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Keywords: income distribution, inequality, poverty, emergency benefits, microsimulations, Italy, Covid-19

JEL Classification: D31, D63, E27, I32, J31

1. Introduction

From the occurrence of the COVID-19 pandemic, the economic literature has dedicated a broad and growing emphasis on the effects of the pandemic spread, focusing both on the determinants of the effectiveness of social distancing measures and on the socio-economic consequences of COVID-19 on a large set of outcomes (concerning, e.g., public budgets, labour market outcomes, health conditions, education divides due to distance learning, gender and racial inequality, environmental consequences; see Brodeur et al., 2020, for a detailed review).

In a first stage, most of studies have tried to forecast the contagion dynamics or to estimate the mitigation effects of lockdown measures on virus transmission (see the review in Bonacini et al., 2021a), as well as to study possible relationships between the compliance to social distancing measures and socio-economic characteristics of individuals (Borgonovi and Andrieu, 2020; Chiou and Tucker, 2020; Durante et al., 2020; Wright et al., 2020). Afterwards, a literature on the effects of the COVID-19 pandemic on labour market outcomes and individual/household incomes has flourished. As regards the studies focusing on the relationship between COVID-19 and labour market, most of them aim to classify professions according to their exposure to disease or their attitude to be performed remotely (e.g., Boeri et al., 2020; Dingel and Neiman, 2020; Koren and Pető, 2020). Some studies have investigated possible heterogenous effects among workers of COVID-19 on employability or business ownership (Béland et al., 2020a and 2020b), while others have emphasised dramatic COVID-19 consequences on gender inequality, because the additional housework and childcare associated to the pandemic have mainly fallen on women (e.g., Alon et al., 2020; Del Boca et al., 2020; Hupkau and Petrongolo, 2020).

A further question concerns the effect of the pandemic on income inequality (Blundell et al., 2020). The wisdom from economic historians suggests that epidemics are inequality reducing (due, e.g., to the shortage of labour supply that fostered wage increases and the dissolution of great fortunes; Scheidel, 2018), but Furceri et al. (2020) find that major epidemics from 1900s onward raised income inequality in the medium-term, hurting the employment prospects of low skilled individuals.

Apart from these suggestions on possible medium- and long-term effects, some studies have recently inquired the immediate 'short-term' effect of the COVID-19 pandemic and the related emergency benefits introduced by the governments on workers' and households' income distribution. However, the capability to answer to this research question is strongly limited by data availability since, as known, representative surveys on population incomes and living conditions are usually delivered with about 2 years of delay from the moment of the interview.[1]

To overcome this limit, some studies used real time surveys (e.g., Adams-Prassl et al., 2020; Galasso, 2020) or big data on bank records (Aspachs et al. 2020), or also labour market outcomes (Berman, 2020, and Cortes and Forsythe, 2020). However, these kinds of data fail in being representative of the whole population, thus not allowing researchers to provide a thorough picture of changes in individuals' and households' income distribution.

Noteworthy, other studies have relied on existing microdata on income distribution, collected in past years and representative of the national population before the onset of the pandemic, to simulate counterfactual scenarios about the changes in the various income sources engendered by

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[1] The only exception regards the UK thanks to the release of an ad-hoc timely wave of the Understanding Society longitudinal survey. Among the studies which used this ad hoc survey, see Benzeval et al. (2020) and Witteveen (2020).

the spread of the new coronavirus, aligning past microdata with aggregate information on changes in labour market outcomes since the onset of the pandemic (see, e.g., Bronka et al., 2020, and Brewer and Tasseva, 2020, for the UK; Beirne et al., 2020, and O' Donoghue et al., 2020, for Ireland; Li et al., 2020, for Australia).[2]

To the best of our knowledge, three studies have investigated the effects of the COVID-19 crisis on the income distribution in Italy by using microsimulations on a representative sample of the whole population (Figari and Fiorio, 2020; Brunori et al., 2020; MEF, 2020). They all find a not negligible increase in market income poverty and inequality, but they notice that the emergency cash benefits have been highly effective in cushioning the increase in inequality due to the pandemic impact in the economic system. Nevertheless, these studies only focused on the very short-term effect of the lockdown occurred in Spring 2020, thus assuming that the Italian economy would have fully recovered just after the interruption of the lockdown, and, because of data limitations when the research was carried out, had to make some rough assumptions about the share of workers who had to suspend their job activities because of the pandemic.

By making use of a static microsimulation model, based on a dataset developed by merging survey and administrative data, in this article we aim to assess the effects of the COVID-19 pandemic on the distribution of workers' and households' incomes in Italy in the whole 2020. To do that, we disentangle the effects related to market incomes changes from the cushioning effects exerted by the emergency strengthened or introduced from March 2020 to contrast the negative effects of the pandemic. We focus on Italy as a major case study, since it has been both one of the countries most affected by COVID-19 and it was the first Western country hit by the spread of the coronavirus and adopting a national lockdown of economic activities (on March 11, 2020).

Specifically, we pursue three main goals: i) provide a detailed picture of the changes in the 2020 income distribution due to the effects of the COVID-19 pandemic, by computing several distributional indicators; ii) estimate compensatory effects on the income distribution exerted by the main emergency benefits introduced to support individuals and households; iii) focus on both earnings distribution among workers (individual-level analysis) and income distribution among equivalised individuals (household-level analysis), to assess the potential compensatory/amplifier role of the household in a context of a severe and sudden crisis.

This paper extends the literature that used microsimulations to infer the link between the pandemic and the income distribution from various perspectives that, to the best of our knowledge, have not been jointly considered by the existing studies. First, it simulates the pandemic effects for the whole 2020 (instead of at most few months only) considering both workers and households as the unit of observation. Second, it disentangles the pandemic effects on market and disposable incomes separately, to capture the compensative impact of redistribution. Third, it explores heterogeneous effects of the pandemic and related emergency policies by socio-economic characteristics of population. Fourth, it estimates the pandemic effects on the Italian income distribution under three scenarios characterised by an increasing length of the COVID-19 outbreak and related emergency benefits. Finally, simulations are based on a unique survey dataset – developed matching the Italian component of the European Union Statistics on Income and Living Conditions (EU-SILC) with the administrative archives managed by the National Social Security Institute (INPS) –, which contains information on worker's activity sector recorded

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[2] Relying on past surveys on employees, other studies simulated, instead, labour market outcomes and individual wages making assumptions on the capacity of individuals to work under social distance measures (Duman, 2020, for Turkey; Bonacini et al., 2020b, for Italy; Palomino et al., 2020, for 29 European countries).

at 6-digit ATECO level. This information allows us to exactly identify individuals working in essential or non-essential sectors as the national regulations established which activity sectors consider as essential (thus not affected by the shutdown due to the pandemic) basing on the 6-digit ATECO level.

More in detail, the article is organised as follows. Section 2 briefly describes the emergency benefits used to protect workers and households against the economic effects of the pandemic. Section 3 presents the microsimulation model, the data and the assumptions we made to run the simulations. Sections 4 and 5 show our main findings focusing on workers and households, respectively. Section 6 concludes assessing the implications of our results for longer-term trends of income inequality.

2. A review of the emergency benefits

From the beginning of March 2020, the Italian government reacted to the pandemic through a series of increasingly stringent social distancing measures. Italy was the first European country introducing significant restrictions to citizens' mobility freedom. The first measure, effective at the national level from March 5, concerned the suspension of school activities for all grades. A second restricting measure, started on March 12 (the day after the World Health Organization declared the COVID-19 spread as a 'global pandemic'), involved the shutdown of all commercial and retail business activities (including food services like bars and restaurants), except for those considered basic necessities. Furthermore, mobility was only allowed to go to work, shopping for food and emergencies in the whole country. Finally, a third measure introduced on March 26 determined the closure of all (still open) 'non-essential' economic activities (identified according to their 6-digit ATECO sector of activity). Most of these restricting measures have been interrupted or alleviated at the beginning of May, and some have been prolonged until the beginning of June.

Despite the quickness of lockdown measures introduced by the national government, Italy dramatically suffered the COVID-19 pandemic in terms of deaths and infections. At the end of September 2020, Italy reported about 36,000 deaths by COVID-19 (6th at global level, after US, Brazil, India, Mexico and UK) and more than 300,000 of confirmed cases (17th at global level). From October 2020, however, a second wave of COVID-19 infection strongly impacted on Italy leading (on December 15, 2020) the number of deaths by the novel coronavirus up to approximately 65,000 and the number of confirmed cases to about 1.9 million (7th at global level). This forced the government to introduce from the end of October further social distancing measures (e.g., the closing of upper secondary schools), the shutdown of some activities (e.g., bars and restaurant have to close at 6 p.m.), and new measures limiting the citizens' mobility freedom calibrated on the trends of COVID-19 infections at regional level.

As a consequence of the pandemic spread, the Italian macroeconomic stance suddenly worsened. The Italian National Institute of Statistics (ISTAT, 2020) reports that the number of full-time equivalent workers has reduced by 17% on a yearly basis, and the National Social Security Institute (INPS, 2020a) reports that total hours authorized to firms as short time work allowance (see below) from March to August 2020 amounted to 2.8 billion, while, for comparison, they were approximately 1.2 billion in 2010, the hardest year for the Italian economy during the crisis started in 2009 (the so-called Great Recession).

From the beginning of March, the Italian government has introduced a set of measures to protect workers against the negative effects of the pandemic spread on the business cycle, as well as to

compensate income drops related to the shutdown of many work activities. Most Important measures were introduced in two decrees: Decree no. 18/2020 issued on March 17, called '*Decreto Cura*', and Decree no. 34/2020 issued on May 19, called '*Decreto Rilancio*'.

We briefly describe below the measures that are simulated in our analysis (see Section 3), while further measures introduced by the government since the occurrence of the pandemic – which have, however, smaller effects on workers and household incomes – are not simulated because of the lack of needed information (e.g., the bonus for the childcare and the €100 lump sum transfer to 'essential employees' which could not work from home during the lockdown period).[3]

The main measure established by the '*Decreto Cura*', and then renewed by subsequent provisions, concerns the extension to all employees – independently of the firm size and the sector of activity – of the short time work allowance *Cassa Integrazione Guadagni* (henceforth CIG), that is the wage-compensation scheme for working-time reduction. The replacement rate of CIG is 80% of the missed wage with, however, binding ceilings that highly reduce the replacement rate for middle- and high-paid workers; the monthly benefit is indeed capped at €940 and €1,130 when monthly wage is below or no lower than €2,160, respectively.

The '*Decreto Cura*' established three further emergency policies worthy of attention. First, the stoppage of layoffs, through which employers were prevented from firing employees since February 23. This measure has been renewed by subsequent decrees up to August 2020, then to December 2020, and finally until March 2021. Second, the duration of the ordinary unemployment benefits (NASPI and DIS-COLL, henceforth UB) was extended up to for 4 months in favour of those recipients whose benefit duration expired from March to June 2020 (see Appendix 1 for details about UB schemes in Italy). Third, it introduced a lump sum transfer (henceforth Bonus-600) targeted to different categories of para-subordinate and self-employed workers (also including seasonal workers who had already worked before March 2020).[4] Para-subordinate collaborators and freelances enrolled in INPS received in March and April a €600 monthly lump sum, while this amount was increased to €1000 in May for those workers who ended their working activity before 19 May. Self-employed categories enrolled in INPS (i.e., craftsmen, dealers and agricultural workers) received a € 600 lump sum benefit in March while they have benefitted from measures explicitly devoted to employers and firms in following months. (as mentioned, measures for firms are not simulated in this article). Lump sum benefits have also been provided to liberal professionals who are enrolled to social security funds managed by their professional association (e.g., lawyers, architects, accountants).[5] The '*Decreto Rilancio*' also extended the lump sum benefit to some categories of employees and atypical workers who were excluded from the measures introduced in March.[6]

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[3] Relying on an individual-level dataset, we do not simulate the effects of the measures introduced from March 2020 to sustain firms' production (e.g., fiscal incentives, tax credits and reliefs on debts).

[4] Para-subordinate arrangements refer to collaborators and some freelance categories who are legally self-employed but often are 'economically dependent' on a single client (Raitano, 2018).

[5] In detail, a €600 monthly benefit was paid in March and April to all those who had earned no more than €35,000 in 2019 or had earned an income comprised between €35,000 and €50,000 in 2019 and suffered from at least a 33% labour income drop in the first quarter of 2020 compared to 2019. In May, a €1000 lump sum benefit was paid to liberal professionals who suffered from at least a 33% labour income drop from March to April 2020 with respect to the same period in 2019.

[6] A €600 monthly benefit for April and May was also paid to domestic workers, seasonal and intermittent employees who had not worked in 2020 yet, and to para-subordinate workers active in 2019 but without a working arrangement

As concerns minimum income schemes, no changes in the entitlement rules and the amount of the ordinary scheme (the Citizenship Income, *Reddito di Cittadinanza*, henceforth RdC) were established from the beginning of the pandemic,[7] whereas the '*Decreto Rilancio*' introduced a new means tested benefit, called Emergency Income (*Reddito di Emergenza*, henceforth REM), substantially addressed to poor households which do not satisfy the eligibility requirements to RdC. The Emergency Income was originally paid for a 2-month period, but its duration has been extended by three additional months by two decrees issued in August and November. Entitlement conditions and benefit amount of RdC and REM are presented in detail in Appendix 1.[8]

The most recent statistics from INPS[9] show that the number of RdC recipients increased considerably from the occurrence of the COVID-19 pandemic. In March 2020, 1,011,784 households were benefitting from RdC, while the number of recipient households has become 1,352,172 in October 2020 (+33.6% with respect to March). INPS figures also show that 291,206 households received the two-month REM instalments introduced by the *Decreto Rilancio*.

3. Microsimulation model, data and assumptions

In this section, we present the main features of the used microsimulation model and the characteristics of our dataset (Section 3.1), as well as the assumptions and scenarios considered in the baseline simulation (Section 3.2).

3.1. *Model characteristics and data*

We adopt a static tax-benefit microsimulation model which partially draws on Baldini et al. (2018) and Gallo (2019) to simulate the implementation of redistributive policies in Italy. As typical in this class of models (Beirne et al., 2020; Bronka et al., 2020; Figari and Fiorio, 2020), we simulate pandemic effects on the income distribution assuming, on the one hand, no individuals' behavioural changes and, on the other hand, no structural changes in the labour demand and in the wage structure.

The model relies on the 2017 wave of the Italian component of the EU-SILC survey (henceforth, IT-SILC), enriched by the information on workers' activity sector recorded in the administrative archives managed by INPS. The dataset thus developed is called AD-SILC 2017. Income variables in AD-SILC 2017, which refer to the year 2016, have been inflation-adjusted to 2020 using consumer price indexes provided by ISTAT.

Exploiting the additional information available in IT-SILC, our model includes an estimate of household housing and financial wealth.[10] It allows us to exactly compute the value of the ISEE indicator – the indicator of equivalised socio-economic conditions that is based on income and

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in February 2020. A further €1000 benefit was also paid in December to some categories of seasonal and atypical workers.

[7] Conditionality rules about job search activities for RdC beneficiaries were, however, suspended from March to July 2020.

[8] For a description and an assessment of the two measures see also Jessoula et al. (2019) and Natili and Raitano (2020).

[9] Data are available at https://www.inps.it/nuovoportaleinps/default.aspx?itemdir=51758.

[10] See Gallo (2019) for details about the model characteristics and the assumptions made to compute the values of housing and financial wealth starting from IT-SILC data.

wealth, the latter valorised at 20% – and precisely identify the households eligible to minimum income benefits (RdC and REM), whose eligibility criteria are based both on ISEE and on specific values of the various income and wealth components (see Appendix 1).

The microsimulation model includes all tax and benefit measures which existed before the pandemic (also those introduced in the 2017-2019 period, mostly the RdC) and simulates entitlement conditions to the layoffs stoppage and to the new emergency benefits introduced from March 2020 onwards (see Section 2 for details). Microsimulations are aligned to aggregate data delivered by national institutions in past months and, in particular, they are aligned to the spread of the CIG allowance among the employees reported in INPS (2020b).

To assess changes due to the occurrence of the pandemic, we refer to the inflation-adjusted income distribution observed in 2016 as the "No-Covid scenario". Hence, we use information on household income and individuals' monthly occupational statuses declared in 2016 to simulate what would have been occurred in 2020 if the pandemic had not happened. In other words, we assume that no differences would have occurred in labour market outcomes of individuals from 2016 to 2020 in absence of pandemic.

As pointed out, we carry out two types of distributional analyses. The first one focuses on workers, to analyse the effect of the pandemic on their gross incomes, also considering the role played by the different types of income support measures for workers. The second one focuses instead on households, to study the effect of the pandemic on equivalised disposable income, before and after the emergency benefits receipt.

More in detail, the individual-level analysis (see Section 4) is based on a subsample of 19,154 individuals aged 15-65 who had positive labour incomes and were not retired in 2016 (79% and 21% of sampled individuals work as an employee or a self-employed, respectively). We thus compare the 2016 distribution (henceforth, the No-Covid scenario) with the distribution in different simulated scenarios of gross annual labour incomes (considering incomes from employment and self-employment) and workers total income. The latter is defined as the sum of labour incomes and the received amount of income support measures introduced or strengthened from March 2020 to help workers (namely, the CIG allowance, different types of UB, and Bonus-600). Therefore, comparing in each scenario the effects on labour and total income, it is possible quantifying the cushioning effect of these benefits on workers' income loss due to the pandemic.

The household-level analyses (see Section 5) is based on 48,819 'equivalised individuals' living in 22,226 households surveyed in IT-SILC 2017. Household incomes are equivalised among household members by using the OECD modified equivalence scale.[11] We thus compare the distribution of equivalised disposable income in the No-Covid scenario with that simulated in various scenarios to inquire the total effect due to the pandemic. Also, we compare household incomes before and after emergency benefits to assess the role played by the emergency benefits to cushion income drops due to the pandemic. To this aim, we consider five emergency benefits (introduced or strengthened from the occurrence of the pandemic, or whose values change when individual/household income changes, thus acting as an automatic stabilizer): the CIG allowance, different types of UB, Bonus-600 and the two minimum income schemes, RdC and REM. We assume no pandemic-related changes in values of the other cash social transfers received by the household (mostly, pensions and disability benefits). Therefore, to assess the cushioning effect of emergency benefits, we compare losses in net market incomes – i.e., changes in household labour

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[11] Note that in what follows we always refer to equivalised incomes when we refer to household income.

or capital income net of taxes, before the receipt of emergency benefits – with changes in disposable incomes.

In order to simulate the effects of the COVID-19 pandemic on income distribution, the information on the activity sector available in our dataset and collected in administrative archives is crucial. Indeed, this information is recorded according to the 6-digit ATECO classification that is the classification used by the Italian government to establish essential and non-essential sectors. Thus, differently from other analyses about Italy (Figari and Fiorio, 2020; Brunori et al., 2020; MEF, 2020) which had data at the 2-digit ATECO level at most and had to randomly select 'essential' and 'non-essential' workers, our dataset allows us to exactly identify workers at risk of firm shutdown because of the social distancing measures introduced to stop pandemic.

Table 1. Share of essential workers by main characteristics

	All workers	Employees	Self-employed
Total	45.7%	49.4%	31.4%
Gender			
Male	44.2%	48.2%	31.8%
Female	47.6%	51.0%	30.6%
Area of work			
North	44.0%	46.9%	31.8%
Middle	44.9%	49.6%	28.2%
South	49.2%	53.8%	33.0%
Age class			
<35	36.5%	37.9%	30.2%
35-44	44.4%	48.1%	29.6%
45-54	48.6%	53.5%	31.5%
55-65	57.1%	64.1%	35.2%
Citizenship			
Italian	47.7%	52.0%	32.2%
Foreign	29.1%	30.4%	20.8%
Deciles of the gross labour income distribution			
1	32.8%	33.6%	31.5%
2	37.9%	40.7%	31.2%
3	35.7%	37.9%	29.3%
4	35.8%	38.1%	28.1%
5	41.4%	44.7%	24.0%
6	46.0%	48.6%	29.2%
7	51.1%	53.6%	34.8%
8	58.3%	62.2%	30.8%
9	59.9%	64.8%	35.0%
10	57.7%	63.5%	39.2%

Source: Elaborations on AD-SILC 2017 data.

Table 1 reports the share of individuals employed in essential and non-essential sectors, as defined, according to the 6-digit ATECO classification, by the national decrees which established the lockdown measures. Table 1 shows that 54.3% of workers were interested by the lockdown

measures and reveals a first disequalising effect related to the fact that those working in firms which were mandatorily shut down by the lockdown lie more frequently in the bottom deciles of the labour income distribution. Consistently, according to our data, those working in non-essential sectors earn, on average, 20.8% less than workers in essential sectors.

3.2. Assumptions and simulated scenarios

In this article the effects of the pandemic are simulated for the whole 2020 under three different scenarios capturing an increasing length of the pandemic.

In Scenario A, we assume that negative effects on the labour market only last from March to May (i.e., the lockdown period) and afterwards the economy comes back to the performance it would have had if the pandemic had not occurred. In Scenario B, a further reduction in the economic stance from June to August is considered. In Scenario C, we assume that the pandemic does not disappear until the end of 2020, extending the negative stance of Scenario B to September and October, and hypothesising a new two-month lockdown in November and December to take into account the possible second wave of COVID-19 infections. Accordingly, as explained below, simulations consider different durations of the emergency benefits in the three scenarios.

To simulate income distribution changes, we adopt several assumptions according to the occupational status of individuals. Specifically, we consider the following six categories of workers: i) open-ended employees in essential sectors; ii) open-ended employees in non-essential sectors; iii) temporary employees in essential sectors; iv) temporary employees in non-essential sectors; v) self-employed in essential sectors; vi) self-employed in non-essential sectors. In what follows we present in detail, for each category of workers, the COVID-19 effects on labour incomes and emergency policies simulated in our microsimulation model, while Table 2 provides a brief summary.

Although the stoppage of layoffs introduced by the national government was not limited to a specific typology of employment contract, we assume that this emergency policy is effective for open-ended employees only, since employers may merely not renew temporary contracts. To simulate the effect of the stoppage of layoffs, we use the information on the monthly employment in 2016 and, for those who were employed in February, we replace – for the whole duration of the layoff stoppage (i.e., March-August in Scenarios A and B, March-December in Scenario C) – the unemployment periods recorded in the following months (thus receiving zero incomes or UB/CIG) with the mean monthly wage (computed according to actual earnings in worked months).[12]

Since employers cannot fire their employees, all firms are allowed to take advantage of CIG. Relying on available data on the distribution of the number of workers who received CIG in essential and non-essential sectors in March-April 2020 reported in INPS (2020b),[13] we assume that during the lockdown period (March-May in Scenarios A and B, March-May and November-December in Scenario C) 62% of employees working in non-essential sectors and 12% of employees in essential sectors were suspended from their job and received CIG (whose value

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[12] Consistently, we do not consider in the post-Covid scenarios UB and CIG received by open-ended employees in the No-Covid scenario during the months of application of the layoffs' stoppage.
[13] INPS (2020a and 2020b) reports that approximately 6 million of employees received CIG during the lockdown. Our figures on the spread of the CIG allowance are then aligned with this aggregate value.

amounts to 80% of previous wage until a ceiling, see Section 2) instead of their monthly wage.[14] As concerns non-lockdown months, we assume that 31% and 6% of employees in non-essential and essential sectors, respectively, received CIG in June-August in Scenario B and in June-October in Scenario C. We thus select randomly, according to these shares and to the sector dichotomy, the employees who suspended their job for the whole lockdown period (note that also temporary employees may receive the CIG until their contract does not expire). After the lockdown, new random procedures for each non-lockdown month with a reduced activity (i.e., June-August in Scenario B and June-October in Scenario C) assign CIG to the employees, while in Scenario C the same employees selected in the first lockdown randomisation receive CIG for the whole second lockdown (i.e., November-December period).

It has to be pointed out that the spread of CIG in non-essential sectors was below 100% during the lockdown period since some firms asked for derogation from the mandatory shutdown of their activity. Moreover, individuals who were able to work from home had the opportunity to continue their activity if their firm was not shut down. Likewise, CIG was also asked by firms in essential sectors which suffered from a reduction in their activity due to the pandemic.

As concerns fixed-term employees, our dataset does not provide information about the expected duration of the contract, thus preventing us from exactly considering the lack of a contract renewal. Consequently, we simulated unemployment spells from March until the end of the negative economic stance in different scenarios for those temporary workers who changed firm or experienced some non-working month in the corresponding period in 2016. Details about the assumptions on the unemployment risk among temporary workers are reported in Appendix 2. We assume that months spent in unemployment from March to the end of the pandemic period according to the three scenarios are covered by ordinary UB. Similarly, we extend the UB duration of those who were already UB recipients in February. Furthermore, as mentioned in Section 2, some categories of seasonal temporary employees in non-essential sectors are also entitled to receive the monthly lump sum Bonus-600, that we assume is paid also in November-December in Scenario C.

As the stoppage of layoffs, coupled with a deep recession, made very unlikely the worker re-employment until the end of the pandemic period, we also assume that all individuals unemployed in February and then working – according to the No-Covid scenario – as an employee or a self-employed in the following months have no labour income from March to August in Scenarios A and B and until the end of 2020 in Scenario C.

As concerns the self-employed, we make different assumptions on their income loss according to the sector of activity and the simulated scenario. Regarding self-employed in essential sectors, we assume a 25% decrease in labour incomes in the 'pandemic months' (from March to May, August and December in Scenarios A, B and C, respectively) to capture the general reduction of the working activity. These monthly reductions lead to an overall loss of the yearly self-employment income amounting 6%, 13% and 21% in the three scenarios, respectively. A similar assumption is made for the self-employed in non-essential sectors except for the fact that we further assume that they had zero monthly income in March-April in all scenarios, and from November to December in Scenario C. Accordingly, the loss of yearly self-employment income becomes 19% in Scenario A, 25% in Scenario B, and 46% in Scenario C.

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[14] Our main findings do not change if we slightly change the percentages about the spread of CIG in essential and non-essential sectors. Detailed results are available upon request.

As mentioned in Section 2, self-employed are entitled to receive the monthly lump sum Bonus-600 for the March-May period. In addition, we assume that two further monthly instalments of this bonus are paid in Scenario C to cope with the November-December lockdown. For the sake of simplicity, we adopt a 100% take-up rate for Bonus-600 among self-employed with an annual labour income lower than €50,000, while the take-up rate becomes 0 for those with an income level higher than €50,000.

We consider labour incomes and individual benefits gross of taxes when we focus on workers' income distribution. When the focus is on the households, incomes are instead considered net of taxes. Accordingly, we apply the personal income tax design to labour income and emergency benefits to compute net values of these income components.[15] When focusing on household incomes, we further assume that the value of social transfers different from those designed to protect workers (i.e., UB, CIG and Bonus-600) – e.g., mostly pensions - do not change, while we let vary the number of recipients and the benefit amount of RdC considering the new household economic conditions in the post-Covid scenarios. As regards the REM benefit (i.e., the emergency minimum income scheme introduced in May 2020), we add it to incomes of household potentially eligible assuming a receipt duration consistent with the three scenarios of pandemic. Specifically, REM provides two monthly benefits in Scenario A, 3 in Scenario B and 5 in Scenario C.[16]

To identify recipients of RdC and REM, as seen in Section 3.1, information about household income and wealth are needed. We thus assume that, to finance a constant consumption expenditure, households reduce their financial wealth by an extent equal to the income loss exceeding the amount of emergency benefits of all household members up to €2,000 for each month of negative economic stance due to the pandemic. This means that the maximum loss of financial wealth is equal to €6,000, €12,000 and €20,000 in Scenarios A, B and C, respectively. Consistently, we slightly reduce household capital income in line with the wealth decrease. Therefore, we obtain total household income in the different post-Covid scenarios by modifying incomes in the No-Covid scenario according to the variations in the amount of labour income and benefits obtained by all household members, plus the variations in capital incomes and in the minimum income benefits (RdC and REM).

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[15] Note that the Bonus-600 is not included in the tax base of the personal income tax.

[16] In the microsimulation model, we set the take-up rate of RdC comparing the estimated full audience of eligible households in AD-SILC 2017 data and the actual number of recipients provided by INPS in terms of macro-region of residence and benefit amount classes. Results of this comparison show that RdC has a 76% take-up rate at national level, but important differences across regions and groups of benefit amount emerge. For instance, the take up-rate is significantly higher among those living in the South and entitled to a middle level of monthly benefit amount (94%), while it is pretty limited (36%) when looking at households living in the North and entitled to a low level of monthly benefit amount. As for REM, a similar comparison between survey-based simulations and real data (much less informative than those on RdC though) shows that the estimated full audience of eligible households is close to the actual number of recipient households provided by INPS. Hence, for the sake of simplicity, we assume for REM a 100% take-up rate. More details are available upon request.

Table 2. Assumptions adopted in the model to simulate COVID-19 effects on labour incomes and the implemen

Scenario	Effect of	Occupational status of individuals			
		Open-ended employees in essential sectors	Open-ended employees in non-essential sectors	Temporary employees in essential sectors	Temporary employees in non-essential sectors
A	COVID-19	Income loss due to CIG for 12% of employees in March-May	Income loss due to CIG for 62% of employees in March-May	Income loss due to CIG for 12% of employees in March-May. Non-renewal of ended contracts until August	Income loss due to CIG for 62% of employees in March-May. Non-renewal of ended contracts until August
	Emergency policies	Stoppage of layoffs until August and CIG until May	Stoppage of layoffs until August and CIG until May	Unended UB until August and CIG until May	Unended UB until August and CIG until May + Bonus-600 in March-May for seasonal workers
B	COVID-19	Additional income loss due to CIG for 6% of employees in June-August	Additional income loss due to CIG for 31% of employees in June-August	Additional income loss due to CIG for 6% of employees in June-August. Non-renewal of ended contracts until August	Additional loss due to CIG for 31% of employees in June-August. Non-renewal of ended contracts until August
	Emergency policies	Stoppage of layoffs and CIG until August	Stoppage of layoffs and CIG until August	Unended UB and CIG until August	Unended UB and CIG until August + Bonus-600 in March-May for seasonal workers
C	COVID-19	Additional income loss due to CIG for 6% of employees in September-October and for 12% of employees in November-December	Additional income loss due to CIG for 31% of employees in September-October and for 62% of employees in November-December	Additional income loss due to CIG for 6% of employees in September-October and for 12% of employees in November-December. Non-renewal of ended contracts until December	Additional income loss due to CIG for 31% of employees in September-October and for 62% of employees in November-December. Non-renewal of ended contracts until December
	Emergency policies	Stoppage of layoffs and CIG until December	Stoppage of layoffs and CIG until December	Unended UB and CIG until December	Unended UB and CIG until December + Bonus-600 for five months (March-May and November-December)

4. Individual-level analysis

We first present results about the effects of the COVID-19 pandemic on the distribution of labour and total incomes received by our sample of workers. We show results related to all the three scenarios (and additional results are included in Appendix 3), although in most of the cases we prefer commenting the comparison between the No-Covid scenario and Scenario C. In fact, unfortunately, Scenario C became the most plausible scenario due to the occurrence of a second wave of COVID-19 infections in all EU countries from autumn 2020.

Table 3 summarises the mean values of gross income losses due to the pandemic and the gross amount of emergency benefits received by workers during 2020, also distinguishing employees and self-employed.

Table 3. Mean individual income loss and emergency benefits received by workers: main figures

|	Benefits amount in relative terms			Income loss wrt No-Covid scenario	
	Benefits/ labour income	Benefits increase/ labour income loss	Benefits/ No-Covid benefits	Labour income	Total income
All workers					
No-Covid	1.5%				
Scenario A	6.3%	48.5%	3.8	-8.7%	-4.4%
Scenario B	8.2%	45.4%	4.8	-12.5%	-6.7%
Scenario C	14.0%	44.3%	7.4	-21.5%	-11.8%
Employees					
No-Covid	1.7%				
Scenario A	5.9%	50.0%	3.2	-7.5%	-3.7%
Scenario B	8.1%	51.0%	4.2	-10.8%	-5.2%
Scenario C	13.3%	50.5%	6.3	-18.1%	-8.8%
Self-employed					
No-Covid	0.6%				
Scenario A	7.9%	45.2%	11.5	-13.7%	-7.5%
Scenario B	8.5%	32.6%	11.6	-19.3%	-12.9%
Scenario C	17.8%	31.1%	19.5	-35.2%	-24.1%

Source: Elaborations on AD-SILC 2017 data.

Labour incomes largely drop in all scenarios and, as expected due to the scenarios assumptions, the largest decrease (-21.5%) occurs in Scenario C. Because of the higher risks related to their working activity during the lockdown periods, self-employed experience on average greater losses than the employees. On average, individual incomes still report a relevant reduction when the emergency benefits are included in workers' total incomes (-11.8% in Scenario C, -8.8% and -24.1% among the employees and the self-employed, respectively). However, in all scenarios income losses approximately halve when emergency benefits are added to the labour income.

The role played by automatic stabilizers as the UB and CIG – whose audience was largely extended by the emergency decrees introduced from the occurrence of the pandemic – and by the newly introduced flat rate Bonus-600 clearly emerges also when computing the mean value of these benefits with respect to labour income and income loss (Table 3). Considering all workers, mean

benefits in Scenario C are 7.4 times higher than those who had been received without the COVID-19 pandemic. Moreover, the ratio between the received amount of emergency benefits and labour income grows from 1.5% in the No-Covid scenario to 14.0% in Scenario C, and the increase in benefits (with respect to those already received in the No-Covid scenario) cover, on average, 44.3% of the labour income loss.

Nevertheless, the extent of gross income loss covered by the benefits increase is not uniform along the workers income distribution. Figure 1 provides, indeed, a first evidence of a progressive effect of emergency benefits, since the ratio between benefits increase and gross labour income loss is the highest in bottom deciles and decreases – remaining not negligible though – in top deciles. The reduction in this ratio in top deciles mostly depends on the effect of the ceiling on CIG amount that relatively penalises middle and high-paid workers and on the lump-sum amount of the Bonus-600. Noteworthy, in the poorest decile the benefits increase due to the emergency policies largely exceeds the income loss. This effect is mainly associated with the introduction of Bonus-600 that, being paid as a lump sum, was received by poorer workers independently of both the income loss extent and the previous labour income. Further, note that the income loss size (as a share of the No-Covid labour income) is not negligibly higher among workers lying in the bottom deciles than among those lying in top deciles (Figure A1 in Appendix 3).

Figure 1. Ratio between benefit increase and labour income loss, by deciles of the No-Covid total income distribution (% values). All workers
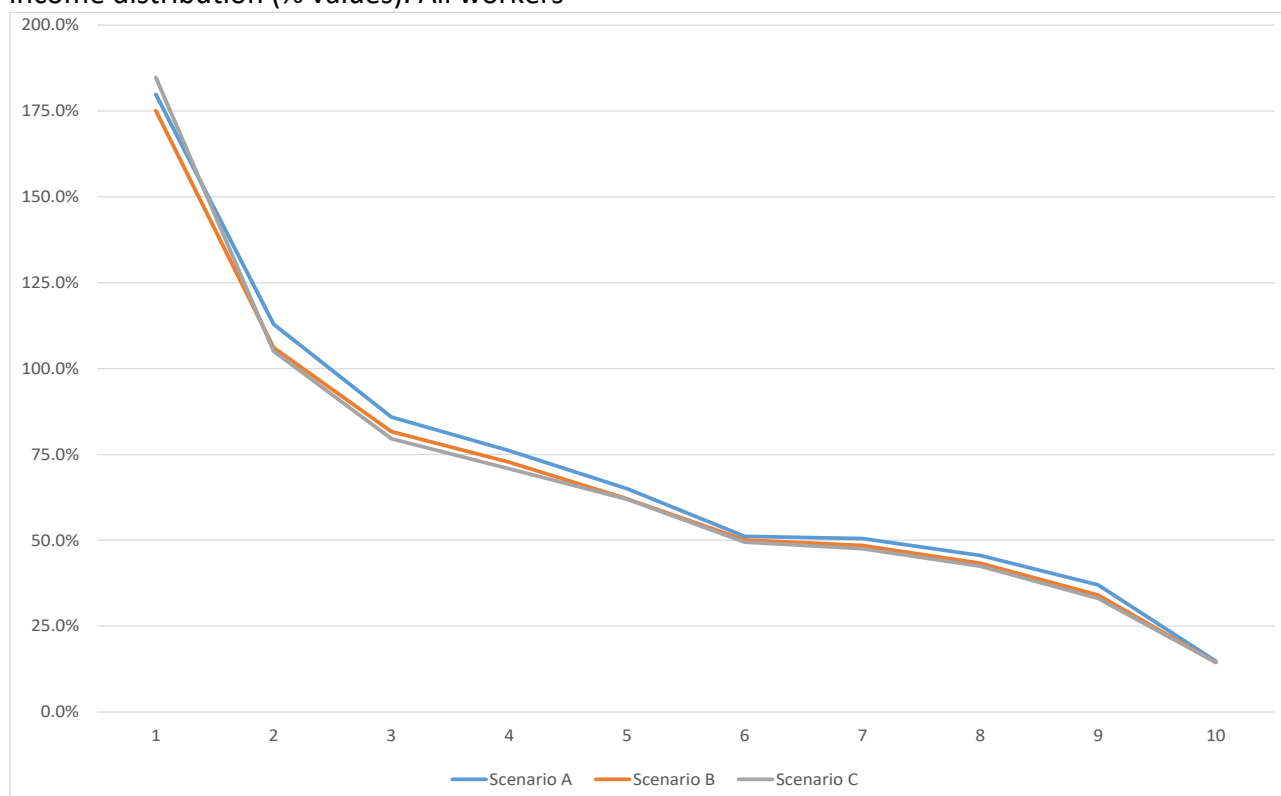
Source: Elaborations on AD-SILC 2017 data.

Table 4 shows the distribution of workers according to the size of the gross income loss with respect to the No-Covid scenario, where great loss and moderate loss are defined as a reduction in income higher than 10% or comprised between 0 and 10%, respectively. Our findings confirm that

a large share of workers experienced a great income loss also when emergency benefits are considered (36.1% in Scenario C). However, in all simulated scenarios, the share of workers experiencing a great loss largely reduces when losses in labour and total incomes are compared (e.g., the reduction in the share of workers experiencing a great loss amounts to 12.6 percentage points – p.p. – in Scenario C).

Table 4. Distribution of workers according to the size of the income loss with respect to the No-Covid scenario

	Labour income		
	Scenario A	Scenario B	Scenario C
No loss	49.7%	43.3%	39.4%
Moderate loss	14.1%	13.1%	11.9%
Great loss	36.2%	43.6%	48.7%
	Total income		
	Scenario A	Scenario B	Scenario C
No loss	58.6%	50.6%	46.8%
Moderate loss	20.4%	22.5%	17.2%
Great loss	21.0%	26.8%	36.1%

Source: Elaborations on AD-SILC 2017 data.

Consistently with previous findings, the comparison between the share of workers lying in the various deciles who experience a great loss before and after the inclusion of emergency benefits clearly shows that the benefits have relatively favoured more the poorest workers (Figure A2 in Appendix 3). Indeed, in Scenario C, the share of individuals experiencing a great loss shrinks by 33.9 p.p. and 0.5 p.p. for those lying in the first and in the tenth decile, respectively, when emergency benefits are added to labour incomes.

In accordance with this result, Figure A3 in Appendix 3 shows that the share of workers who received from March 2020 at least one of the three types of emergency benefits considered in this section (i.e., UB, CIG and Bonus-600) is much higher from the third to the fourth deciles of the No-Covid labour income distribution than in the richest three deciles (approximately 50%). However, it has to be noticed that the share of those benefiting from an emergency benefits appears very high also among the top deciles, because of both the universal spread of CIG among employees and the lump sum design of Bonus-600 for self-employed (conversely, only very few high-paid workers received CIG or UB in the No-Covid scenario).[1]

The analysis then focuses on the incidence of income lowness among workers. To this scope, consistently with the EU definition or relative poverty, we define an individual exposed to 'low income risk' when his/her income is below a line amounting to 60% of the national median of the individual income distribution (the threshold is based on No-Covid labour or total income

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[1] Note that, on average, in the No-Covid scenario 11.6% of workers received CIG or UB, while the share of workers beneficiaries of the three considered emergency benefits rises to 51.2, 58.7 and 63.7% in Scenarios A, B and C, respectively.

according to the considered income concept).[2] To assess the potential reduction in living standards of individuals due to the pandemic, we compare incomes before and after the COVID-19 emergency with the 'low income risk' line defined in the No-Covid scenario. As argued by Figari and Fiorio (2020), among the others, keeping constant the threshold when total income reduces due to a deep recession is equivalent to calculating absolute low income or poverty rates with a fixed line. Therefore, the share of individuals below a fixed line can be considered as an appropriate proxy for the experience of impoverishment that workers/individuals face (Matsaganis and Leventi, 2011).

Figure 2. Workers 'low income risk' in the various scenario. Headcount ratio (% values)
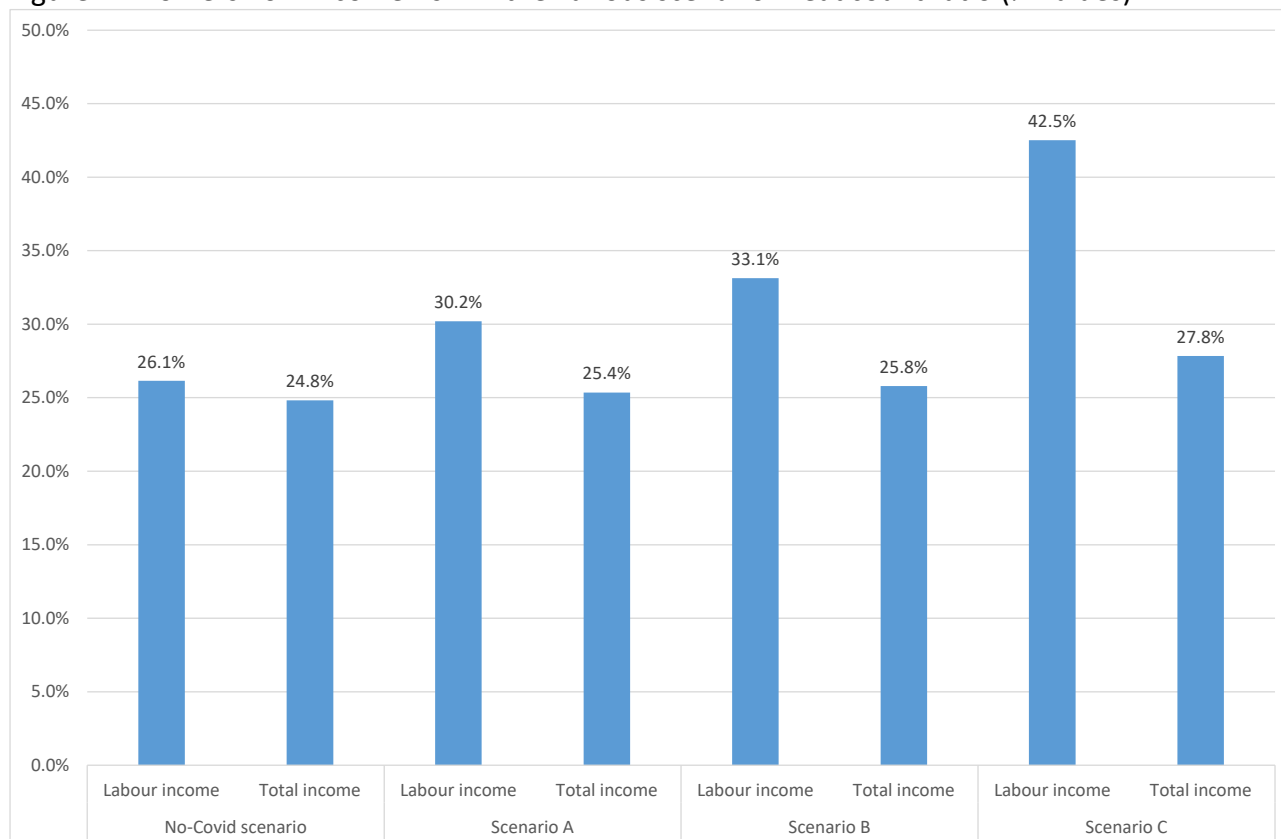
Note: The low income threshold is defined as 60% of the median of the distribution of labour or total income in the No-Covid scenario. Source: Elaborations on AD-SILC 2017 data.

Figure 2 shows that the share of low-income workers largely increases with respect to the No-Covid scenario (26.1%) when labour incomes are considered (42.5% in Scenario C), while the increase in the incidence of income lowness largely reduces when emergency benefits are considered (27.8% in Scenario C). However, confirming that the pandemic has engendered a reduction in the absolute living standard of a not negligible number of workers, the incidence of the 'low income risk' increases by 0.6%, 1.0% and 3.0% when we compare Scenarios A, B and C, respectively, with the No-Covid scenario considering an income concept which included the cash

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[2] Note that this definition differs from the official EU definition of in-work poverty (IWP) that is instead based on a threshold defined according to the household equivalised income (and only individuals working more than 6 months in a year are considered).

benefits assigned to workers.[3] Table A1 in the Appendix 3 also shows that, as expected, the increase in the incidence of the low income risk with respect to the No-Covid scenario is much higher among non-essential workers (+27.1 p.p. and +5.3 p.p., not including or adding emergency benefits, respectively) than among those employed in essential sectors (+3.6 p.p. and +0.3 p.p., not including or adding emergency benefits, respectively).

Figure 3. Gini index of individual labour and total income inequality in the various scenarios
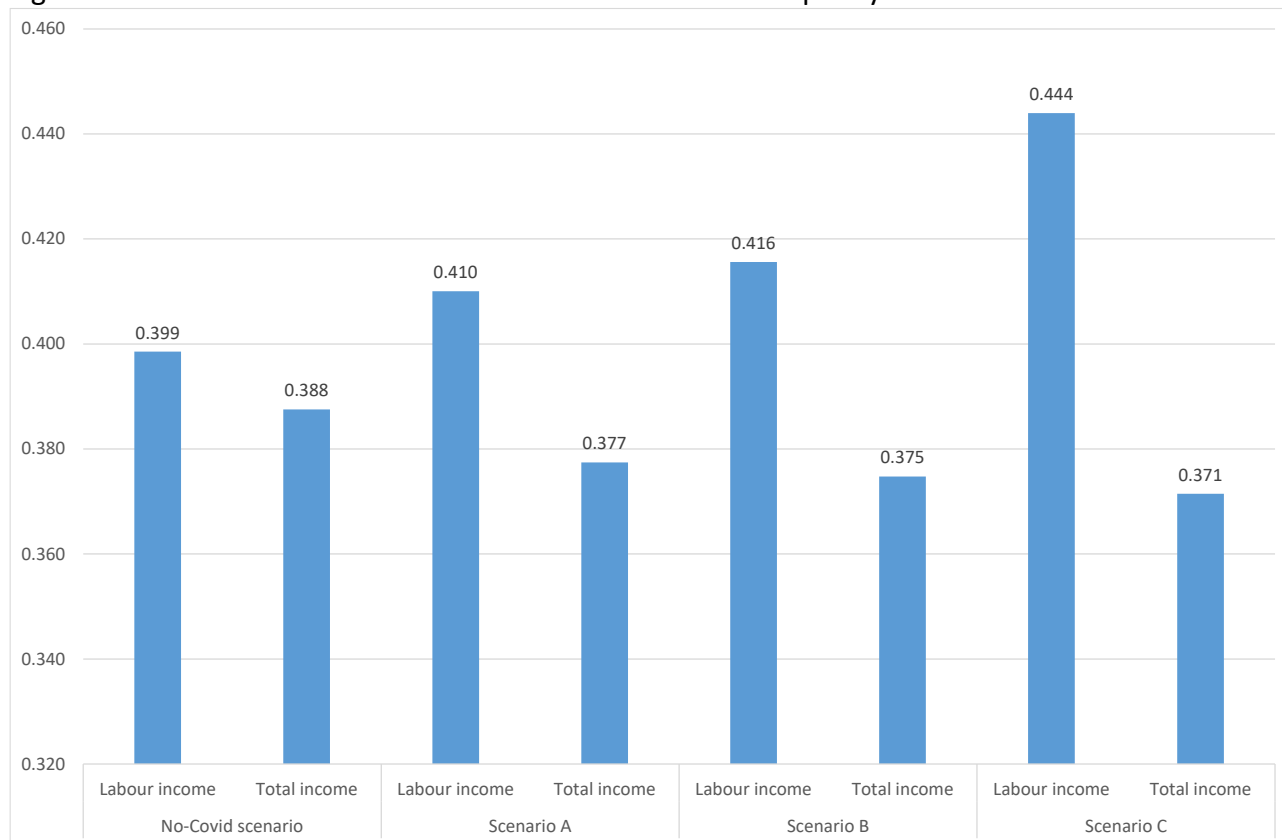
Source: Elaborations on AD-SILC 2017 data.

In spite of the dramatic drop in total incomes for many workers shown in previous analyses, the emergency benefits strengthened or introduced by the Italian government from March 2020 have been effective to contrast the rise in individual income inequality after the occurrence of the pandemic (Figure 3). Being the non-essential workers both at higher risk of seeing their firm shut down and relatively less paid than essential workers, inequality levels in gross labour income seem highly increased because of the pandemic. The Gini index of annual gross labour income rises from 0.399 to 0.410, 0.416 and 0.444 in Scenarios A, B and C, respectively. However, once emergency benefits are included in total incomes, the Gini index decreases in comparison with the No-Covid scenario (from 0.388, to 0.377, 0.375 and 0.371 in Scenarios A, B and C, respectively). The equalising effect of the emergency benefits depends on both the progressive formula of UB and CIG, which provide a fixed replacement rate of previous wage but have a rather low maximum

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[3] Similar trends are observed if we consider an absolute threshold equal to 1,000 euros per month. Estimates available upon request show that the share of workers with labour incomes lower than 1,000 euros per month rose from 24.8 to 28.6, 31.3 and 40.7% in Scenarios A, B and C, respectively. Likewise, as concerns total individual income, the headcount low income risk ratio rose from 23.1 to 23.6, 24.1 and 25.8% in Scenarios A, B and C, respectively.

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amount (see Section 2), and on the adoption of a lump-sum benefit independent of previous income (the Bonus-600) to compensate the self-employed.

We also disentangle the effect on the incidence of low income risk and income inequality by adding one by one the various emergency benefits to assess their relative effects in cushioning the worsening of the income distribution due to the pandemic (Table 5). Focusing on Scenario C only, it clearly emerges that the largest role for decreasing the two considered indicators of a worsening individual income distribution has been played by CIG (low income incidence and Gini index reduce by 11.1 p.p. and 4.1 p.p., respectively, when CIG is added to labour income plus UB). Our results show that Bonus-600 also played a not negligible role, especially as concerns income inequality (the Gini reduces by 1.7 p.p. when this lump sum bonus is included to total individual income).

Table 5. Effect of the various income components on low income risk and inequality. Scenario C

		Headcount ratio	Gini index
No-Covid scenario	Total income – No-Covid scenario	24.8%	0.388
Post Covid - Scenario C	Labour income	42.5%	0.444
	Labour income plus UB	41.4%	0.429
	Labour income plus CIG and UB	30.3%	0.388
	Total income (with UB, CIG and Bonus-600)	27.8%	0.371

Source: Elaborations on AD-SILC 2017 data.

Finally, it has to be noted that so far we considered in many analyses the pandemic effects on workers' income distribution by distinguishing individuals according to the deciles where they were placed before the occurrence of the pandemic. However, apart from changing individual incomes, a deep economic crisis as that engendered by the COVID-19 pandemic might also contribute to change the income distribution by bringing about a large re-ranking of individuals between the pre- and post-crisis distribution. Therefore, we computed a mobility matrix between deciles of the individual total gross income distribution in the No-Covid scenario and in Scenario C (Table A2 in Appendix 3, where row percentages according to the starting decile are shown). Noteworthy, we find that the extent of the re-ranking has been not negligible since values on the principal diagonal of this matrix are largely below 100% and, furthermore, a high share of individuals have moved towards the bottom decile or have exited out of the richest deciles. Future research are, however, needed to assess whether this re-ranking has been only temporary (e.g., due to the different exposition of labour market risks of self-employed with respect to the employees) or may engender persistent changes in the structure of the Italian labour income distribution.

5. Household-level analysis

We now move to analyse the changes in the distribution of household income due to the effects of the pandemic.[4]

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[4] As remarked in Section 3.1, the unit of analysis of the household-level simulation is made by all individuals living in the sampled households, and household income are equivalised through the OECD modified scale.

Table 6 summarises the mean values of the disposable income loss before and after emergency benefits are considered, where in this section we include UB, CIG and Bonus-600 received by all household members plus RdC and REM among the emergency benefits. Also note that, different from Section 4, all income components are now considered net of taxes.

On average, equivalised disposable incomes decrease by 6.1% in Scenario C, with respect to the No-Covid scenario, while, as expected, the reduction is lower in Scenarios A and B where a reduced length of the consequences of the pandemic on the economic system is assumed. However, emergency benefits exert a considerable role in cushioning income drop, since the income loss would have amounted to 19.8% if the emergency benefits would have not been paid. Comparing Table 6 with the corresponding Table 3 about workers, it also emerges that the income drop is smaller when observed at the household level instead of at the worker level, thus signalling that the household acts as a buffer against individual income losses. Moreover, the extent of the reduction in the income loss due to the emergency benefits is higher at the household level than at the individual level (the household mean loss reduces by more than 2/3 when emergency benefits are considered while it approximately halves when we focus on individuals only).

Table 6. Mean equivalised disposable income and emergency benefits: main figures

|	Amount of emergency benefits in relative terms			Disposable income loss wrt No-Covid	
	Benefits /Disposable income	Benefits increase/ net market income loss	Benefits/ No-Covid benefits	Disposable income before emergency benefits	Disposable income after emergency benefits
No-Covid	2.9%				
Scenario A	7.2%	46.5%	2.3	-8.0%	-2.1%
Scenario B	8.8%	43.4%	2.7	-11.5%	-3.3%
Scenario C	13.9%	42.0%	3.9	-19.8%	-6.1%

Source: Elaborations on AD-SILC 2017 data.

On average, in Scenario C, emergency benefits amount to 13.9% of disposable income while the value of these benefits in the No-Covid scenario was 2.9% (the amount of benefits is 3.9 times higher than total benefits paid before the COVID-19 occurrence).[5] Furthermore, in this scenario the increase in mean benefits amount compensates 42% of mean loss in equivalised net market incomes (i.e., labour and capital net incomes earned by all household members). Consistently with the worker-based evidence in Section 4, the compensatory effect of the emergency benefits is the highest in the poorest decile (where some households composed by self-employed people receive more than their income loss, thanks to the lump-sum Bonus-600) and reduces across deciles even if it remains not negligible also in the top of the No-Covid disposable income distribution (Figure

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[5] As explained in Section 2, it has to be remarked that Bonus-600 and REM did not exist before the COVID-19 occurrence, while the amount of CIG, UB has increased because of the automatic stabiliser effect (due to the increase in the number of suspended and unemployed individuals) and the extension in the coverage of these benefits. No changes in the entitlement conditions and in the amount of RdC have been instead established, even if the number of beneficiaries endogenously changes with respect to the No-Covid scenario because of the worsening household economic conditions (i.e., the RdC acts as an automatic stabiliser).

4). The loss in net market income is the highest in the two bottom deciles, while it is instead rather constant among the households lying from the 3rd to the 10th decile (Figure A4 in Appendix 4).

Figure 4. Ratio between benefits increases and net market income losses, by deciles of the No-Covid disposable income distribution (% values)
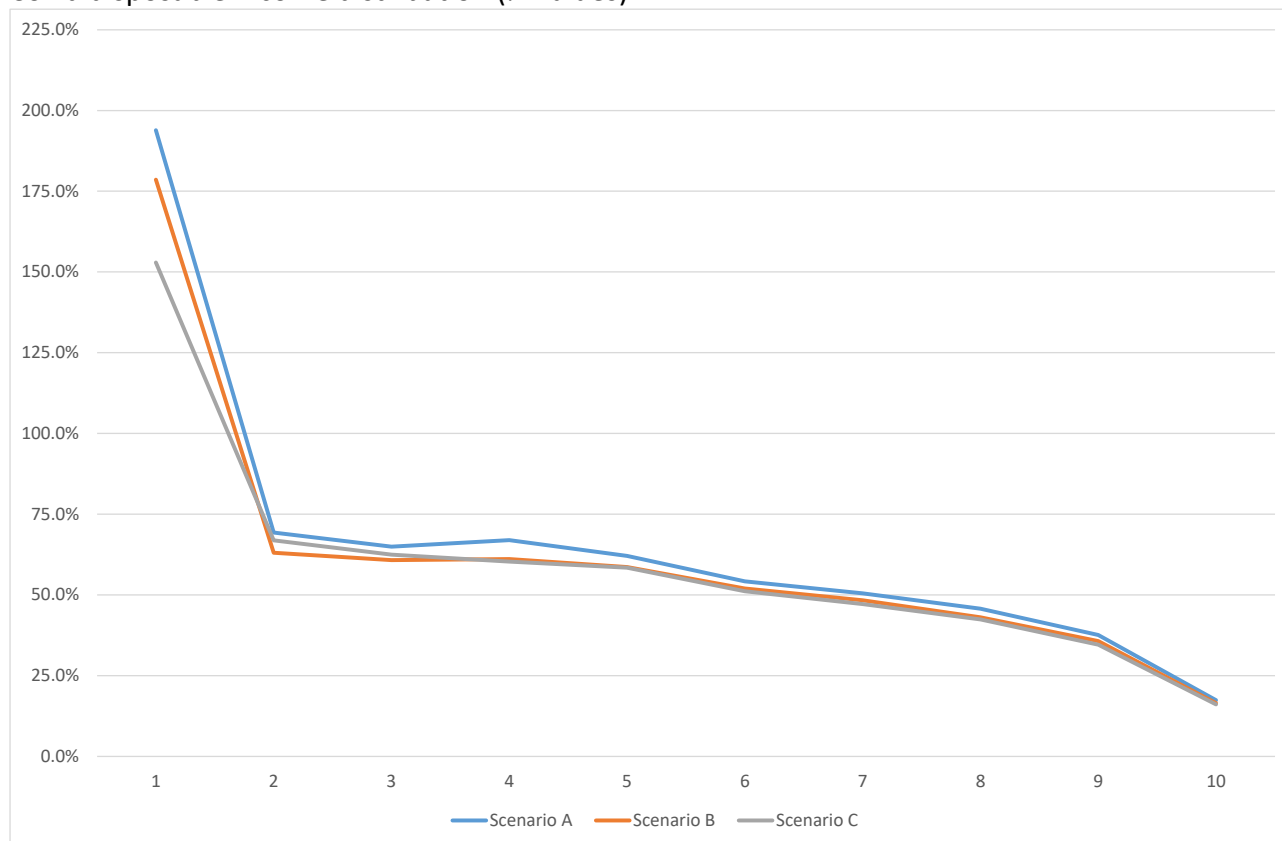
Source: Elaborations on AD-SILC 2017 data.

Looking at the distribution of workers according to the size of the gross income loss with respect to the No-Covid scenario, we find that the number of households experiencing a great loss, both before and after emergency benefits, is lower when households instead than workers are considered (compare Tables 7 and 4). Furthermore, in Scenario C the share of equivalised individuals with a disposable income loss higher than 10% reduces by 17.1 p.p. (from 40.7% to 23.6%) when the emergency benefits are considered (Table 7). Confirming the progressive effect exerted by the emergency benefits, we also find that the reduction in the share of households with a great loss when emergency benefits are considered is much larger in bottom deciles than in higher deciles of the No-Covid disposable income distribution (Figure A5 in Appendix 4).

On average, before the pandemic emergency 20.0% of equivalised individuals received at least one of the emergency benefits here considered while the share of beneficiaries rises to 53.2%, 57.8% and 60.7% in Scenarios A, B and C, respectively. Interestingly, the share of households who benefit from these benefits is higher than 50% in all deciles, even if the highest share (approximately 75%) emerges in the poorest decile, where the bulk of households benefitting from the minimum income benefits RdC and REM lie (Figure A6 in Appendix 4).

Table 7. Distribution of equivalised individuals according to the size of income loss

	Disposable income before emergency benefits		
	Scenario A	Scenario B	Scenario C
No loss	46.6%	41.9%	39.3%
Moderate loss	29.5%	27.1%	20.1%
Great loss	23.9%	31.0%	40.7%
	Disposable income after emergency benefits		
	Scenario A	Scenario B	Scenario C
No loss	58.5%	52.2%	50.0%
Moderate loss	35.2%	34.9%	26.4%
Great loss	6.3%	12.9%	23.6%

Source: Elaborations on AD-SILC 2017 data.

Figure 5. At risk of poverty (AROP) rate in the various scenarios. Headcount ratio (% values)
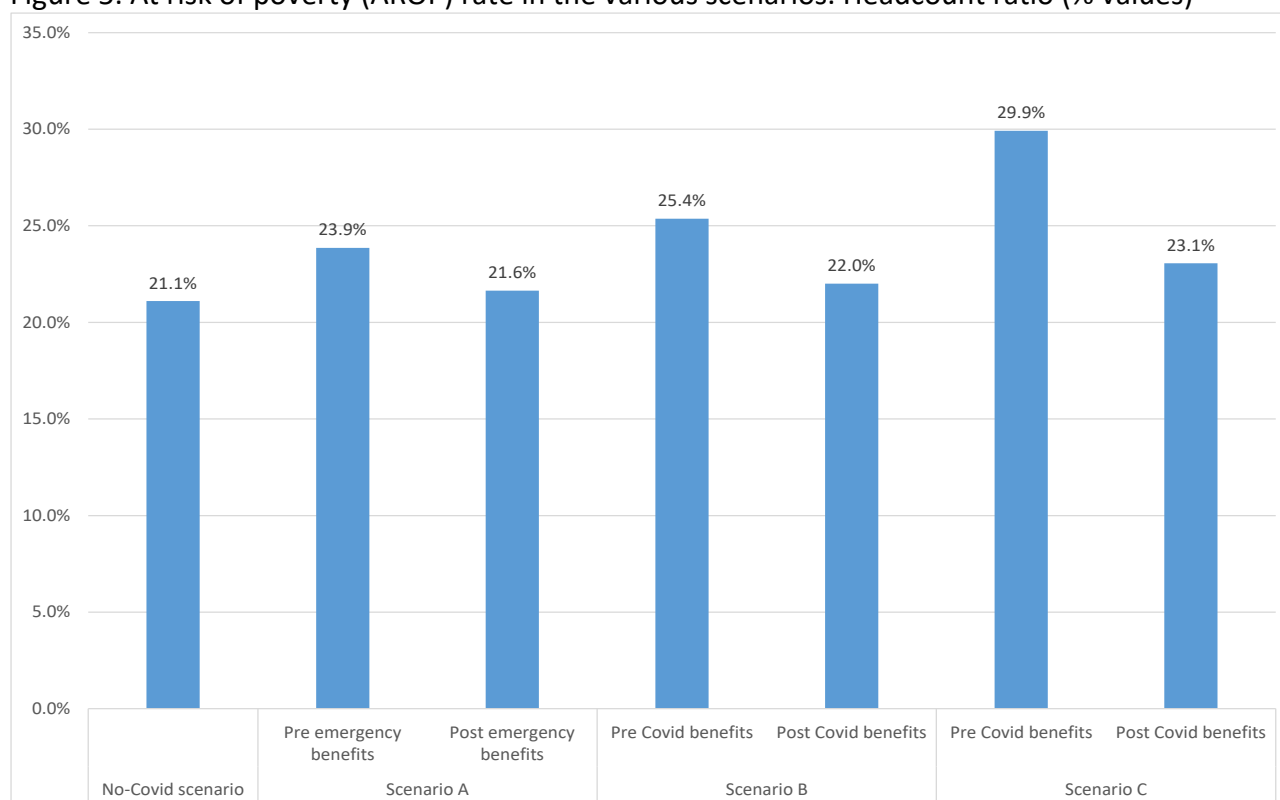

Note: The poverty line is defined as 60% of the median of the distribution of the equivalised disposable income in the No-Covid scenario. Source: Elaborations on AD-SILC 2017 data.

When we focus on the incidence of the at-risk-of-poverty (AROP) – based on a line expressed as 60% of the median of the equivalised distribution in the No-Covid scenario – we find that the poverty headcount increases when also emergency benefits are considered (+0.5 p.p., +0.9 p.p. and +2.0 p.p. in Scenarios A, B and C, respectively), even if the cushioning effect of emergency benefits is clearly confirmed since, without these benefits, the AROP incidence would have increased by 2.8 p.p., 4.3 p.p. and 8.8 p.p. in Scenarios A, B and C, respectively. Table A3 in Appendix 4 shows that the increase in the AROP incidence computed on disposable income with respect to the No-Covid scenario has been particularly intense for younger household (those

headed by an individual aged less than 45), and it has been slightly higher in the South than in the other Italian geographical macro-areas (in Scenario C, the AROP rate increases by 2.5 p.p. in the South with respect to +1.6 p.p. in the North and in the Centre).

Consistently with individual-level findings, disposable income inequality, as measured by the Gini index, slightly reduces after the pandemic (-1.1 p.p. in Scenario C with respect to the No-Covid scenario; Figure 6), because of the progressive effect of the emergency benefits already highlighted in previous analyses. If the emergency benefits had not been paid, income inequality would have instead considerably increased (+1.7 p.p. in Scenario C; Figure 6).

Figure 6. Gini index of household income inequality in the various scenarios
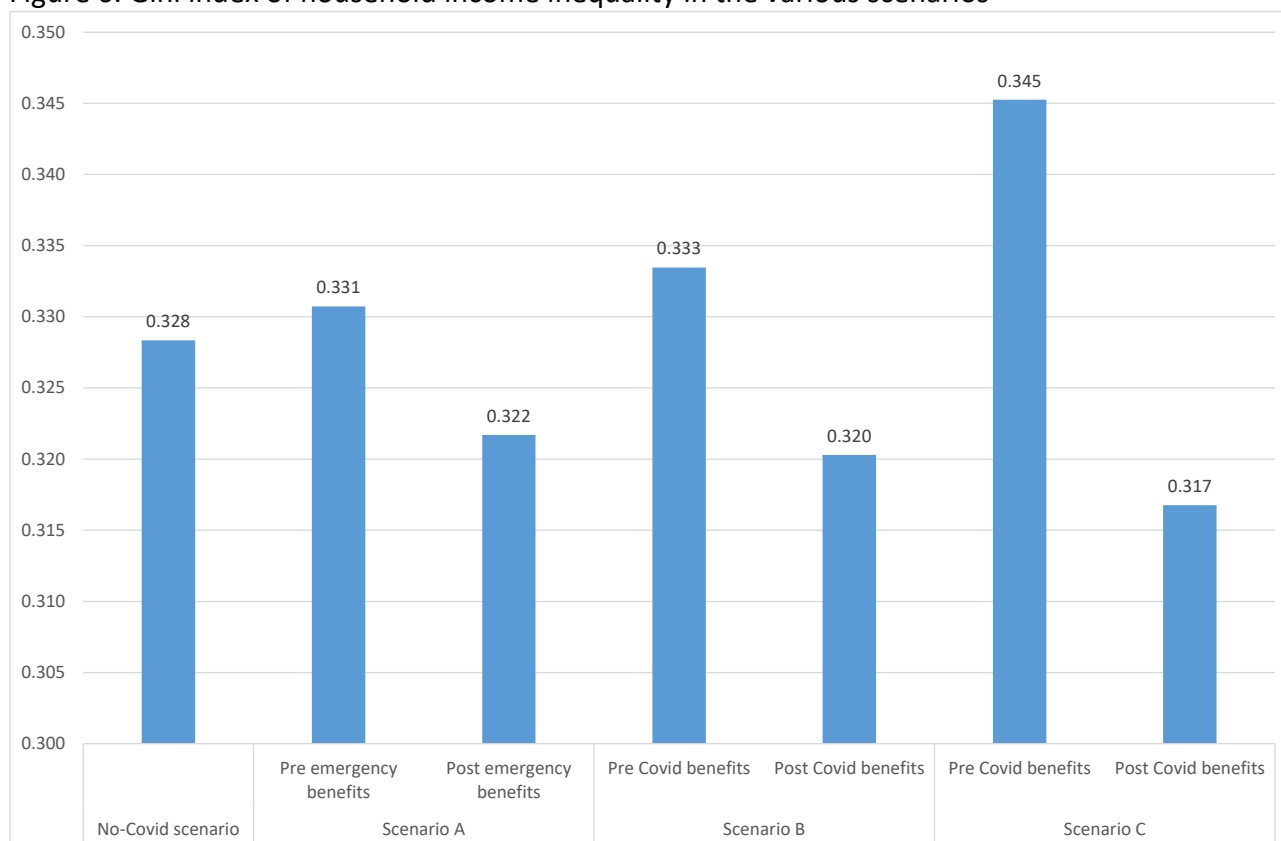
Source: Elaborations on AD-SILC 2017 data.

To assess the role played by the various emergency benefits to contrast the increase in poverty and inequality that would have been due to the pandemic without the existence of these benefits, we focus on Scenario C and first drop from the No-Covid disposable income the amount of these benefits and then add one-by-one the various emergency benefits (Table 8). It clearly emerges that the largest cushioning role on the AROP and the Gini has been played by the already existent instruments (CIG, UB and RdC) who acted as an automatic stabiliser but also, as concerns UB and, mostly, CIG, were extended in their coverage. However, a not negligible role for reducing AROP and Gini has been also played by the lump-sum Bonus-600 while the role played by the REM benefit has been very limited, because of the limited number of beneficiaries (approximately 290,000 households; Natili and Raitano, 2020).

Finally, we assess the extent of households re-ranking along the disposable income distribution after the pandemic. Table A4 in Appendix 4 clearly shows that – in addition to a large income drop

for many households – the COVID-19 emergency has also brought about a process of mobility along the various deciles of the income distribution, since sample frequencies of households remaining in the same decile of the No-Covid distribution are well below 100%.

Table 8. Effect of the various emergency benefits on AROP and inequality. Scenario C

		Headcount ratio	Gini index
No-Covid scenario	Disposable income	21.1%	0.328
	Disposable income without emergency benefits	29.9%	0.345
Post Covid	Adding Cig, UB and RDC increase	24.5%	0.325
Scenario C	Adding Cig, UB, RDC increase and bonus-600	23.2%	0.318
	Adding Cig, UB, RDC increase, bonus-600 and REM	23.1%	0.316

Source: Elaborations on AD-SILC 2017 data.

6. Conclusions

Using a static microsimulation model based on a link between EU-SILC 2017 data and INPS records, this article investigates the effects of the COVID-19 pandemic on the income distribution in Italy – the first European country hid by the spread of COVID-19 –, considering different scenarios about the pandemic length and related emergency policies. Being not available for a long time span timely information on the evolution of the income distribution (note, e.g., that EU-SILC income data for 2018 still have to be delivered), simulations of distributional changes in a given population observed in past years is the best suited strategy available for researchers to inquire the effects on poverty and inequality of the COVID-19 pandemic.

The analysis was carried out first focusing on workers and then on households (by relying on equivalised incomes). For both units of observation, to measure the extent of redistributive social transfers, we compared incomes before and after the receipt of the emergency benefits which were introduced or extended by the Italian government from March 2020, as well as the receipt of already existent benefits which acted as automatic stabilisers, to cope with the market incomes drop due to the consequences of the pandemic.

We find that market incomes largely decreased, for both workers and households, as a consequence of the pandemic-related social distancing measures and that the reduction extent increases in line with the duration of the COVID-19 spread. However, the emergency benefits have been so far effective in attenuating the worsening of the income distribution: on average, workers' income loss approximately halves (from -21.5% to -11.8% in the worst scenario of pandemic, our Scenario C) when emergency benefits are considered, whereas the drop in household incomes declines by about 2/3 when emergency benefits targeted to workers and minimum income schemes are considered (from -19.8% to -6.1% in Scenario C). Furthermore, although the market incomes drop is larger for those lying in the bottom deciles of the pre-COVID-19 distribution, our findings highlight that the ratio between benefits increase and income loss is decreasing along the income distribution.

As a crucial outcome, the emergency benefits appear to have significantly cushioned potential (dramatic) increases on income poverty and inequality levels. Compared with the 'No-Covid

scenario', once emergency benefits are included in individual incomes, the growth of 'low income risk' among workers is pretty limited and the Gini index even slightly lessens thanks to the progressivity of the emergency benefits design. Indeed, the CIG benefit – the main measure used to protect workers – is capped at relatively low wages, while the lump sum Bonus-600 – provided to compensate the self-employed' losses – is independent of both pre-COVID-19 income and the income loss extent.

Similar effects emerge when the focus is on households, since the AROP rate – assessed with respect to the pre-COVID-19 poverty line – moves from the initial 21.1% to 23.1% in the worst scenario of pandemic, but it would have been equal to 29.9% in absence of emergency benefits. Noteworthy, the Gini index of disposable income slightly reduces after the pandemic, again, because of the progressive design of emergency benefits (e.g., in Scenario C, the Gini declines by 1.1 p.p., whereas it would have increased by 1.7 p.p. in absence of emergency benefits). Also note that the pandemic has engendered a not negligible re-ranking of individuals and households along the income distribution, since the consequences of the COVID-19 occurrence have not spread evenly across the population.

Despite a severe reduction in income levels for a large share of individuals and households, these findings might be seen from a relatively optimistic perspective by those mostly worried about a worsening of income inequality, that was rather high in Italy with respect to other developed countries before the pandemic (Raitano, 2019).

Nonetheless, a more careful assessment might lead to a much less optimistic perspective. Actually, our analyses focused on the effects emerging in 2020 when extraordinary emergency measures – also including further measures sustaining workers' conditions like the stoppage of layoffs – have been implemented, thus signalling the crucial role played by these measures to contrast the most serious economic consequences of the COVID-19 pandemic.

A longer-term perspective might therefore induce to a pessimistic view. This is particularly true if we envisage that, on the one hand, also because of public budget constraints, emergency benefits and layoffs stoppage cannot be continuously applied and, on the other hand, the pandemic consequences on the macroeconomic stance are far from disappear as individuals' risks to transit out of (or their difficulties to entry in) the labour market might persist over time.

Finally, it has to be remarked that, consistently with the use of a static microsimulation model – that is a proper tool to investigate short-term effects of shocks and policy changes –, we did not consider possible behavioural reactions by individuals and firms in this article. The latter may be, for instance, associated with some policies introduced during the pandemic to support firm activities (and not considered here) or with a changing of profit distribution among firms. Mostly, we did not simulate changes in the productive structure, also driven by variations in the sectorial demand of certain goods, which in turn might clearly lead to a deep reorganisation of production activities and employment opportunities in many sectors. As a final step, of course, this may engender changes in functional and personal income inequality.

Considering that, as shown in the article, workers in 'non-essential sectors' already had on average lower wages and low-skilled workers have usually fewer opportunities both to work from home (Adams Prassl et al., 2020; Bonacini et al., 2021b) and to move across productive sectors (because of their lower endowment of general human capital), the risk of a further increase in market and disposable income inequality once the pandemic emergency will be stopped might become very concrete. And this risk might be as concrete as ever if effective structural predistributive and redistributive policies will be not implemented.

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Appendix

Appendix 1: Characteristics of unemployment benefits and minimum income schemes in Italy

Unemployment benefits (UB)

NASPI (*Nuova prestazione di Assicurazione Sociale per l'Impiego*) is the main pillar of the unemployment benefits (UB) system, along with an unemployment allowance (DIS-COLL, *Indennità di disoccupazione per collaborazione coordinata*) devoted to para-subordinate collaborators. UB recipients are employees and para-subordinate collaborators. People without previous employment experience (with less than 13 worked weeks in the previous 4 years) and the self-employed are not eligible for UB. The duration of unemployment benefits is proportional to individual contribution history. Specifically, the NASPI duration is half of worked months in the previous 48 months (excluding months already spent receiving an unemployment benefit), while the maximum duration of DIS-COLL is 6 months. Calculation of monthly amounts, which cannot exceed a maximum of €1,335.40 in 2020, is the same for NASPI and DIS-COLL: 75% of last wage up to €1,227.55; plus an additional 25% of the portion of wage exceeding the previous threshold until the maximum amount is achieved. However, a significant progressive tapering of NASPI and DIS-COLL exists, since a 3% monthly reduction of the benefit amount starting from the 4th month of receipt is applied.

Citizenship Income (RdC)

Law Decree No 4/2019 introduced the RdC ("Citizenship Income", *Reddito di Cittadinanza*), replacing the REI (Inclusion Income, *Reddito di Inclusione*) on 1 April 2019. Although the name suggests a universal unconditional basic income, the RdC is actually a means-tested cash benefit which is targeted at poor and socially excluded households and conditional on participation in job-search activities.

To be eligible for the RdC, households must have a maximum annual ISEE (i.e., the indicator of equivalised socio-economic conditions, taking into account both income and wealth) of €9,360 and an annual equivalised income no higher than €6,000. Moreover, housing (excluding primary residence) and financial wealth may not exceed €30,000 and €10,000, respectively. The eligibility criteria also include 10 years of residence in Italy - and the last 2 years continuously spent in Italy.

The benefit for a single-member household tops up annual income to €6,000. This threshold increases with family size according to an equivalence scale which assumes significant economies of scale, as it attributes only 0.4 to each additional adult and only 0.2 to each minor aged less than 18. Moreover, the equivalence coefficient cannot exceed 2.1, independent of family size (2.2 if there is a member with disabilities). The RdC provides an additional €280 to top up the monthly benefit for households who rent their accommodation, whereas a €150 top-up is paid to beneficiaries who pay a mortgage (the amount of these extra benefits is independent of household size).

The RdC is paid for 18 months but can be renewed after a 1-month suspension.

The conditionality requirements are particularly strict. To avoid losing entitlement, beneficiaries have to: i) sign a "Work pact" with the Public Employment Services (PES); ii) accept at least one out of three "suitable" job offers in the first 18 months (suitability is measured in terms of both wage [monthly wage above €850] and distance [first job offer: workplace no more than 100 km from

place of residence; second offer: 250 km; third offer: whole Italian territory; in case of benefit renewal, the first job offer has to be accepted whatever the distance]); iii) be available to take part up to 8 hours a week in "socially useful activities" identified by municipalities; and iv) sign a "Social Inclusion Pact" with municipal social services (e.g. social services or training), if the beneficiary is affected by "'multi-dimensional" poverty and social exclusion (e.g. for single parents or people unable to work for whatever reason) and not only unemployment.

Emergency Income (REM)

Since the beginning of the COVID-19 crisis, a debate has been on-going in Italy about the need to provide a safety net to all individuals and households covered neither by existing income support measures nor by the COVID-19 related emergency measures introduced by the so-called *Decreto Cura Italia* (Decree No. 18/2020 of 17 March 2020). This decree extended the short-time compensation schemes (*Cassa Integrazione* – CIG) and introduced a bonus for the self-employed and "para-subordinate workers" (individuals legally self-employed but often "economically dependent" on a single client; Raitano, 2018). However, a few groups of workers were excluded from these emergency measures: some categories of seasonal and intermittent workers, unemployed people who were no longer eligible for unemployment benefits before the emergency, and informal workers. Poor households that did not meet the eligibility conditions for the Citizenship Income (*Reddito di Cittadinanza* – RdC) - or did not apply for the latter due to the stringent requirements – also received no extra support.

The need for more effective income support to households in need could have been met either by relaxing some of the conditions for entitlement to RdC, or by introducing a new means-tested benefit (Natili, 2020). The government chose the second option, set out in the so-called *Decreto Rilancio* (Decree No. 34/2020 of 19 May) which introduced the Emergency Income (*Reddito di Emergenza*, REM).

To be eligible for REM, households must fulfil the following requirements:
- No household member must be receiving unemployment benefit, CIG, RdC or any of the allowances introduced in response to the COVID-19 crisis.
- Household members must be residing in Italy at the time of application, irrespective of how long they have done so.
- The household ISEE value (the indicator of equivalised socio-economic condition, calculated on the basis of household income and wealth) must be below €15,000.
- The household's equivalised monthly income in April 2020 must be below €400 for a single-person household. A scale assigning 1 to the household head, 0.4 to each other adult and 0.2 to each member aged below 18 is used in order to calculate the equivalised amount for larger households. The maximum amount of the equivalence scale is set at 2.0 (2.1 if there is a disabled member in the household).
- Financial wealth in 2019 for a single-person household must be below €10,000 (increased by €5,000 for each household member, whatever the age, with a maximum value equal to €20,000).

Importantly, the ISEE thresholds and wealth limits are higher for the REM than for the RdC, thus enlarging the set of potential beneficiaries; also, unlike for the RdC, eligibility for REM does not take into account housing assets nor the possession of certain durable goods (e.g. cars and

motorbikes). Moreover, 10 years of residence are required for non-EU citizens to be eligible for RdC. Finally, REM beneficiaries do not need to satisfy any job search conditions.

The amount of REM received is €400 per month for a single-person household (thus lower than the RdC, which is €500 per month for a single-person household, plus a possible €280 for house rental), an amount which is increased for larger households according to the equivalence scale described above.

Until July 2020, REM could only be granted for 2 months. Under the Decree No. 104, issued on 14 August, it could be paid for an additional month, and under the *Decreto Ristori* (Decree No. 137 of 27 October), applicants could receive it for two more months (November and December 2020). Therefore, households whose applications have met all the entitlement conditions will receive REM for 5 months in total.

Appendix 2: Detailed assumptions on unemployment spells of temporary employees

To attribute unemployment periods to fixed-term employees in the simulation, we first calculate an 'inactivity rate' equals to the ratio between the number of months spent in unemployment during the reference period and the duration of the reference period (i.e. six months, from March to August, for Scenarios A and B, and ten months, from March to December, for Scenario C). We consider the same period for Scenarios A and B since we assume that the employability of temporary workers is negatively affected by the duration of the layoffs stoppage in each scenario.

Then we make the following assumptions:

- in Scenario A, temporary workers in non-essential sectors and with an inactivity rate lower than 100% (but greater than 0) remain three months in unemployment; temporary workers in non-essential sectors and with a 100% inactivity rate remain six months unemployed; half (randomly selected) of temporary workers in essential sectors and with a 100% inactivity rate remain three months in unemployment.
- in Scenario B, temporary workers in non-essential sectors and with an inactivity rate lower than 100% remain three months in unemployment; temporary workers in non-essential sectors and with a 100% inactivity rate remain six months in unemployment; half (randomly selected) of temporary workers in essential sectors and with a 100% inactivity rate remain six months in unemployment.
- in Scenario C, temporary workers in non-essential sectors and with an inactivity rate lower than 100% remain five months (i.e. three months for the March-May lockdown and further two months for the November-December one) in unemployment; temporary workers in non-essential sectors and with a 100% inactivity rate remain ten months in unemployment; and half (randomly selected) of temporary workers in essential sectors and with a 100% inactivity rate remain ten months in unemployment.

The number of months spent in unemployment in the three simulated scenarios are decreased by the number of months spent in CIG, as we believe the latter however remains a preferable solution for employers with respect to the non-renewal of employment contracts. For each month spent in unemployment, we reduce the yearly gross employee income by the estimated extent of one month's salary and increase the total amount of perceived unemployment benefits by the estimated UB amount. For the sake of simplicity, we assume that every temporary employee is eligible for UB and adopt a full take-up rate for the UB.
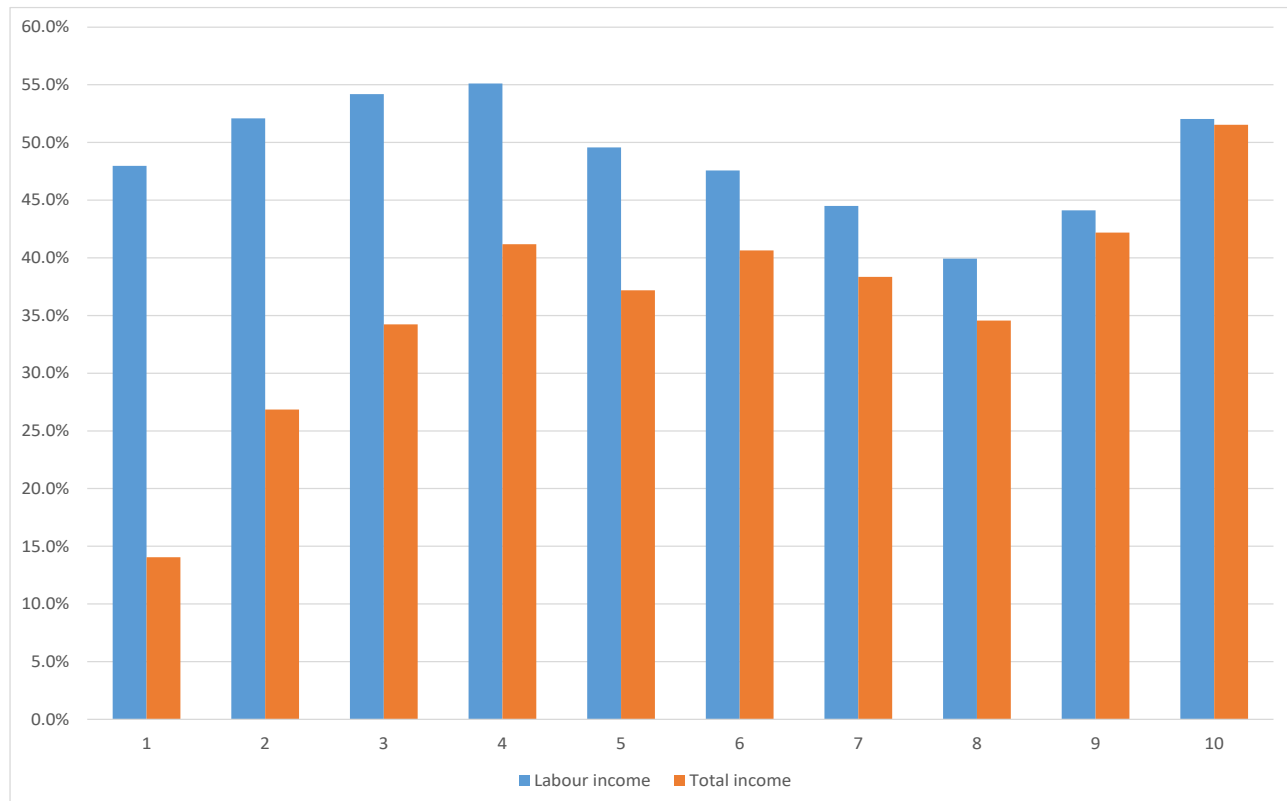
Appendix 3: Additional results on workers income distribution

Figure A1. Labour income loss, by deciles of the No-Covid labour income distribution. Scenario C
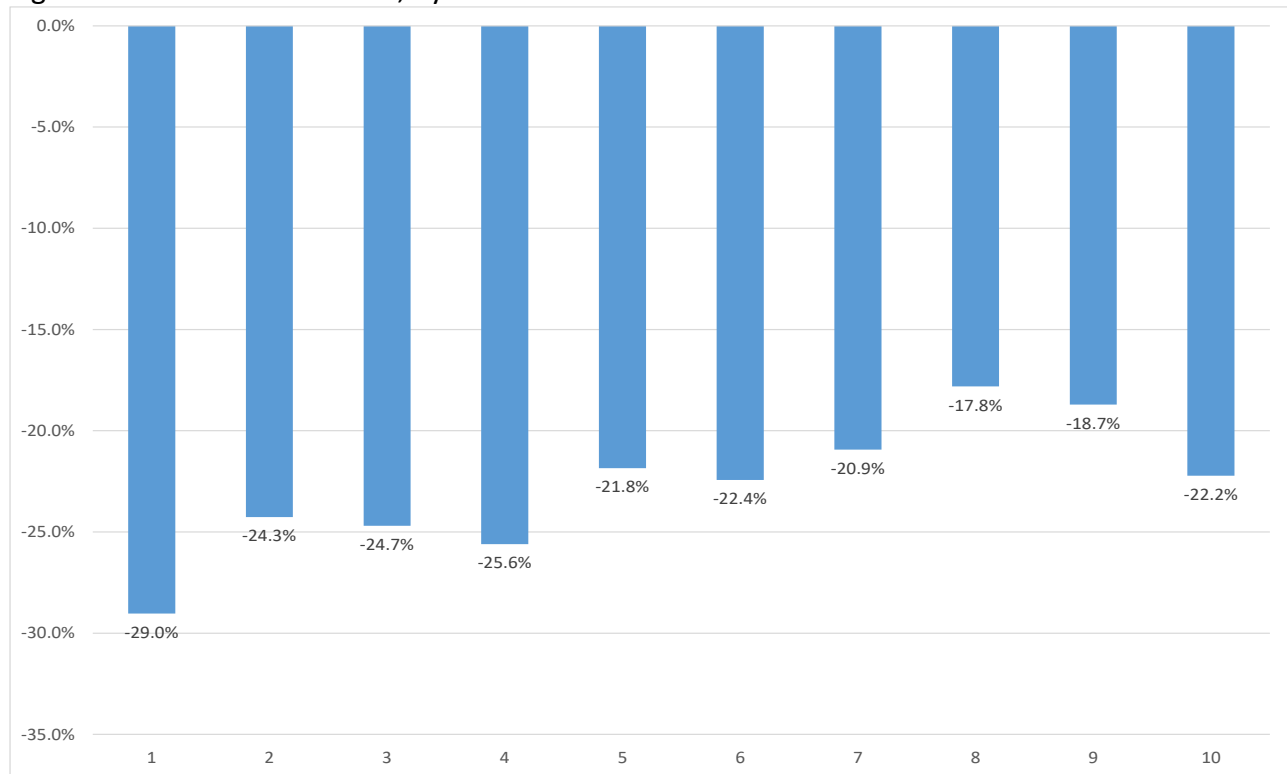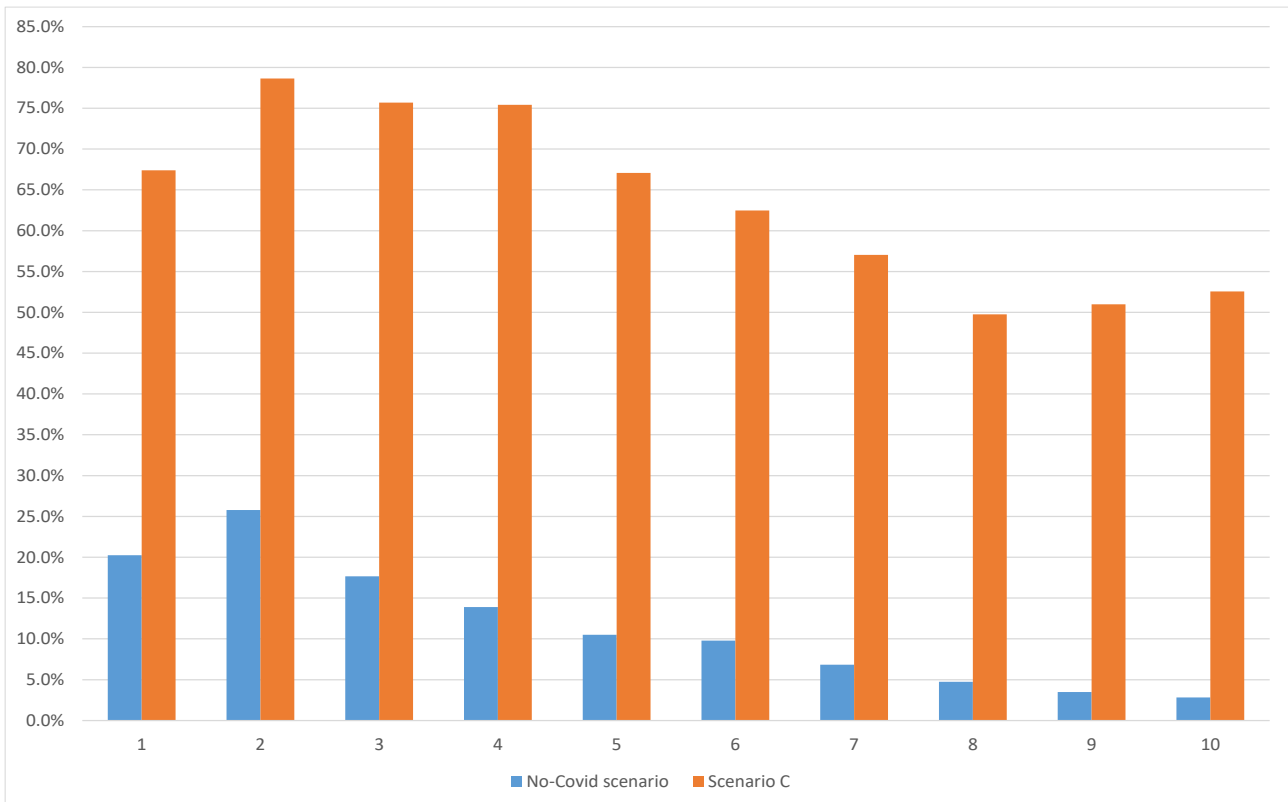

Source: Elaborations on AD-SILC 2017 data.

Figure A2. Share of workers experiencing a great loss according to the income concept, by deciles of the No-Covid labour income distribution. Scenario C

Source: Elaborations on AD-SILC 2017 data.

Figure A3. Share of workers receiving at least one individual emergency benefit, by deciles of the No-Covid labour income distribution (% values). Comparison between the No-Covid scenario and the Scenario C

Source: Elaborations on AD-SILC 2017 data.

Table A1. Workers 'low income risk', by individual characteristics. Headcount ratio (% values)

		Total	Gender		Age class				Area of resid	
			Male	Female	16-34	35-44	45-54	55-65	North	Middle
Labour income	Base	26.1	21.4	32.6	40.7	23.0	21.0	17.8	19.3	25.7
	A	30.2	25.0	37.2	46.3	26.9	24.5	20.6	23.1	29.6
	B	33.1	28.2	39.8	49.9	30.2	27.0	22.6	25.9	32.8
	C	42.5	38.7	47.6	58.3	41.0	36.5	31.1	36.6	42.4
Total income	Base	24.8	19.7	31.7	39.3	21.6	19.8	16.6	18.0	24.2
	A	25.4	20.4	32.1	40.1	22.0	20.3	16.9	18.8	24.4
	B	25.8	21.0	32.4	40.1	22.7	20.9	17.4	19.2	25.0
	C	27.8	23.4	33.8	41.7	24.8	23.0	19.8	21.2	27.0

Note: The low income threshold is defined as 60% of the median of the distribution of the labour or total incom
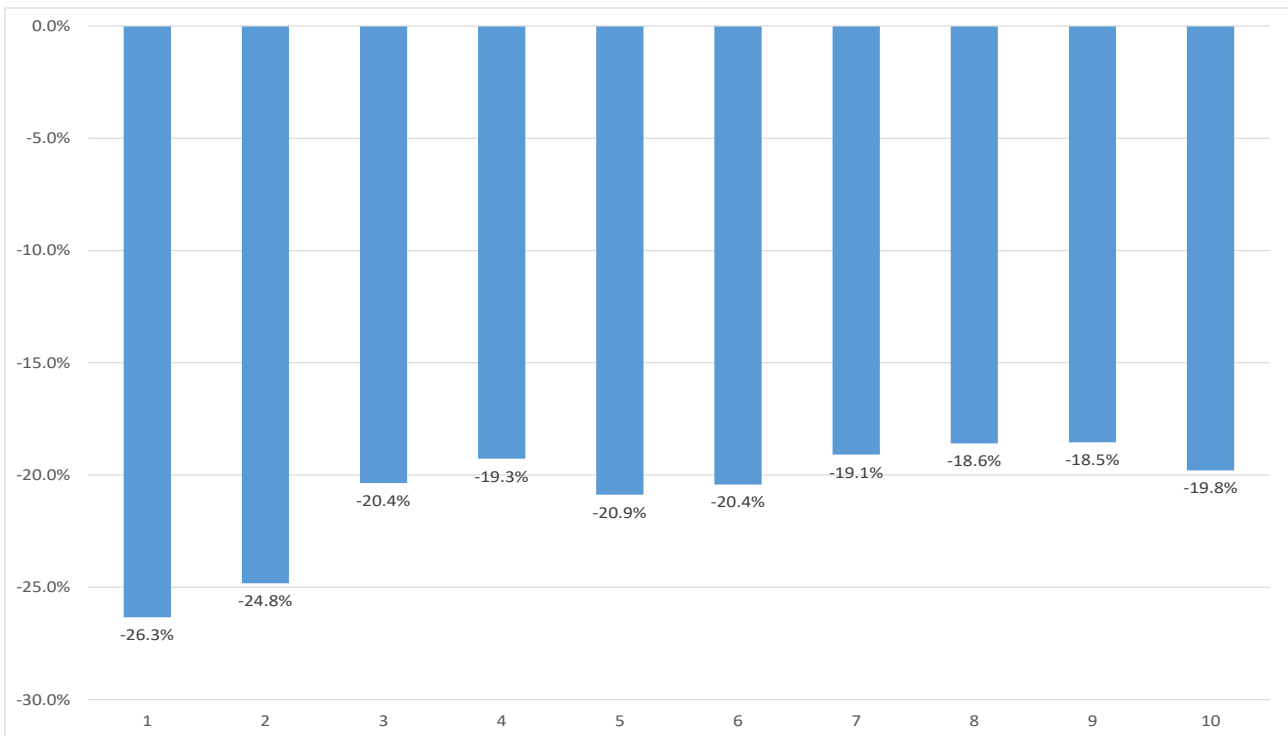Elaborations on AD-SILC 2017 data.

Table A2. Mobility table between deciles of workers total income distribution, before and after Covid. Row per

No-Covid total income	Post-Covid total income: Scenario C						
	1	2	3	4	5	6	7
1	87.1	11.8	1.0	0.1	0.0	0.0	0.0
2	8.7	71.2	16.1	3.0	0.6	0.3	0.1
3	1.3	15.3	56.5	19.9	4.4	2.0	0.8
4	1.0	1.4	20.0	38.7	29.5	3.4	5.5
5	0.2	0.2	6.1	23.8	22.1	40.8	2.6
6	1.0	0.2	0.2	12.5	21.7	20.1	41.6
7	0.5	0.0	0.1	2.0	18.3	13.3	23.7
8	0.2	0.0	0.0	0.0	3.4	15.9	10.1
9	0.1	0.0	0.0	0.0	0.0	4.3	14.6
10	0.1	0.0	0.0	0.0	0.0	0.1	0.9

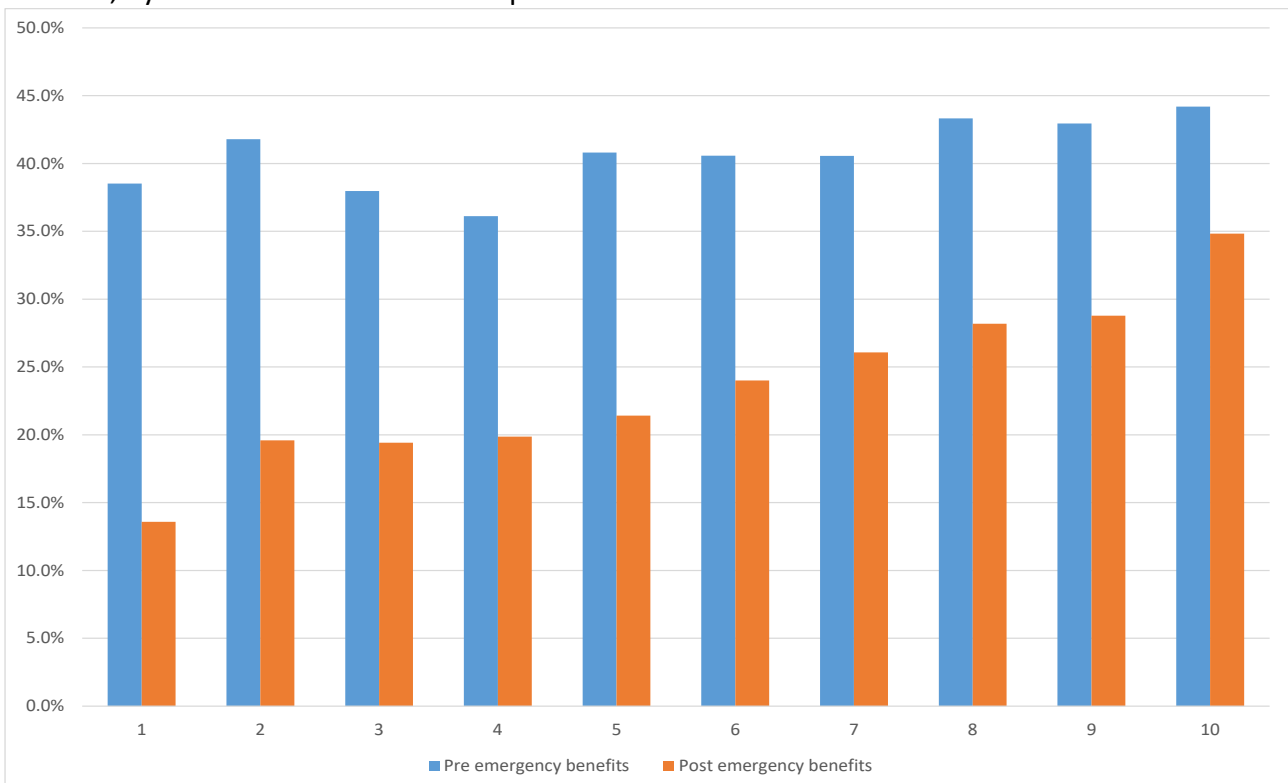Source: Elaborations on AD-SILC 2017 data.

Appendix 4: Additional results on household income distribution

Figure A4. Net market income loss, by deciles of the No-Covid disposable income distribution. Scenario C
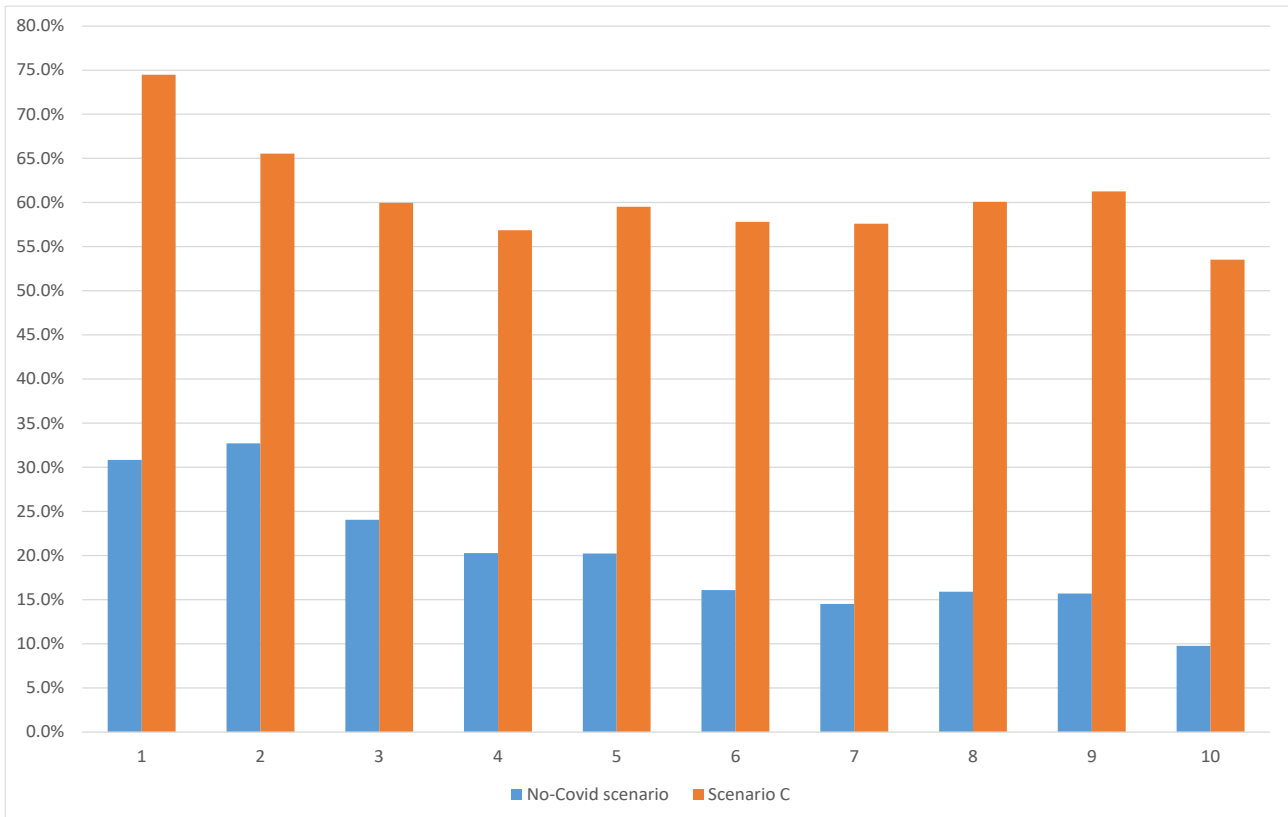

Source: Elaborations on AD-SILC 2017 data.

Figure A5. Share of equivalised individuals experiencing a great loss before and after emergency benefits, by deciles of the No-Covid disposable income distribution. Scenario C

Source: Elaborations on AD-SILC 2017 data.

Figure A6. Share of equivalised individuals receiving at least one emergency benefit, by deciles of the No-Covid disposable income distribution. Comparison between the No-Covid scenario and the Scenario C

Source: Elaborations on AD-SILC 2017 data.

Table A3. AROP by characteristics of the household head. Headcount ratio (% values)

		Total	Gender		Age class		
			Male	Female	16-44	45-54	55-65
No-Covid scenario		21.1%	20.3%	23.4%	27.9%	24.0%	17.2%
Scenario A	Pre emergency benefits	23.9%	23.3%	25.4%	32.1%	27.8%	20.1%
	Post emergency benefits	21.6%	21.0%	23.4%	28.4%	24.8%	18.4%
Scenario B	Pre emergency benefits	25.4%	24.7%	27.1%	34.7%	29.7%	21.6%
	Post emergency benefits	22.0%	21.4%	23.6%	29.0%	25.3%	18.7%
Scenario C	Pre emergency benefits	29.9%	29.1%	32.0%	41.7%	35.9%	25.6%
	Post emergency benefits	23.1%	22.6%	24.3%	31.0%	26.7%	19.2%

Note: The poverty line is defined as 60% of the median of the distribution of the equivalised incom
Elaborations on AD-SILC 2017 data.

Table A4. Mobility table between deciles of the equivalised disposable income distribution, before and after
Scenario C

No-Covid disposable income	Post-Covid disposable income (Scenario C)						
	1	2	3	4	5	6	7
1	83.4	13.0	2.8	0.5	0.3	0.0	0.0
2	14.0	69.2	15.6	0.9	0.3	0.0	0.0
3	1.8	14.7	63.4	18.4	1.7	0.1	0.0
4	0.4	2.5	14.0	58.7	22.7	1.6	0.1
5	0.2	0.4	3.7	14.7	53.0	26.2	1.7
6	0.1	0.2	0.4	5.6	14.4	51.7	26.5
7	0.0	0.0	0.0	0.8	6.4	15.0	49.5
8	0.0	0.0	0.0	0.1	1.3	4.5	16.7
9	0.0	0.0	0.1	0.2	0.1	0.6	5.5
10	0.0	0.0	0.0	0.0	0.0	0.2	0.1

Source: Elaborations on AD-SILC 2017 data.