemic measures, we include both the introduction of new types of benefits, such as STW, and the increased generosity of existing transfers, such as the increased ceiling of the unemployment insurance. To identify the contribution of the transfers already

[2] The monthly earnings data do not include earnings for sole proprietors or business owners, but results in appendix Table A-4 show that our main result holds when including these income sources at an annual level. We also do not observe capital incomes on a monthly basis, further limiting our ability to study sole proprietors and business owners. In Table A-6 we can, however, show that there were limited effects overall on capital income in 2020 from an annual model (see Section 5).

[3] Swedish Higher Education Authority, https://www.uka.se/publikationer--beslut/publikationer--beslut/statistiska-meddelanden/statistiska-meddelanden/2020-11-18-16-000-fler-sokande-utan-tidigare-hogskolestudier.html, accessed 2022-09-08.

[4] These include disability benefits, pensions, additional housing allowance for pensioners, work-related injury compensation, child allowance, and pregnancy benefits. Results from an annual model (see Section 5) in Table A-6 suggests that study allowance increased by an average of 31 SEK per month during 2020 and that pension benefits increased by about 2 SEK per month during 2020.

existing at the onset of the pandemic separately from the contribution of the pandemic measures introduced during 2020, we compute the amount of a given transfer type that an individual would have received had pandemic measures not been introduced, taking the individual's behavior as given. Under the assumption that behaviors, e.g., the risk of becoming unemployed or sick, did not change in response to the pandemic measures themselves, the high level of detail of our data also allows us to disentangle the additional benefit an individual received due to the introduction of pandemic measures.[5] This assumption is more likely to hold in the early stages of the pandemic.

3.3 Estimation framework

The strength of our analysis is the access to monthly data on labor earnings, government transfers and STW pay. Since the COVID-19 pandemic was a sudden and unforeseen change in the economic environment, we can exploit the onset of the pandemic to study the effects of the pandemic on individual incomes during 2020. We do this by applying a difference-in-differences (DiD) framework, in which we compare the change in monthly income from different sources before and after the onset of the pandemic in March 2020 with the corresponding change during previous years. This type of method has previously been employed when studying the impact of the pandemic (see, e.g., Hensvik et al., 2021; Angelov and Waldenström, 2023a; 2023b).

For our main estimation results, we define cohorts k=2016, ..., 2019 consisting of all individuals aged 19-63 in December of year k. In order to allow for several unaffected months for the pandemic cohort sampled in 2019, we follow the cohorts from July in the sampling year k to December in year $k+1$, i.e., our DiD estimation consists of a total of 18 months during which we compare outcome variables. Our main model can be written as:

$$Y_{i,k,m,t} = \alpha + \beta \times Pandemic_t + \lambda_m + \lambda_k + \varepsilon_{i,k,m,t} \quad (1)$$

where i denotes an individual of cohort k, m the running month for each cohort (1=July$_k$, …, 18=December$_{k+1}$), and t the calendar month (July 2016, …, December 2020). The vectors λ_m and λ_k are month and cohort-fixed effects. The treatment dummy *Pandemic* takes the value

[5] The only transfer we are not able to precisely decompose into existing transfers and pandemic measures are activity support benefits to unemployed workers participating in an active labor marker program. These are paid out based on the same criteria following the basic and income-related unemployment insurance. Because of missing information on unemployment insurance membership for these recipients, we are not able to incorporate all changes introduced during the pandemic. Missing information for activity support benefits should, if anything, result in an underestimation of the effect of UI-related pandemic measures.

one from March 2020 and onwards and zero otherwise, and the parameter of interest β captures the average monthly effect of the COVID-19 pandemic on individual incomes during March-December 2020. The variable 〖Pandemic〗_t corresponds to an interaction between an indicator for belonging to the treatment group (k=2019) and being in the post-treatment period (March-December in year k+1). This effect is the overall effect of the pandemic, including underlying economic effects (such as layoffs), any behavioral effects due to the pandemic, but also any behavioral effects that are related to the changes of the government transfer system during the pandemic. While this might seem like a strong assumption, Ganong et al. (2020) provide evidence for the US that the strong increase in UI supplements had only minor effects on re-employment rates.

We are also interested in the dynamic effects of the COVID-19 pandemic during 2020. To study this, we augment Equation (1) and estimate month-specific treatment effects β_s in an event-study framework:

$$Y_{i,k,m,t} = \alpha + \sum_{s=July_k}^{Dec_{k+1}} \beta_s \times T_s \times Treat_i + \lambda_m + \lambda_k + \varepsilon_{i,k,m,t} \qquad (2)$$

where T_s are monthly indicators, $Treat_i = 1\{k = 2019\}$ is an indicator for belonging to the 2019 cohort which was exposed to the pandemic, and β_s estimates the month-specific effects. January is used as the reference month (i.e., $T_{January_{k+1}}$ is left out). Although no government pandemic responses were implemented until March, we can't rule out some behavioral responses already in February, as the pandemic started reaching Europe. We use January as the reference point to allow for such "anticipatory" effects. Because individuals can enter the analysis in different cohorts, standard errors are clustered at the individual level throughout the analysis.

Our key identifying assumption is that, absent the COVID-19 pandemic, all cohorts would have had similar trends in labor earnings and benefit levels. While there is no formal test of this assumption, we assess its plausibility by comparing pre-trends from July in year *k* to February in year *k+1* in the following subsection and in Subsection 4.3.

3.4 Descriptive evidence

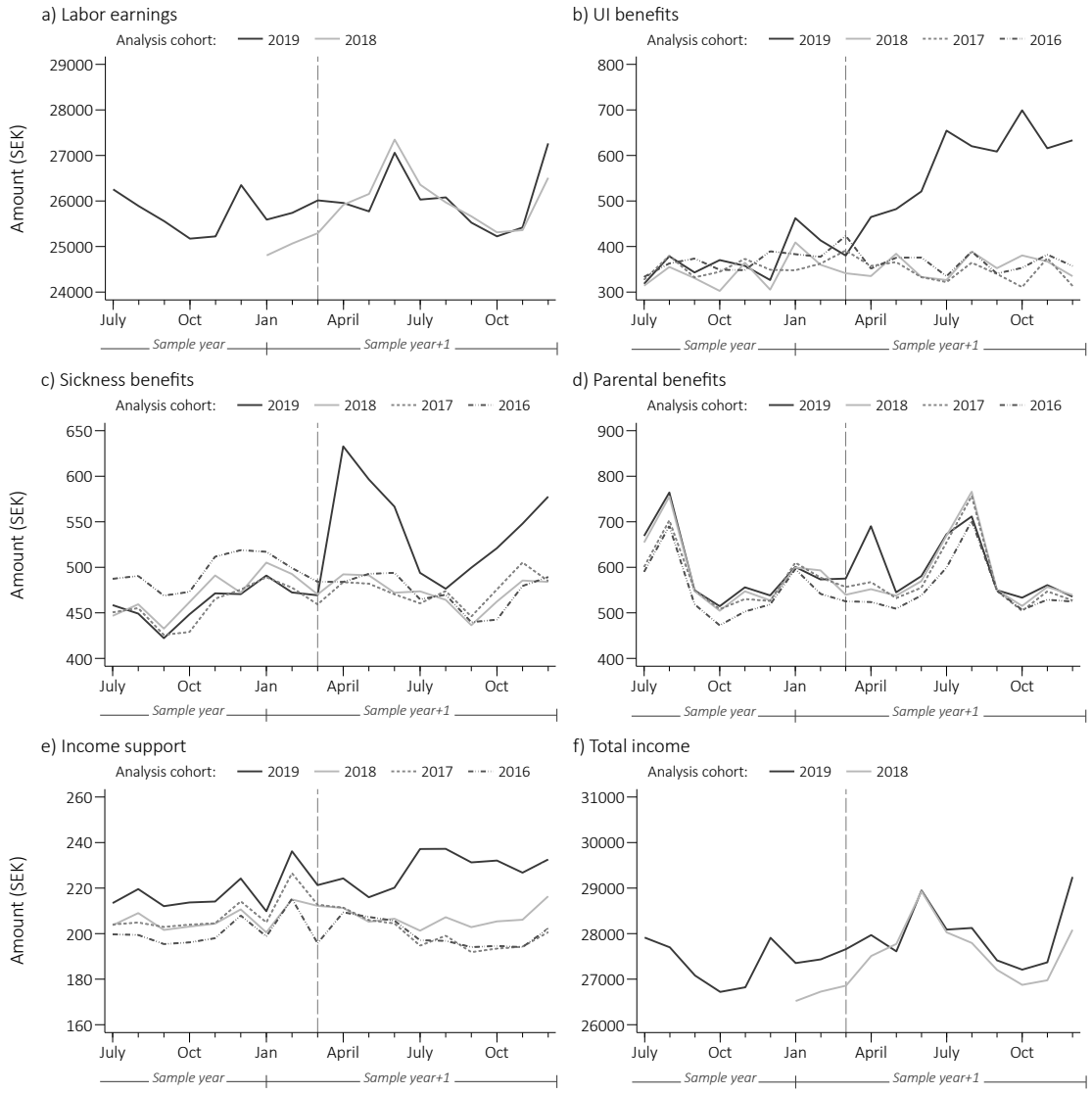
Figure 1 shows the development of our main outcome variables, i.e., labor earnings (Panel a), the four transfer types (Panels b-e), and total income (Panel f) for each of the analysis cohorts during the 18-month follow-up period between July of year *k* and December of year *k+1*.

Because labor earnings are available at the monthly level only from January 2019, Panels a and f show the corresponding information from January to December of year *k+1*. Because STW did not exist prior to the pandemic, we do not show it here.

Panel a of Figure 1 shows the development of average labor earnings for the analysis cohorts 2018 and 2019. Although monthly data on labor earnings is restricted to 2018 onwards, the figure paints a clear picture. Before the pandemic, average labor earnings were higher for the 2019-cohort in comparison to the same months for the 2018-cohort. Once the pandemic hits the 2019-cohort, their average labor earnings drop relative to the average levels of the 2018-cohort one year earlier.

Panels b to e show the development of different transfers for the cohorts k=2016, …, 2019. For these outcomes an 18-month comparison period is available. For unemployment insurance, sickness insurance, and parental benefits, respectively, the average levels are fairly similar during the pre-period from July in year *k* to February in year *k+1* (i.e., data points to the left of the dashed vertical line). The same holds for the period between March and December in year *k+1* for cohorts unaffected by the pandemic. During the pandemic (cohort *k*=2019 between March and December in *k+1*), however, the average benefits are clearly higher than those of previous cohorts. From a DiD perspective, these patterns in the data suggest that the parallel trends assumption is met. For income support, shown in Panel e, the figure shows that average benefits were at a higher level already before the pandemic (blue line, *k*=2019). During the pandemic, however, income support transfers were further increased, relative to the previous cohorts. Despite higher levels before the pandemic, this suggests that income support was affected by the pandemic.

Figure 1: Average monthly labor earnings, government transfers and total income over time



Notes: This figure displays average monthly income over time by different cohorts. Data on monthly labor earnings are available from January 2019 and onwards. Labor earnings for 2019 cohort include payments for STW. UI benefits include unemployment insurance and activity support. Sickness benefits include sickness insurance, disease carriers' benefits, etc. Parental benefits include parental leave and temporary parental leave benefits and Income support includes social assistance and housing allowance. Total income is the sum of all income sources.

Panel f shows the corresponding figure for total income, i.e., the sum of labor earnings and the four transfer types. As expected, the lines are similar to those of labor earnings, but levels are slightly larger.

Table A-3 in the Appendix shows some descriptive statistics for the 2019 cohort. In the sample, which comprises all the 5,746,478 individuals aged 20 to 64 registered in Sweden in January 2020, average monthly labor earnings are 25,592 SEK (2,790 USD). 75 percent of all individuals have positive labor earnings. Between four and five percent of the sample receive transfers from the unemployment insurance, sickness insurance, and income support, respectively. Almost eight percent of the sample receive parental benefits.

4 The impact of the pandemic on incomes during 2020

We now turn to the average and dynamic effects of the pandemic during 2020 on earnings and incomes from various sources for the working-age population, based on estimations of Equations (1) and (2), respectively. We disentangle the protective role of the already existing transfer system from the additional measures introduced during the pandemic. We further provide evidence on the effect of the pandemic on different population groups and trace its impact across the income distribution.

4.1 Labor earnings, STW, and transfers

Table 1 presents the average effects of the pandemic across the entire population during March to December 2020, based on Equation (1). Panel a presents the results for average amounts in SEK. Column 1 in Panel a shows that the pandemic reduced monthly labor earnings during 2020 by, on average, 683 SEK (approx. 70 USD). This corresponds to an earnings reduction of 2.7 percent compared to the pre-pandemic average for the 2019-cohort. However, without the STW allowance introduced in March 2020, the drop in labor earnings would most likely have been higher because more workers would have lost their jobs. On average, payments for STW amounted to 481 SEK per person and month between March and December 2020 (Column 2, Panel a). An upper bound on the pandemic's impact on labor earnings is thus a reduction of 1,164 SEK per person and month (Column 3, Panel a), or 4.5 percent of pre-pandemic labor earnings. This suggests that without the introduction of STW, labor earnings would have been reduced by between 2.7 and 4.5 percent.

Government transfers to individuals also played an important role in mitigating the adverse income effects of the pandemic. On average, the pandemic brought an increase in transfers by 289 SEK during the period from March to December 2020 (Column 4, Panel a). The estimated effect includes both existing transfers and new pandemic measures, such as higher replacement in the unemployment insurance. Total income, i.e., labor earnings plus government transfers, decreased on average by 411 SEK (Column 5, Panel a). This implies that increased transfers compensated, on average, for 42 percent (289/683) of the drop in labor earnings. In Appendix Table A 6, we estimate an annual model using individualized disposable household income (see Section 5 for details). The estimated effect is smaller (-223) than our estimate for total income but is also more imprecisely estimated (with a standard error of 78).

Table 1: The effect of the COVID-19 pandemic on earnings, short-time work payments, government transfers, and total income

	(1)	(2)	(3)	(4)	(5)
	Labor earnings	STW	Labor earnings (excl. STW)	Transfers	Total income
Panel a: Amounts (SEK)					
COVID-19 effect	-683.2	481.3	-1164.5	289.3	-410.6
	(11.047)	(0.831)	(11.091)	(1.652)	(10.797)
Mean dep. var.	25,665.2	–	25,665.2	1,645.3	27,394.9
Percentage change	-2.662	–	-4.537	17.59	-1.499
Panel b: Take-up (percent)					
COVID-19 effect	-0.829	4.589	-0. 858	5.501	-0.0152
	(0.013)	(0.007)	(0.013)	(0.012)	(0.011)
Mean dep. var.	75.06	–	75.06	18.47	83.28
Percentage change	-1.105	–	-1.143	29.77	-0.0183
Number of individuals	5,900,301	6,195,625	5,900,301	6,195,625	5,900,301
Number of observations	137,339,492	408,541,848	137,339,492	408,541,848	137,339,492

Notes: This table shows results from estimating Equation (1). The mean of the dependent variable is defined as the average of the period between July 2019 to February 2020 for the 2019-treatment cohort. STW=short-time work allowance. Transfers include unemployment benefits, sickness benefits, parental benefits, and means-tested income support and Total income includes labor earnings plus transfers. Standard errors in parentheses are clustered at the individual level.

Panel b presents the results on the extensive margin, i.e., the change in the percentage of the population with positive labor earnings, STW and different types of income. Column 1 in Panel b shows that the share of the population with positive labor earnings decreased by 0.8 percentage points, or about 1 percent, on average during 2020. Almost 5 percent of the population received the new STW allowance (Column 2, Panel b). The average take-up of any kind of transfers increased substantially, by 5.5 percentage points or more than 18 percent (Column 4, Panel b), implying that the share receiving income from labor or transfers, taken together, was unaffected (Column 5, Panel b).[6]

4.2 Existing government transfers vs. pandemic measures

Starting in March 2020, Sweden introduced a range of temporary changes to the existing government transfer system (see Section 2.2 and Appendix Table A-1). Table 2 shows results disaggregated by transfer type and whether the transfer existed before the pandemic or was introduced as part of the new pandemic measures. Panel a displays the overall effects of the

[6] We present robustness analyses of the results in Table 1 in the Appendix. Since labor earnings are available at a monthly level only from 2019 onwards, whereas monthly transfers are available from 2016, the number of observations is lower in column (1), (3) and (5) in Table 1. The results in Table A-5 limit all estimations to the same population as for labor earnings, including only 2019-2020 and estimating the model on 12 months (Jan-Dec) with two pre-months (Jan-Feb) rather than 18 months with 8 pre-months (June-Feb) as in our main model. The corresponding estimates are similar for transfer income (272.6, Panel a) and take-up of transfers (5.6, Panel b). Panel c and d also include individual characteristics in the model. Because our sample includes the full population, the composition of which does not change much from year to year, we do not expect controls to matter. Because results with and without inclusion of controls are indeed virtually identical, we henceforth present results without individual controls, unless otherwise stated. Table A-4 in the Appendix shows corresponding estimates when using annual labor earnings information divided by 12 for all years. Despite some differences, the results are fairly similar to those shown in Table 1.

transfer system by type, where the overall impact of 289 SEK is decomposed into the four transfer types: unemployment (UI) benefits, sickness benefits, parental benefits, and income support. The results show that, of the total effect of the different transfer types in 2020, UI benefits increased the most: 67 percent of the total increase in transfers is due to UI benefits (193 SEK of 289 SEK). Sickness benefits increased by 79 SEK (27 percent of the increase in transfers), followed by parental benefits and income support with 5 SEK and 13 SEK (2 and 4 percent), respectively.

We present estimates of effects on take-up of the various transfers in Panel b. Column 1 shows that the fraction of the working age population receiving unemployment benefits increased by 1 percentage point, corresponding to an increase of 31 percent. The fraction receiving any sickness benefits increased much more: 5.4 percentage points or by 169 percent. Columns 3 and 4 show that the take-up of parental leave benefits and income support was essentially unchanged.

In the next step, we disentangle the share of transfer payments that comes from the existing transfer system that was in place before the pandemic and the share that comes from measures introduced during the pandemic. Even though we are not able to disentangle potential behavioral responses to changes in the welfare system, these estimates provide us with an indication of the relative contribution of different transfer types, as well as the relative contribution of existing government transfers and pandemic measures. In that sense, these estimates provide a benchmark to which degree the existing transfer system protected individual incomes.

Table 2: Effects of the COVID-19 pandemic on transfer payments, overall and attributed to the existing transfers and to pandemic measures

	(1)	(2)	(3)	(4)	(5)
	UI benefits	Sickness benefits	Parental benefits	Income support	Total transfers
Panel a: Overall effects – Amounts (SEK)					
COVID-19 effect	193.1	78.68	5.089	12.52	289.3
	(0.936)	(1.000)	(1.012)	(0.316)	(1.652)
Mean dep. var.	371.3	460.5	595.6	217.9	1645.3
Percentage change	52.00	17.09	0.854	5.746	17.59
Panel b: Overall effects – Take-up (percent)					
COVID-19 effect	0.0106	0.0535	0.000	0.002	5.501
	(0.000)	(0.000)	(0.000)	(0.000)	(0.012)
Mean dep. var.	0.0342	0.0317	0.0892	0.0461	18.47
Percentage change	30.92	168.8	0.500	4.482	29.77
Panel c: Existing transfers					
COVID-19 effect	130.1	18.76	5.089	2.624	157.0
	(0.857)	(0.992)	(1.012)	(0.314)	(1.609)
Mean dep. var.	371.3	460.4	595.6	217.9	1645.3
Percentage change	35.16	4.075	0.854	1.204	9.544
Panel d: Pandemic measures					
COVID-19 effect	62.50	59.91	–	9.895	132.3
	(0.169)	(0.109)	–	(0.027)	(0.202)
Number of individuals	6,195,625	6,195,625	6,195,625	6,195,625	6,195,625
Number of observations	408,541,848	408,541,848	408,541,848	408,541,848	408,541,848

Notes: This table shows results from estimating Equation (1). Columns 1 to 4 show the estimate for the respective transfer type; Column 5 shows the sum of the four transfer types. Panels a-b shows the effects for the transfer type overall; Panel c shows corresponding results for the transfers that existed before March 2020; Panel d shows the effects of the newly introduced or changed transfers during the pandemic. The mean of the dependent variable is defined as the average of the period between July 2019 to February 2020 for the treatment cohort. Standard errors in parentheses are clustered at the individual level.

Panel c shows corresponding results for the existing transfer system, i.e., the changes in transfers that would have accrued, given individual behaviors, had no pandemic measures been introduced. Of the existing transfers, UI benefits are by far the most important, making up 82 percent of the total increase in transfer payments (130 SEK of 157 SEK), followed by sickness benefits (12 percent), parental support (3 percent) and income support (1.7 percent). Under the implicit assumption that individual behavior is unaffected by the introduction of pandemic measures, the existing government transfer system would thus have protected individuals' incomes by 157 SEK or 23 percent of individual earnings losses due to the pandemic, hence contributing a bit over half of the total replacement rate of 42 percent of the transfer system (see Section 4.1).

Panel d of Table 2 shows the estimated increases in transfer payments due to new pandemic measures. Changes to unemployment and sickness insurance had the most substantial impact, with on average 63 SEK and 60 SEK per month, respectively, constituting 47 percent and 45

percent of the effect of pandemic measures, respectively. For UI, the main changes include faster eligibility for income-related UI (shortened membership and work requirements), and higher floors and ceilings in both basic insurance and income-related UI. For sickness insurance, reimbursement of the waiting day deduction, affecting all individual sickness spells, resulted in increased transfers. There were no changes to parental benefits, and the increase in income support of on average 10 SEK per month (8 percent) resulted from the additional housing allowance. Overall, the pandemic measures increased the benefits by 132 SEK per month, which corresponds to 19 percent of the total labor earnings losses of 683 SEK due to the pandemic.

The estimates in Table 2 help us understand the relative importance of existing transfers and pandemic measures within each transfer type. For UI, the benefits from pandemic measures amount to roughly half of those of the existing system. For sickness insurance, however, the pandemic measures were three times larger than the existing transfers.

4.3 The dynamics of the effects on earnings, government transfers, and income

Extending our DiD model to a dynamic event study version, as shown in Equation (2), serves two purposes. First, it enables us to trace the dynamic effects on incomes and transfers which might have been caused by dynamics in economic activity as well as by the design of the pandemic measures, such as changes in the minimum membership requirements for UI payments. Second, it allows us to assess further the parallel trends assumption underlying our DiD model.

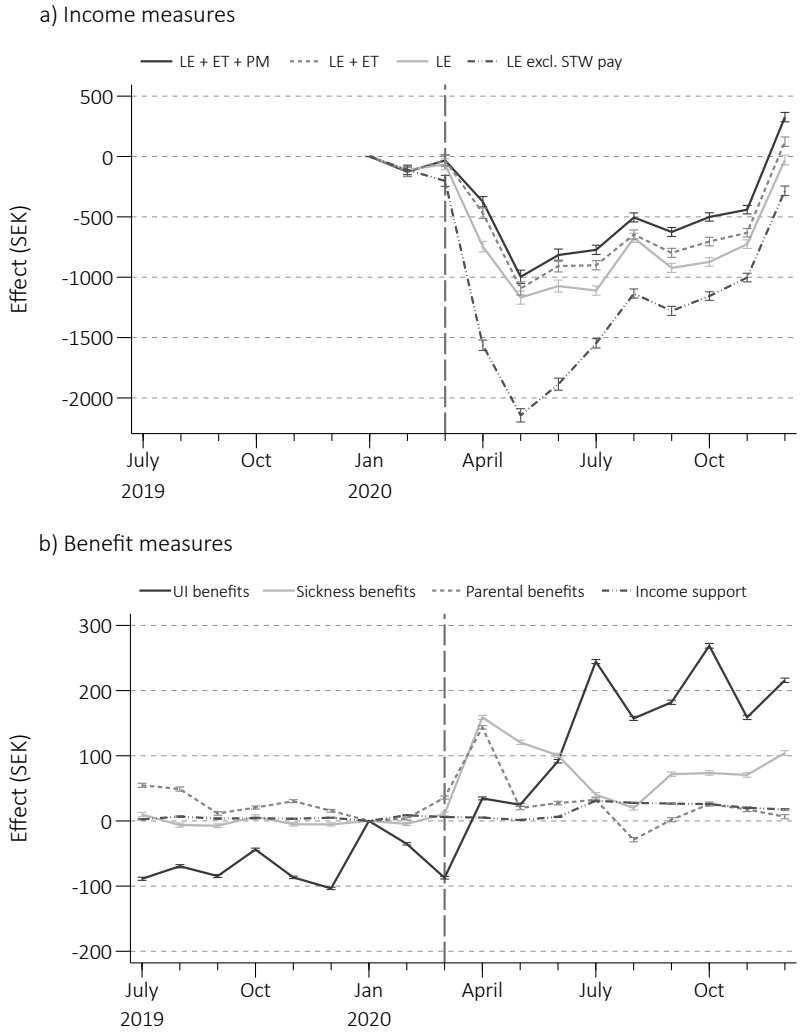
Figure 2 shows the dynamic effects on earnings and income measures (Panel a) and the different types of transfers (Panel b). Panel a shows that average labor earnings fell drastically at the onset of the pandemic. The policy response to introduce STW was rapid. In line with the estimates shown in Table 1, the measure of labor earnings excluding STW allowance (dashed orange) fell more than 2,000 SEK by May 2020, compared to pre-pandemic levels. As mentioned, this represents an upper bound on the impact of the pandemic on labor earnings because it is likely that unemployment would have been higher in the absence of the STW allowance, but unlikely that all workers on STW would have been dismissed. The provision of STW allowance roughly halved the fall in labor earnings. The dashed green line displays the fall in income when the increase in transfers from the existing government transfer system are included, and the black line displays the fall in income when transfers from pandemic measures and adjustments are also accounted for. From May 2020 onwards, all income types shown in Panel a started to recover and total income even surpassed pre-pandemic levels at the end of

the year. Note that the sharp recovery in December 2020 likely stems, at least in part, from payments due to agreed wage raises accumulated for the last few months as union-employer negotiated wage agreements were finally signed in late 2020 (Medlingsinstitutet, 2021). Despite this positive trend towards the end of 2020, the overall pandemic effect on earnings in 2020 shown in Table 1 was a reduction of wage earnings by 2.7 percent and a loss of total income of 1.5 percent.

Panel b of Figure 2 shows the estimated monthly changes for the four transfer types. In line with Table 2, most transfers increased during the pandemic, although by different magnitudes. As suggested by the point estimates in Table 2, increases in UI and sickness benefits have the most significant compensatory effect on the drop in labor earnings. While sickness and parental benefits increased sharply at the beginning of the pandemic as many workers were sick or needed to care for sick children, UI reached a high level by July. This delayed response can be explained by notice periods in employment contracts, the design of UI, and the changed eligibility criteria, which allowed individuals to receive income-related UI benefits already after three months of membership in their respective UI funds (instead of, previously, 12 months), creating an additional incentive to become member in one of Sweden's UI-funds. Indeed, from May 2020 onwards, membership levels were around seven percent higher than in 2019. Before March 2020, however, membership levels were essentially the same as in the previous year.[7]

[7] Data taken from the Swedish Unemployment Insurance Inspectorate (IAF)'s website (https://www.iaf.se, accessed 2022-09-08).

Figure 2: Dynamic effects on earnings, incomes, and government transfers



Notes: This figure shows event-study estimates with 95 percent confidence intervals (standard errors clustered at the individual level) for earnings and various income measures (Panel a), and for transfers (Panel b). LE=labor earnings, ET=existing transfers, PM=pandemic measures. Estimates are taken from estimating Equation (2).

Figure 2 also allows us to look at pre-trends. Albeit estimated only for a short pre-pandemic period, due to the lack of monthly labor earnings data prior to 2019, all income measures in Panel a show pre-pandemic estimates close to zero, suggesting that the parallel trends assumption holds. Panel b shows that for all transfer types except UI, the estimates are close to zero prior to March. UI levels appear lower prior to the pandemic compared to the reference month, January, but display no trend. In fact, it seems January is somewhat of an outlier with a high level of UI. Had February been chosen as the reference month, pre-pandemic estimates would have been closer to zero. The estimates for UI, nevertheless, show a clear break in the trend with the onset of the pandemic suggesting a causal effect of the pandemic also on UI transfers. We argue that the estimated pre-pandemic effects presented in Figure 2 support a

causal interpretation of our estimated effects of the pandemic on earnings, transfers, and income.[8]

4.4 The effect of the pandemic on different groups

So far, the focus has been on the average effects of the pandemic on labor earnings, transfers, and total income. Still, it is likely that some groups were more severely affected by the spread of the virus itself, while the rapid contraction of economic activity hit groups differentially. Figure 3 shows estimates of the effects on labor earnings and total income, i.e., the sum of earnings and transfers, for several groups defined by demographic, socio-economic, and work characteristics. Demographic groups include gender, age, migration background, and family status. Socio-economic groups are limited to education categories. Work characteristics include whether or not an individual was employed in an occupation with possibility to work from home, whether or not an individual worked in the hospitality sector that was severely hit by the pandemic, and whether or not an individual worked in a "contact profession" with regular contact to other individuals.[9] Note that the groups are not mutually exclusive. Instead, the sample is divided into groups by each characteristic separately. Characteristics are determined in the sampling year, i.e., pre-pandemic for the 2019-treated cohort.

The results show that the labor earnings losses (in percent) were largest for young individuals, individuals with low education, foreign-born individuals, and, by far most severe, for those who worked in the hospitality industry before the pandemic.[10] Unlike evidence from other countries and earlier studies for Sweden (Angelov and Waldenström, 2023a; Adams-Prassl et al., 2020; Dang and Viet Nguyen, 2021), we do not find that the pandemic hit women more severely than men. On the contrary, earnings losses and total income losses are significantly larger for men than for women.[11]

[8] We note that most of the pre-treatment point estimates would be statistically significantly different from zero in a hypothesis test setting. We choose not to focus on this for two reasons: first, given our large data set, almost any estimate will be statistically significant, even when the point estimate is very small in economic terms, which is the case here. Second, Roth (2022) warns against conditioning event studies on tests for pre-trends, because this might cause both point estimates and confidence intervals to be biased in the subsequent analysis.

[9] The measure for the possibility of working from home uses occupational information created by Dingel and Neiman (2020) based on SOC12. Hensvik et al. (2021) harmonize it to the Swedish standard SSYK2012. The measure for contact profession comes from CES (Centre for Epidemiology and Community Medicine) and CAMM (Center for Occupational and Environmental Medicine). It approximates how much physical contact an occupation requires. The measure goes from 0 (no physical contacts) to 100 (very close physical contact). We create three groups, low (0-49), medium (50-74) and, high (75-100) contact.

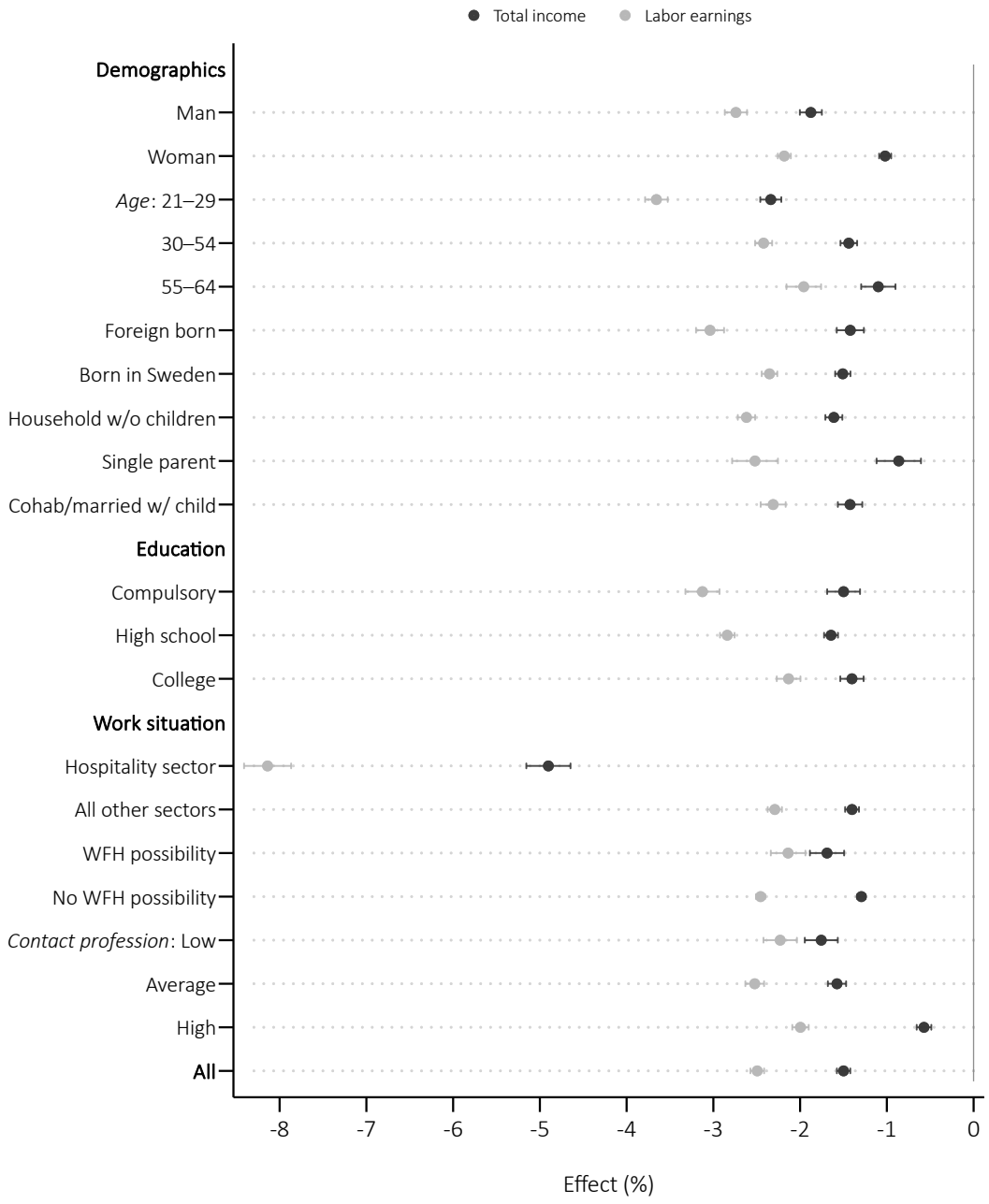
[10] The percentage effect for group *G* is defined as the estimated effect for group *G* relative to the average pre-pandemic total income for group *G* in the 2019-cohort. Figure A-1 includes corresponding estimates for all sectors of industry.

[11] One hypothesis for this difference is that Angelov and Waldenström (2023a) also include capital income. Our estimates using an annual model (see Section 5), however, show a very small effect on capital income (Table A-6). A second possibility is that our sample includes individuals without labor earnings. This group is larger among women.

Comparing the losses of labor earnings to the impact on total income, our analysis shows that the government transfer system functioned in a compensatory way, i.e., that those hit hardest were also those who were "compensated" for large losses by the transfer system. In spite of this, young individuals emerge as a group that was hit hard, and where the transfer types included in this analysis failed to fully compensate the earnings losses. This group might, however, have found other ways to mitigate labor earnings losses, e.g., by registering in education and thus increasing their take-up of study allowance, i.e., student grants or student loans. Unfortunately, our data do not include study allowance on a monthly basis, but CSN (2021) reports that the number of students at municipal adult education, vocational colleges, and universities increased by 17 percent, 9 percent, and 29 percent, respectively in 2020 compared to the year before. We can, however, estimate the effect of the pandemic on the uptake of study allowance using annual data. Our estimates using an annual model (see Section 5) suggest that there was an increase in study allowance by SEK 31 per month in 2020 (Table A-6). However, adding study allowance to total income does not significantly change the results presented in Figure 3. The group-level estimates for total income with and without study allowance are shown in Figure A-3, using annual information on earnings and study allowances. While including study allowance reduces the income loss for young adults somewhat, most estimates are unaffected and patterns across groups remain.

To analyze whether pandemic measures targeted specific groups, Figure A-2 in the Appendix shows the replacement rate for existing transfers and pandemic measures for different groups. The replacement rate is defined as the estimated COVID-19 effect on existing transfer or pandemic measures divided by the estimated COVID-19 effect on labor earnings using Equation (1). This analysis shows that among demographic groups, single parents received the strongest income protection from transfers during the pandemic in relative terms. They benefitted from the additional housing allowance, increased UI, and sickness benefits. Workers in jobs characterized by a high level of personal contact also received a high replacement rate from the transfer system for their loss in labor earnings. This group is largely made up of health sector employees and teachers, and they benefitted from high protection from sickness benefits and the waiting day reimbursement. In Figure A-4 in the Appendix, we present estimates for the extent to which the introduction of the STW allowance protected the labor earnings of these different groups. The amount of STW allowance is put in relation to the loss in labor earnings. This analysis shows that STW was almost as large as the loss in earnings for workers with low contact jobs and workers with the ability to work from home.

Figure 3: Effects on labor earnings and total income by group



Notes: This figure shows estimation results for labor earnings (yellow dots) and total income (blue dots) with corresponding 95 percent confidence intervals using standard errors clustered at the individual level. Each estimate is based on a separate regression for the respective subsample. WFH = working from home.

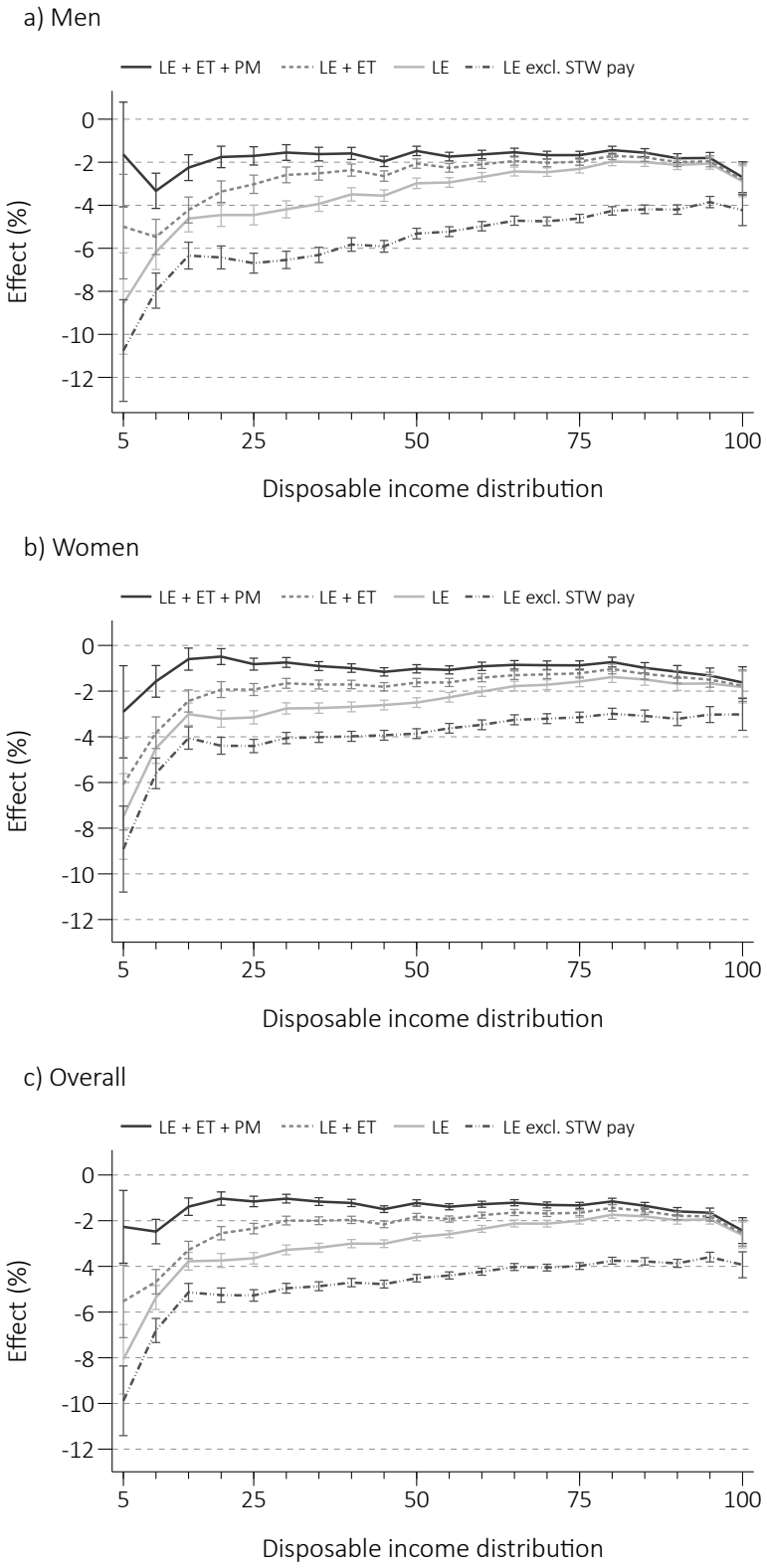
4.5 Income losses across the income distribution

The previous subsection shows significant heterogeneity in the effect of the pandemic on labor earnings with less heterogeneity in the effect on total incomes, suggesting that the government transfer system had a compensatory effect on total incomes. This section presents an analysis of effects along the entire distribution of pre-pandemic disposable income. We present estimates for the impact on labor earnings, labor earnings excluding STW, incomes including

labor earnings and transfers from the existing government transfer system, and total income including pandemic measures in Figure 4. The estimates are presented for each vingtile of the distribution. Because our previous analysis shows different effects of the pandemic for men and women, we conduct the analysis separately for men and women, and overall. Panel a shows that male labor earnings fell by eight percent for the lowest vingtile and by six percent for the second vingtile. For the remaining part of the income distribution, the earnings losses range from four percent to two percent for the highest vingtiles. The figure clearly shows that in the absence of STW allowance, these earnings losses would have been substantially larger, by up to two percentage points. Existing transfers reduced income losses the most at the lower end of the income distribution. But including these transfers, the income losses are still largest for low-income groups. The pandemic's effect on total income, which also includes the transfers due to pandemic measures, is similar across the pre-pandemic income distribution. Hence, the pandemic measures provided important income protection for men with low incomes.

Panel b shows corresponding results for women. The key differences to the patterns of men are the following: first, losses in labor earnings are smaller than for men in the lower half of the income distribution. In the upper part of the income distribution, losses in labor earnings are relatively similar to losses of men. Second, short-time work allowance played a smaller role for women: while STW prevented about two percentage points of earnings losses for men, the corresponding protection for women is between one and 1.5 percentage points. Third, total income losses are also slightly smaller for women, overall. But the figure also shows that while ordinary transfers did not contribute much to leveling out female income losses at the very low end, and instead had a more protective effect for below median incomes above the 15th percentile, the pandemic measures, in particular the additional housing allowance, had a protective role at the very bottom of the income distribution of women. Yet, women in the bottom vingtile experienced slightly larger income losses, relative to their previous economic situation, than the lowest vingtile among men. Figure A-5 in the appendix shows the results in absolute terms. These figures show that absolute losses were greater at the top of the distribution, and that men experienced larger losses than women.

Figure 4: The effect of COVID-19 in 2020 across the disposable income distribution



Notes: Each figure shows estimates for the respective earnings and income definitions for men (Panel a), women (Panel b), and the overall sample (Panel c). LE=labor earnings, ET=existing transfers, PM=pandemic measures. Each point estimate and respective 95 percent confidence interval is based on a separate regression of the respective vingtile of the two-year pre-pandemic disposable income distribution.

In Panel c, we show the corresponding results for our entire sample. For the entire population, the larger earnings losses in the lowest vingtiles, which are driven by women, can be clearly seen. From roughly the fourth vingtile, however, the earnings losses are largely equalized through both existing transfers and pandemic measures.

5 Effects beyond 2020

So far, we have focused on the immediate impact of the corona pandemic during the onset of the pandemic in 2020. After the turbulence of 2020, economies worldwide started to recover in 2021 and economic uncertainty was much reduced. The analysis strategy we employ exploits the sudden onset of the pandemic in March 2020 and relies on the assumption that monthly variations in previous years are good counterfactuals for what would have happened during 2020 had the pandemic not occurred. This assumption becomes less valid the further in time the analysis is extended, since other things could have happened that would change the development compared to previous years. An additional challenge to extend the analysis beyond 2020 is that monthly data on labor earnings is available on a monthly basis only from 2019. Also, the monthly data on transfers are not available through the entire year of 2021.

Although our main analysis strategy is not well-suited to analyze long-term effects, this section provides some suggestive evidence of the economic recovery beyond the first year of the pandemic. Because data on labor earnings is available on monthly basis only from 2019 and because we only have annual information, and not monthly, on the different income sources for 2021 we are unable to use our previous identification strategy which makes use of monthly data. Instead, we use annual data on the corresponding outcomes, or the annual measures that are most similar to the monthly records used in the previous analysis.

We estimate the following equation:

$$Y_{i,k,y,t} = \alpha + \beta_1 \times d2020_y + \beta_2 \times d2021_y + \lambda_t + \lambda_k + \varepsilon_{i,k,y,t}, \quad (3)$$

where Y is the outcome of individual i of cohort k in calendar year y (2016, … , 2021) for the observation year $t = \{k, k+1, k+2\}$. The vectors λ_t and λ_k are observation year and cohort fixed effects. The treatment dummies $d2020$ and $d2021$ take the value one during 2020 and 2021, respectively, and zero otherwise, and the parameters of interest β_1 and β_2 capture the average annual difference during 2020 and 2021 compared to previous years. For ease of comparison to previous results, estimated effects are presented as monthly averages.

Note that all annual estimates presented in this paper have the limitation that the "treated" period covers all of 2020, and thus includes the last two pre-pandemic months. This introduces

a downward bias in the annual estimates for 2020, which should be kept in mind when interpreting them.

It is reassuring that the estimated effects for 2020 in Table 3, in spite of different data sources and a coarser estimation strategy, only differ slightly from the estimates obtained in Table 1 using monthly data. Some caution in interpreting the exact levels of these estimates is nevertheless warranted. Yet, the analysis is useful for comparing the effects of the pandemic on incomes in 2020 and 2021 to the incomes in 2019. Column 1 of Table 3 shows that the labor earnings losses of SEK 176 in 2021 were substantially smaller, only one quarter, compared to the SEK 665 noted for 2020. Income from short-time work was also lower in 2021, SEK 122 compared to SEK 392 in 2020. The increase in transfers was, however, larger in 2021 compared to 2020, SEK 298 as opposed to SEK 241. As a result, the average individual in the working age population actually gained SEK 123 in total income in 2021 as compared to 2019. Transfers during 2021 thus more than compensated for the loss of labor income earnings. Hence, over the two pandemic years, average loss of labor earnings was about 1.6 percent, while the average loss of total income was some -0.6 percent.

Table 3: The effect of the COVID-19 pandemic on earnings, short-time work payments, government transfers, and total income during 2020 and 2021 relative to 2019

	(1)	(2)	(3)	(4)	(5)
	Labor earnings	STW	Labor earnings (excl. STW)	Transfers	Total income
COVID-19 effect 2020	-664.8	392.1	-1,056.9	240.7	-424.0
	(6.565)	(0.674)	(6.607)	(1.644)	(6.251)
COVID-19 effect 2021	-175.6	121.9	-297.5	298.4	122.8
	(9.720)	(0.441)	(9.731)	(2.375)	(9.266)
Mean dep. var.	25,540.6	0	25,540.6	1,643.2	27,183.8
Percentage change 2020	-2.603	.	-4.138	14.65	-1.560
Percentage change 2021	-0.687	.	-1.165	18.16	0.452
Number of individuals	6,195,625	6,195,625	6,195,625	6,195,625	6,195,625
Number of observations	62,365,078	62,365,078	62,365,078	62,365,078	62,365,078

Notes: This table shows results from estimating Equation (1). All outcomes are defined as the annual outcome divided by 12. Standard errors in parentheses are clustered at the individual level. Labor earnings also include income of sole proprietors and business owners. STW=short-time work allowance. Transfers include unemployment benefits, sickness benefits, parental benefits, and means-tested income support and Total income includes labor earnings plus transfers.

Table 4 reveals that increases in both unemployment and sickness benefits compared to the pre-pandemic period were larger in 2021 than in the first pandemic year. Moreover, parental benefit receipts, which were reduced the first pandemic year, declined further in 2021 and the increase in income support compared to 2019 was only slightly lower in 2021 than in 2020. This implies that increased UI benefits contributed 72 percent of the increase in total transfers in 2021 compared to 68 percent in 2020, while sickness benefits constituted 31 percent in 2021

and 26 percent in 2020. These results show that both UI and sickness benefits remained important sources of income in 2021.

Table 4: The effect of the COVID-19 pandemic on government transfers during 2020 and 2021

	(1)	(2)	(3)	(4)	(5)
	UI benefits	Sickness benefits	Parental benefits	Income support	Total transfers
COVID-19 effect 2020	164.8	61.93	-5.444	19.48	240.7
	(0.935)	(0.991)	(0.993)	(0.341)	(1.644)
COVID-19 effect 2021	214.5	92.73	-24.10	15.27	298.4
	(1.351)	(1.470)	(1.371)	(0.507)	(2.375)
Mean dep. var.	397.7	468.6	578.7	198.2	1643.2
Percentage change 2020	41.43	13.22	-0.941	9.832	14.65
Percentage change 2021	53.93	19.79	-4.165	7.705	18.16
Number of individuals	6195625	6195625	6195625	6195625	6195625
Number of observations	62365078	62365078	62365078	62365078	62365078

Notes: This table shows results from estimating Equation (3). All outcomes are defined as the annual outcome divided by 12. Standard errors in parentheses are clustered at the individual level. Columns 1 to 4 show the estimate for the respective transfer type; Column 5 shows the sum of the four transfer types.

6 Conclusions

During the COVID-19 pandemic, many governments introduced temporary adjustments to the government transfer system to counter the economic and public health consequences of the COVID-19 pandemic. We study the effects of the COVID-19 pandemic on labor earnings and on government transfers using a difference-in-differences approach and population-wide Swedish administrative data on monthly earnings and monthly government transfer payments.

We find that, on average, labor earnings declined by 2.7 percent during the first ten months of the pandemic. Almost half of this decline, however, was replaced by government transfers, primarily unemployment and sickness benefits. Moreover, we find that the generous short-time work allowance, introduced to protect jobs, constituted a large share of individual labor earnings during 2020 and is thus likely to have significantly reduced the economic impact of the pandemic on earnings by an order of magnitude similar to the government transfer system. Our analysis of 2021 points to a recovery of labor earnings, while transfers remained high.

Our detailed data allows for disaggregation of government transfers into payments due to already existing transfers, that were in place before the pandemic, and payments due to pandemic measures that were introduced in response to the pandemic. The analysis shows that the pandemic measures were almost as important for replacing earnings losses as the existing transfers in 2020. The most important transfer systems were UI and sickness insurance. Important pandemic measures included the raised ceilings in income-related UI, and the waiting day reimbursement in the sickness insurance system.

Our results further show that labor earnings at the lower end of the pre-pandemic income distribution were most heavily affected by the pandemic, and that losses were particularly large for young individuals, low-educated, foreign-born, and, most notably, for those working in the hospitality sector prior to the pandemic. Yet, both the existing transfers and the pandemic measures were compensatory and were largely able to even out differences in income losses, at least in 2020. The short-time work scheme, on the contrary, was non-compensatory, replacing a larger share of earnings losses higher up in the distribution in 2020. The analysis for 2021 shows that earnings losses were substantially smaller during 2021 than in 2020 compared to pre-pandemic levels, but that transfer payments remained high. This resulted in increasing total income compared to pre-pandemic levels.

Our findings show that swift discretionary policy measures can play an important role in mitigating the economic consequences of unanticipated crises. While existing transfer systems can mitigate some of these consequences, using them to target particularly vulnerable groups with additional measures and introducing measures adjusted to the nature and type of crisis can be equally important. A challenge in designing temporary measures lies in targeting the groups most affected by upcoming crises, as well as being able to remove temporary measures when they are not needed any longer.

While these findings hold first and foremost for the pandemic in Sweden, we can compare estimates with earlier crises in Sweden, and other countries during the pandemic. Regarding earlier crises, our estimate for the loss in labor earnings is remarkably similar to recent findings for the crisis in the 90s and the financial crisis in Sweden, which led to 12 percent lower labor incomes two years after the onset of the crisis in the 90s, and to a 1 percent increase for the financial crisis (Engdahl and Nybom, 2021). With regards to the comparability to other countries, it is important to highlight that the main policy responses to the pandemic were similar to other countries. Short-time work, for example, has been used in many countries, including the United Kingdom, Germany and France. It would be valuable to have studies similar to ours for other countries to corroborate our findings.

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A. Appendix

Tables

Table **A**-1: Changes to the government transfer system during the pandemic

Type of change	Introduction	Repeal	Change to existing transfers
(a) Short-time work (STW)			
Short-time work expansion	03/16/2020	30/09/2021	Short-time work allows to reduce working hours by 20, 40 or 60 percent (between 05/01/2022 and 07/31/2022 also 80 percent possible). Government covers 75

			percent of wage reduction up to a ceiling of 44,000 SEK.
(b) UI benefits			
Membership condition (medlemsvillkor)	03/01/2020	12/31/2020	Change of minimum membership period for eligibility for income-related benefit from 12 to 3 months.
Work condition (arbetsvillkor)	03/30/2020	12/31/2022	Change of minimum work requirements for UI eligibility from (to) at least 80 (60) hours/month in six out of the 12 months preceding unemployment or at least 480 (420) hours in six consecutive months with at least 50 (40) hours/month during the 12 months prior to unemployment.
Basic UI benefits (grundbelopp)	04/13/2020	ongoing	Increase basic benefit from 365 to 510 SEK per day and increase of the minimum benefit from 0 to 255 SEK per day.
Minimum amount income-related UI (inkomst-relaterad ersättning)	04/13/2020	ongoing	Increase of minimum income-related benefit from 365 to 510 SEK per day.
Ceiling increase (days 1-100)	04/13/2020	ongoing	Increase of ceiling for days 1-100 of income-related benefit from 910 to 1,200 SEK per day.
Ceiling increase (days >100)	06/29/2020	ongoing	Increase of ceiling for days >100 of income-related benefit from 760 to 1,000 SEK per day.
Removal mandatory waiting period (karensvillkor)	04/13/2020	01/03/2021	Removal of mandatory waiting periods (otherwise 6 days).
(c) Sickness benefits			
Removal of one-day qualifying period	03/11/2020	10/01/2021	Income loss at first day of sickness reimbursed. By 700 SEK from 11/03/2020, 804 SEK from 06/01/2020 and 810 SEK from 01/01/2021.
Relaxed requirement of a doctor's certificate when using sickness benefits	03/21/2020	04/01/2022	A doctor's certificate of the medical status when receiving sickness benefits postponed from the 8th day to the 15th day from 13/03/2020 and to the 21st day from 03/26/2020. From 11/01/2020 to 12/15/2020 a certificate needed at the 15th day and after that at the 21st day.
Disease carrier's benefits for COVID-19	02/01/2020	04/01/2022	COVID-19 classified as public health hazard. Employees with confirmed or suspected COVID-19 receive 80 percent replacement rate, up to a daily cap of 804 SEK for labor earnings losses. The amount increases to 810 SEK 01/01/2021. From 07/01/2020, disease carrier's benefit also covers persons who works closely with or are relatives to persons classified as high-risk groups of COVID-19.
Risk group compensation	08/24/2020	04/01/2022	Workers with medical conditions making them vulnerable to COVID-19 receives benefits if they can't work from home. Benefits amount to 804 SEK per day and could be applied retroactively from 07/01/2020.
(d) Parental benefits			
No requirement of a doctor's certificate to get temporary parental benefits	03/19/2020	03/31/2022	The requirement to get a doctor's certificate of the child's medical status at the 7th day is abolished.
Temporary parental benefits possible if daycare/school closed	04/25/2020	03/31/2022	Parents can receive temporary parental benefits if their child's daycare or school is closed due to a COVID-19 outbreak.
(e) Income support			

Additional housing allowance	07/01/2020	12/31/2020	Additional allowance to families with children who receive housing allowance. Amounts to 25 percent of ordinary allowance. Reintroduced 07/01/2021 to 12/31/2021.

Table **A**-2: Data sources and types of transfers

Type of transfer	Transfers included	Data source
STW	STW payments at the individual worker level	Swedish Agency for Economic and Regional Growth
UI benefits	Income-related benefits and basic benefits	Swedish Unemployment Insurance Inspectorate (IAF)
	Activity support to unemployed individuals who participate in ALMPs	Swedish Social Insurance Agency (SIA)
	Development allowance for individuals aged 18 to 24	SIA
	Introduction benefits for newly arrived immigrants	SIA
Sickness benefits	Sickness insurance benefits (also includes benefits aimed at preventing sickness or for participating in rehabilitation)	SIA
	Disease carrier's benefits	SIA
	Risk group compensation	SIA
	Waiting day compensation	SIA
Parental benefits	Parental leave	SIA
	Temporary parental leave	SIA
Income support	Social assistance	National Board of Health and Welfare
	Housing allowances	SIA

Table **A**-3: Descriptive statistics for the 2019 cohort

	(1) Mean	(2) Standard deviation
Labor earnings	25,590.3	40,125.9
Share positive (in percent)	75.2	
UI benefits	462.3	2,854.0
Share positive (in percent)	3.7	
Sickness benefits	491.0	3,189.8
Share positive (in percent)	3.3	
Parental benefits	600.8	2,750.5
Share positive (in percent)	9.5	
Income support	209.8	1,299.1
Share positive (in percent)	4.5	
Total income	27,354.1	39,716.8
Woman (in percent)	48.9	
Age	41.1	
Compulsory education (in percent)	13.9	
Upper secondary education (in percent)	44.1	
Post-secondary education (in percent)	42.0	
Foreign born (in percent)	25.2	
Single parent	5.5	
Cohabitating or married with child(ren)	32.7	
Household without children	61.8	

Notes: This table includes mean (Column (1)) and standard deviations (Column (2)) for the most recent sample cohort (k=2019), which includes all individuals aged 19-63 in 2019. Earnings and benefit measures are from January 2020. Education is defined as the highest completed education. Individuals are defined as children until they reach age 18. The total number of individuals is 5,746,478.

Table **A**-4: Robustness of main results to inclusion of all cohorts and business income

	(1)	(2)	(3)	(4)	(5)
	Labor earnings	STW	Labor earnings (excl. STW)	Transfers	Total income
Panel a: Main results using all cohorts					
COVID-19 effect	-687.4	401.0	-1088.4	253.4	-434.0
	(6.457)	(0.692)	(6.502)	(1.636)	(6.201)
Mean dep. var.	25,569.0	0	25,569.0	1,617.1	27,186.1
Percentage change	-2.688	.	-4.257	15.67	-1.596
Panel b: Main results including earnings for sole proprietors and business owners using all cohorts					
COVID-19 effect	-639.4	401.0	-1040.3	253.4	-386.0
	(6.542)	(0.692)	(6.587)	(1.636)	(6.286)
Mean dep. var.	26,079.3	0	26,079.3	1,617.1	27,696.5
Percentage change	-2.452	.	-3.989	15.67	-1.394
Number of individuals	6,195,625	6,195,625	6,195,625	6,195,625	6,195,625
Number of observations	408,541,848	408,541,848	408,541,848	408,541,848	408,541,848

Notes: This table reproduces the results in Table 1 using average monthly labor earnings allowing us to use data from 2016-2020. Average monthly labor earnings at the individual level are defined as annual labor earnings divided by 12. Panel a shows results for labor earnings for regular employees. Panel b shows results for labor earnings also including sole proprietors and business owners. Standard errors in parentheses are clustered at the individual level. The mean of the dependent variable is defined as the average of the period between July 2019 to February 2020 for the treatment cohort. This table shows estimation results from estimating Equation (1) without additional controls. STW=short-time work allowance.

Table **A**-5: Robustness of main results to shorter pre-period and inclusion of controls

	(1)	(2)	(3)	(4)	(5)
	Labor earnings	STW	Labor earnings (excl. STW)	Transfers	Total income
Panel a1:a: 2019-2020 – Amounts (SEK)					
COVID-19 effect	-683.2	481.3	-1164.5	272.6	-410.6
	(11.047)	(0.831)	(11.091)	(2.265)	(10.797)
Mean dep. var.	25,665.2	–	25,665.2	1,645.3	27,394.9
Percentage change	-2.662	–	-4.537	16.57	-1.499
Panel a2:b: 2019-2020 – Take-up (percent)					
COVID-19 effect	-0.829	4.589	-0.858	5.642	-0.0152
	(0.013)	(0.007)	(0.013)	(0.016)	(0.011)
Mean dep. var.	75.06	–	75.06	18.47	83.28
Percentage change	-1.105	–	-1.143	30.54	-0.0183
Panel b1:c: 2019-2020, with controls – Amounts (SEK)					
COVID-19 effect	-683.2	481.3	-1164.4	272.6	-410.6
	(11.045)	(0.831)	(11.089)	(2.265)	(10.795)
Mean dep. var.	25,665.2	–	25,665.2	1,645.3	27,394.9
Percentage change	-2.662	–	-4.537	16.57	-1.499
Panel b2:d: 2019-2020, with controls – Take-up (percent)					
COVID-19 effect	-0.829	4.589	-0.858	5.642	-0.0152
	(0.013)	(0.007)	(0.013)	(0.016)	(0.011)
Mean dep. var.	75.06	–	75.06	18.47	83.28
Percentage change	-1.105	–	-1.143	30.54	-0.0183
Number of individuals	5,900,301	5,900,301	5,900,301	5,900,301	5,900,301
Number of observations	137,339,492	137,339,492	137,339,492	137,339,492	137,339,492

Notes: This table reproduces the results in Table 1 using the same pre-period (January to December of year (*k+1*) and including control variables to the regression model. Panels a-b shows results without control variables. Panels c-d includes all group-

level variables as control variables. Standard errors in parentheses are clustered at the individual level. The mean of the dependent variable is defined as the average of the period between January to February 2020 for the treatment cohort. STW=short-time work allowance.

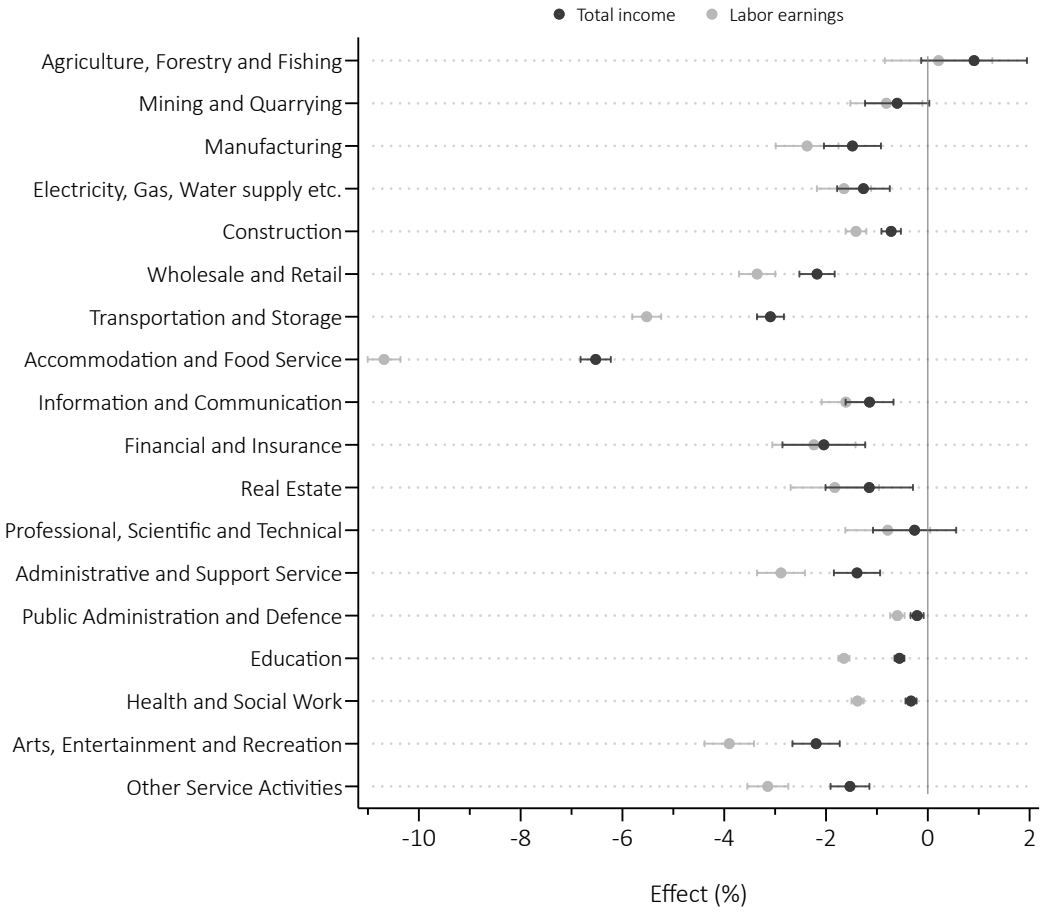
Table A-6: The effect of the COVID-19 pandemic on disposable income, capital income, student grants and loans, and pensions during 2020

	(1)	(2)	(3)	(4)
	Disposable household income	Capital income	Study grants and loans	Pension receipts
COVID-19 effect	-222.6	-7.926	31.45	2.401
	(77.866)	(6.824)	(0.746)	(0.385)
Mean dep. var.	25,195.8	182.3	470.5	82.76
Percentage change	-0.884	-4.348	6.684	2.902
Number of individuals	6,195,625	6,195,625	6,195,625	6,195,625
Number of observations	45,466,544	45,466,544	45,466,544	45,466,544

Notes: This table uses annual data from 2016-2020 and estimate Equation (3). All outcomes are defined as the annual outcome divided by 12. Standard errors in parentheses are clustered at the individual level. The mean of the dependent variable is defined as the average in 2019 for the treatment cohort.

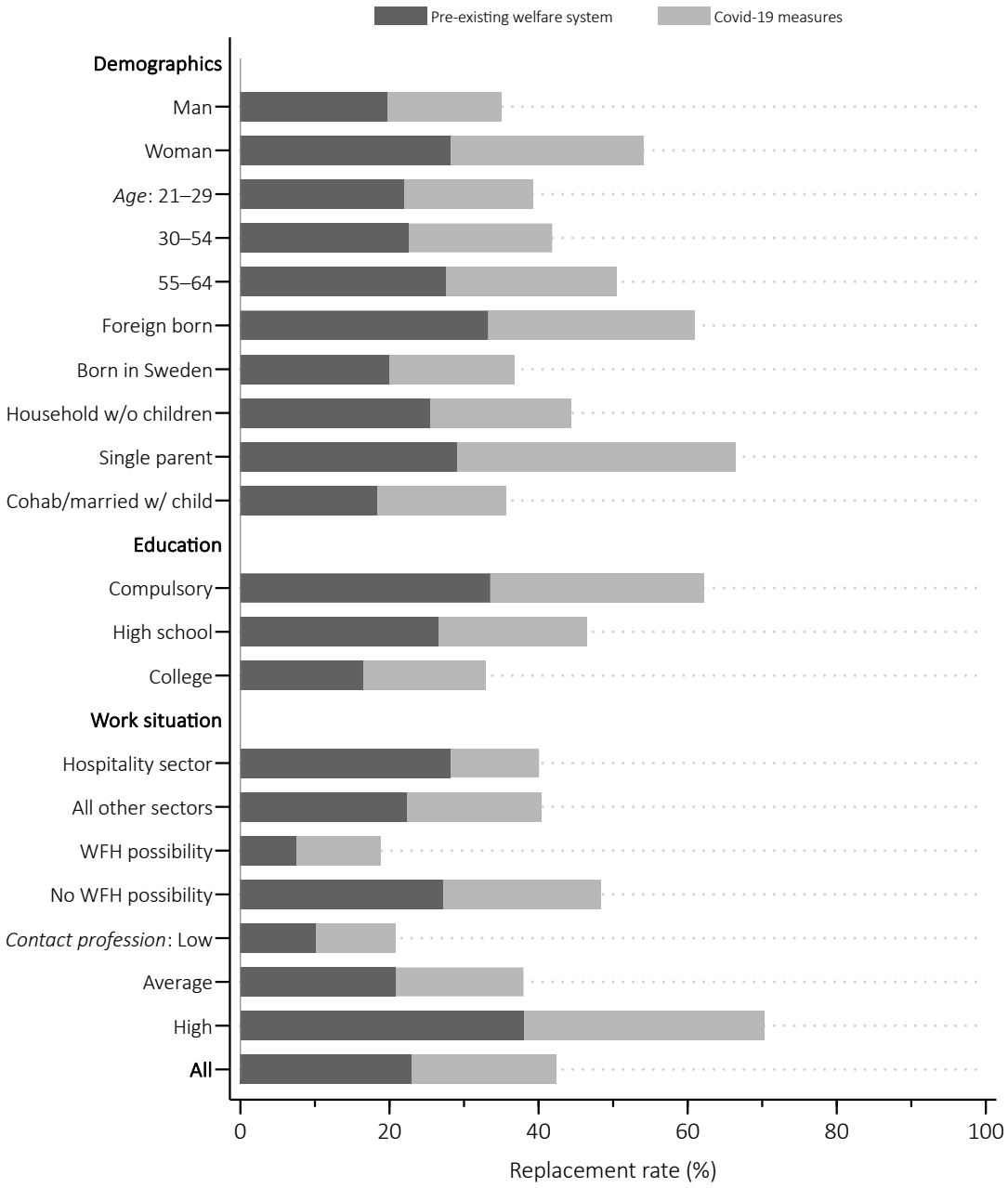
Figures

Figure **A**-1: Corona effects by sector of industry



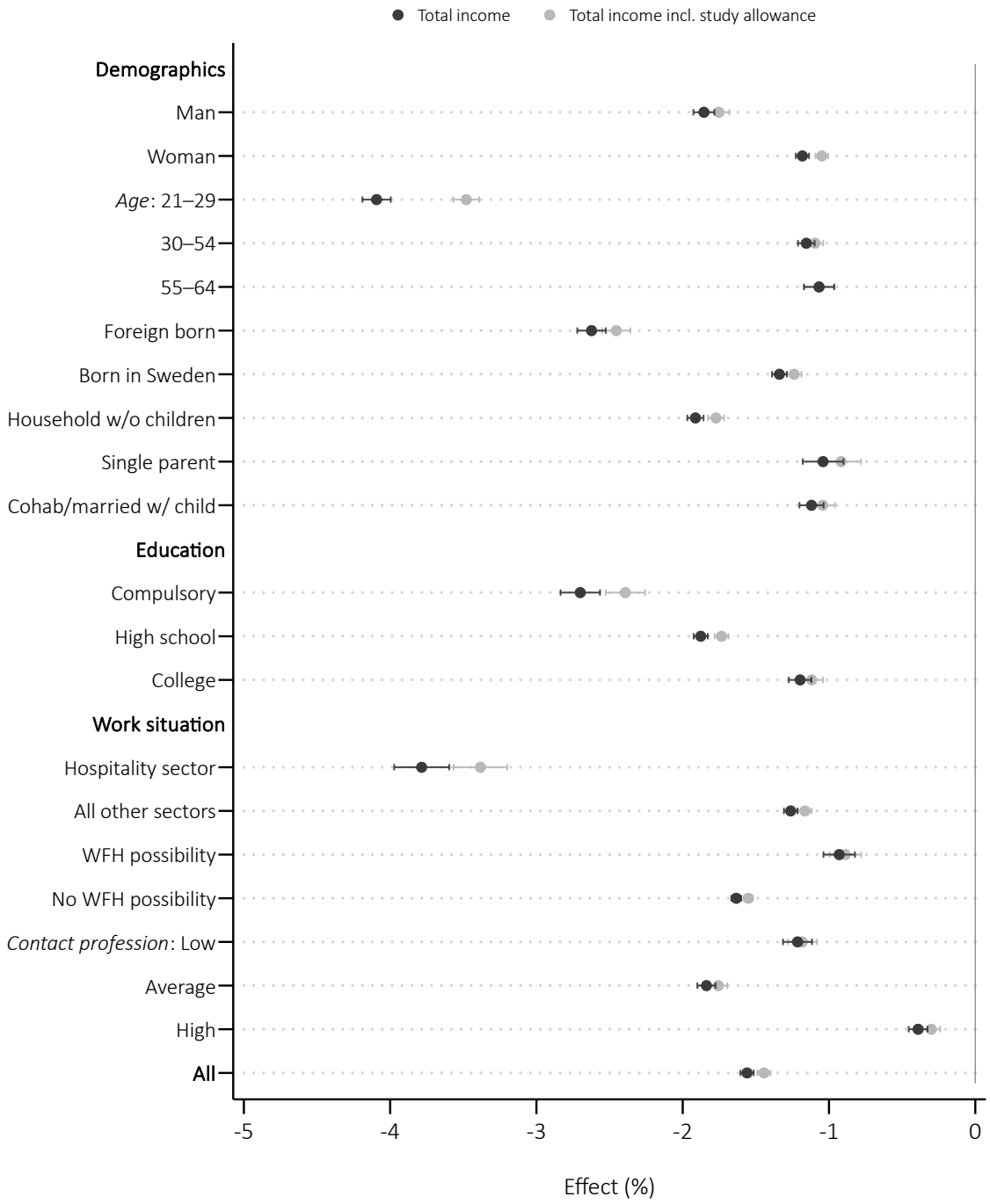
Notes: This figure shows estimated COVID-19 effects on labor earnings (yellow dots) and total income (blue dots) with corresponding 95 percent confidence intervals using standard errors clustered at the individual level. Each estimate is based on a separate regression for the respective subsample using Equation (1).

Figure **A**-2: Replacement rates of existing transfers and pandemic measures



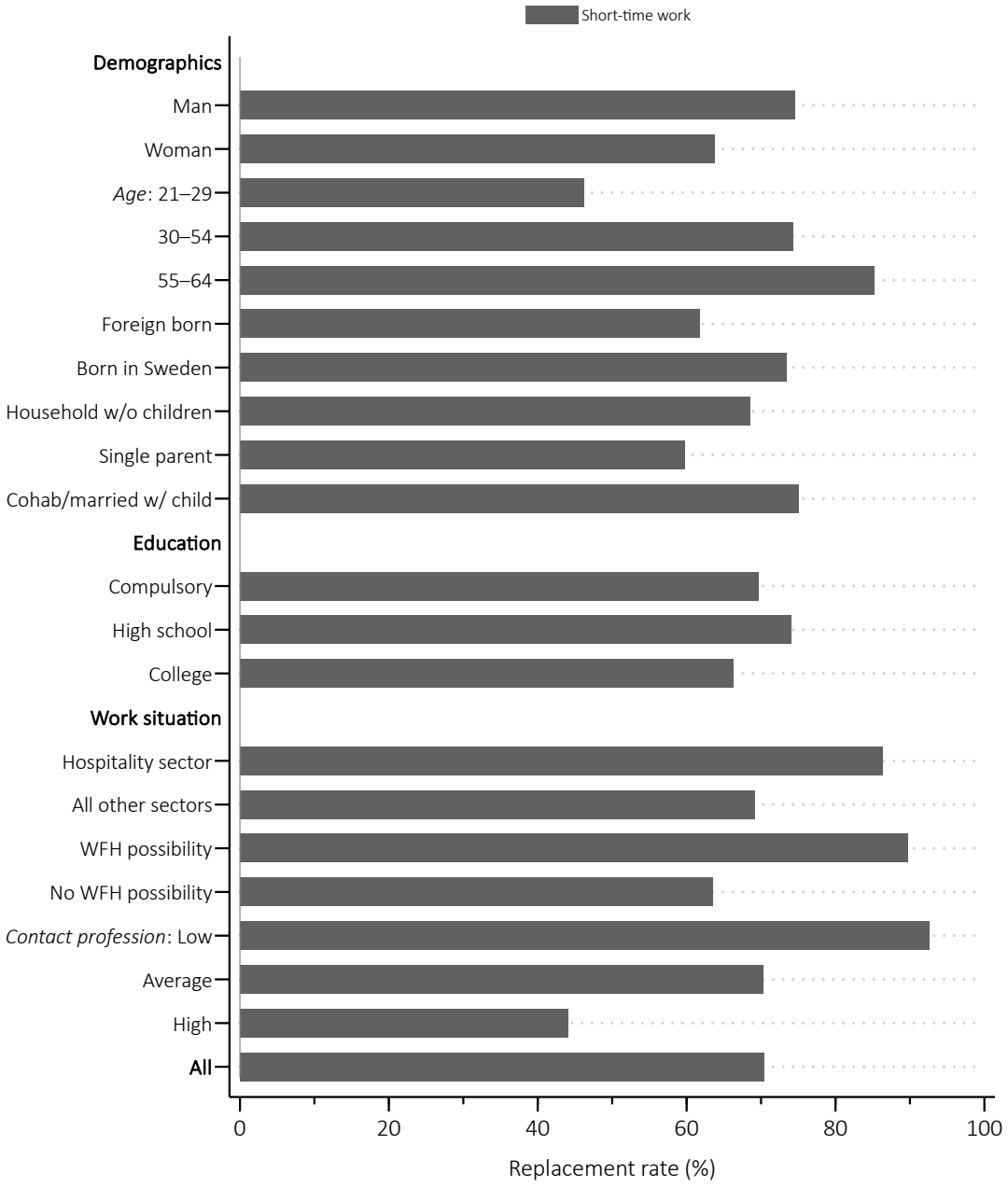
Notes: This figure displays the replacement rate from existing transfers and pandemic measures for different groups. The replacement rate is defined as the estimated COVID-19 effect on existing transfers or pandemic measures scaled by the estimated COVID-19 effect on labor earnings. Each estimate is based on a separate regression for the respective subsample using Equation (1). WFH = working from home.

Figure **A**-3: Effects on total income, excluding and including student grants and loans, by group



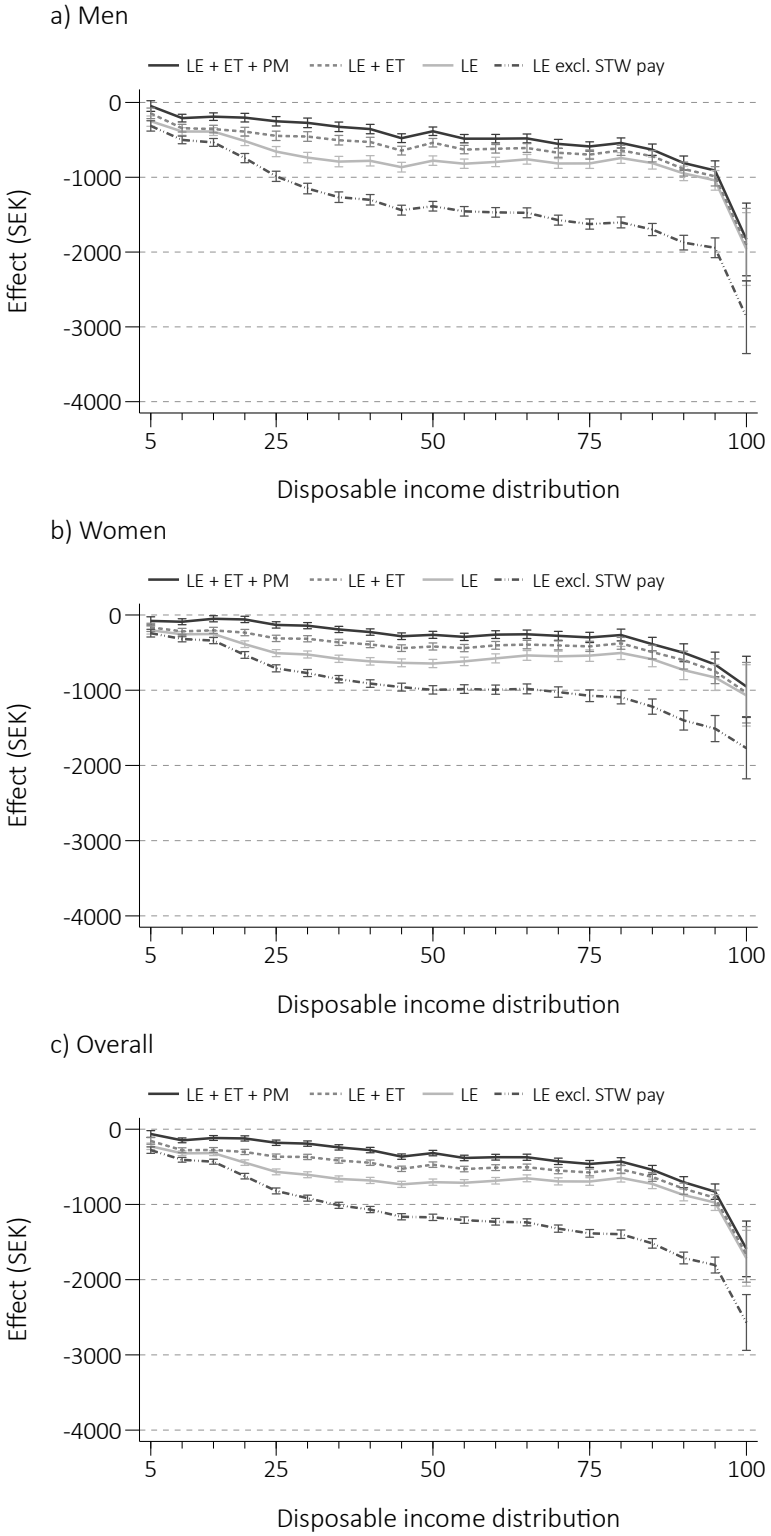
Notes: This figure shows estimated COVID-19 effects on total income, excluding (blue dots) and including (yellow dots) study allowance, with corresponding 95 percent confidence intervals clustered at the individual level. Each estimate is based on a separate regression for the respective subsample using Equation (1), but with annual averages by month of earnings and study allowance. WFH = working from home.

Figure A-4: Short time work allowance in relation to labor earnings losses by demographic group



Notes: This figure displays the "replacement rate" from short-time work allowance, defined as the estimated COVID-19 effect on short-time work scaled by the estimated COVID-19 effect on labor earnings. Each estimate is based on a separate regression for the respective subsample using Equation (1). WFH = working from home.

Figure **A**-5: Levels of income loss



Notes: Each figure shows estimates for the respective earnings and income definitions for men (Panel a), women (Panel b), and the overall sample (Panel c). LE=labor earnings, ET=existing transfers, PM=pandemic measures. Each point estimate and respective 95 percent confidence interval is based on a separate regression of the respective vingtile of the two-year pre-pandemic disposable income distribution. Values in SEK.