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JEL Cassification: J62, J63, E24, E32

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This paper analyses the effect of the COVID-19 pandemic on household disposable income and household demand in the European Union (EU) during 2020, making use of the EU microsimulation model EUROMOD and nowcasting techniques. We show evidence of heterogeneity in the impact of the COVID-19 pandemic on the labour markets in EU Member States, with some countries hit substantially harder than others. Most EU Member States experience a large drop in market incomes, with poorer households hit the hardest. Tax-benefit systems cushioned significantly the transmission of the shock to the disposable income and the household demand, with monetary compensation schemes playing a major role. Additionally, we show that monetary compensation schemes prevent a significant share of households from becoming liquidity constrained during the pandemic.

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**An analysis of the impact of COVID-19 on household income in the Euro Area with different data and different time-horizons was included in the Quarterly Report on the Euro Area (QREA), Vol 20(4), Chapter one, European Commission.

1. Introduction

The COVID-19 pandemic hit Europe severely in 2020, leading to a large reduction in gross domestic product (GDP) across all EU Member States. Households faced an increased risk of unemployment due to lockdown measures and the general reduction in economic activity. Member States tried to withstand the crisis with specific policy measures. In particular, monetary compensation schemes (MC) (short-time work (STW) for employees and schemes for the self-employed) aimed at compensating workers for the reduction in their economic activity played a major role in stabilising household incomes and demand as well as enabling a smoother return to economic activity for workers and firms.

In addition to MC schemes, European governments adopted various policy measures to cushion against a strong drop in household income. This raises the following questions: To what extent did the tax-benefit systems of the EU Member States protect household incomes during the COVID-19 pandemic? Which was the contribution of tax-benefit systems to stabilise household demand and, therefore, the overall economy? Did monetary compensation schemes prevent a significant share of households from becoming liquidity constrained during the pandemic?

Our analysis uses EUROMOD to estimate the cushioning effect of taxes and social transfers on both household income and household demand in the context of the COVID-19 pandemic. EUROMOD is the microsimulation model of the EU. We employ detailed labour market statistics provided by Eurostat to simulate transitions from work into unemployment and MC schemes (e.g. STW schemes, monetary support for the self-employed) to replicate the labour market conditions of 2020 using the underlying EU Statistics on Income and Living Conditions (SILC) data.

To the best of our knowledge, this research is the first to employ this approach in studying the cushioning effect of taxes and social transfers in the context of the COVID-19 pandemic for each EU Member State and for the EU as a whole. The paper contributes to the literature in the following ways.

First, we apply an innovative nowcasting approach to study the consequences of the observed changes in labour market conditions during the pandemic using the microsimulation model EUROMOD. This methodology allows us to simulate transitions to MC schemes at the micro level. Our approach allows us to take the duration of labour market transitions into account at the individual level. This is fundamental in the context of the COVID-19 crisis, given that some workers were hit only during lockdown periods, while other workers suffered long-term loss of employment. To estimate the impact of COVID-19 at the micro level and calculate the stabilising effect of tax-benefit systems, it is very important not only to consider the duration of policy measures but also the duration of labour market transitions.

Second, this paper is the first EU-wide assessment of the cushioning effect of taxes and social transfers during the COVID-19 pandemic, including unemployment benefits and MC schemes (STW schemes and compensation for the self-employed), using this novel methodology based on the labour market transition approach and considering that in some countries MC schemes were only in place for a limited time and the maximum duration of unemployment benefits was less than one year.

Third, we provide an initial assessment of the impact of the COVID-19 pandemic on household demand by estimating its impact on liquidity constrained (LC) households and analysing the role of tax-benefit systems in stabilising household demand, looking particularly at MC schemes.

Our research indicates that most countries experienced a significant drop in market income during 2020, with poorer households hit harder than richer ones. However, the COVID-19 shock was partially absorbed by the tax-benefit systems in EU Member States, which caused disposable income to fall to a substantially lesser extent and in a progressive way. We discover that MC schemes play a key role in protecting household income against the effect of the crisis. When it comes to demand stabilisation, we can see that most tax-benefit systems in EU Member States absorb a substantial part of the potential drop in aggregate household demand, indicating that fiscal policy, and especially MC schemes, played a crucial role in stabilising household income, household demand and, therefore, the economy as a whole.

This paper is organised as follows. Section 2 provides an overview of the related literature; section 3 outlines the data and methods employed; section 4 presents the results and section 5 provides a conclusion.

2. Literature

Both macro- and micro-based approaches are traditionally used to assess the stabilisation properties of tax-benefit systems. The macroeconomic approach employs macroeconomic models to quantify the stabilisation effect of fiscal policy on GDP. Macro-based stabilisation coefficients have the significant advantage of embedding both direct and indirect (second round) effects of fiscal policy, including behavioural responses and macroeconomic feedback. However, macro-based estimates often require a high degree of simplification when modelling the fiscal policy rules in a certain country, and they allow for limited distributional analysis. The microeconomic approach typically employs microsimulation models to quantify the stabilisation properties of tax-benefit instruments. This approach enables a detailed representation of the tax-benefit rules in a certain country, including recent policy reforms, and it produces reliable simulations of the cushioning effect of tax-benefit systems along various dimensions, e.g. income distribution. In its basic form, the microeconomic approach disregards second round effects, focusing on the 'day after' effect of shocks or policy reforms (Mohl et al., 2019).[1]

In this paper, we provide a micro-based assessment of the cushioning effect of EU tax-benefit systems on household income and demand, including the policy response to the pandemic. The reasons for this choice are twofold: first, distributional considerations are important when assessing the shock absorption properties of tax-benefit systems, and second, it allows us to simulate the characteristics of tax-benefit systems in EU Member States with a high level of accuracy and precision.

The literature on the impact of the COVID-19 pandemic on household income and, as a consequence, on income inequality, is increasing rapidly. Given the lack of detailed up-to-date microdata, several attempts have been made to obtain insights on the depth of the crisis and the related income drop in households.

A first strand of the literature uses specific survey data that was created with the sole purpose of collecting additional information related to the COVID-19 crisis. Clark et al. (2020) use the COME-HERE survey, a COVID-19-related survey for France, Germany, Italy, Spain and Sweden. They show that during 2020, both relative and absolute income inequality fell, indicating that poor households may have benefited more than rich households from the policy measures implemented by governments. Similarly, Menta (2021) uses the COME-HERE data to demonstrate that poverty rates increased in the first half of 2020 but fell again in the second half of the year; however, these results vary across the five countries analysed. The author also finds that young individuals and women especially suffered a disproportionately high increase in poverty. Despite the timelines, the data used in these studies are not very detailed (especially on income), leading to several shortcomings when analysing and interpreting the results. In particular, in light of the focus of this paper, Clark et al. (2020) and Menta (2021) did not study the role of governments in cushioning the impact of the crisis on the incomes and demands of households.

A second strand of the literature aims to nowcast the underlying microdata to new labour market characteristics using different modelling approaches, which is similar to the approach used in this paper. The findings suggest that at the onset of the crisis, both automatic stabilisers and discretionary policy measures had an important role in the UK (Brewer and Tasseva, 2021; Bronka et al., 2020), Italy (Figari and Fiorio, 2020) and (Monteduro et al., 2022), Germany (Bruckmeier et al., 2021) and Finland (Kyyrä et al., 2021). The country-specific studies represent an important step in understanding the roles of EU Member States in alleviating the worst effects of the crisis. However, comparing

[1] They also describe the statistical approach for the computation of automatic stabilisation coefficients. The approach is used in fiscal surveillance and focuses on the extent to which the government budget balance responds to a change in GDP. In particular, automatic stabilisers are identified as the cyclical components of the government budget balance. Although relevant, this concept is only partially related to the stabilising effect of fiscal policy on household incomes.

them is difficult because of differences in methodology, data and the time horizons used.

In a cross-country setting, Cantó et al. (2021) analyse the impact of the first month of the COVID-19 pandemic in a cross-country framework for Belgium, Italy, Spain and the UK. The analysis highlights that the fiscal response of governments helped cushion the impact of the COVID-19 pandemic not only on household income but also on inequality. In all four countries, income inequality remained more or less stable during the pandemic; however, the tax-benefit systems were not well-equipped to counteract the poverty-increasing nature of this shock. One major limitation of this research is that, in contrast to this study, the time horizon of the analysis is restricted to April 2020. Considering a longer period is important as subsequent pandemic waves have heterogeneously affected individuals in different sectors or occupations.

Using a different approach to update the microdata, namely, by reweighting the underlying survey data, Almeida et al. (2021) analyse the impact of the COVID-19 pandemic on household income for all 27 EU countries. They use the differences in macroeconomic forecasts before and after the COVID-19 pandemic to create counterfactual scenarios and estimate the cushioning effect of policy measures during the crisis. They discovered that governmental policy measures had a substantial effect on cushioning the income loss of households in the EU, lowering the income loss from –9.3% to –4.3% for the average equivalised disposable income. Additionally, the authors found that policy measures were key in reducing the regressive, poverty-increasing impact of the COVID-19 pandemic; however, they also found substantial differences in the cushioning effect across the 27 EU countries.

As highlighted by Cantó et al. (2021), the approach by Almeida et al. (2021) has two drawbacks: first, reweighting assumes that the newly unemployed have similar characteristics to the unemployed observed in the underlying microdata. In times of crisis, this is a very strong assumption, as the shutdown of specific sectors during the COVID-19 pandemic questions this assumption. Second, this approach takes the macro forecast of wages into account (which includes the impact of policy measures) to simulate the impact of the crisis. However, the heterogeneous effects of these policies at the micro level are not considered. As explained in the next section, we overcome these shortcomings by employing detailed statistics on the type of workers affected by the crisis to model the transition to unemployment and MC schemes.

3. Methodology and Data

The analysis uses the EU tax-benefit microsimulation model EUROMOD and relies on data from the 2019 EU-SILC (2018 incomes).[2] EUROMOD allows direct tax liabilities

[2]2018 EU-SILC (2017 incomes) data for Belgium, Sweden and Slovenia were used because the 2019 EUROMOD data was not available at the time of analysis.

and cash benefit entitlements to be simulated comparably across EU countries. Tax-benefit instruments that cannot be simulated due to a lack of information in the underlying EU-SILC data are taken directly from the microdata. EUROMOD is a static tax-benefit simulator because it simulates the day-after effect of policy changes and disregards any potential behavioural response. The model has been validated at both the micro and macro level and has been tested in several applications. For a comprehensive overview, see Sutherland and Figari (2013).

This analysis is based on tax-benefit rules in 2020. As the underlying data refer to 2018 incomes, the monetary values of market incomes and non-simulated tax and benefit instruments are uprated to the relevant year using specific uprating factors.[3] Furthermore, microdata have been adjusted to account for the significant adverse changes in labour market conditions that occurred during 2020 as a consequence of the COVID-19 pandemic.

We introduce a novel, innovative nowcasting approach to study the consequences of the observed changes in labour market conditions during the pandemic using the microsimulation model EUROMOD. This methodology allows us to simulate transitions to MC schemes at the micro level.[4] Building on EUROMOD's Labour Market Adjustment (LMA) add-on, we can simulate the policies triggered by changes in the labour market status of individuals. Although only standard labour market transitions have been modelled so far (employment to unemployment and vice versa), we can now also model the transition from employment to monetary compensation, which was the most common transition during the COVID-19 pandemic. A detailed description of this tool is provided in Appendix A.

3.1. Data

We employ statistics on the share of workers experiencing transitions from work to unemployment or from employment or self-employment to MC schemes to mimic the labour market conditions of 2020 as observed in the underlying EU-SILC data.[5]

All of these labour transitions are modelled using data provided by Eurostat, which are based on detailed information from the Labour Force Survey (LFS) in combination with detailed administrative data. The impact across different types of individuals (males or females, employees or self-employed, etc.), the duration of unemployment/absence and the percentage of reduction in the share of hours worked are modelled using the EU-LFS

[3] For detailed information on the uprating factors used, see the specific EUROMOD Country Reports.

[4] The novelty of EUROMOD Verion I3.86+ was developed in close collaboration with the flash estimates team at EUROSTAT and the EUROMOD national teams.

[5] Please note, we do not account for the transition from inactivity/unemployment to employment because 1) this transition played a very minor role in 2020, and 2) modelling it would require a large number of assumptions to be made (for example, related to the potential wage of each transitioning individual).

longitudinal and quarterly transitions as the target.[6]

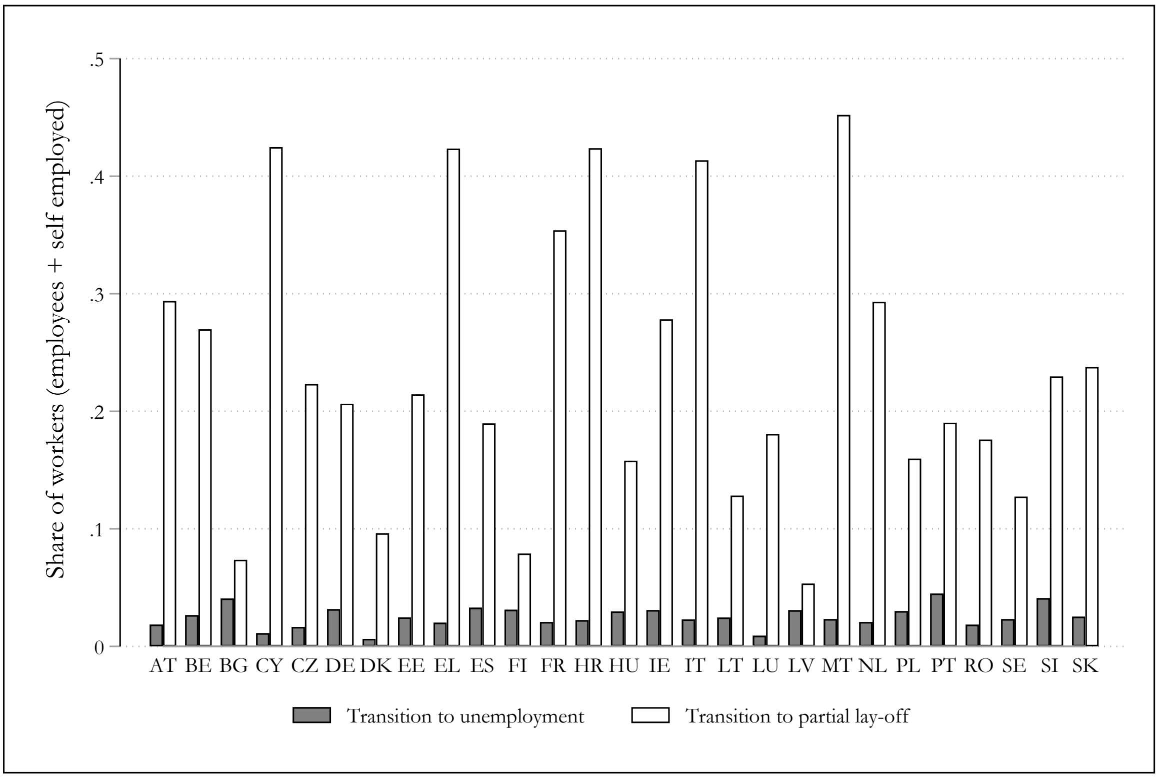
To ensure the most accurate replication of the 2020 labour market conditions, we use a very high degree of disaggregation when modelling transitions. With respect to the transition from work to unemployment, the level of disaggregation is based on gender and the level of education separately for employees and the self-employed. Transitions from employment to MC schemes are modelled by the sector of activity and gender separately for employees and the self-employed. Within each degree of disaggregation (gender, sector, self-employed or employees, etc.), workers are randomly assigned into a new labour market status until the target number of transitions is reached.

To give a brief overview of the impact of COVID-19 on the labour markets in the EU Member States, Figure 1 shows the yearly aggregate transition rate for 2020 for both unemployment and partial lay-offs.[7] We find evidence of heterogeneity across EU Member States in both transitions. In some countries, e.g. Cyprus, France, Greece, Croatia, Italy and Malta, more than 40% of workers (including the self-employed) moved to partial lay-off, but in other countries, such as Bulgaria, Denmark, Finland and Latvia, the share is below 10%.

[6] For more information, please consult the Methodological Note of Eurostat.

[7] Partial lay-off covers workers still employed but temporarily absent from work or workers who reduced their working hours due to the lockdown. For these transitions, we model an exogenous income shock to account for their loss of income. These workers (especially employees) are often covered by MC schemes or similar measures.

Figure 1: Labour market transitions in 2020 - EU Member States



Source: Our elaboration on Eurostat data (2021), which are based on a combination of the LFS and administrative data.

When looking at the impact on unemployment, we can, on the one hand, see that in Member States, such as Portugal, Slovenia, Bulgaria, Spain, Germany and Finland, more than 3% of workers (including the self-employed) lost their job and moved to unemployment. On the other hand, in Member States, such as Denmark, Luxembourg or Cyprus, this number is close to 1%, indicating that the COVID-19 pandemic had a comparatively small impact on unemployment.

The statistics employed to simulate labour transitions are further disaggregated by the duration of unemployment and MC scheme as well as the reduction in the hours worked during the spell. This allows us to cover the shock for 2020 in its entirety using homogenised data across EU countries.

3.2. Scenarios

The analysis compares three alternative scenarios for 2020: i) labour market transitions to and from unemployment and/or partial lay-offs did not occur; ii) labour market transitions occurred and MC schemes simulated; iii) labour market transitions occurred but MC schemes not implemented, meaning that partial lay-offs were not compensated by the government. This comparison allows us to focus on the extent to which 2020 policies protected the incomes of households that underwent these labour market changes.

More formally: let t be the tax-benefit function that depends on the tax-benefit system (P) as well as the labour market condition, LM, including COVID-19-related labour market transitions (LM^{Trans}) or not ($LM^{NoTrans}$). We can then define our scenarios as follows:

- **Baseline (no COVID-19 scenario):** Our baseline is a hypothetical COVID-19-free scenario, where COVID-19-related labour market transitions do not take place. We use the 2020 tax-benefit system in EUROMOD with the underlying input data. In more formal terms: $t(P_{2020}, LM_{2020}^{NoTrans})$.
- **COVID-19 scenario:** The COVID-19 scenario is also based on the 2020 tax-benefit system, but simulates all the transitions to MC schemes (for employees and self-employed) and unemployment. This scenario updates the microdata using labour market transitions to account for the labour market shock generated by the COVID-19 crisis. In more formal terms: $t(P_{2020}, LM_{2020}^{Trans})$.
- **No government intervention scenario:** This scenario does not consider the targeted intervention of the government, meaning that MC schemes are not considered.[8] However, workers still have access to the standard policy measures of the welfare state. In more formal terms: $t(P_{2020}^{NoMC}, LM_{2020}^{Trans})$.

3.3. Income stabilisation coefficient (ISC)

We analyse to what extent market incomes and disposable incomes vary between the baseline scenario and the COVID-19 scenario. Therefore, we compute the income stabilisation coefficient (ISC) in the spirit of Dolls et al. (2012):

$$ISC = 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M} = \frac{\sum_i \Delta Y_i^M - \sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M}, \tag{1}$$

where ΔY_i^D is the change in disposable income and ΔY_i^M is the change in market income for individual i. The coefficient is reported in percentage terms (ISC*100). Intuitively, it indicates the share of a shock that is absorbed by the tax-benefit system. ISC=100 indicates

[8]Please note that this scenario implies that we observe the same number of lay-offs as in the COVID-19 scenario. This is an extreme assumption and implies that our results should be seen as an upper bound of the impact of the COVID-19 pandemic in the absence of MC schemes.

no change in disposable income despite a change in market income, and ISC=0 indicates that disposable income changes exactly as much as market income, hence, the shock is fully transmitted to disposable income.

Additionally, we provide a decomposition of disposable income that allows us to analyse the role that each tax-benefit component plays in the stabilisation of household disposable income in the aftermath of the labour market transitions that occurred due to the pandemic. We decompose the ISC in parts attributed to taxes and social insurance contributions (SICs), MC schemes, unemployment benefit and other benefits and pensions:

$$ISC = \frac{\sum_i \Delta Y_i^M - \sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M} = \frac{\sum_i \Delta T_i - \sum_i \Delta UB_i - \sum_i \Delta MC_i - \sum_i \Delta OB_i}{\sum_i \Delta Y_i^M}, \quad (2)$$

where T_i are taxes and SICs paid by individual i, MC_i is monetary compensation (for employees and the self-employed) received by individual i, UB_i is unemployment benefit and OB_i are other benefits, including pensions.

The ISC and its decomposition is provided for the entire population and by income quintile groups as defined in the baseline based on equivalised disposable income.

3.4. Demand stabilisation coefficient (DSC)

To measure the impact of the crisis on household demand, we follow the approach of Paulus et al. (2017). Based on Auerbach and Feenberg (2000), we assume that for transitory income shocks, household demand will not change given the possibility of borrowing or using savings. Only households with liquidity constraints will adjust their consumption as a result of a temporary income shock (see Clinton et al. (2011) or Galí et al. (2007)), according to their income loss.

Following Paulus et al. (2017) and Jappelli et al. (1998), we identify liquidity (and credit) constrained (LC) households as those who state not having 'the capacity to face unexpected financial expenses' in the EU-SILC 2019 data. We then use this information to predict the probability of being LC based on income (Y), household assets (A) and other socio-economic characteristics (X) of the household. We set up a logit model to predict the probability of each household being LC in each of our scenarios. Results of the logit model for all countries are reported in Tables B.1 - B.3. Given that several individuals' disposable income was affected during the crisis, our estimation on the probability of households being LC is also affected.

Then, to establish the extent to which European tax-benefit systems cushion against a fall in household demand, we estimate the DSC in a similar way to the ISC.

$$DSC = 1 - \frac{\sum_i \Delta Y_i^{D,LC}}{\sum_i \Delta Y_i^{M}}, \tag{3}$$

where $\Delta Y_i^{D,LC}$ is the change in disposable income of all individuals i that are LC, and ΔY_i^{M} is the change in market income for individual i. Please note that $\Delta Y_i^{D,LC}$ is an expected value based on the probability of being LC.

In addition to computing ISC and DSC, we also analyse the share of resources targeted to Liquidity Constrained households following the pandemic, how the COVID-19 crisis affected the probability of being liquidity constrained and how tax-benefit instruments mitigated this risk. This allows us to assess the effectiveness of the tax-benefit system in targeting households that are expected to reduce demand the most due to a temporary income shock, such as the COVID-19 pandemic. We estimate whether COVID-19 has increased the number of LC households in 2020. To be more precise, we estimate the difference in the probability of being LC in the baseline and after the income shock $(PR(LC = 1|\hat{Y}_{COVID-19}, A, X) - PR(LC = 1|\hat{Y}_{baseline}, A, X))$. We also want to assess to what extent fiscal policy measures avoid further increases in LC households; therefore, we analyse the estimated probability of being LC in the COVID-19 scenario as well as in the no government intervention scenario $(PR(LC = 1|\hat{Y}_{NoMC}, A, X) - PR(LC = 1|\hat{Y}_{COVID-19}, A, X))$.

4. Results

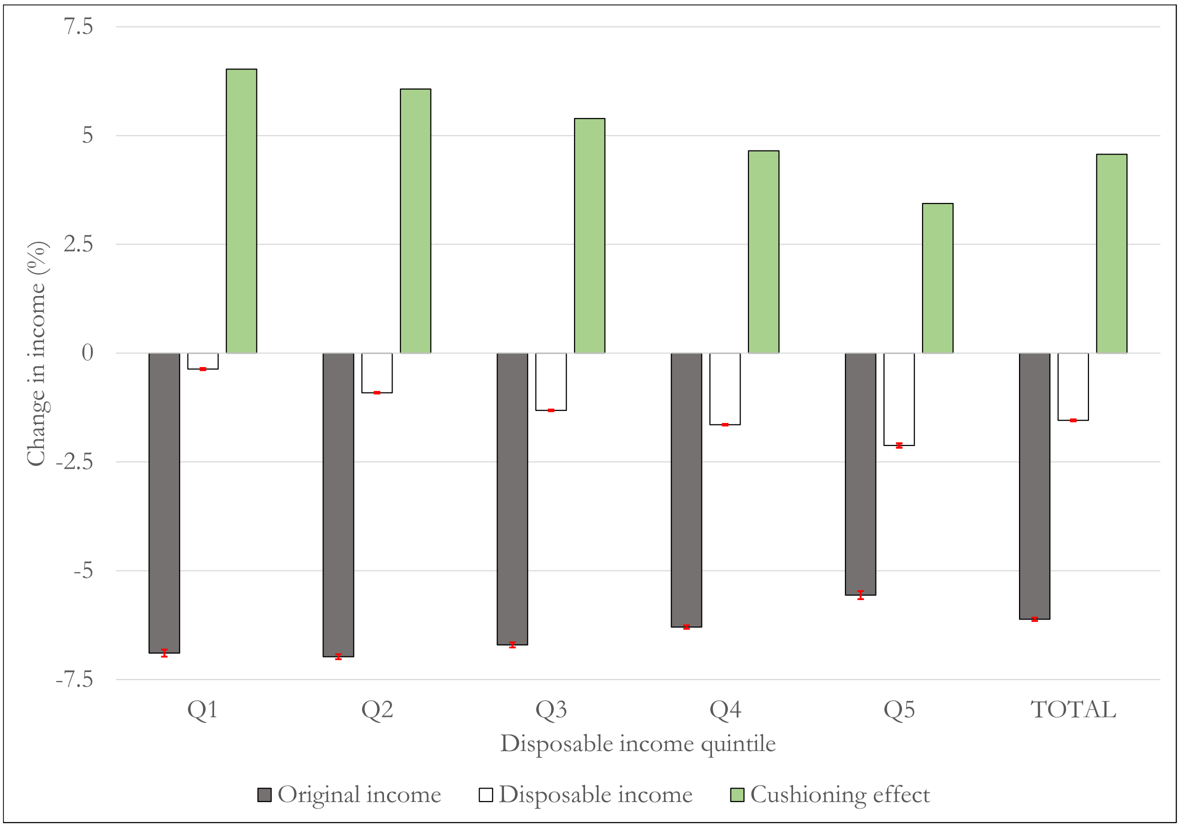
4.1. Impact of COVID-19 on household income

To examine how the impact of the COVID-19 pandemic on the labour market translates to household income, we first analyse its impact on market and disposable incomes in the EU by quintile groups and for the entire population.[9] Figure 2 demonstrates that overall market income in the EU drops by about 6.1%. This effect is slightly stronger for low-income households. In the first and second quintile, households experience a drop of 6.9%, while in the highest quintile, the drop was about 5.5%. This indicates that the COVID-19 pandemic has a slightly regressive impact on household market income.

However, when focusing on disposable income, this picture is reversed, meaning that tax-benefit systems seem to reverse the regressive nature of the shock, resulting in an income drop for low-income households (in the first quintile) of about -0.4%, while richer

[9] The EU-level indicators are built by aggregating the raw changes in market (disposable) income at the EU level and dividing the aggregated market (disposable) income in the baseline system. The EU indicators by quintile are built using the same logic but aggregate market (disposable) incomes by quintile based on the equivilised disposable income.

Figure 2: Change in market and disposable incomes (%) – EU



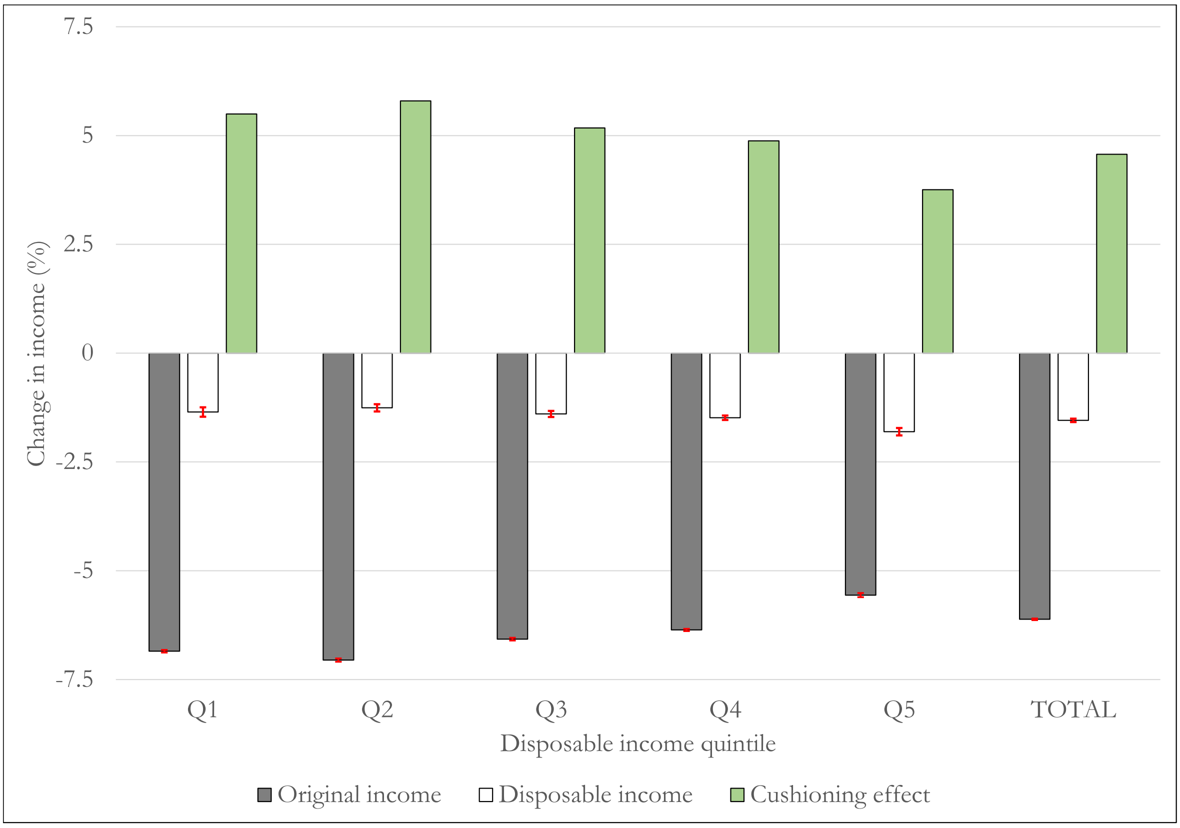
Note: Quintile groups defined in the baseline scenario based on equivalised disposable income. Standard errors are calculated by bootstrapping with 50 repetitions.
Source: Authors' calculation using EUROMOD I3.86+

households (in the fifth quintile) are confronted with a drop in disposable income of about -2.1%. Overall, disposable household income is expected to drop by 1.5%. Looking at the cushioning effect of the EU Member States' tax-benefit systems (green bar), we can see that it is substantially stronger in the lower part of the income distribution than in the upper part.

Taking into account that households might change their position in income distribution, we also show the impact on income by comparing the level and composition of household net incomes in the baseline and COVID-19 scenarios within each quintile group after re-ranking households in each of the scenarios.

Not surprisingly, Figure 3 shows that the total impact on both market and disposable income stays the same as the scenario in which household income distribution is not re-ranked; however, the distributional impact changes substantially. Households in the first

Figure 3: Change in market and disposable incomes (%, re-ranked) – EU

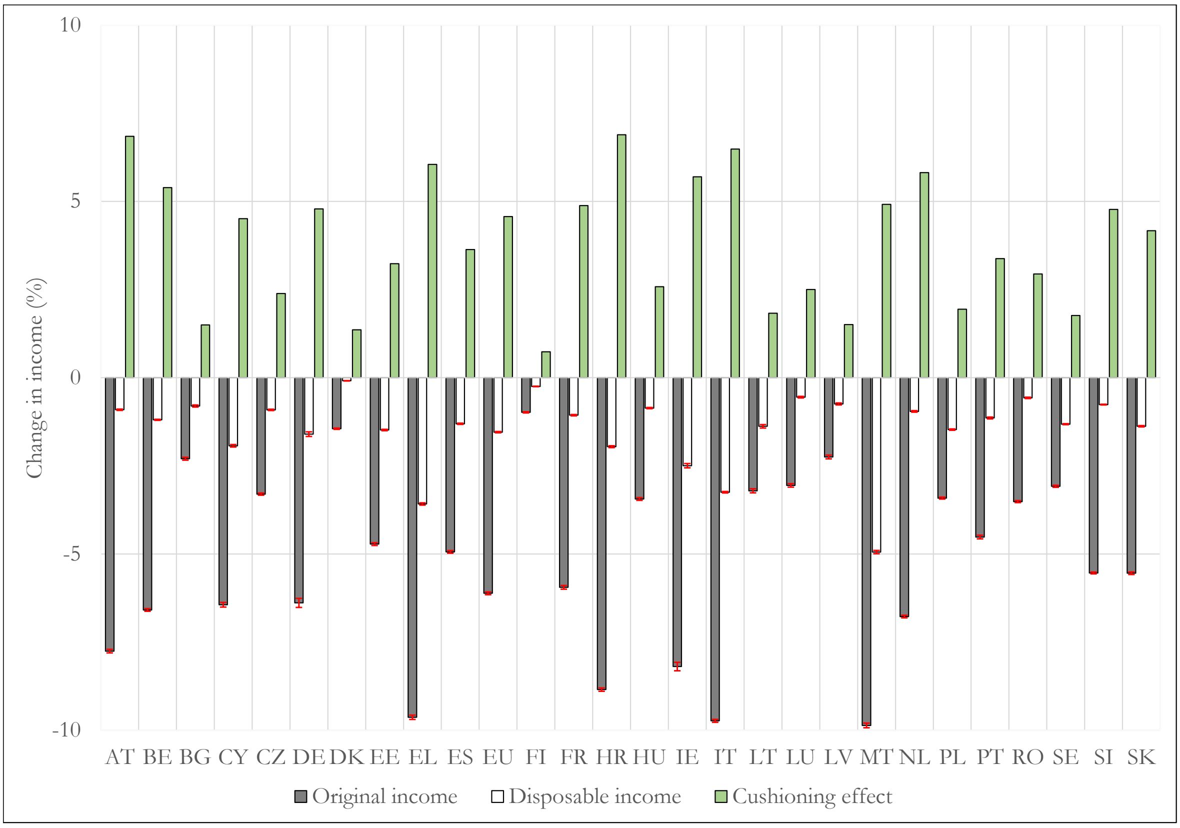


Note: Quintile groups defined in each scenario based on equivalised disposable income. Standard errors are calculated by bootstrapping with 50 repetitions.
Source: Authors' calculation using EUROMOD I3.86+

quintile lose, on average, 6.8% of market income, while households in the fifth quintile lose about 5.6% of their market income. Looking at disposable income, the impact of the COVID-19 pandemic is more equal, meaning that low-income households (first quintile) lose about 1.4% of their disposable income, while high-income households lose about 1.8%. As a result, the cushioning effect of the tax-benefit system is less progressive than when re-ranking is not accounted for.

As already shown, the labour market impact of the COVID-19 pandemic was very diverse across EU Member States. Therefore, its impact on market income is estimated to differ substantially across Member States. However, tax-benefit systems are designed differently across countries; therefore, their mitigating effects can be very different. Looking at the country-specific results in Figure 4, we can see that the drop in market income is stronger in countries, such as Malta (-9.9%), Italy (-9.7%), Greece (-9.6%) and Ireland (-8.2%), while in Finland and Denmark, we only estimate a drop of about 1% and 1.4%,

Figure 4: Change in market and disposable incomes – EU Member States



Note: Standard errors are calculated by bootstrapping with 50 repetitions.
Source: Authors' calculation using EUROMOD I3.86+

respectively. Overall, market income drops in all Member States.

Tax-benefit systems in EU Member States can absorb a substantial part of this market income loss. A very strong cushioning effect (defined as the difference between the drop in market income and the drop in disposable income) can be observed in Croatia, Austria, Belgium, Italy, Greece, Netherlands and Ireland, where more than 5 percentage points (pp) of the market income drop are absorbed by the tax-benefit system.

To lend intuition to the distributional impact of the COVID-19 pandemic, Figure B.1 in the appendix reports the percentage changes in market and disposable incomes for each EU Member State by quintile.[10] The reduction in market income usually shows a regressive pattern, with earning losses in the lower part of income distribution being larger than

[10]The results based on re-ranked income distribution are reported in Figure B.2 in the Appendix.

those in the upper part. However, the pattern is less clear-cut in several countries. The pattern of disposable income change is markedly progressive, with households in the richest quintile experiencing a greater loss than those at the bottom of the income distribution in most countries. Moreover, some countries, such as Croatia and Spain, experience a slight increase in the disposable income of households located in the lower part of the income distribution. In Croatia, this is mostly due to the flat-rate design of the MC scheme.

4.2. Income stabilisation of EU tax-benefit systems

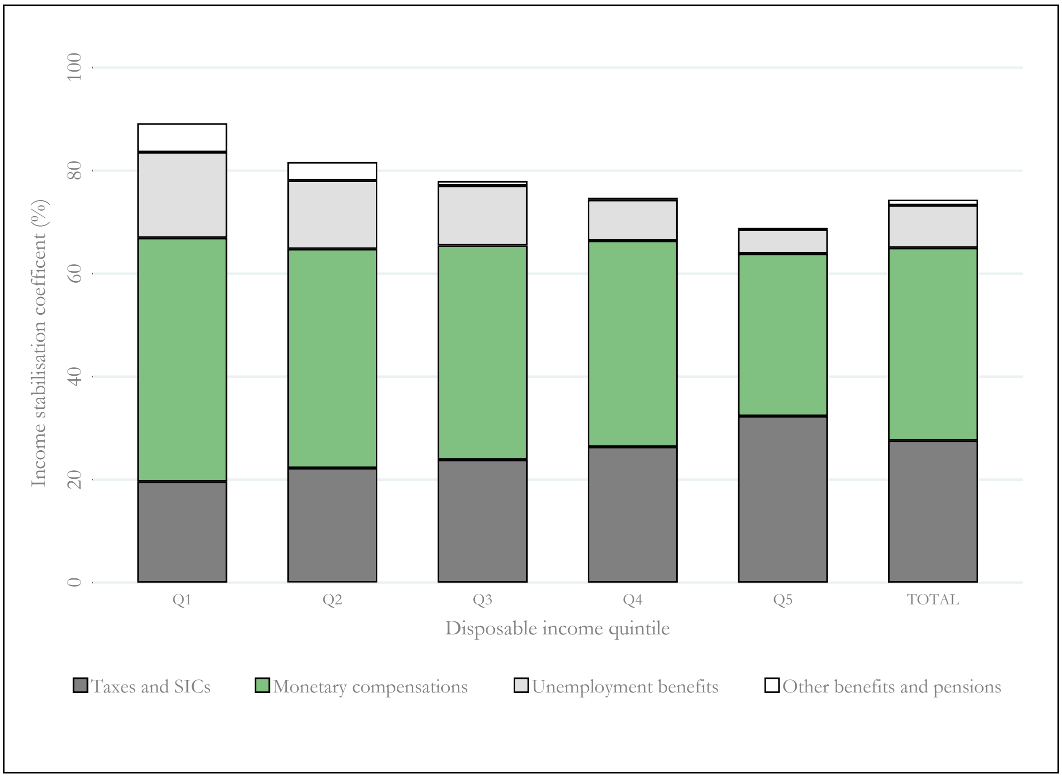
To analyse the stabilising effect of EU tax-benefit systems, we take a closer look at the ISC. The ISC for the EU reported in Figure 5 permits us to quantify the stabilisation properties of the tax-benefit systems in EU countries and identify the contribution of each of the fiscal policy instruments of interest. Our analysis shows that European tax-benefit systems absorbed as much as 74.4% of the market income shock at the EU level in 2020. MC schemes seem to have absorbed the largest share of the shock (37.4%), followed by taxes and SICs (27.6%). The stabilisation provided by unemployment benefit is significant but smaller than that provided by MC schemes. This finding is in line with fewer transitions from work to unemployment compared to transitions from work into MC schemes (see Figure 1). Other benefits and pensions play a relatively minor role overall.

The degree of stabilisation offered by tax-benefit systems is higher for lower-income households at the EU level. It should be noted that the importance of MC schemes decreases with income, while the stabilisation properties of taxes and SICs follow the opposite pattern. The result aligns with the existence of upper thresholds or lump-sum components in the amount of monetary compensation received and with the progressivity of the tax system. Additionally, as expected, the importance of other benefits is larger at the bottom of the income distribution because of means-tested benefits.

Figure 6 reports similar information for each of the EU Member States. The figure shows that ISCs ranged from 47.6% in Malta to 95.2% in Denmark. Monetary compensation played a major role in most countries, ranging from 84.3% in Denmark to only 4.9% in Finland. The contribution of (reduced) taxes and SICs to income stabilisation is also significant, ranging from 43.2% in Austria to 4.7% in Denmark. It should be noted that the coefficient on other benefits and pensions is slightly negative in a limited number of countries because of the interaction of MC schemes with taxes, SICs and means-tested benefits and pensions.

The decomposition of ISC by quintile (Figure B.3 in the Appendix) confirms that tax-benefit instruments have stabilised the incomes of poorer households more than those of richer households. In Croatia, Spain, France, Lithuania and Romania, the ISC for households at the bottom of the income distribution is actually above 100%, indicating a certain degree of overcompensation for the income loss in poor households. The results are often driven by the presence of generous MC schemes (often with flat, lump-sum components)

Figure 5: Income stabilisation coefficient – EU



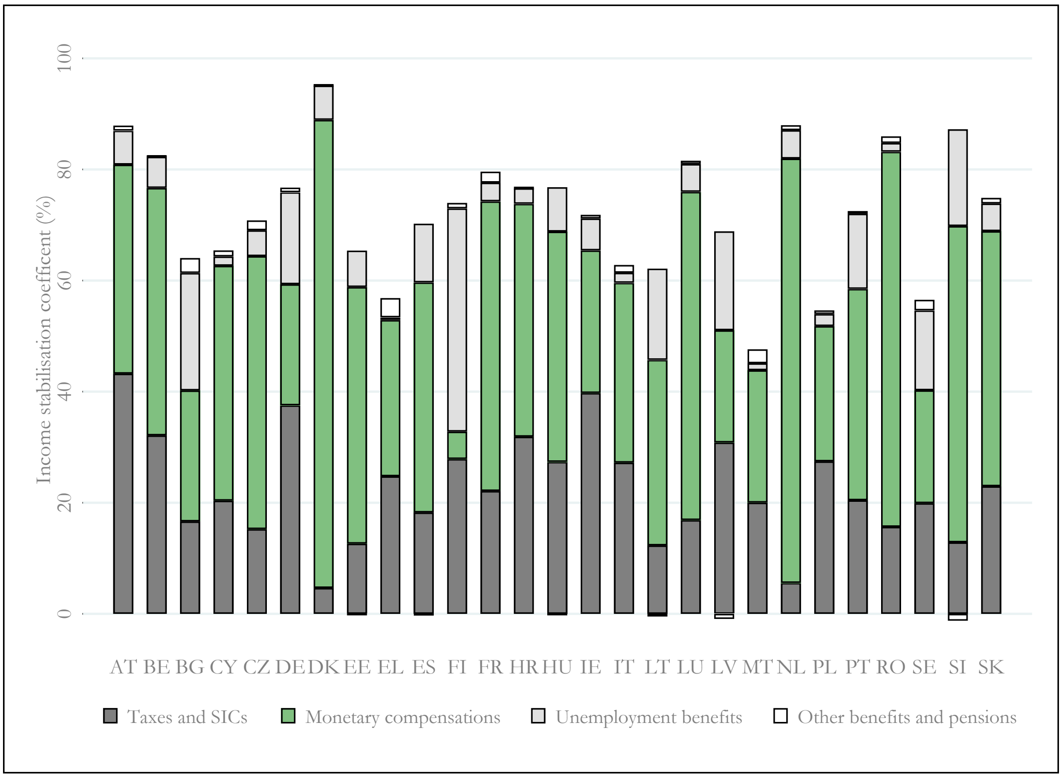
Note: Quintile groups defined in the baseline scenario‘y+‘y based on the equivalised disposable income.
Source: Authors' calculation using EUROMOD I3.86+.

that are, in some cases, exempt from SICs and/or personal income taxes or are not taken into account in the means-testing of benefits.

As a last step, we compare ISCs in two different scenarios: the COVID-19 scenario mentioned above, which takes government intervention into account during the COVID-19 pandemic, and the no government intervention scenario, where we assume the absence of MC schemes. This comparison allows us to evaluate the extent to which existing tax-benefit instruments, such as social assistance, would have compensated for a lack of government intervention. As highlighted in Figure 7, MC schemes played a crucial role in stabilising household income. The biggest differences in ISCs between the two scenarios can be found the Netherlands, Denmark, Croatia and Romania, where the ISC is more than 40 pp higher when taking MC schemes into account. These results are also partly driven by the fact that other assistance schemes (such as social assistance) might have very low replacement rates, leading to very low ISCs in the absence of STW (such as in Czechia, Cyprus or Poland).

The income shock results and the cushioning effect of EU tax-benefit systems on house-

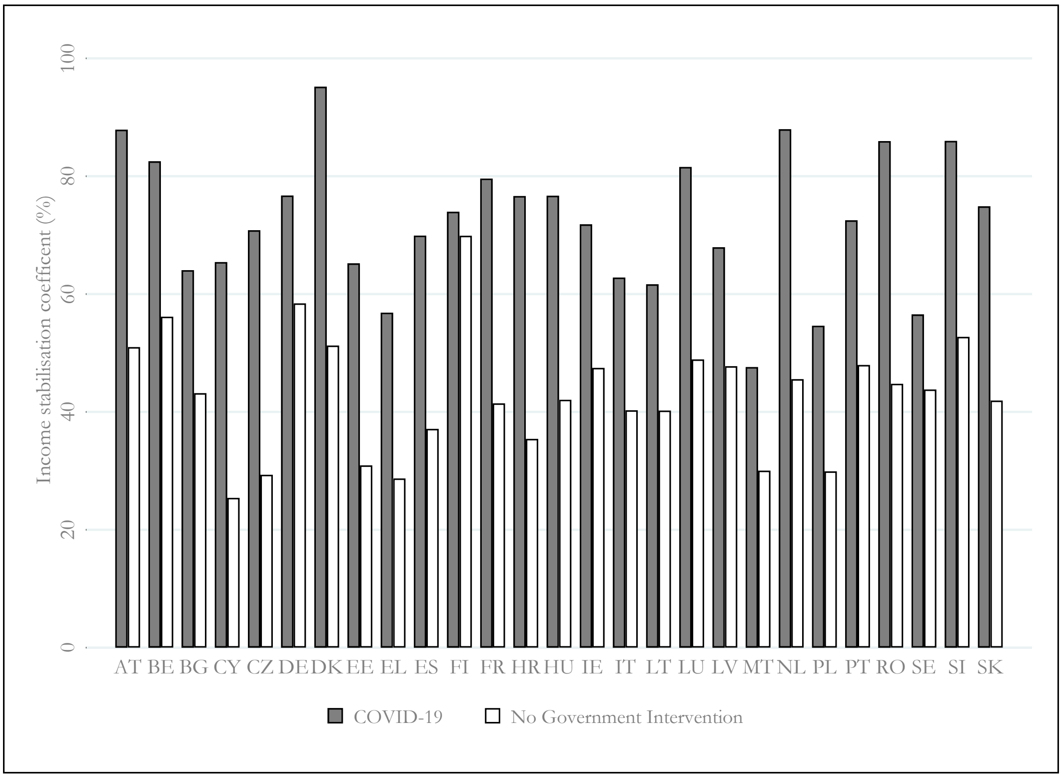
Figure 6: Income stabilisation coefficient - EU Member States



Source: Authors' calculation using EUROMOD I3.86+.

hold income are in line with the previous literature described in Section 2. However, some differences in the magnitude of the shocks and insurance role of the States are expected because of differences in methodology, time horizons and the type of policies selected in this and previous studies.

Figure 7: Income stabilisation coefficient in specific scenarios - EU Member States



Source: Authors' calculation using EUROMOD I3.86+.

4.3. Demand stabilisation and the impact of MC schemes

To analyse the income stabilising effects of EU tax-benefit systems, we investigate the extent to which MC schemes impact the aggregate household demand during the COVID-19 crisis. Assuming that only LC households will adjust their consumption (demand) due to the temporary income shock related to the COVID-19 pandemic, we provide evidence of how specific policy measures can stabilise household expenditures on goods and services in a partial equilibrium setting.[11] As highlighted in Figure 8, the estimated share of LC individuals in 2020 (in the no COVID-19 scenario) ranges from around 15.0% in Malta to 54.6% in Croatia and 54.4% Romania.[12]

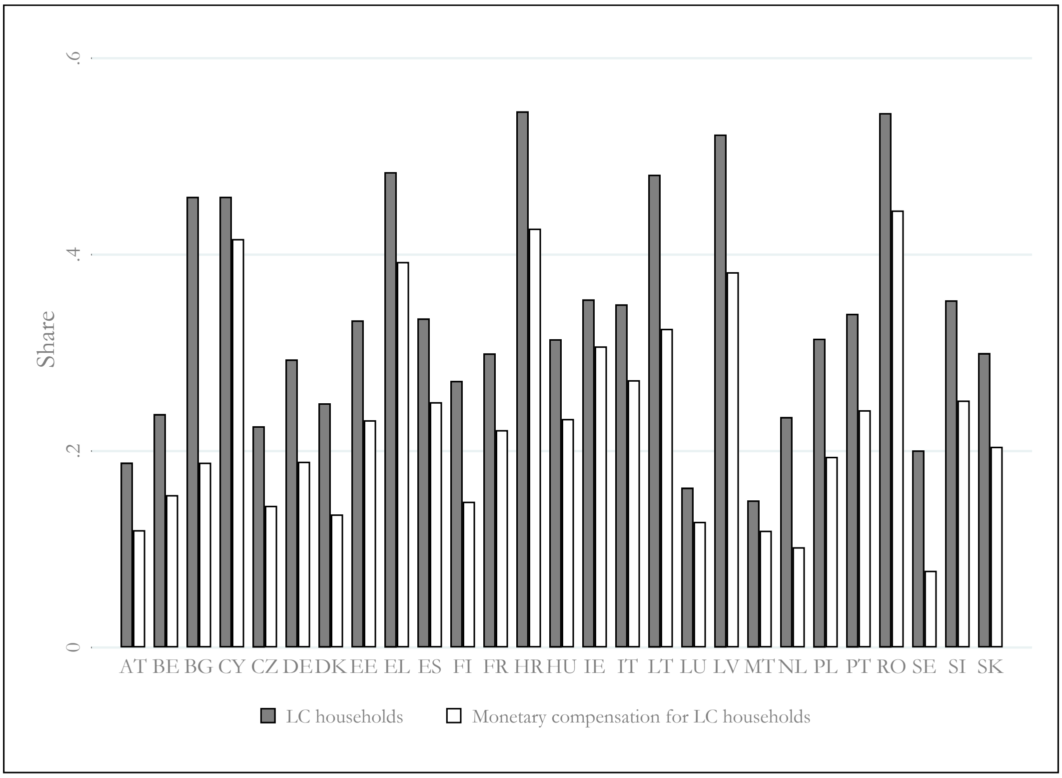
Additionally, we found that the share of expenditure for MC schemes that were received by LC individuals was especially high in countries, such as Romania (44.5%), Cyprus

[11] Our approach is equivalent to proxying marginal propensity to consume with the predicted probability of being liquidity constrained.

[12] We use a logit model, described in section 3, to estimate the probability of LC in the different scenarios, based on information from EU-SILC 2019 and the expected changes in household income.

(41.6%), Croatia (42.6%) and Greece (39.3%), while in countries like Sweden (7.8%), the Netherlands (10.2%), Malta (11.9%) and Austria (12.0%), only a small share of total expenditures for MC schemes were received by LC individuals. These results are related to the observed lower share of LC households in those countries. Not surprisingly, the share that goes to LC households is lower than the share of LC households, mainly because LC households typically have a low work intensity and, therefore, no access to monetary compensation during the COVID-19 pandemic.

Figure 8: Share of LC individuals and share of monetary compensation received by LC individuals - EU Member States

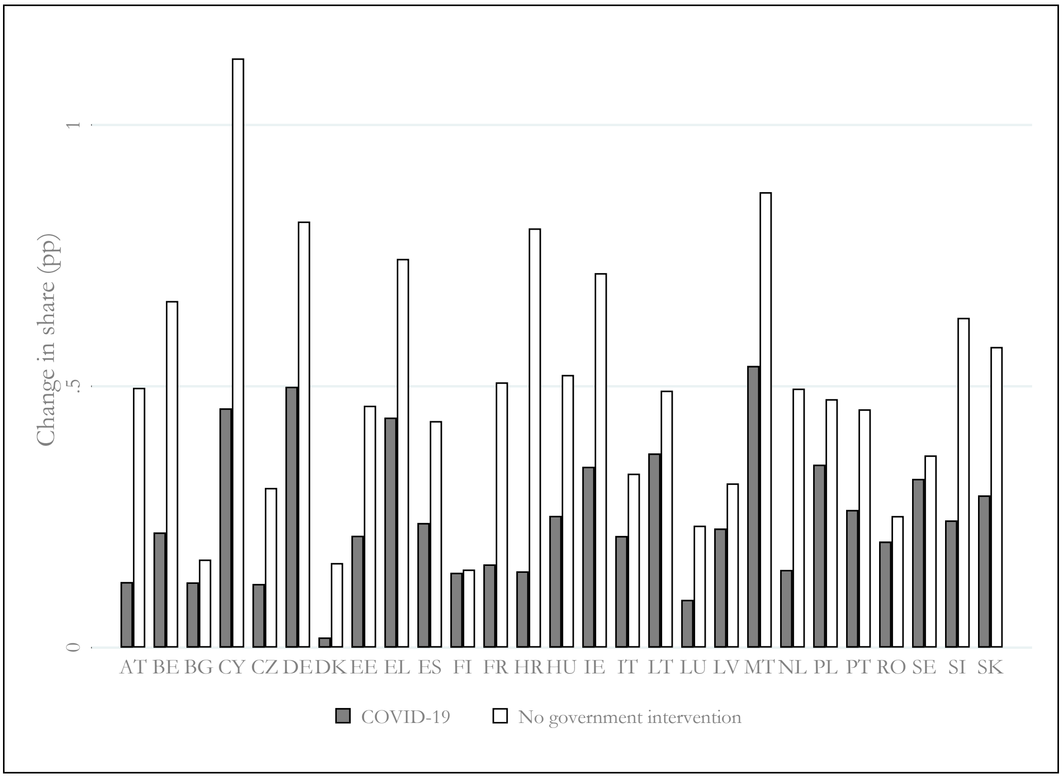


Source: Authors' calculation using EUROMOD I3.86+.

Figure 9 highlights the expected change in LC individuals due to COVID-19 as well as the change in cases of no government intervention (i.e. in the absence of MC schemes). We show that in all EU Member States, the impact of the COVID-19 crisis is substantial. On the one hand, in countries with higher ISCs for the poor, such as Croatia, Denmark, Luxembourg, Austria or the Netherlands,[13] the impact is less pronounced. On the other hand, we observe a substantial increase in LC individuals in countries, such as Malta, Germany, Cyprus (all +0.5 pp) and Greece (+0.4 pp).

[13]In the Netherlands, there is no direct MC scheme for workers; however, firms are subsidised by the

Figure 9: Change in LC individuals - EU Member States



Source: Authors' calculation using EUROMOD I3.86+.

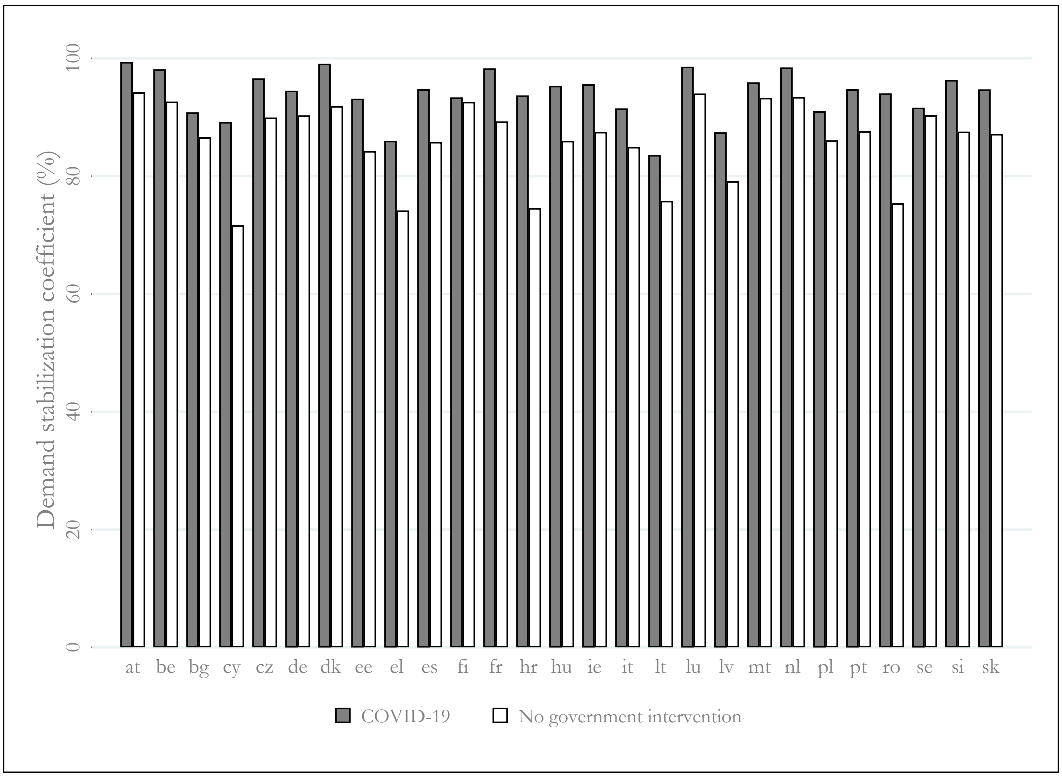
Looking at the impact of MC schemes (compared with the no government intervention scenario), we can see that the increase in LC individuals would be substantially higher. For example, in Austria, LC people are expected to increase by 0.1 pp, while in the absence of MC schemes, they are expected to increase by 0.5 pp. Even more drastic is the impact of monetary compensation in Cyprus, where we expect an increase in LC people during the COVID-19 crisis by 0.5 pp. However, in the absence of MC schemes, we estimate an increase in LC individuals by 1.1 pp.

Assuming that only LC households will adjust their consumption as a result of a temporary income shock, we can estimate the DSCs across EU Member States. Figure 10 highlights substantial differences in the cushioning effect of tax-benefit systems related to LC individuals. Many tax-benefit systems in EU Member States can stabilise demand on a very high level. Austria, Denmark, Luxembourg, the Netherlands, France and Belgium show DSCs very close to 100, meaning that household demand was almost completely stabilised during the COVID-19 pandemic. Alternatively, countries, such as Lithuania, Greece, Latvia, Cyprus and Bulgaria, show DSCs substantially below or very close to

state for continuing to pay 100% of wages. In this paper, we consider this subsidy as a MC scheme.

90, indicating that their tax-benefit systems have substantially lower demand stabilisation properties. In general, a high DSC is the result of a strong income protection of households that are expected to be liquidity constrained.

Figure 10: Demand stabilisation coefficient - EU Member States



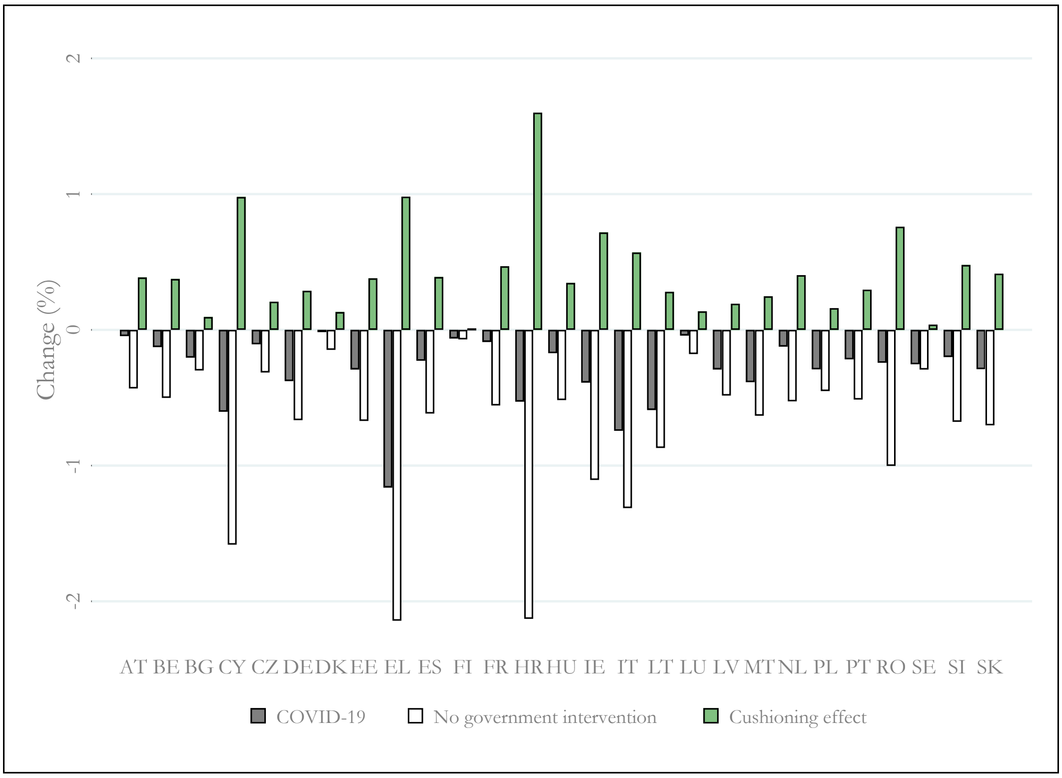
Source: Authors' calculation using EUROMOD I3.86+.

When looking at the impact of monetary compensation on DSCs, Figure 10 suggests that in the no government intervention scenario, DSCs would be substantially lower, and for all EU Member States, they would be far below 100, indicating that MC schemes substantially protected against a fall in aggregate household demand. The demand cushioning effect of monetary compensation is especially strong in Croatia, Romania, Cyprus and Greece, where the difference in DSCs is more than 10 pp.

When looking at the drop in household consumption as a percentage of total household income (no COVID-19 scenario), Figure 11 shows that the drop is expected to be especially strong in Greece (-1.2%), Italy (-0.7%), Cyprus and Lithuania (-0.6%), Croatia (-0.5%) and Ireland, Malta and Germany (all -0.4%). This is the result of both an increase in LC households and low income stabilisation of the tax-benefit system for those people.

However, when examining the drop in household consumption in the no government intervention scenario, we can see that the drop in aggregate household consumption would

Figure 11: Drop in household consumption (in % of total hh income) - EU Member States



Source: Authors' calculation using EUROMOD I3.86+.

be substantially higher. We observe drops of more than 1% in Cyprus, Ireland, Italy and Romania and over 2% in Croatia and Greece. The strongest demand cushioning effect of tax-benefit systems related to the overall household demand can be found in Croatia, Greece and Cyprus, where more than 1 pp of disposable income is absorbed by policy intervention (i.e. MC schemes).

5. Conclusion

This paper analyses the effect of the COVID-19 pandemic on household disposable incomes and household demand in the EU. We use EUROMOD, the EU tax-benefit microsimulation model, with underlying data from the 2019 EU-SILC. We also use labour statistics with various levels of aggregation to model micro-level transitions to unemployment and MC schemes, aiming to replicate the effect of the pandemic on EU labour markets.

The contribution of this work to existing literature is twofold. First, to the best of our knowledge, this paper contains the first EU-wide assessment of the cushioning effects of taxes and social transfers during the COVID-19 pandemic, including unemployment benefits and MC schemes. Additionally, we are the first to assess the impact of COVID-

19 on LC households, allowing us to assess the potential impact on aggregate household demand, which is a crucial indicator of general economic development.

Second, from a methodological point of view, the paper employs a novel, simplified nowcasting approach to study the consequences of changes in labour market conditions using microsimulation techniques. Our methodology allows us to easily adjust the underlying microdata to labour market shocks (such as the new labour market characteristics related to COVID-19) as soon as this information becomes available. Additionally, it allows us to model policy changes and counterfactual scenarios, which can be useful for future analysis.

Our analysis compares three different scenarios for 2020 (no COVID-19, COVID-19 with government intervention and COVID-19 with no government intervention) to identify the cushioning role of tax-benefit systems as a whole, and MC schemes in particular, on household income and demand.

First, we show that the impact of the COVID-19 pandemic on labour markets in EU Member States was very diverse, with some countries hit substantially harder than others. We find that most EU Member States experienced a large drop in market incomes in 2020, with poorer households hit the hardest. However, the tax-benefit systems absorbed a significant share of the COVID-19 shock and were able to offset – in most countries – the regressive nature of the shock on market incomes.

We find that MC schemes played a major role in alleviating the effect of adverse labour market transitions. At the EU level, tax-benefit systems were able to cushion about 74.4% of the drop in market income, but this rate varied substantially across Member States, highlighting the strong differences in the stabilising features of tax-benefit systems.

Finally, we demonstrate that MC schemes substantially limited the increase in LC households caused by the COVID-19 pandemic by diminishing their loss of income. We discover a general high demand stabilising effect in all EU Member States, with substantial heterogeneity across members. The results show that tax-benefit systems, especially MC schemes, played a crucial role in stabilising the economy by avoiding a stronger economic downturn due to an additional reduction in household demand.

Three caveats should be kept in mind when interpreting these results. First, we randomly identify workers within sociodemographic groups to undergo labour market transitions. This adds some uncertainty to the distributional findings of the model. We tried to overcome this issue by using bootstrapping to report the confidence intervals related to the random choice. Second, a problem of oversimulating monetary compensation amounts might arise because of the interaction between EU-SILC data, microsimulation modelling and country-specific rules. For instance, in cases where a minimum monetary compensation amount is determined by law and is based on the minimum wage, we might end up oversimulating the compensation for individuals that, in EU-SILC, earn less than the minimum wage. Finally, our analysis does not take into account constraints to demand due to the impossibility of buying/consume some type of goods and services during the first months of the pandemic. Keeping those caveats in mind, our research offers the first comprehensive insight into the effectiveness of tax-benefit policies in mitigating the impact of the COVID-19 pandemic on household incomes and household demand across European countries.

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Appendix A. Simulating labour market transitions in EUROMOD: The EUROMOD LMA add-on and COVID-19–related policies

EUROMOD I3.86+ allows users to design and implement labour market transitions from work to either unemployment or MC schemes. The transitions are made operational through the Labour Market Adjustment (LMA) add-on.

General information about the LMA add-on. This add-on is designed to cover the following labour market transitions:

- from employment/self-employment to unemployment (short-term or long-term)
- from unemployment to employment
- from employment/self-employment to monetary compensation

Intuitively, the tool modifies the values of specific sociodemographic variables of observations eligible for transitions (such as earnings, months in work, labour market characteristics, etc.) to reflect their new labour market status.

Simulating transitions. EUROMOD allows transitions to be modelled based on aggregate statistics using (informed) random allocation.

To simulate transitions to unemployment, we need to define the share of employees/self-employed (disaggregated by sex or other subgroups) who move to unemployment along with the duration of this transition (i.e. the number of months in employment during the year before transitioning to unemployment). For individuals who undergo this transition, the LMA add-on will adjust their labour market status, job characteristics and income variables. For employees, employment income, fringe benefits and health benefits are adjusted proportionally to the number of months left in employment, as the length of their unemployment spell can vary. The income of self-employed individuals transitioning to unemployment is set to zero; the length of their unemployment spell is fixed and is set to the same value as their in-work spell.

Additionally, based on the characteristics observed in the original SILC-based data, the LMA add-on will generate new variables needed to assess individuals' eligibility for unemployment benefits. The main variables used for these simulations are the contribution base for unemployment benefits (which usually depends on previous wage) and their contributory history (i.e. the number of months worked in the qualifying period).

To simulate transitions to MC schemes, we need to define the share of employees/self-employed (disaggregated by NACE code or other subgroups) who move to MC, the duration of this transition (number of months) and the share of hours worked while receiving MC. For individuals undergoing this transition, the LMA add-on will adjust their income variables (employment and self-employment income) and the number of months in receipt of those incomes proportionally, considering the number of months spent receiving MC. In some countries, this transition also triggers the simulation of relevant childcare schemes or new unemployment benefits. A detailed description of policies that are triggered by the LMA add-on in each country can be found in (Christl et al., 2022).

Details about the detailed policies modelled in the EUROMOD LMA add-on can be found in Table A.1.

Table A.1: Monetary compensation schemes in the EU Member States

Country	Measure name	Target	(Type)	Other	Comments
AT - Austria	Kurzarbeit	employees	percentage of earnings	upper limit	
	Härtefall-Fonds	self-employed	lump sum	n/a	simulated as one-off payment with average amount of compensation phase 1 and 2
BE - Belgium	Tijdelijke werkloosheid/Chômage temporaire (temporary unemployment scheme)	employees	percentage of earnings	lower and upper limit	share of hours not taken into account in simulation of MC
	Overbruggingsrecht voor zelfstandigen/Droit passerelle pour indépendants	self-employed	lump sum	amount for self-employed with or without dependent family	
BG - Bulgaria	60/40	employees	percentage of earnings	n/a	
	-	-	-	-	
CY – Cyprus	Eidiko sxedio anastolis ergasiwn tis epixeirisis	employees	percentage of earnings	n/a	
	Eidiko sxedio stiriksis autotelws ergazomenwn	self-employed	percentage of earnings	lower and upper limit	
CZ - Czechia	Programme Antivirus	employees	percentage of earnings	upper limit	existence of two different regimes
	Kompenzační bonus	self-employed	lump sum	upper limit	
DE - Germany	Kurzarbeitergeld	employees	percentage of earnings	n/a	
	-	-	-	-	
DK - Denmark	lønkompensation	employees	percentage of earnings	upper limit	
	tilskud	self-employed	percentage of the loss of revenues	upper limit	
EE - Estonia	töötasu hüvitis	employees	percentage of earnings	lower and upper limit	plus employer should pay at least 150 euro
	-	-	-	-	

Table A.1: Monetary compensation schemes in the EU Member States, cont.

Country	Measure name	Target	(Type)	Other	Comments
EL - Greece	Apozimiwsi eidikou skopou	employees	lump sum	n/a	beneficiaries (whose labour contracts are suspended) are determined on the basis of the NACE codes of the firms in which they are employed
	Apozimiwsi eidikou skopou	self-employed	lump sum	n/a	beneficiaries are determined on the basis of the NACE codes of their business
ES - Spain	Expediente de Regulación Temporal de Empleo – ERTE	employees	percentage of earnings	lower and upper limit	
	Prestación extraordinaria por cese de actividad para autónomos	self-employed	percentage of previous contribution base	lower and upper limit	
FI - Finland	yrittäjien työmarkkinatuki	self-employed	lump sum	n/a	
	Yksinyrittäjien korona-avustus	self-employed	one-off	n/a	
FR - France	Chômage partiel	employees	percentage of earnings	lower and upper limit	
	Fonds de solidarité	self-employed	percentage of the loss of turnover	upper limit	100% of turnover is compensated for self-employed (modelled as an average value, as turnover is not available)
HR - Croatia	potpora za očuvanje radnih mjesta	employees	lump sum	n/a	different lump-sum amounts provided for March and April/May
	potpora za očuvanje radnih mjesta	self-employed	lump sum	n/a	different lump-sum amounts provided for March and April/May
HU - Hungary	Munkahelyvédelmi bértámogatás	employees	percentage of earnings	n/a	
	-	-	-	-	
IE - Ireland	Temporary Wage Subsidy Scheme	employees	percentage of previous earnings or flat rate according to the amount of the previous earnings	upper limit	
	-	-	-	-	

Table A.1: Monetary compensation schemes in the EU Member States, cont.

Country	Measure name	Target	(Type)	Other	Comments
IE - Ireland	Temporary Wage Subsidy Scheme	employees	percentage of previous earnings or flat rate according to the amount of the previous earnings	upper limit	
	-	-	-	-	
IT - Italy	Cassa integrazione guadagni	employees	percentage of previous earnings	upper limit	
	Bonus 600€ / Ristoro 1000€	self-employed	lump sum benefit	n/a	
LT - Lithuania	subsidijos išlikti darbo rinkoje	employees	percentage of earnings	upper limit	
	laikina išmoka savarankiškai dirbantiems	self-employed	lump sum benefit	n/a	
	ligos išmoka	sickness (COVID-19 quarantine)	percentage of earnings	n/a	
	laikina darbo paieškos išmoka	unemployment (new scheme)	lump sum benefit	n/a	
LU – Luxembourg	Chômage partiel	employees	percentage of previous earnings	lower and upper limit	
		-	-	-	
LV - Latvia	Dīkstāves pabalsts and Dīkstāves palīdzības pabalsts	employees	percentage of previous earnings	lower and upper limit	downtime benefit and downtime assistance benefit cannot be simulated separately in EUROMOD, downtime assistance = the lower limit of the downtime benefit
	Dīkstāves pabalsts and Dīkstāves palīdzības pabalsts	self-employed	percentage of previous self-employment income	lower and upper limit	downtime benefit and downtime assistance benefit cannot be simulated separately in EUROMOD, downtime assistance = the lower limit of the downtime benefit

Table A.1: Monetary compensation schemes in the EU Member States, cont.

Country	Measure name	Target	(Type)	Other	Comments
MT - Malta	Skema ta' Suppliment gas-Salarju Covid-19	employees	several flat rates	n/a	
	Skema ta' Suppliment gas-Salarju Covid-19	self-employed	several flat rates	n/a	
NL - Netherlands	Noodmaatregel Overbrugging Werkgelegenheid (NOW)	employers	percentage of the wage cost of employers	n/a	employees receive 100% of their wage, this is a benefit for employers
	-	-	-	-	
PL - Poland	Dofinansowanie wynagrodzeń	employees	either percentage of earnings or flat rate	lower and upper limits	two possibilities: if employee is eligible for both, max one is selected
	Świadczenie postojowe	self-employed	flat rate	n/a	also for temporary workers
PT - Portugal	Layoff Simplificado (Medida Extraordinária de Apoio à Manutenção dos Contratos de Trabalho)	employees	percentage of previous earnings	lower and upper limits	
	Apoio Extraordinário à Redução da Atividade Económica de Trabalhador Independente	self-employed	depending on the average remuneration recorded as contribution base: average, or a percentage or a lump sum	upper limit	
RO - Romania	Indemnizația de șomaj tehnic	employees	percentage of previous earnings	upper limit	
	Indemnizația de sprijin COVID-19	self-employed	lump sum	n/a	

Table A.1: Monetary compensation schemes in the EU Member States, cont.

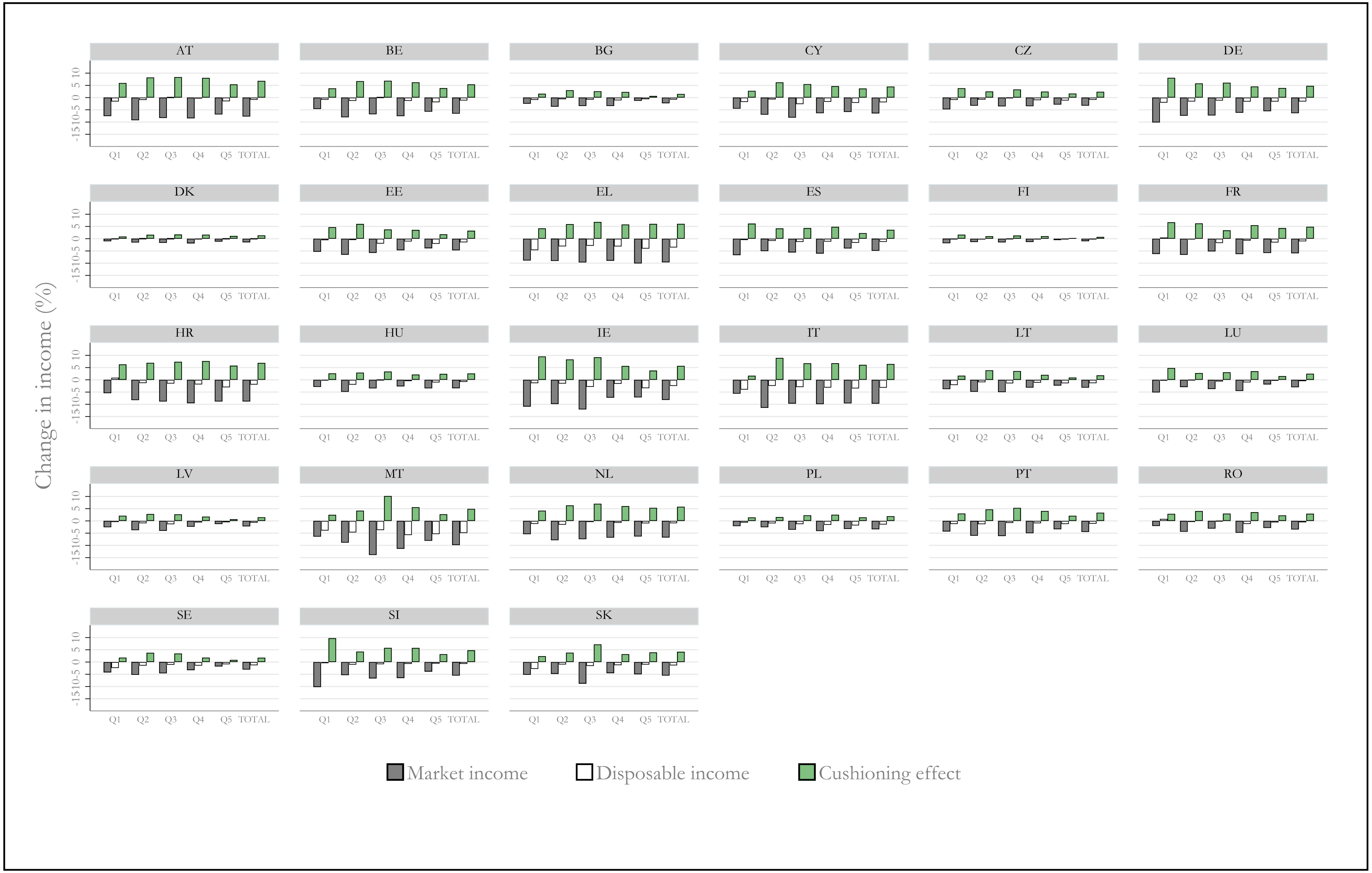
Country	Measure name	Target	(Type)	Other	Comments
SE - Sweden	korttidspermittering	employees	percentage of previous earnings	upper limit	different levels of compensation depending on share of hours worked, cannot be 0 hours worked
	-	-	-	-	
SI - Slovenia	nadomestilo plače za čas čakanja na delo	employees	percentage of previous earnings	n/a	
	Izredna pomoč v obliki mesečnega temeljnega dohodka	self-employed	lump sum	n/a	
	začasno denarno nadomestilo za čas brezposelnosti	unemployment (new scheme)	lump sum	n/a	
SK - Slovakia	Projekt na podporu udržania pracovných miest	employees	percentage of previous earnings	lower and upper limits	
	Príspevok pre SZČO	self-employed	lump sum	n/a	different sum depending on randomly assigned revenue (approximated by profit) loss
	Pandemické ošetrovné	employees and self-employed	percentage of previous income	upper limit	nursing benefit, only one parent can receive the benefit per eligible child during school closures

Appendix B. Additional Figures and Tables

Figure B.1: Change in market and disposable incomes by quintile (%) - EU Member States

Note: Quintile groups defined in baseline scenario based on equivalised disposable income.
Source: Authors' calculation using EUROMOD I3.86+

Figure B.2: Change in market and disposable incomes by quintile (%) - EU Member States, re-ranked



Note: Quintile groups defined in each scenario based on equivalised disposable income.
Source: Authors' calculation using EUROMOD I3.86+

Figure B.3: Income stabilising coefficients - EU Member States

Note: Quintile groups defined in baseline scenario based on equivalised disposable income.
Source: Authors' calculation using EUROMOD I3.86+

Table B.1: Logit regressions I

	(1) BG	(2) CY	(3) CZ	(4) DK	(5) EE	(6) EL	(7) ES	(8) FI	(9) FR
disp. income	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-204.98)	(-125.68)	(-256.96)	(-245.24)	(-122.88)	(-213.41)	(-609.16)	(-208.02)	(-737.70)
fin. assets	0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(38.03)	(-29.10)	(-12.99)	(-45.74)	(-16.13)	(-33.48)	(-134.22)	(-79.95)	(-381.26)
hh_unemp	0.17***	0.05***	0.08***	0.24***	0.02	-0.05***	0.23***	0.37***	0.23***
	(27.12)	(3.57)	(9.76)	(68.92)	(1.67)	(-10.20)	(160.44)	(87.32)	(153.42)
hh_inact	0.09***	-0.01	-0.26***	0.57***	0.21***	-0.10***	0.19***	0.27***	0.19***
	(13.98)	(-0.43)	(-34.75)	(82.78)	(16.31)	(-15.71)	(77.82)	(38.44)	(75.81)
hh_empl	0.06***	0.16***	-0.12***	0.39***	0.04***	-0.12***	0.09***	0.18***	0.22***
	(10.70)	(9.64)	(-17.22)	(83.81)	(3.45)	(-19.95)	(43.06)	(35.81)	(101.76)
hh_self	-0.04***	0.09***	-0.61***	-0.01*	-0.25***	-0.31***	-0.33***	-0.43***	-0.18***
	(-8.34)	(6.84)	(-88.97)	(-1.99)	(-19.27)	(-50.67)	(-162.70)	(-77.14)	(-84.35)
hh_couple	-0.10***	-0.18***	-0.09***	-0.17***	-0.18***	-0.01***	-0.15***	-0.01*	-0.20***
	(-35.66)	(-24.29)	(-36.16)	(-59.61)	(-33.11)	(-3.35)	(-156.53)	(-1.97)	(-194.49)
hh_age18	0.04***	0.46***	0.22***	0.28***	0.30***	-0.07***	0.24***	0.36***	0.46***
	(8.53)	(41.28)	(61.83)	(72.66)	(38.51)	(-22.34)	(143.55)	(104.18)	(347.71)
hh_age30	-0.39***	0.63***	0.64***	0.01	0.16***	0.15***	0.20***	0.17***	0.37***
	(-57.57)	(34.16)	(81.39)	(1.40)	(12.47)	(22.57)	(77.98)	(20.51)	(139.81)
hh_age40	-0.61***	0.29***	0.80***	0.29***	0.01	0.32***	0.24***	0.36***	0.51***
	(-85.62)	(14.56)	(97.63)	(37.94)	(0.89)	(47.50)	(89.18)	(40.63)	(175.67)
hh_age50	-0.55***	0.63***	0.76***	0.42***	0.13***	0.19***	0.24***	0.43***	0.61***
	(-77.28)	(30.48)	(93.25)	(53.03)	(9.64)	(27.59)	(90.15)	(48.20)	(211.90)
hh_age65	-0.43***	0.31***	0.41***	0.29***	0.21***	0.25***	0.17***	0.20***	0.54***
	(-61.45)	(15.07)	(50.21)	(38.96)	(15.57)	(36.89)	(64.36)	(23.49)	(193.93)
hh_age100	-0.54***	0.43***	0.24***	-0.24***	0.26***	0.43***	0.23***	-0.07***	0.34***
	(-45.67)	(11.03)	(19.96)	(-15.25)	(11.12)	(46.33)	(46.49)	(-5.15)	(68.25)
hh_student	-0.04***	-0.13***	-0.00	0.02***	0.09***	0.05***	-0.04***	-0.13***	0.07***
	(-7.63)	(-12.52)	(-0.80)	(6.45)	(10.77)	(16.29)	(-22.39)	(-35.44)	(49.64)
hh_pensioner	0.46***	-0.31***	-0.34***	0.50***	-0.26***	-0.35***	0.03***	-0.08***	0.19***
	(42.48)	(-8.27)	(-30.52)	(34.22)	(-12.36)	(-39.84)	(5.99)	(-6.32)	(40.33)
Constant	-0.31***	-0.42***	-1.35***	-1.41***	-0.15***	-0.53***	-1.31***	-0.69***	-1.42***
	(-33.72)	(-20.87)	(-181.08)	(-178.71)	(-11.13)	(-100.16)	(-478.59)	(-59.91)	(-531.00)
Add. var.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2929191	326677	4452997	2906239	617447	4123368	18602885	2748958	29058942

Note: Additional variables include household characteristics related to living standards, such as the possession of a TV, washing machine and others; t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.2: Logit regressions II

	(1) HR	(2) HU	(3) IE	(4) LU	(5) LT	(6) LV	(7) MT	(8) NL	(9) PL
disp. income	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-189.11)	(-484.06)	(-166.67)	(-71.58)	(-160.63)	(-158.51)	(-71.34)	(-318.73)	(-559.18)
fin. assets	-0.00***	-0.00***	-0.00***	-0.00***	0.00***	-0.00***	0.00***	-0.00***	-0.00***
	(-60.62)	(-60.79)	(-59.21)	(-8.29)	(10.02)	(-30.87)	(14.17)	(-451.97)	(-32.08)
hh_unemp	-0.50***	0.29***	0.23***	0.52***	0.41***	0.18***	-0.21***	0.38***	0.65***
	(-33.38)	(38.46)	(40.20)	(17.89)	(58.99)	(22.11)	(-5.22)	(94.50)	(99.55)
hh_inact	0.22***	0.12***	-0.04***	-0.05	0.33***	-0.03**	-0.01	0.42***	0.43***
	(26.48)	(28.13)	(-4.57)	(-1.13)	(36.92)	(-2.82)	(-0.18)	(90.48)	(129.06)
hh_empl	0.28***	0.25***	-0.03***	0.06	-0.10***	-0.15***	0.23***	0.12***	0.42***
	(36.24)	(88.42)	(-4.61)	(1.48)	(-14.19)	(-16.86)	(6.18)	(32.63)	(135.83)
hh_self	-0.15***	-0.29***	-0.86***	-0.16***	-0.17***	-0.47***	0.00	-0.19***	-0.35***
	(-25.82)	(-146.15)	(-110.60)	(-3.50)	(-33.05)	(-48.77)	(0.07)	(-51.49)	(-123.24)
hh_couple	-0.12***	-0.06***	-0.34***	-0.09***	-0.18***	-0.05***	-0.31***	-0.08***	-0.24***
	(-37.41)	(-25.95)	(-100.63)	(-7.34)	(-51.25)	(-13.04)	(-26.59)	(-38.77)	(-237.21)
hh_age18	0.24***	0.52***	0.65***	0.47***	0.31***	0.11***	0.48***	0.15***	0.28***
	(52.72)	(151.24)	(134.63)	(31.77)	(57.23)	(18.21)	(21.62)	(47.35)	(241.17)
hh_age30	-0.04***	0.39***	0.50***	0.57***	0.31***	0.25***	0.80***	-0.07***	-0.19***
	(-4.70)	(89.02)	(59.12)	(13.26)	(36.07)	(24.42)	(19.62)	(-13.31)	(-57.28)
hh_age40	-0.09***	0.33***	0.55***	0.42***	-0.05***	0.12***	0.76***	0.03***	-0.28***
	(-9.97)	(65.43)	(56.77)	(9.12)	(-4.88)	(11.43)	(18.31)	(6.04)	(-82.43)
hh_age50	-0.01	0.21***	0.66***	0.55***	0.39***	0.26***	0.85***	0.06***	-0.22***
	(-1.35)	(43.40)	(65.93)	(12.03)	(42.63)	(23.20)	(19.62)	(10.63)	(-61.82)
hh_age65	-0.08***	0.40***	0.66***	0.47***	0.29***	0.25***	0.73***	0.04***	-0.28***
	(-8.76)	(84.75)	(67.38)	(10.26)	(33.69)	(24.19)	(16.90)	(8.59)	(-79.16)
hh_age100	-0.06***	0.66***	0.77***	0.65***	-0.08***	0.08***	0.97***	-0.18***	-0.35***
	(-4.10)	(74.05)	(48.17)	(9.62)	(-4.62)	(3.94)	(15.14)	(-18.26)	(-65.96)
hh_student	-0.10***	0.47***	-0.13***	-0.13***	-0.10***	0.23***	-0.13***	0.13***	-0.10***
	(-23.24)	(134.39)	(-30.53)	(-8.62)	(-17.08)	(32.53)	(-6.11)	(46.99)	(-44.36)
hh_pensioner	0.11***	-0.13***	-0.53***	-0.54***	0.29***	0.01	-0.18**	0.11***	0.39***
	(7.96)	(-16.33)	(-35.91)	(-8.29)	(17.91)	(0.52)	(-3.05)	(11.54)	(77.36)
Constant	0.50***	-1.40***	-1.53***	-1.98***	-0.39***	0.35***	-2.44***	-0.55***	-0.06***
	(49.33)	(-261.65)	(-156.02)	(-62.65)	(-40.79)	(32.70)	(-72.17)	(-103.95)	(-19.71)
Add. var.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1464802	4123481	1885204	259048	1290359	841944	196467	7924767	13180281

Note: Additional variables include household characteristics related to living standards, such as the possession of a TV, washing machine and others. t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.3: Logit regressions III

	(1) PT	(2) RO	(3) SE	(4) SI	(5) SK	(6) AT	(7) BE	(8) DE	(9) IT
disp. income	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-323.07)	(-263.22)	(-262.08)	(-139.52)	(-132.65)	(-225.23)	(-355.60)	(-1184.19)	(-362.30)
fin. assets	-0.00***	-0.00*	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-135.46)	(-2.40)	(-115.49)	(-24.76)	(-84.38)	(-63.47)	(-59.12)	(-362.08)	(-173.77)
hh_unemp	0.14***	0.75***	0.39***	0.02*	0.12***	0.48***	0.12***	0.56***	0.18***
	(22.88)	(40.54)	(87.49)	(2.26)	(10.16)	(131.59)	(22.53)	(347.07)	(113.67)
hh_inact	0.24***	-0.00	0.31***	0.31***	-0.81***	0.29***	0.23***	-0.06***	0.19***
	(37.79)	(-0.11)	(54.24)	(31.24)	(-56.66)	(52.02)	(31.92)	(-27.19)	(92.49)
hh_empl	0.38***	-0.11***	-0.02***	0.41***	-0.60***	0.19***	0.36***	0.20***	0.20***
	(63.46)	(-20.19)	(-3.77)	(48.59)	(-43.73)	(41.27)	(56.22)	(121.83)	(105.13)
hh_self	-0.30***	-0.31***	-0.41***	-0.33***	-1.12***	-0.35***	-0.79***	-0.42***	-0.02***
	(-54.33)	(-58.21)	(-80.42)	(-52.45)	(-80.56)	(-71.76)	(-105.58)	(-204.84)	(-12.66)
hh_couple	-0.27***	-0.05***	-0.25***	-0.01**	-0.23***	-0.10***	-0.10***	-0.06***	-0.14***
	(-142.17)	(-40.73)	(-92.49)	(-3.06)	(-89.31)	(-36.97)	(-39.22)	(-72.45)	(-161.14)
hh_age18	0.38***	0.22***	0.24***	0.25***	0.51***	0.27***	0.72***	0.51***	0.04***
	(104.40)	(101.55)	(79.10)	(36.82)	(126.67)	(76.72)	(192.67)	(469.61)	(32.07)
hh_age30	0.08***	0.18***	0.52***	-0.01	1.14***	0.21***	0.55***	0.51***	-0.06***
	(11.45)	(31.38)	(83.93)	(-1.25)	(79.94)	(34.17)	(74.17)	(237.66)	(-28.26)
hh_age40	-0.08***	0.11***	0.57***	0.05***	0.92***	0.05***	0.81***	0.34***	0.00
	(-11.76)	(19.01)	(84.23)	(4.09)	(62.93)	(6.85)	(99.87)	(142.19)	(0.72)
hh_age50	0.05***	0.14***	0.62***	-0.09***	0.94***	0.13***	0.78***	0.45***	-0.16***
	(7.36)	(23.39)	(88.85)	(-8.00)	(64.98)	(18.51)	(96.15)	(191.51)	(-70.65)
hh_age65	0.02***	0.11***	0.30***	-0.02*	0.87***	0.12***	0.69***	0.32***	-0.08***
	(3.64)	(18.13)	(44.90)	(-2.05)	(60.15)	(18.31)	(87.45)	(142.83)	(-34.10)
hh_age100	-0.02	-0.18***	0.35***	0.14***	0.97***	0.10***	0.46***	-0.19***	0.01
	(-1.82)	(-22.54)	(27.89)	(7.02)	(54.51)	(12.81)	(36.76)	(-46.77)	(1.85)
hh_student	-0.07***	-0.13***	0.01***	0.03***	-0.27***	0.05***	-0.24***	-0.03***	0.08***
	(-21.01)	(-60.56)	(4.59)	(4.76)	(-68.23)	(14.57)	(-66.18)	(-30.72)	(58.46)
hh_pensioner	0.23***	0.20***	-0.26***	0.16***	-0.81***	-0.08***	-0.28***	0.17***	0.17***
	(22.84)	(26.34)	(-22.43)	(8.88)	(-46.21)	(-13.05)	(-23.70)	(46.92)	(43.99)
Constant	-0.55***	-0.53***	-1.11***	-0.61***	-0.63***	-1.72***	-1.29***	-0.77***	-1.75***
	(-105.17)	(-115.61)	(-157.75)	(-51.46)	(-60.16)	(-216.33)	(-200.57)	(-319.35)	(-754.34)
Add. var.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4172064	7519236	4938502	814852	1852079	3943565	4922257	41099307	26042742

Note: Additional variables include household characteristics related to living standards, such as the possession of a TV, washing machine and others; t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix C. Acknowledgements

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Appendix D. Conflict of interest

The content of this article does not reflect the official opinion of the European Commission. Responsibility for the information and views expressed in the article lies entirely with the author(s).