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Assessing the Effectiveness of Social Protection Measures in Mitigating COVID-19-Related Income Shocks in the European Union[1]

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Abstract. By means of counterfactual simulation methods, this paper quantifies the role of tax–benefit policies in mitigating the shock of the COVID-19 pandemic to household income in the European Union. The tax-benefit microsimulation model for the European Union EUROMOD is used to decompose changes in the income distribution into the effects of: (i) earnings losses due to COVID-19, (ii) automatic stabilizers, (iii) monetary compensation schemes introduced during the pandemic; and (iv) COVID-19-specific reforms to taxes and benefits implemented by European Union governments. The results show a great deal of heterogeneity between countries in terms of earnings losses and the effect of tax-benefit policies during the COVID-19 pandemic. In most countries, the largest contribution to cushioning the economic shock of the pandemic comes from monetary compensation schemes. Automatic stabilizers also play a role, mainly through the effects of social insurance contributions, taxes, and unemployment insurance benefits. Tax-benefit systems cushioned incomes to a large extent even among those most severely affected by the shock to earnings, with an important role for monetary compensation schemes, but also a larger stabilizing effect of unemployment insurance. Among automatic stabilizers, social assistance benefits played an important role in cushioning the income shock for the poorest quintiles among the most severely affected, but only in selected countries.

JEL: D31, E24, H24, I38

KEYWORDS: Social protection, Social Safety Nets and Transfers, Social Welfare, COVID-19, Poverty and Fiscal, Financial and Economic Crisis, EU, Income Distribution.

[1] The results presented in this paper are based on EUROMOD version I4.0+. Originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021 EUROMOD is maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission, in collaboration with EUROSTAT and national teams from the EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. The results and their interpretation are the authors' responsibility. This paper is a deliverable of the RSR-18 funded project "Analytic Tools to Assess Social Protection Systems' Responses to COVID-19 and their Sustainability in ECA (P176852)".

1 Introduction

Europe has been one of the world's regions most severely affected by COVID-19, with more than 100 million cumulative cases registered in the first two years of the pandemic, corresponding to over 20% of the global count. The demand and supply shocks induced by the COVID-19 pandemic hit economies in the region in an unprecedented way during 2020, undermining welfare gains and poverty reduction experienced in the last decade.

Governments in Europe have responded to the crisis with a combination of measures aiming at preserving jobs, supporting firms, especially individual employers and SMEs, and by protecting vulnerable groups (e.g., informal workers, low-wage workers) recently fallen into poverty, by expanding existing safety nets and unemployment insurance, or by introducing emergency programs. Additionally, many European countries have responded to the crisis in an unprecedented way (both in scope and scale) by introducing or expanding monetary compensation schemes (Moreira and Hick, 2021), consisting of both short-term work schemes and monetary support for the self-employed. Shortly after EU countries introduced lockdown measures in March 2020, 42 million people in the EU were in such schemes, which amounts to 20 percent of all employees in the region (European Commission, 2020; Müller and Schulten, 2020). Especially the short-term work schemes prevented a high number of lay-offs by allowing employers to reduce the working hours of their employees more flexibly while still protecting the incomes of affected workers. As a result, EU unemployment rates remained more stable than for example in the US, albeit with welfare-regime specific differences (Ebbinghaus and Lehner, 2022). Ebbinghaus and Lehner (2022) furthermore find regional differences in the design logics of schemes with the Continental, Mediterranean and liberal welfare state focusing more on preserving the employment relationship than the Nordic, Central and Eastern European countries.

In this paper, we assess the effectiveness of social protection systems in mitigating COVID-19-related income shocks in the EU. Specifically, we analyze whether mitigation effects are largely based on newly introduced monetary compensation schemes, driven by other COVID-19-related policy changes or due to automatic stabilizers, i.e., the automatic response of pre-COVID-19 tax-benefit policies to the income shock. The role of automatic stabilizers is disaggregated into the contribution of unemployment insurance, social assistance and other benefits as well as taxes and social insurance contributions (SIC). This allows for a more fine-grained analysis of the cushioning role of existing tax-benefit policies in each country. In addition to the effects for the whole population in each country, we also provide results for the population subgroups most severely affected in each country.

Our analysis makes use of the tax-benefit microsimulation model EUROMOD, which allows for a comparative cross-country analysis of all EU countries. The decomposition analysis of the different tax-benefit elements is based on different counterfactual scenarios simulated using the models together with labor market adjustments to account for COVID-19-related labor market changes. The methodology is built on a rich strand of literature that also uses EUROMOD and similar decomposition approaches. Our contribution to the existing literature is that we expand the decomposition further by also considering other COVID-19-related policy changes and by differentiating between the earnings part of monetary compensation schemes and the actual compensation part. Additionally, we focus on the population as a whole, but also zoom in on those more severely affected by the labor market changes and analyze the extent the tax-benefit system provided a safety-net for them.

Our analysis provides a number of interesting findings. First, we show that there is a great deal of heterogeneity between countries in terms of earnings losses and the extent these are mitigated by tax-benefit policies. Overall, the cushioning role of tax-benefit systems is important as changes in mean disposable income are significantly smaller than those in market income in all countries. Second, in most countries, the largest contribution to cushioning the economic shock of the pandemic comes from monetary compensation schemes. In particular, our results show that the 'compensation' part accounts for the largest cushioning effect of monetary compensation schemes in most countries. Third, automatic stabilizers also play an important role in cushioning household incomes, contributing up to 6% to the change in mean disposable income in Ireland. In most countries, the cushioning effect of automatic stabilizers increases with income, depicting the role of taxes and social insurance contributions in providing income stabilization. In terms of benefits, unemployment insurance contributes the most to automatic stabilization, whereas the role of social assistance benefits is limited in most countries. Fourth, COVID-19-specific changes in taxes and benefits play only a minor role in most countries, except in Ireland, where they account for a 4% increase in household income. Finally, a similar pattern is observed for those severely affected by the market income shocks, confirming the important role played by monetary compensating schemes across different population subgroups.

The remainder of the paper is structured as follows. We first present already available results on COVID-19-related income changes and the role of the tax-benefit system and related, a literature review on the role of automatic stabilizers versus emergency support. Section 3 outlines the methodology and data used for the analysis. Section 4 presents the empirical results. Section 5 summarizes and concludes the analysis.

2 Literature

This section briefly reviews the most recent studies assessing the role of tax-benefit policies in protecting household income during the COVID-19 pandemic. Additionally, we briefly discuss the literature focusing on automatic stabilizers beyond the context of the pandemic.

2.1 COVID-19-related studies

Around the world, recent empirical applications have used EUROMOD for timely monitoring of the distributional impact of the COVID-19 pandemic and the cushioning effect of tax-benefit policies before micro data on the situation became available. Examples of international studies are Avellaneda et al. (2021) for Andean countries; Barnes et al. (2021) for South Africa; Jara et al. (2021) for Ecuador; Lastunen et al. (2021) for five countries in Africa and Wright et al. (2021) for Indonesia.

They all apply Atkinson's (2009) "stress-test" methodology where micro data is shocked – in these cases based on external information on the adverse effects of the COVID-19 pandemic – to assess the resilience of the welfare state and to identify vulnerabilities of the system (Popova and Navicke, 2019).

While the analysis in these emerging and low-income economies is often based on the role of emergency measures, the European context allows for a more nuanced analysis of the role of monetary compensation schemes as well as automatic stabilizers.

Cantó et al. (2021) focus on the welfare resilience at the beginning of the crisis and analyze the income situation in April 2020 in Belgium, Italy, Spain and the UK - four large and severely hit countries in Europe. They find that even though market incomes dropped substantially in all four countries, these losses were to a large extent cushioned by the tax-benefit system but not sufficiently enough to avoid increases in poverty for those affected by the shock. Two important identified insurance functions of the welfare state are the monetary compensation schemes but also the role of other household members' incomes (at least under the assumption of full income pooling). Still, they also identify design flaws such as lump-sum benefits that do not take previous contribution bases into account or restricted support including workers with precarious work arrangements.

Several country-specific studies furthermore highlight the dual role of both, automatic stabilizers and COVID-19-related policy measures (see Brewer and Tasseva, 2021 for the UK; Bronka et al., 2020 for the UK; Figari and Fiorio, 2020 for Italy; Bruckmeier et al., 2021 for Germany; Kyyrä et al., 2021 for Finland).

Another comparative study has been carried out by Christl et al. (2022b) and confirms the important role of monetary compensation schemes, followed by reductions of taxes and SIC as well as smaller contributions of unemployment benefits and a minor role of other benefits. Different from Cantó et al. (2021), they focus on the average effect throughout 2020 and include all EU countries. Their analysis highlights the heterogeneity of labor market impacts of the COVID-19 pandemic, which, together with differences in tax-benefit policies, resulted in a diverse picture of disposable income changes across the EU. Results by income quintiles furthermore suggest a regressive pattern of market income changes in most countries as opposed to a progressive pattern of disposable income changes. While the role of monetary compensation schemes as well as other benefits decreases with income, the automatic stabilization effect of taxes and SIC increases with income. An important explanatory factor for the progressive effect of monetary compensation schemes is their flat and lump-sum components as well as upper benefit thresholds.

We apply the same methodology used by Christl et al. (2022b) which is partly based on our own work on nowcasting poverty and income changes in the EU (Gasior and Rastrigina 2017) and developed to account for the specific situation of labor market changes caused by the COVID-19 pandemic. The methodology is set out in detail in section 3.

Different from their work and others cited above, we use an updated version of the model including updated information on labor market transitions and policy changes. This might have led to differences in results.

Our contribution to the existing literature is that we take the decomposition two steps further by also considering other COVID-19-related policy changes and by differentiating between the earnings part of monetary compensation schemes and the actual compensation part. Additionally, we focus on those most severely hit by labor market changes and analyze the extent the tax-benefit system mitigates market income changes.

2.2 Automatic stabilizers versus emergency support

Automatic stabilizers characterize the elements of tax-benefit policies which absorb shocks to earnings without any discretionary government action (Auerbach and Feenberg 2000, Browning and Crosley 2001, Dolls et al 2012). Policy instruments such as income taxes and unemployment

insurance benefits have been widely studied in the macro and micro literature due to their role in stabilizing household income, consumption and aggregate output (Auerbach and Feenberg 2000, Dolls et al 2012, Dolls et al 2022).

In the aftermath of the financial crisis of 2007–08, several studies making use of microsimulation techniques focused on the role of automatic stabilizers in cushioning income shocks. Tasseva and Paulus (2020) decompose changes in the income distribution of EU countries between 2007 and 2014 into the effect of gross market incomes and population changes, automatic stabilizers, and discretionary tax-benefit policy reforms. Their results show that both, automatic stabilizers and discretionary policies, most often contributed to offset the inequality-increasing effect of the income shocks. Doorley et al. (2021) use similar techniques to assess the role of tax-benefit policies in income inequality in Portugal, Ireland, Italy, Greece and Spain. Their results show that benefits acting as automatic stabilizers played an important role in reducing inequality in all countries between 2007 and 2013.

Other studies have tested the stabilization properties of tax-benefit policies by applying hypothetical earnings or employment shocks. In general, these studies show that benefits stabilize incomes at the bottom of the distribution, whereas taxes act as automatic stabilizers at the top. In general, the effect of taxes has been found to be larger and households at the bottom distribution have been shown to be less protected by policies against income shocks (Dolls, Fuest and Peichl 2011).

In the context of the COVID-19 pandemic, a great deal of attention has also been given to the role of automatic stabilizers and emergency policies in mitigating the impact of the crisis. In high-income countries, the important role played by taxes and benefits acting as automatic stabilizers was confirmed during the pandemic. Additionally, monetary compensation schemes contributed to a large extent to protect household incomes (Brewer and Tasseva 2021, Figari and Fiorio 2020, Bruckmeier et al. 2021, Kyyrä et al. 2021, Christl et al. 2022b). In the context of developing countries, the picture is more mixed. In some countries, no emergency policies were introduced to mitigate the impact of the pandemic (e.g., Mexico as shown by Huesca et al. 2021), whereas other governments implemented generous social protection programs which reduced inequalities (e.g., Brazil as shown by Lustig et al. 2021). A common trait across among many low and middle-income countries is the little effect of automatic stabilizers. In particular, due to the design of social assistance programs as proxy means-tested benefits, no automatic stabilization is provided at the bottom of the distribution in these countries. In this context, automatic stabilizers act only at the top of the distribution due to the effect of social insurance contributions and income tax (Lastunen et al. 2021, Rodriguez et al. 2022).

3 Data and methodology

The analysis makes us of EUROMOD I4.0, the most recent version of the European tax-benefit microsimulation model, to evaluate the effectiveness of the current system in providing support as well as to simulate counterfactual scenarios excluding COVID-19-specific policies.

3.1 EUROMOD and the underlying micro-data

EUROMOD combines detailed country-specific policy rules with representative household survey data to simulate direct taxes, social insurance contributions and cash benefits for the household

population in each EU country (Sutherland and Figari 2013). Using the same platform, the models produce comparative results based on the same income concepts, joint modeling conventions and similar assumptions. The simulations performed by EUROMOD are static in the sense that they abstract from behavioral reactions of individuals, and changes in the population composition are not considered.

The underlying microdata used in the simulations comes from the 2019 European Union Statistics on Income and Living Conditions (EU-SILC), which contain income information for 2018 and labor market information for 2019. Our simulations are based on 2020 tax-benefit policies (as of June 30) taking already existing and COVID-specific policies into account. Market incomes and non-simulated tax-benefit instruments in the data are adjusted to 2020 levels using source specific updating factors.

The data is furthermore adjusted for COVID-related labor market changes using the EUROMOD Labour Market Adjustment (LMA) Add-on (Christl et al. 2022a) which is adapted for the purpose of this research. The tool was initially developed to nowcast poverty and inequality changes in Europe (Gasior and Rastrigina 2017) as microdata only becomes available with a time-lag of about two years and is regularly being used by EUROSTAT – the statistical office of the EU – for their flash estimates of poverty and inequality.[2] Adjusted for the COVID specific situation, the LMA add-on transitions individuals from work (employment and self-employment) to unemployment as well as well as from work to monetary compensation schemes – i.e. workers still employed, but temporarily absent from work or working reduced hours, due to the lockdown - if available in the respective country. Following Christl et al. (2022b), we exclude transitions from inactivity or unemployment to employment as such transitions played a very small role in 2020.

Individuals are randomly selected for a transition to a different labor market status based on transition shares calculated from administrative information and the European Labour Force Survey, both provided by EUROSTAT. Both types of transitions – to unemployment and a monetary compensation scheme - are based on quarterly transitions in order to approximate annual overall transition rates in 2020 (an overview of transition shares foreach category in each country is provided in Appendix B). The 'out of employment' status is based on detailed quarterly LFS data for net changes in employment broken down by sex, age, sector of activity and type of contract. The break-down differs in some countries due to small sample sizes. Net changes are applied due to sample differences between LFS and EU-SILC data. For those transitioning to unemployment, their labor market incomes are adjusted based on the number of months left in employment and labor market characteristics are changed in order make the 'newly' unemployed eligible to unemployment benefits if they fulfil the eligibility criteria of the benefit. Transitions to monetary compensation schemes are based on monthly administrative data collected by EUROSTAT from EU Member States and measures the stock of workers supported by governments. For employees who transit to monetary compensation schemes, employment income and the number of months in employment are adjusted proportionally, considering the number of months in compensation schemes. For self-employed who transit to monetary compensation schemes, self-employment income and the number of months in self-employment are adjusted proportionally, considering the reduction in the number of months worked.

[2] https://ec.europa.eu/eurostat/web/experimental-statistics/income-inequality-and-poverty-indicators [accessed on 23 May 2022]

3.2 Decomposition approach

The analysis furthermore applies a decomposition approach that helps to quantify the extent to which household incomes were cushioned by automatic stabilizers versus emergency benefits and policy changes introduced during the COVID-19 pandemic, and to assess the lack of sufficient support to fully absorb the shock on labor incomes. Following similar approaches to those by Paulus and Tasseva (2020) and Bargain and Callan (2010), we simulate four scenarios to quantify the contribution of different factors to changes in income distribution amid the COVID-19 pandemic. Table 1 provides an overview of the simulated scenarios.

Scenario A captures the income distribution during the COVID-19 pandemic, namely, it reflects the labor market situation during COVID-19 and takes into account all policies in place during the pandemic. On the other side of the spectrum, Scenario D represents the pre-COVID-19 scenario, meaning that we do not take into account COVID-19-related labor market and policy changes. Scenario B and C provide two in-between counterfactual scenarios where COVID-19-related labor market changes are applied but not all COVID-19-related policy changes are considered. Scenario B only considers monetary compensation schemes but no additionally implemented policy changes. Other COVID-19-related policies refer for example to increases in existing unemployment or social assistance schemes, additional lump-sum benefits for specific groups or COVID-19-specific tax and SIC changes (see Table B2 in the Appendix for a country-specific overview of other measures). Scenario C does not consider any policy interventions to the COVID-19 pandemic. In the latter scenario, we assume that everyone who was selected to transition to a monetary compensation scheme in scenario A is transitioned to unemployment for the duration of being in the monetary compensation scheme in the absence of such monetary compensation schemes. This is an artificial extreme scenario as we do not know the counterfactual reality without the monetary compensation schemes. However, it allows to show the extent to which existing unemployment benefits and other related policies would have been able to cushion the shock as well as the extent the new schemes provided additional support.

Table 1: Overview of simulated scenarios

Scenario		Policy changes	Input dataset	EUROMOD
A	COVID	All COVID and non-COVID related policy changes	Adjusted for COVID-related labor market changes	LMA Add-on
B	COVID with monetary compensation schemes	All non-COVID related policy changes plus newly introduced monetary compensation schemes	Adjusted for COVID-related labor market changes	New extension to switch non-compensation scheme related policy changes off
C	COVID without COVID-related policy changes	Non-COVID related policy changes only	Adjusted for COVID-related labor market changes. Employees and self-employed selected to transition to the monetary compensation scheme are re-transitioned to unemployment	New Add-on based on LMA Add-on for re-transition to unemployment
D	No COVID	Non-COVID related policy changes only	No adjustment for COVID-related labor market changes	New extension to switch all COVID-related policy changes off

Source: Author's elaboration

More formally, let I[.] represent a welfare index such as mean income. The overall welfare impact of COVID-19 can be quantified as:

$$\Delta = I[y^A - t^A(y^A) + b^A(t^A, y^A)] - I[y^D - t^D(y^D) + b^D(t^D, y^D)] \quad \text{Total welfare change} \quad (1)$$

Where y refers to market incomes, t to taxes and social insurance contributions as a function of y and b to benefits as a function of y and t. A and D denote the scenarios that are compared with each other, i.e. the COVID-19 scenario with the no COVID-19 scenario.

Equation (1) can be further decomposed into COVID-19-related policy changes (excluding newly introduced monetary compensation schemes) and other changes using the counterfactual scenario B where additional COVID-19-related policy changes are not considered:

$$\begin{aligned} \Delta = &\{I[y^A - t^A(y^A) + b^A(t^A, y^A)] - I[y^B - t^B(y^B) + b^B(t^B, y^B)]\} && \text{COVID-19-related policy changes} \\ + &\{I[y^B - t^B(y^B) + b^B(t^B, y^B)] - I[y^D - t^D(y^D) + b^D(t^D, y^D)]\} && \text{Other changes} \quad (2) \end{aligned}$$

For additively decomposable measures, such as mean income, other changes can be further decomposed into changes in market incomes, automatic stabilizers (benefit and taxes and SIC) and the additional contribution of new monetary compensation schemes. Scenario C is used to analyse the role of newly introduced monetary compensation schemes.

$$\begin{aligned} \Delta = &\{I[y^A - t^A(y^A) + b^A(t^A, y^A)] - I[y^B - t^B(y^B) + b^B(t^B, y^B)]\} && \text{COVID-19-related policy changes} \\ + &\{I[y^B - t^B(y^B) + b^B(t^B, y^B)] - I[y^C - t^C(y^C) + b^C(t^C, y^C)]\} && \text{New monetary compensation schemes} \\ + &\{I[y^C - t^C(y^C) + b^C(t^C, y^C)] - I[y^A - t^D(y^D) + b^D(t^D, y^D)]\} && \text{Automatic stabilizers} \\ + &\{I[y^A] - I[y^C]\} && \text{Market income changes} \quad (3) \end{aligned}$$

In most cases, monetary compensation schemes did not only provide income support but also allowed employees to stay on the job for a reduced number of hours. This dual role of monetary compensation schemes is considered in the decomposition analysis by further splitting the contribution of the new monetary compensation schemes into the compensation and the earnings part. The compensation part shows the actual contribution of the monetary compensation scheme by the government. The earnings part refers to the labor market incomes retained by workers while benefiting from the monetary compensation scheme.

4 Empirical results

This section presents the results of the distributional effects of the COVID-19 pandemic and the effectiveness of different policy instruments in mitigating the shock to household incomes. We first discuss overall changes in total welfare based on market and disposable income and its composition. Then, we assess the contribution of earnings losses, automatic stabilizers, monetary compensation schemes and tax-benefit COVID-19 policies to changes in mean household disposable income. In addition to the effects for the whole population in each country, the first two sections discuss the results focusing on the population most severely affected in each country. The severity measure is based on original income changes comparing the COVID-19 scenario with the non-COVID-19 scenario. Severely affected is defined as experiencing changes in equivalized

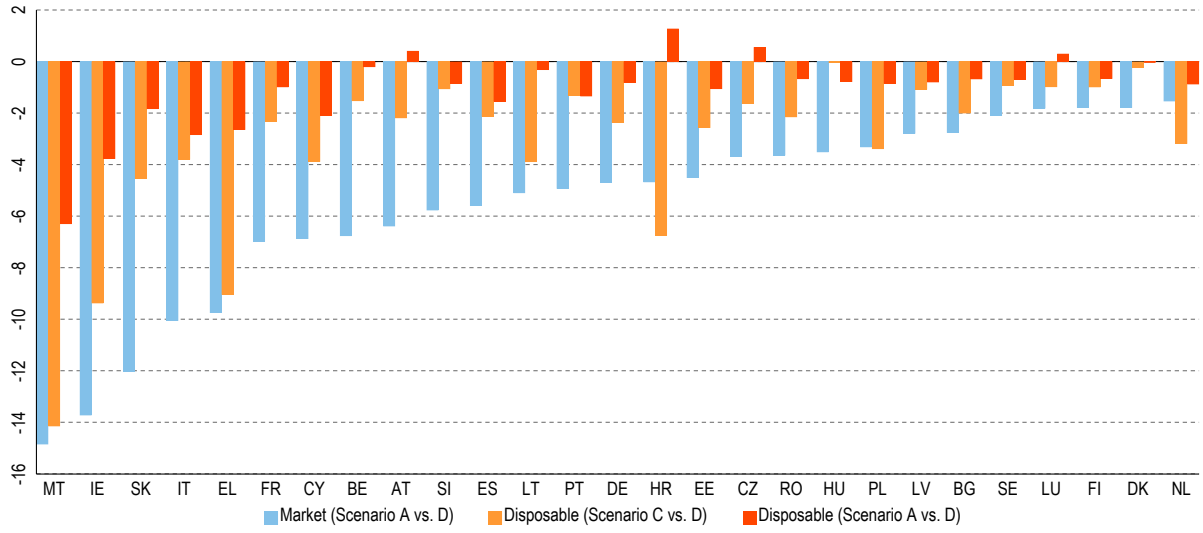
market incomes above the EU median of more than 11.4 percentage points. Less affected is defined as experiencing changes below the EU median but above 0. The non-affected groups include individuals with no changes. Finally, results are also presented for population subgroups among those severely affected.

4.1 Total welfare change

Although on average all EU countries experienced losses in gross market incomes, the simulated losses based on transitions from LFS data have been comparably small (below 5 percent) for the majority of countries (Blue bars in Figure 1). The countries with the highest losses (10 percent or more) are Malta, Ireland, the Slovak Republic, Italy and Greece, with Malta experiencing the highest losses (15 percent). A second group of countries with losses above 5 but below 10 percent are France, Cyprus, Belgium, Austria, Slovenia, Spain and Lithuania.

Thus, the starting point for tax-benefit systems to cushion the adverse effects of the COVID-19 pandemic varies across countries. In most countries, mean changes in disposable incomes are significantly smaller than changes in mean market incomes. Mean disposable incomes decreased by less than 2 percent in 18 out of 27 countries and even slightly increased in Austria, Croatia, Czechia and Luxembourg. Thus, on average, most tax-benefit systems provided sufficient support during the first year of the pandemic. Although this is also partly true for Malta and Ireland, the countries with the highest changes in market incomes, mean changes in disposable income are still comparably high with 6 and 4 percent.

Figure 1: Mean change in market vs. disposable incomes (in percent)



Note: See Figure A1 in the Appendix for income quintile specific results.
Source: Own calculations based on EUROMOD I4.0+.

Figure A1 in the Appendix presents the same analysis but looking at changes in mean market and disposable income by income quintiles based on equivalized household disposable income in the pre-COVID-19 scenario (scenario D). In most countries, the largest drop in market income is observed in the first two quintiles and the smallest at the top confirming the findings by Christl et al. (2022b) on the regressiveness of the impact on market incomes. The only exceptions are Greece where the largest drop is in quintile three and the smallest in quintile four, Croatia where mean market income remains broadly unchanged in the first quintile and the largest drops (of similar

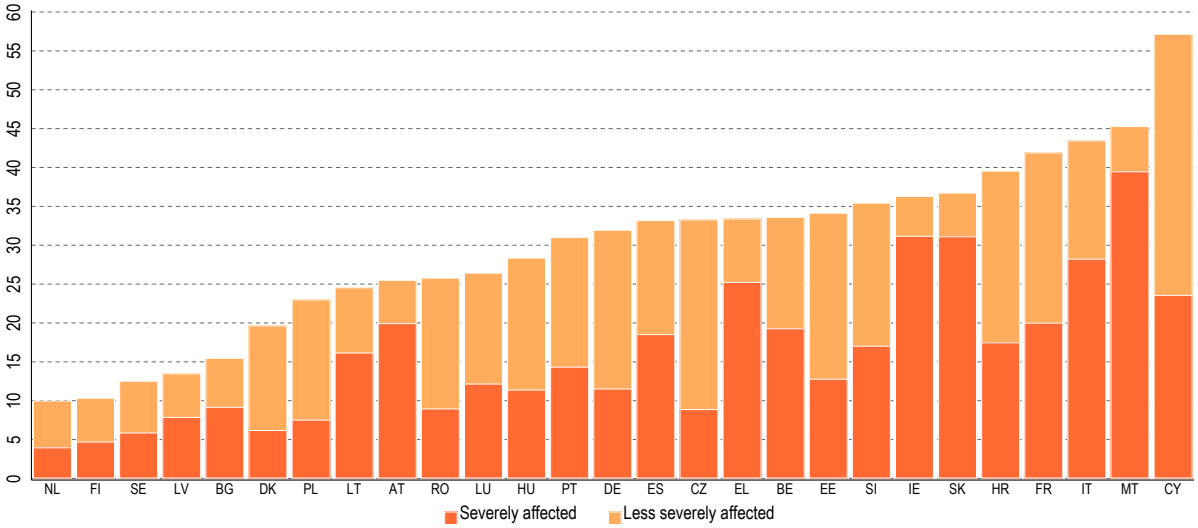
size) are observed in quintile three, four and five, and the Slovak Republic where the first quintile experiences the smallest drop and the fourth quintile, the largest.

The pattern along the pre-COVID-19 income distribution is reversed when mean disposable income is considered. In all countries, except Bulgaria, the largest drop in disposable income is observed at the top of the distribution. In Bulgaria, the drop in disposable income is broadly similar across quintiles with a slightly larger drop in the second quintile. Additionally, in 16 countries' mean disposable income increased in the bottom quintile. In Austria, Croatia, Czechia and Luxembourg, mean disposable income increase in all quintiles except the top one.

Figure 2 shows the share of the population that is severely affected by the shock in market incomes and the share that was less severely affected. Severely affected is defined based on the median change in market incomes across the EU. Losses higher than 11 percent are defined as severe, losses of 11 or less as less severe. The difference between 100 percent and the sum of the two shows the share of people not affected by the adverse effects.

Countries with higher mean changes in market incomes usually also present a larger group of severely affected individuals. 40 percent of the Maltese population and close to 30 percent of the Irish and Slovak population experienced market income losses of more than 11 percent compared to less than 5 percent in the Netherlands and Finland. The share of individuals not affected by changes in market incomes ranges between 90 percent in the Netherlands and 43 percent in Cyprus.

Figure 2: Share of population affected by changes in market incomes by level of severity



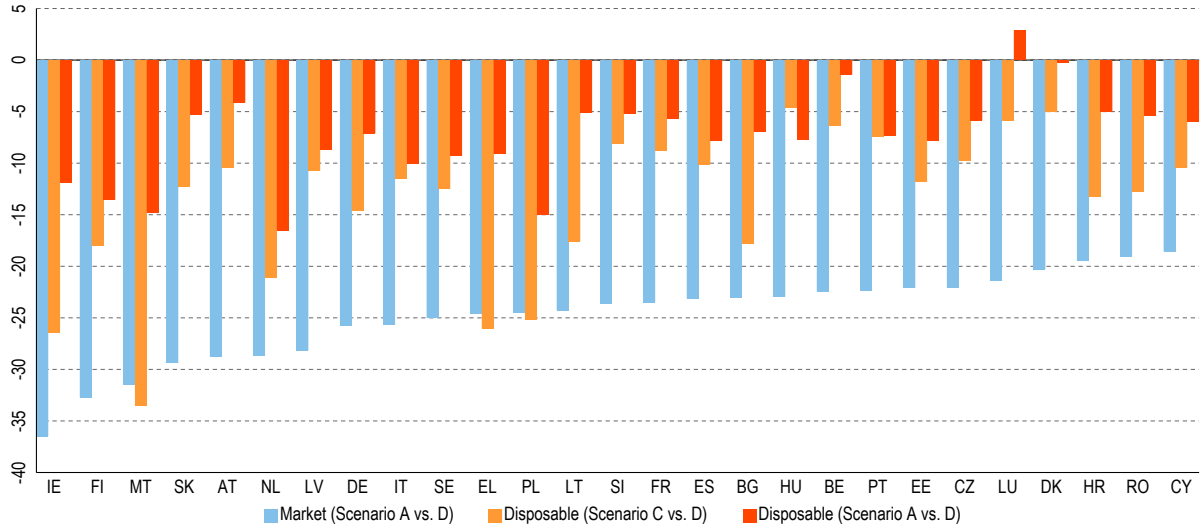
Note: See Figure A2 in the Appendix for results by income groups. Severely refers to losses in market income of more than 11 percent (Scenario A vs. D).
Source: Own calculations based on EUROMOD I4.0+.

Looking at the prevalence of the severely affected population across the pre-COVID-19 income distribution (Figure A2 in the Appendix), we can distinguish four groups of countries. In Belgium, Germany, Estonia, Greece, Ireland, Croatia, the Slovak Republic, Malta and Poland, the share of severely affected population increases with income. In contrast, the share of the severely affected decreases with income in Austria, Denmark, Spain and Luxembourg. In some countries, the share of the severely affected is broadly similar across income quintiles. This is the case of Bulgaria, Czechia, Cyprus, Finland, France, the Netherlands and Sweden. A third group is made of countries where the severely affected population is concentrated in the middle of the distribution: Latvia,

Lithuania, Portugal, Romania and Slovenia. Finally, Hungary is the only country where we find a U-shaped pattern with a smaller share of the severely affected in the middle of the distribution.

Figure 3 zooms in on those severely affected to assess whether tax-benefit systems have been able to cushion the shock of those with comparably high changes in market incomes. As such, it controls for differences in the share of affected individuals which influences mean outcomes and presents the effectiveness of the social protection system for those who needed it the most.

Figure 3: Mean change in market vs. disposable incomes of those severely affected (in percent)



Note: See Figure A3 in the Appendix for results by income groups. Severely refers to losses in market income of more than 11 percent (Scenario A vs. D).
Source: Own calculations based on EUROMOD I4.0+.

By construction, losses in market incomes are higher than for the total population ranging between 37 percent in Ireland and 19 percent in Cyprus. These pronounced losses in incomes are only partly cushioned by European tax-benefit systems. Although the share of severely affected is very small in the Netherlands, those who face substantial income drops are not cushioned sufficiently by the tax-benefit system and experience losses in disposable incomes of over 15 percent. The situation is similar in Finland, Poland and Malta, although the share of those severely affected is by far higher in Malta than in the other three countries. Countries that stand out in cushioning higher market income losses are Belgium, Denmark and especially Luxembourg, where mean disposable income of those severely affected increases.

Figure A3 in the Appendix shows changes in mean market and disposable income by income quintiles among those severely affected. In terms of market income, in all countries except France, the drop in market income is smaller at the top than at the bottom of the distribution. In France a clear inverted U-shaped pattern is observed. In terms of disposable income, the opposite pattern is observed, with a smaller decrease in disposable income at the bottom relative to the top quintile among those severely affected. The only exceptions are Bulgaria and Sweden. In the former, the drop in disposable income becomes smaller up until quintile four, but then it decreases further in quintile five. In the latter, a somewhat U-shaped pattern is observed.

To grasp better the heterogeneous impact of the pandemic within countries, Table 2 presents the share of severely affected and changes in mean disposable income by population subgroups.

Table 2: Share of severely affected and mean changes in disposable incomes by population subgroups

Group		AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
Women	SA	19.2	19.2	8.9	23.1	8.9	11.3	6.1	12.2	24.5	18.4	4.7	19.0	16.9	11.1	31.7	27.4	15.9	11.8	7.6	38.0	4.0	7.2	14.0	8.8	5.8	16.7	30.3
	CH	0.5	-0.2	-0.5	-2.1	0.6	-0.8	0.0	-1.0	-2.6	-1.5	-0.7	-0.9	1.2	-0.7	-3.6	-2.8	-0.4	0.3	-0.7	-6.1	-0.8	-0.8	-1.3	-0.8	-0.7	-0.8	-1.8
Men	SA	20.7	19.4	9.6	24.1	8.9	11.8	6.3	13.5	26.0	18.7	4.8	21.1	18.1	11.7	30.7	29.2	16.5	12.5	8.2	40.9	4.0	7.9	14.7	9.2	6.0	17.4	32.0
	CH	0.3	-0.2	-0.8	-2.1	0.6	-0.8	0.0	-1.2	-2.7	-1.6	-0.7	-1.1	1.3	-0.8	-3.9	-2.9	-0.2	0.3	-0.9	-6.5	-0.9	-0.9	-1.4	-0.6	-0.7	-0.9	-1.8
<15	SA	16.3	25.3	11.0	24.1	9.7	13.6	6.7	15.5	31.0	22.2	5.0	25.1	21.7	10.2	34.1	34.6	21.9	16.4	10.0	45.7	4.7	8.3	16.9	10.2	6.8	19.7	34.1
	CH	1.3	-0.3	-0.5	-2.4	0.0	-0.4	0.0	-1.3	-3.4	-2.0	-0.7	-1.2	1.1	-0.8	-3.1	-3.6	0.1	0.5	-0.9	-7.7	-0.8	-1.0	-1.8	-0.8	-0.6	-1.1	-2.1
15-24	SA	16.0	22.9	12.3	24.9	10.1	14.5	8.0	13.4	30.2	22.9	5.6	25.2	20.0	10.4	37.9	35.7	19.5	13.8	10.8	47.4	4.7	8.7	17.5	10.6	5.9	19.9	35.1
	CH	1.1	-0.2	-0.7	-2.1	0.1	-0.9	0.0	-1.0	-2.5	-1.8	-1.0	-0.9	2.4	-0.9	-4.1	-3.6	-0.1	0.3	-0.9	-6.6	-1.2	-1.0	-1.5	-0.9	-0.8	-0.8	-2.1
25-49	SA	24.9	23.8	11.4	26.1	9.9	14.6	7.6	15.5	32.5	21.5	5.2	25.4	21.3	12.0	37.4	34.5	20.1	14.0	9.6	47.3	4.6	8.5	17.2	10.7	6.9	21.1	36.8
	CH	0.4	-0.1	-0.9	-2.5	0.1	-1.1	0.0	-1.4	-3.2	-2.0	-0.7	-1.3	1.3	-1.1	-4.2	-3.4	-0.3	0.4	-1.1	-7.6	-1.0	-1.0	-1.7	-0.8	-0.8	-1.1	-2.1
50-64	SA	24.3	18.7	9.0	27.8	10.5	12.8	6.6	11.5	25.3	18.3	4.9	20.9	17.8	11.3	29.2	31.7	14.9	12.1	6.6	40.2	4.8	7.9	15.7	8.8	6.9	16.0	33.0
	CH	-0.5	-0.4	-0.6	-2.3	0.7	-1.2	0.0	-0.7	-3.2	-1.7	-0.7	-1.3	1.3	-0.9	-4.8	-3.4	-0.9	0.2	-0.6	-5.5	-1.0	-0.8	-1.4	-0.6	-0.9	-0.8	-1.8
65+	SA	9.9	3.9	3.3	10.7	4.3	2.7	2.0	6.7	8.3	8.2	3.4	3.6	6.7	12.2	9.1	9.3	5.1	1.7	3.3	12.4	1.0	4.0	5.7	3.9	2.4	6.8	9.9
	CH	0.7	-0.1	-0.4	-0.5	2.4	-0.2	0.0	-0.5	-0.7	-0.2	-0.3	0.0	0.6	-0.1	-1.2	-0.8	0.0	0.1	-0.3	-1.8	-0.3	-0.4	-0.4	-0.1	-0.3	-0.2	-0.6
EMPL	SA	24.8	23.3	11.8	26.5	8.1	15.7	7.4	14.6	36.6	20.2	4.9	25.7	22.8	11.6	40.8	35.6	20.1	14.6	9.5	48.1	3.2	8.9	17.5	11.7	7.2	19.7	41.9
	CH	0.4	0.1	-0.8	-2.3	-0.1	-1.2	0.0	-1.1	-3.1	-1.8	-0.6	-1.2	1.7	-0.6	-4.5	-3.6	-0.4	0.6	-0.9	-7.3	-0.6	-1.0	-1.4	-1.1	-0.8	-0.8	-2.2
SELF	SA	18.0	32.6	8.5	33.2	25.0	7.3	5.5	13.0	34.5	34.6	16.9	25.3	13.5	19.8	30.3	37.0	13.0	21.2	6.6	50.3	14.2	10.5	23.7	10.4	6.9	21.2	27.1
	CH	-2.3	-2.6	-1.5	-2.7	1.8	-0.8	0.0	-1.2	-5.2	-2.2	-2.4	-1.5	2.9	-0.8	-5.6	-3.8	-1.2	-3.7	-0.4	-6.4	-3.7	-1.3	-3.7	0.9	-1.2	-1.2	-1.9
Low	SA	16.5	16.0	7.6	22.1	8.0	8.9	5.8	12.0	20.4	17.2	4.2	16.6	14.1	11.3	26.3	24.9	13.3	10.6	6.7	32.5	3.4	6.8	11.9	7.6	5.0	14.8	23.5
	CH	0.9	-0.1	-0.5	-1.8	1.1	-0.4	0.0	-0.9	-1.7	-1.1	-0.5	-0.4	1.6	-0.3	-2.6	-2.2	0.2	0.3	-0.7	-5.1	-0.6	-0.7	-1.0	-0.3	-0.5	-0.6	-1.4
Total	SA	20.0	19.3	9.2	23.6	8.9	11.6	6.2	12.8	25.3	18.6	4.7	20.0	17.5	11.4	31.2	28.3	16.2	12.2	7.9	39.5	4.0	7.5	14.4	9.0	5.9	17.1	31.1
	CH	0.4	-0.2	-0.7	-2.1	0.6	-0.8	0.0	-1.1	-2.6	-1.6	-0.7	-1.0	1.3	-0.8	-3.8	-2.8	-0.3	0.3	-0.8	-6.3	-0.9	-0.9	-1.3	-0.7	-0.7	-0.9	-1.8

Note: SA refers to severely affected and is defined as losses in market income of more than 11 percent. CH refers to mean change in disposable income.
Source: Own calculations based on EUROMOD I4.0+.

In most countries, a larger share of men is severely affected compared to women. However, the differences are small, and it is worth noting that they are explained by the fact that equivalized market income is used to identify those severely affected. Pooling income at the household level blurs the assessment of gender effects of the pandemic. In fact, a similar effect is observed in terms of changes in mean disposable income. Changes between men and women always move in the same direction and the gender differences are small. Only in Ireland and Malta, the drop in mean disposable income is larger for men. In terms of age, the prevalence of those severely affected is high among those aged 15-24 and 25-49. Despite having a larger share of severely affected, mean disposable income among those aged 15-24 in most countries is less affected compared to other age groups, pointing to a positive income protection effect of taxes and benefits for this population group. On the contrary, mean disposable income drops by more than the average among those aged 25-49, which could reflect that tax-benefit systems are less effective in cushioning the shock in income among this group. No clear pattern is observed between employees and the self-employed, in the prevalence of those severely affected. In 13 countries, the share of those severely affected is higher among the self-employed, whereas a larger number of employees are more affected in the other countries. Differences across these group are, however, clear in terms of changes in mean disposable income. In 19 countries, a higher drop in disposable income is observed among the self-employed, with large differences are observed in Austria, Belgium and Luxembourg, where disposable income for employees increases, whereas it dropped for the self-employed; and in Greece, the Netherlands and Portugal where the drop in disposable income was substantially higher for the self-employed compared to employees. Only in Czechia, Croatia and Romania mean disposable income of the self-employed increases. Finally, the share of severely affected in lower than the average among low earners (i.e., those with earnings below the poverty line). This might, however, be an effect of the way the severity of the shock is defined, given the low earnings of this particular subgroup. From a policy point of view, the table highlights the important role of tax-benefit policies in protecting the income of low earners. In fact, in all countries, mean disposable income for this group drops less than the average (or increases more than the average).

4.2 Decomposition of changes in disposable income

This section presents the results of the decomposition of mean equivalized household disposable income. We first discuss the results for the whole population and then move on to those severely affected by the crisis, with a focus on the contribution of earnings losses, monetary compensation schemes, automatic stabilizers and other COVID-19-related tax-benefit policies.

Decomposition results for the whole population

Figure 4 presents the decomposition results. The white circles depict the percentage change in mean equivalized household disposable income and are equivalent to the results discussed in the previous section (red bars in Figure 1). Mean disposable income dropped in all countries, except Denmark, Luxembourg, Austria, Czechia and Croatia. The largest drop is observed in Malta (-6.3%), whereas mean disposable income increased by 1.3% in Croatia.

The light blue bars in Figure 4 represent the contribution of earning losses (market income losses) to changes in mean disposable income. As expected, due to the economic shock resulting from the pandemic, changes in market incomes contribute to a reduction in disposable income in all countries. However, monetary compensation schemes and tax-benefit policies (both automatic stabilizers and COVID-related policies) cushion the impact of the income shock.

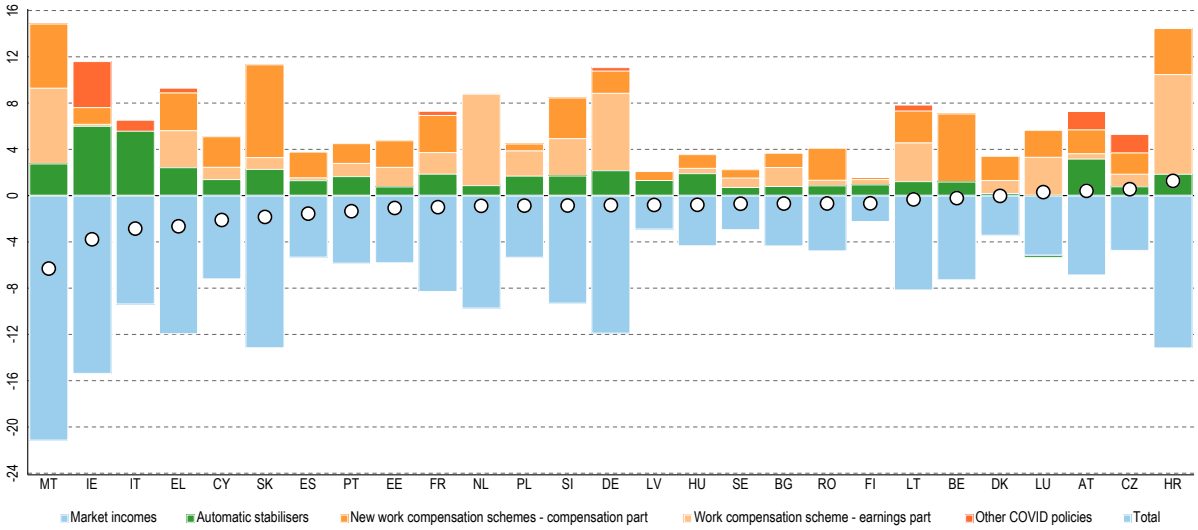
In most countries, the largest contribution to cushion the economic shock of the pandemic comes from monetary compensation schemes (dark orange and light orange bars), which account for an increase in disposable income between 0.6% in Finland and 12.6% in Croatia. Only in Italy there is no contribution from monetary compensation schemes, as such policies were already in place and thus, are not considered a new COVID-19 policy. Note that the large effect of monetary compensation schemes is partly due to our underlying counterfactual scenario which assumes that in the absence of such schemes, workers benefiting from them would have become unemployed during the pandemic. For this reason, we break down the effect of monetary compensation schemes into two components: (i) the compensation part (dark orange bars); and (ii) the earnings part (light orange bars).

In 15 countries, the compensation part accounts for the largest contribution of monetary compensation schemes, particularly so in Belgium, Spain, Ireland and the Slovak Republic. On the contrary, the relative size of the earnings component of monetary compensation schemes is higher in Bulgaria, Germany, Finland, Croatia, Lithuania, Luxembourg, Malta, Poland and, to some extent, Sweden. Figure A4 in the Appendix shows that the contribution of monetary compensation schemes across the income distribution varies across countries. In Belgium, Bulgaria, Germany, Denmark, Greece, Lithuania, Hungary, the Slovak Republic, the Netherlands, Sweden, Poland and Slovenia, the contribution of monetary compensation schemes increases or somewhat increases across the income distribution, meaning that such schemes cushioned household incomes mostly in the top quintiles. The opposite pattern is observed in Spain and, to some extent, in Austria, where income protection by monetary compensation schemes is higher at the bottom compared to the top. In Cyprus, Estonia, Ireland, Latvia and Portugal, a reversed U-shaped pattern is observed, whereas a broadly uniform pattern is depicted in Czechia, Finland, Luxembourg, Malta and Romania. In France, the contribution of monetary compensation schemes is broadly uniform from quintile 1 to 4 but decreases in the top quintile. Finally, no clear pattern is observed in Croatia. In most countries, the pattern of monetary compensation schemes across the income distribution seems to be explained by the pattern of the earnings part of monetary compensation schemes.

The contribution of automatic stabilizers (green bars in Figure 4) to the change in disposable income ranges between -0.2% in Luxembourg to 6% in Ireland. In addition to Ireland, the contribution of automatic stabilizers is also large in Italy, Austria and Malta.

Figure A4 in the appendix shows that in 16 out of 27 countries, the contribution of automatic stabilizers increases with income. In 10 countries (Bulgaria, Czechia, Denmark, Spain, France, Finland, the Netherlands, Sweden, Portugal and Slovenia), the contribution is uniform or follows no particular pattern. Only in Hungary, the contribution of automatic stabilizers decreases with income.

Figure 4: Mean change in disposable income and decomposition of change

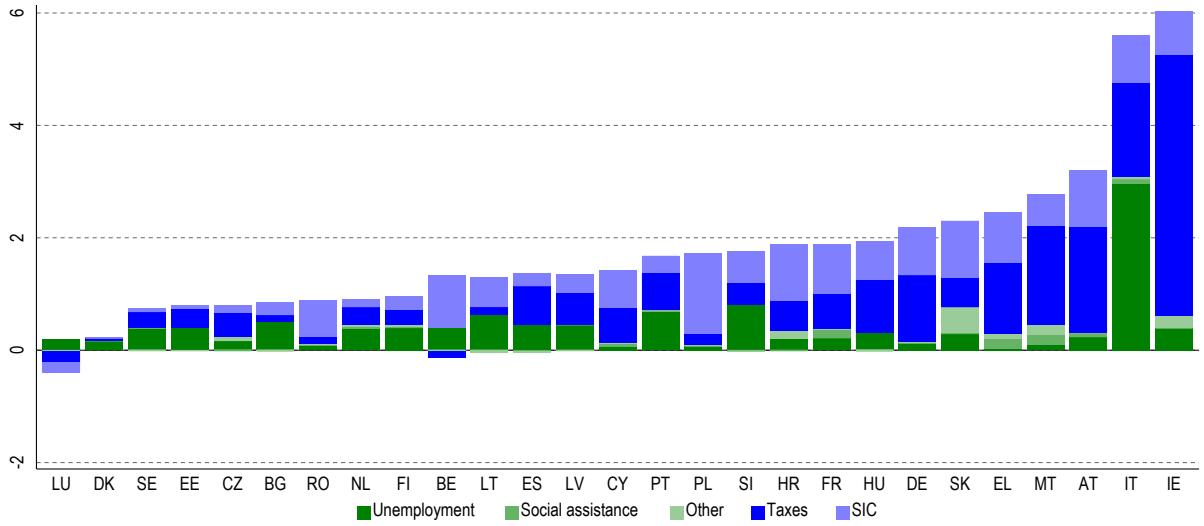


Note: See Figure A4 in the Appendix for results by income groups. Mean change in disposable income refers to the difference between Scenario A vs. D. The decomposition itself is based on all four scenarios.
Source: Own calculations based on EUROMOD I4.0+.

The increasing pattern of automatic stabilizers is most likely the effect of the contribution of taxes and social insurance contributions to changes in mean disposable income. To dig deeper into the latter, Figure 5 and Figure A5 in the appendix break down the effect of automatic stabilizers into the contribution of specific tax-benefit instruments: (i) social insurance contributions, (ii) taxes, (iii) unemployment benefits, (iv) social assistance benefits, and (v) other benefits. Figure 7 shows that in all countries, except Bulgaria, Denmark, Estonia, Italy and Sweden, the contribution of taxes and social insurance contribution exceeds that of benefits. In 13 countries, taxes contribute the most to automatic stabilization. In Bulgaria, Denmark, Estonia, Sweden and particularly in Italy, unemployment benefits pay the most important role in cushioning the impact of the economic crisis. Social assistance and other benefits play only a minor role, namely because in the short-term, unemployment benefits play the main role in terms of benefits. Figure A5 in the appendix confirms that the effect of tax increases along the income distribution due to the progressivity of personal income tax in most EU countries. The effect of social insurance contributions in uniform or slightly increasing in most countries. In Belgium and Luxembourg, we observe a negative impact of taxes and SIC on changes in mean disposable income. In countries where unemployment benefits cushion household incomes, to some extent (more than 0.5% contribution in at least one quintile), three patterns are observed across the income distribution. In Portugal, Slovenia, Spain and Hungary, unemployment benefits provide more protection at the bottom of the distribution. In Italy, Finland, Latvia, Estonia, Belgium, Bulgaria and Ireland, the largest contribution of unemployment benefits is observed in the middle quintiles. In Lithuania,

Luxembourg, Austria, France, Denmark, Sweden and the Netherlands, the largest effect is observed in the fourth quintile.

Figure 5: Composition of automatic stabilizers



Note: See Figure 5 in the Appendix for results by income groups. Other benefits include housing benefits, family and education benefits, health benefits as well as old-age and survivor benefits.
Source: Own calculations based on EUROMOD I4.0+.

Finally, Figure 4 shows that additional COVID-19-emergency reforms to taxes and benefits (red bars in Figure 4) play only a small role in most countries. The effect of additional policies is particularly important in Ireland, accounting for a 4 percent increase in household income. COVID-19-emergency policies also play a role in Austria (1.6 percent), Czechia (1.6 percent) and Italy (1 percent), whereas they contribute by less than 0.6 percent in all other countries. In general, their effect is concentrated in the lower part of the distribution (Figure A4 in the Appendix).

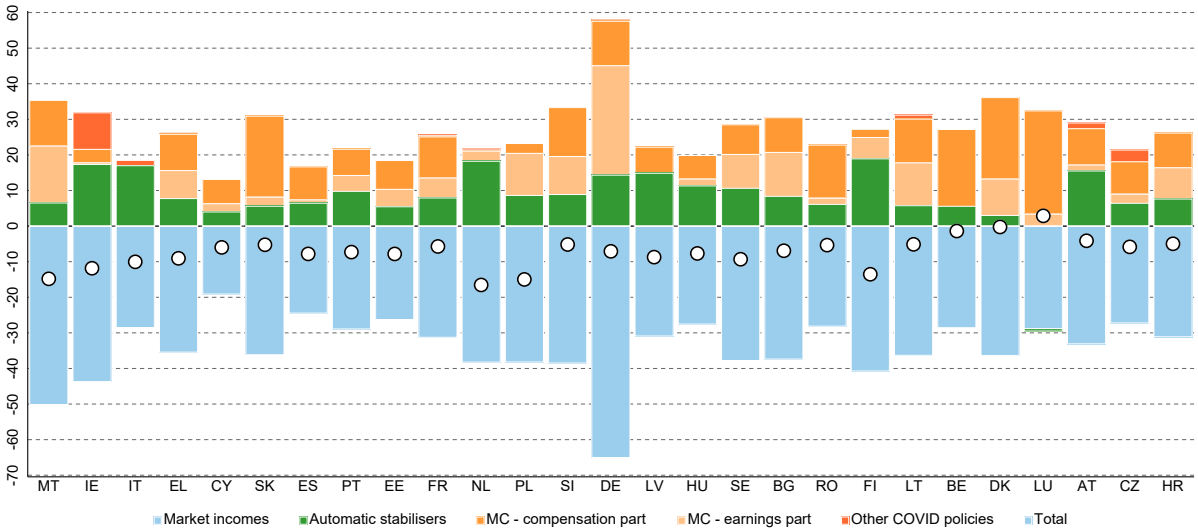
Decomposition results for the most affected by the crisis

Figure 6 shows the same decomposition but zooms in on those severely affected by market income shocks, leading to quite pronounced decompositional differences compared to the total population (shown in Figure 4).

By definition, the role of market income changes is more pronounced for those more severely hit by the pandemic. However, there are notable differences between the overall population and those severely affected. While Scandinavian countries as well as Bulgaria show comparably low drops in market incomes overall, the role of market incomes is significantly more pronounced for those severely affected. The difference to the total population is largest in Germany with a negative contribution of market incomes of close to 70 percent. While these differences are sufficiently mitigated in Denmark, disposable incomes still decrease by close to 10 percent or more in Bulgaria, Finland, Sweden and Germany.

In a number of countries, automatic stabilizers are more important for the group of severely affected than overall. This is especially the case in Finland, the Netherlands, Denmark, Germany and Latvia. At the same time, the Netherland is an interesting case where those severely affected benefit very little from the monetary compensation scheme.

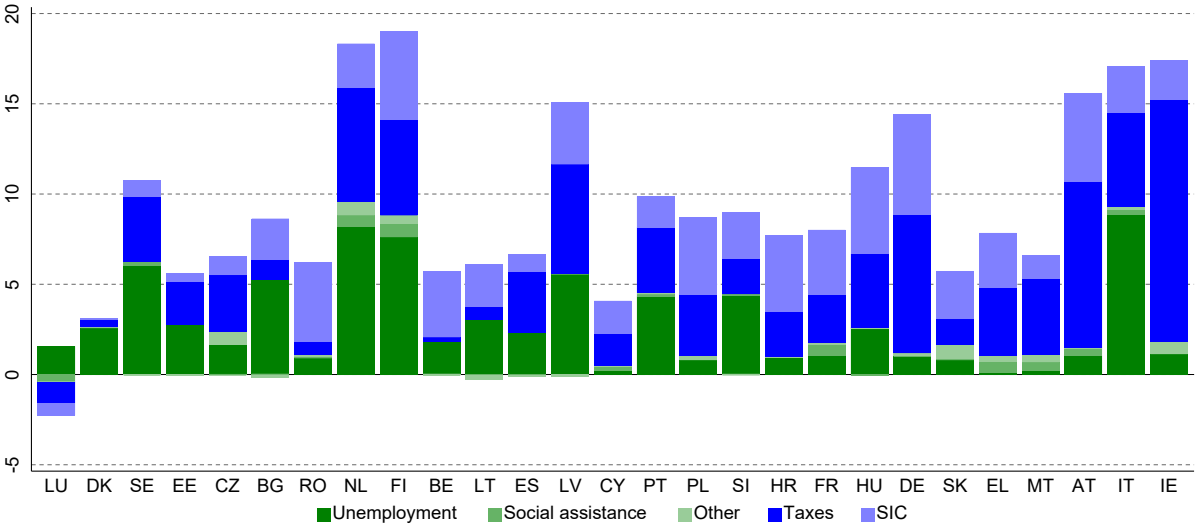
Figure 6: Mean change in disposable income and decomposition of change of those severely affected



Note: See Figure A6 in the Appendix for results by income groups. Order of countries based on Figure 4. Mean change in disposable income refers to the difference between Scenario A vs. D. The decomposition itself is based on all four scenarios. Severely refers to losses in market income of more than 11 percent (Scenario A vs. D).
Source: Own calculations based on EUROMOD I4.0+.

Figure 7 shows the composition of automatic stabilizers for those severely affected (similar to Figure 5 for the total population). The composition of automatic stabilizers is similar to that of the overall population for the countries where automatic stabilizers play a more pronounced role for those affected the most. Also most other countries show very similar compositional patterns between the overall population and those most affected. The only country with notable differences is Poland where taxes play a larger role and SIC a reduced role, thus the difference is only on the contribution side but not due to differences in benefits.

Figure 7: Composition of automatic stabilizers of those severely affected



Note: See Figure A7 in the Appendix for results by income groups. Order of countries based on Figure 5. Other benefits include housing benefits, family and education benefits, health benefits as well as old-age and survivor benefits. Severely refers to losses in market income of more than 11 percent (Scenario A vs. D).
Source: Own calculations based on EUROMOD I4.0+.

Similar to the overall population, Figure A6 in the appendix shows decomposition results by income groups for those severely affected only and Figure A7 the composition of automatic

stabilizers by income group. The observed decomposition patterns are largely the same pattern as for the overall population with two exceptions. Lower income groups in Croatia and Poland show a more pronounced role of automatic stabilizers. While this is due to a higher contribution of SIC in Croatia, it is due to a higher contribution of taxes in Poland.

A general observation is the reduced role of other COVID-19-related policy changes in the bottom quintiles which seem to play an even more minor role for severely affected than the overall population. The only exception is Ireland, where other COVID-19-related policies significantly cushion decreases in market incomes. As shown by Figure A7, in selected countries social assistance benefits, among automatic stabilizers, had an important role in cushioning the negative income shock of the crisis on the poorest quintile for the most severely affected: this occurred to a larger extent in the Netherlands, Finland and Greece, but also in Italy, France, Austria, and Cyprus. This result can be explained by the fact that, in recent years, some of these countries (especially the Netherlands, Greece, Italy, and, to some extent France) have significantly improved generosity and coverage of their means-tested social assistance programs, especially of Guaranteed Minimum Income (GMI) schemes.

5 Conclusion

This paper seeks to analyze the effectiveness of tax-benefit systems in mitigating the effect of the COVID-19 pandemic on household income in the EU. In the absence of actual data containing information on household income during the pandemic, we use the tax-benefit microsimulation model EUROMOD to nowcast the distribution of household disposable income during the first year of the pandemic in each EU country, based on information on labor market transition shares observed in the EU-LFS and administrative data. EUROMOD is further used to decompose the changes in the income distribution and to quantify the effects of: (i) earnings losses due to COVID-19, (ii) automatic stabilizers, (iii) monetary compensation schemes introduced during the pandemic; and (iv) COVID-19-specific reforms to taxes and benefits implemented by EU governments.

Our analysis provides a number of interesting findings. First, we show that there is a great deal of heterogeneity between countries in terms of earnings losses and the effect of tax–benefit policies during the COVID-19 pandemic. According to our nowcasting exercise, gross market incomes dropped between 1.8% in the Netherlands and around 15% in Malta during the first year of the pandemic. The cushioning role of tax-benefit systems is important as changes in mean disposable income are significantly smaller than those in market income in all countries. Second, in most countries, the largest contribution to cushioning the economic shock of the pandemic comes from monetary compensation schemes. In particular, our results show that the 'compensation' part accounts for the largest cushioning effect of monetary compensation schemes in most countries. Third, automatic stabilizers also play an important role in cushioning household incomes, contributing up to 6% to the change in mean disposable income in Ireland. In most countries, the cushioning effect of automatic stabilizers increases with income, depicting the role of taxes and social insurance contributions in providing income stabilization. In terms of benefits, unemployment insurance contributes the most to automatic stabilization, whereas the role of social assistance benefits is limited in most countries. Fourth, COVID-19-specific changes to taxes and benefits play only a minor role in most countries, except in Ireland, where they account for a 4% increase in household income. Finally, a similar pattern is observed for those severely affected by

the market income shocks, confirming the important role played by monetary compensating schemes across different population subgroups.

Our contribution to the literature is twofold. First, we extend the decomposition technique used in previous studies to take explicitly into account the 'earnings' effect and the 'compensation' effect of monetary compensation schemes, which arise from the underlying assumption of what would have happened to workers in the absence of such schemes. Moreover, we also decompose the contribution of COVID-19-specific reforms to taxes and benefits introduced during the pandemic. Second, we dig deeper into the role of tax-benefit systems in protecting household incomes of those who were most severely affected by the shock to market incomes. Assessing the role played by taxes and benefits across different population subgroups and income quintiles, is important from a policy perspective to make sure that income protection is ensured for those most vulnerable to economic shocks and to consider pathways to enhance social protection in view of future economic crises.

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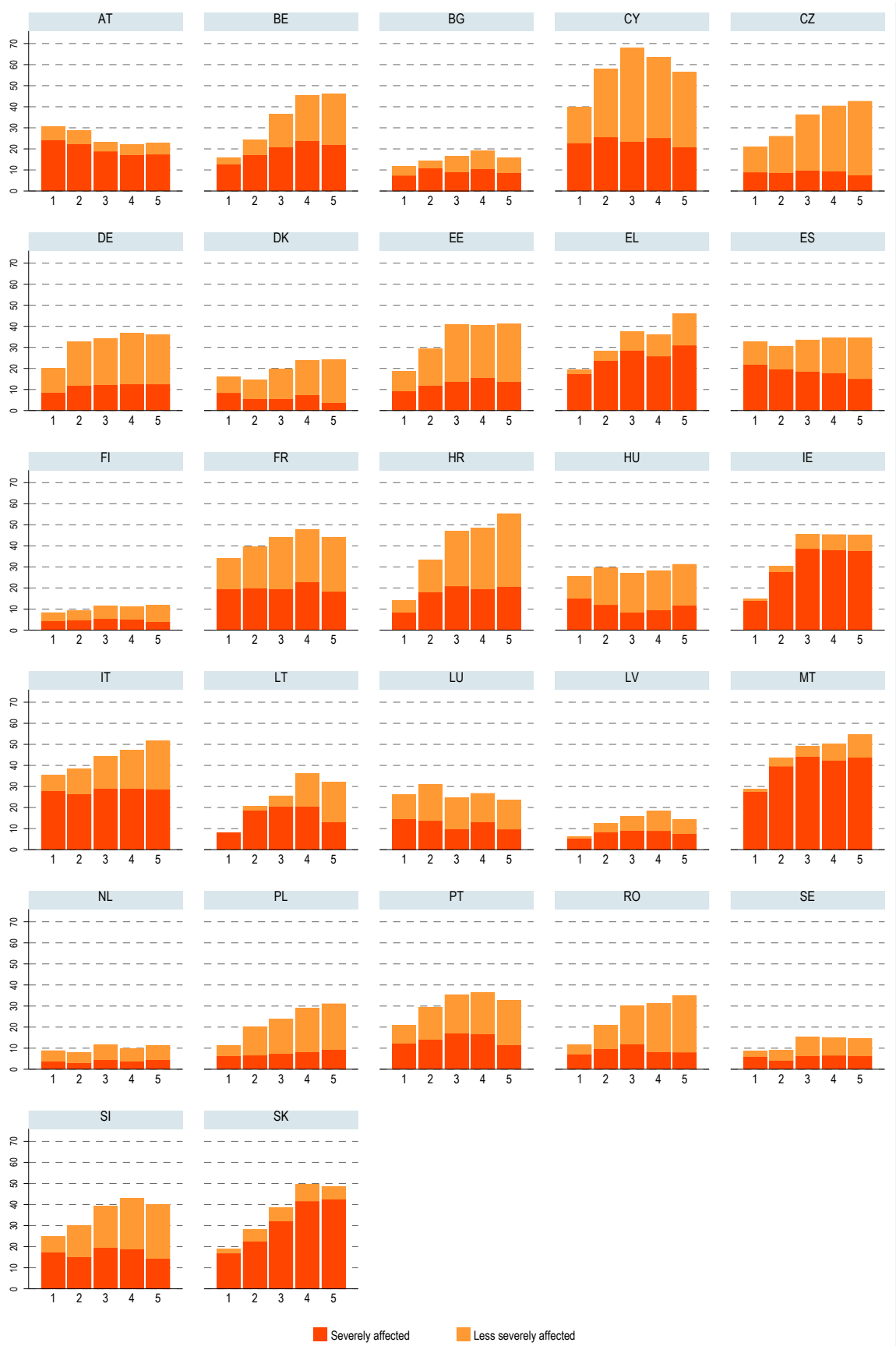
Appendix A. Results by income quintiles

Figure A1: Mean change in market vs. disposable incomes by income groups (in percent)

Note: Income groups defined based on Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

Figure A2: Share of population affected by changes in market incomes by income groups and level of severity



Note: Severely refers to losses in market income of more than 11 percent (Scenario A vs. D). Income groups defined based on Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

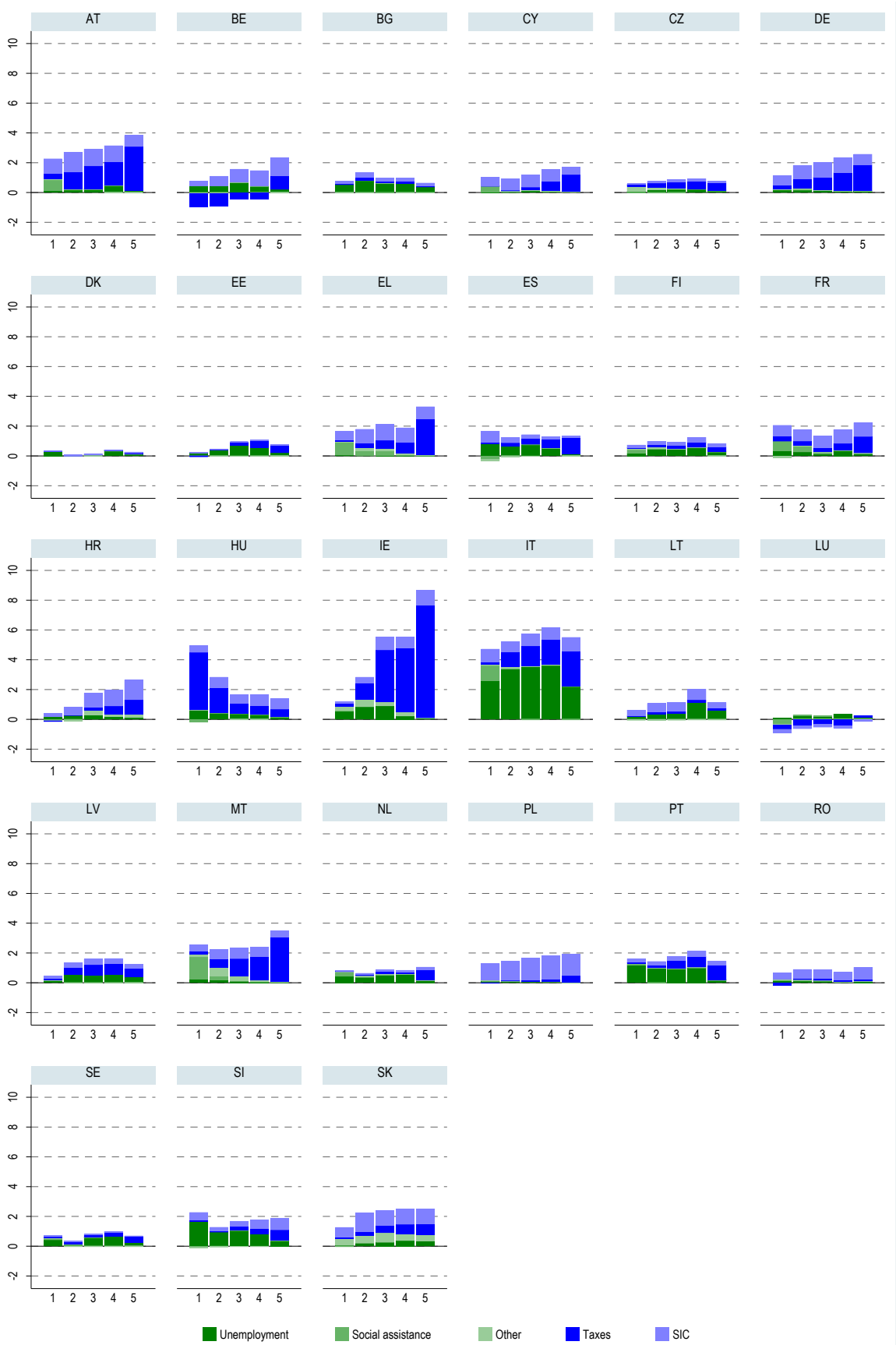
Figure A3: Mean change in market vs. disposable incomes of those severely affected by income groups (in percent)

Note: Severely refers to losses in market income of more than 11 percent (Scenario A vs. D). Income groups defined based on Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

Figure A4: Decomposition of changes in disposable income by income groups

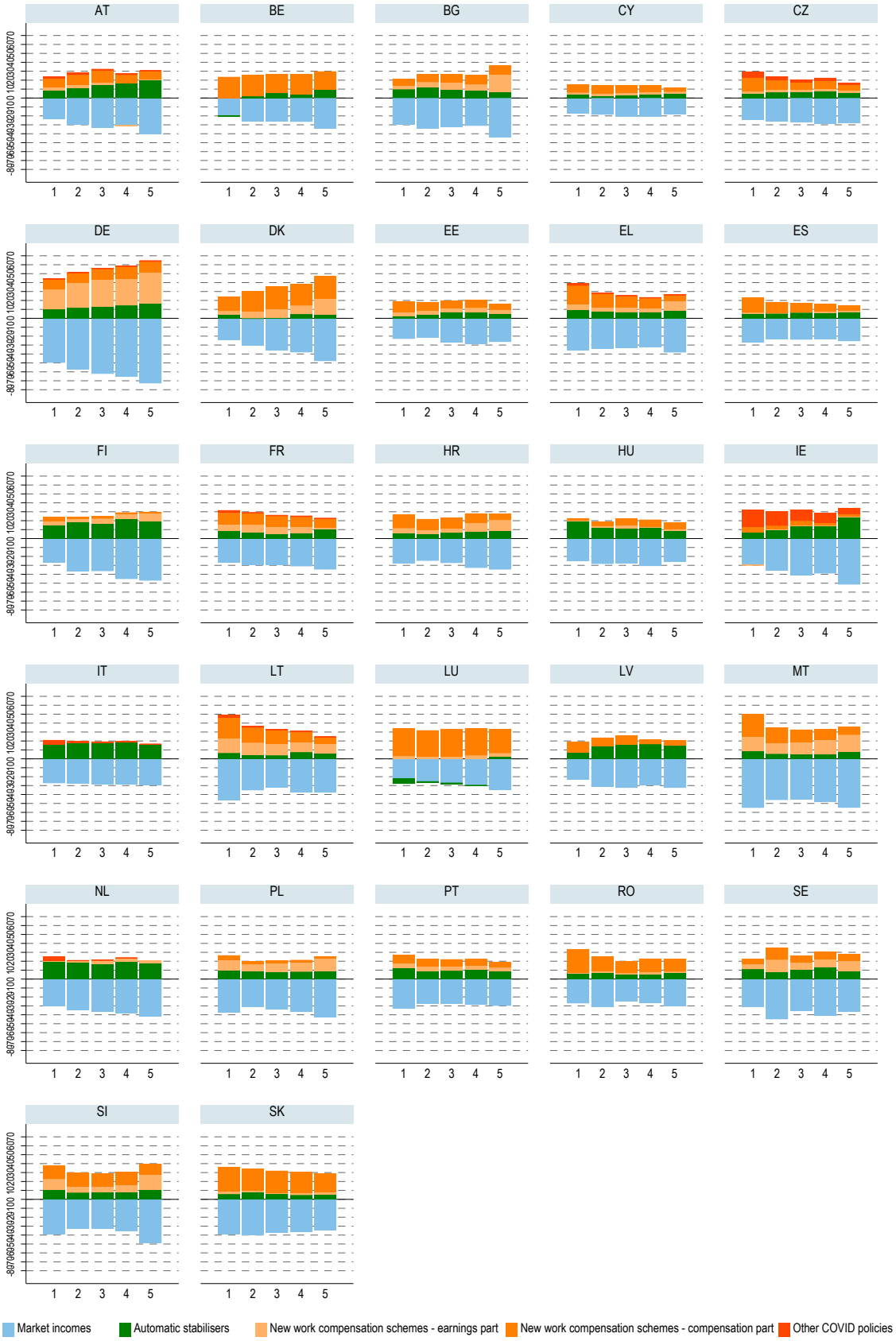
Note: Income groups defined based Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

Figure A5: Composition of automatic stabilizers by income groups



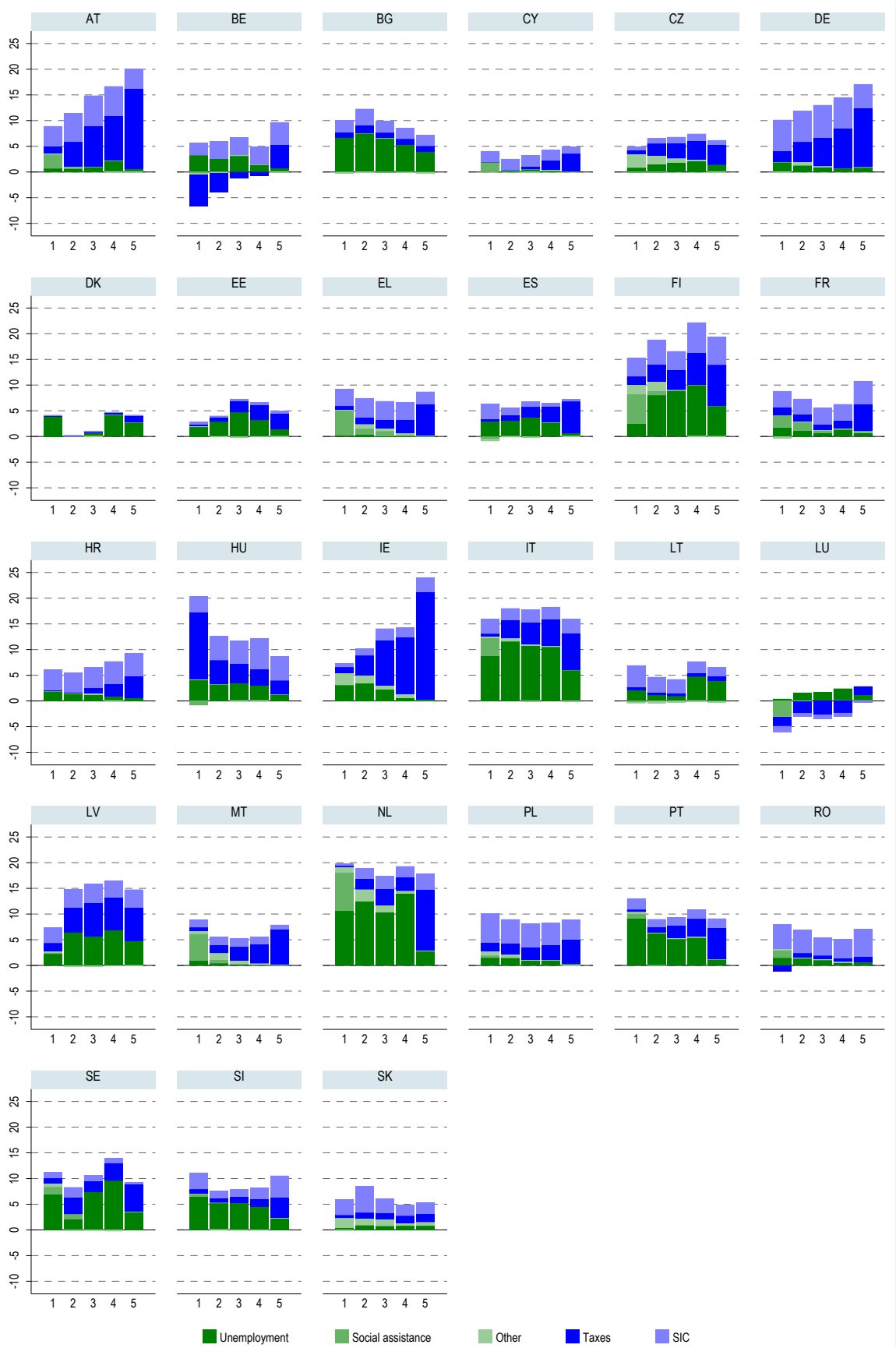
Note: Income groups defined based on Scenario D. Other includes housing, family and education, health as well as old-age and survivor benefits.
Source: Own calculations based on EUROMOD I4.0+.

Figure A6: Decomposition of changes in disposable income of those severely affected by income groups



Note: Severely refers to losses in market income of more than 11 percent (Scenario A vs. D). Income groups defined based on Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

Figure A7: Composition of automatic stabilizers by income groups of those severely affected



Note: Severely refers to losses in market income of more than 11 percent (Scenario A vs. D). Other includes housing, family and education, health as well as old-age and survivor benefits. Income groups defined based on Scenario D.
Source: Own calculations based on EUROMOD I4.0+.

Appendix B. Additional tables

Table B1: Transition shares by type of transition

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK
EMPL to UE																											
Women																											
- low-skilled	0.03	0.08	0.14	0.05	0.06	0.00	0.00	0.22	0.09	0.11	0.14	0.05	0.21	0.06		0.06	0.02	0.00	0.10	0.09	0.07	0.06	0.07	0.11	0.09	0.16	0.18
- middle-skilled	0.03	0.07	0.06	0.01	0.04		0.02	0.01	0.01	0.04	0.07	0.04	0.01	0.05		0.03		0.00	0.04	0.00	0.03	0.03	0.05	0.01	0.04	0.07	0.03
- high-skilled	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Men																											
- low-skilled	0.00	0.07	0.10	0.00	0.00	0.00	0.02	0.08	0.08	0.08	0.13	0.03	0.07	0.07		0.04	0.02	0.00	0.03	0.04	0.08	0.12	0.10	0.14	0.08	0.15	0.17
- middle-skilled	0.03	0.03	0.04	0.02	0.01		0.00	0.03	0.00	0.03	0.03	0.02	0.03	0.04		0.01		0.04	0.04	0.02	0.02	0.02	0.00	0.00	0.01	0.01	0.02
- high-skilled	0.00	0.00	0.00	0.00	0.01		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SELF to UE																											
Women	0.03	0.00	0.02	0.02	0.01	0.04	0.00	0.08	0.00	0.00	0.06	0.00	0.00	0.00		0.05	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.02	0.03	0.04
Men	0.03	0.00	0.01	0.00	0.01	0.04	0.00	0.02	0.02	0.01	0.00	0.00	0.00	0.00		0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.12	0.02
EMPL to MC																											
Women																											
	0.40	0.23		0.67	0.28		0.08	0.20		0.15		0.26	0.60	0.09		0.46		0.17			0.37	0.18	0.26		0.10	0.27	
	0.27	0.20		0.00	0.10		0.00	0.05		0.17		0.42	0.65	0.03		0.40		0.28			0.22	0.15	0.03		0.02	0.32	
	0.32	0.33		0.51	0.20		0.13	0.27		0.17		0.33	0.33	0.08		0.33		0.19			0.40	0.16	0.18		0.07	0.28	
	0.85	0.78		0.81	0.65		0.52	0.85		0.46		0.71	0.76	0.36		0.76		0.43			0.65	0.59	0.60		0.24	0.78	
	0.14	0.23		0.25	0.24		0.06	0.14		0.15		0.38	0.25	0.10		0.33		0.18			0.17	0.24	0.14		0.03	0.10	
Men																											
	0.34	0.26		0.36	0.17		0.08	0.31		0.14		0.28	0.61	0.08		0.41		0.16			0.49	0.14	0.20		0.15	0.25	
	0.31	0.38		0.73	0.11		0.03	0.23		0.23		0.63	0.44	0.08		0.66		0.37			0.34	0.13	0.07		0.04	0.21	
	0.33	0.26		0.38	0.14		0.10	0.18		0.15		0.35	0.50	0.08		0.32		0.15			0.35	0.12	0.15		0.07	0.23	
	0.77	0.85		0.61	0.78		0.35	0.82		0.49		0.79	0.67	0.24		0.75		0.38			0.54	0.61	0.59		0.23	0.75	
	0.11	0.20		0.14	0.16		0.09	0.16		0.10		0.36	0.19	0.06		0.19		0.13			0.15	0.12	0.09		0.02	0.07	

Note: Information retrieved from EUROMOD I4.0+. Transition shares are differently defined in selected countries and based on country-specific information. This is the case for Germany, Greece, Ireland, Lithuania, Latvia, Malta, Romania, and Slovakia. The applied shares are documented in the respective country-models. Transition shares from employment to monetary compensation schemes are defined by gender and aggregated sectors. Sector 1 refers to agriculture and industry; sector 2 refers to construction; sector 3 refers to wholesale, retail, transport, communication and financial intermediation; sector 4 refers to real estate and business, public administration and defence, education, health and social work and other sectors; sector 5 refers to hotels and restaurants.
Source: EUROSTAT based on LFS statistic

Table B2: COVID measures considered in the analysis

Country	Monetary compensation schemes	Additional COVID-related policy
AT	COVID hardship fund for self-employed	Unemployment insurance benefit increase
	COVID short-time work	Unemployment assistance benefit increase
		Additional lump-sum and increased income limit for family allowance recipients
		Decreased tax rate for income tax
		Higher increase of commuters' tax credit supplement
		Higher increase of negative income tax supplement
BE	Temporary unemployment scheme for employees	
	Compensation premium for self-employed	
BG	Monetary compensation scheme for employees	
CY	Unemployment scheme for employees	
	Unemployment scheme for self-employed	
CZ	Monetary compensation scheme for employees	COVID bonus for pensioners
		Reduction of SIC for self-employed
	Self-employment income compensation	
DE	Wage compensation	One-off child bonus
	Self-employment income compensation	
DK	Wage compensation	
	Self-employment income compensation	
EE	Wage compensation	
EL	Wage compensation	Extended provision of unemployment insurance benefit
	Self-employment income compensation	
		Extended provision of unemployment assistance
		Top-up of existing GMI
ES	Wage compensation	
	Self-employment income compensation	
FI	Self-employment income compensation	
FR	Wage compensation	Additional support for self-employed
	Self-employment income compensation	Social assistance linked to COVID
		Exceptional increase of the means-tested education-related family benefit
HR	Wage compensation	
HU	Wage compensation	
IE	Wage compensation	Job seekers transitional payment
		Pandemic unemployment benefit
IT		Minimum income
		Bonus for self-employed
		Bonus for employees
		Mortgage subsidy for self-employed
LT	Temporary benefit for self-employed	Sickness benefits for taking care of children during COVID-19
	Subsidies to remain in the labor market during COVID-19 quarantine	Temporary jobseeker's benefit
		Social assistance increase due to COVID
LU	Wage compensation	
LV	Downtime benefit for employees	
	Downtime benefit for self-employed	
	Supplementary payment to downtime benefit for dependent children	
MT	Wage compensation	

	Self-employment income compensation	
NL	Monetary compensation for employers	Temporary social assistance for self-employed
PL	Wage compensation	
	Self-employment income compensation	
PT	Wage compensation	
	Self-employment income compensation	
RO	Wage compensation	Compensation for parental leave
	Self-employment income compensation	
SE	Wage compensation	
SI	Wage compensation	
	COVID-19 universal income for self-employed	
	COVID-19 lump sum allowance for vulnerable groups	
SK	Wage compensation	
	Self-employment income compensation	
	Additional pandemic nursing benefit	

Source: Own compilation based on EUROMOD Country Reports[3]

[3] https://euromod-web.jrc.ec.europa.eu/resources/country-reports