Modelling the Distributional Impact of the COVID-19 Crisis*

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Abstract

The COVID-19 emergency has had a dramatic impact on market incomes and income-support policies. The lack of timely available data constrains the estimation of the scale and direction of recent changes in the income distribution, which in turn constrains policymakers seeking to monitor such developments. We overcome the lack of data by proposing a dynamic calibrated microsimulation approach to generate counterfactual income distributions as a function of more timely external data than are available in dated income surveys. We combine nowcasting methods using publicly available data and a household income generation model to perform the first calibrated simulation based upon actual data, aiming to assess the distributional implications of the COVID-19 crisis in Ireland. Overall, we find that the crisis had an equalizing real-time effect for both gross and

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disposable incomes, notwithstanding the significant hardship experienced by many households.

I. Introduction

The sudden appearance and global spread of the COVID-19 virus is doing enormous damage to public health and living standards. Recognising the significance of this new virus, governments have responded rapidly with large-scale interventions to slow the spread of the virus and to limit the damage to incomes. From an economic perspective, the policy response has had two main elements. First, physical gatherings to produce goods and services deemed non-essential have been largely shut down, even as production in targeted health-related areas has expanded. Second, new in-employment and out-of-employment income-support schemes have been put in place to ensure that household access to essential goods and services – and, where possible, continued formal links to employers – are maintained during the emergency. It is recognised that these policies will have major implications for public finances, but there is widespread acceptance that significant deficits are a necessary price for suppressing the spread of the virus while limiting economic damage, provided borrowing capacity can be retained.

This is a distinctive crisis, expected to dwarf the financial crisis from 2008 with a major cost in terms of health and human lives. Apart from detrimental health losses, the crisis is also inducing economic pressure on workers who become unemployed or lose (part of) their incomes. In this context, public policy comes at the forefront of the crisis applied in a ‘timely, targeted and temporary’ way, with a huge potential to stabilise the economy during the crisis. Policymakers need to support the incomes of those adversely affected by the policy-imposed shutdown, especially given the speed with which the crisis has unfolded. This requires a timely understanding of those most affected by the containment measures or those more at risk. In managing income distribution impacts (and associated fiscal costs), it is valuable to be able to assess the effects of different wage and unemployment support policies given the most up-to-date information on the labour market.

The aim of this paper is to undertake a real-time analysis of the income distribution effects of the COVID-19 crisis in Ireland in order to identify those most likely to suffer from income losses, to assess how these losses are distributed in society, and to provide policymakers with the evidence-based input needed for designing effective/efficient targeting of income-support measures. To reach this objective, we develop a calibrated

1Baldwin and Weder di Mauro, 2020.
2Gaspar and Mauro, 2020.
3See Beirne et al. (2020) for an early analysis of the income distribution effects of the crisis in Ireland.

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microsimulation approach based upon actual data to generate counterfactual income distributions as a function of more timely external data than the underlying income surveys.\textsuperscript{4} We combine nowcasting methods using up-to-date data from Live Register,\textsuperscript{5} official reports on the labour market and policy impacts of the COVID-19 crisis with the Labour Force Survey (LFS) and a household income generation model\textsuperscript{6} to predict the distributional impact and the fiscal costs of the COVID-19 crisis.

Apart from the conventional definition of household disposable equivalised income, we also consider an alternative definition by adjusting household disposable equivalised income for work-related expenses, housing expenditures and some capital losses. By using this definition, we can identify real changes in the financial resources available to households during the crisis, compared with the period before the crisis. We find that a decrease in this expenditure during the crisis helped most deciles to maintain their disposable incomes at pre-crisis levels or even to increase them, which served as an important mitigation instrument for market income losses.

This study focuses on Ireland, which was one of the countries that experienced the largest impact of the 2008 financial crisis and saw one of the highest return bounces. The COVID-19 crisis is thus an additional test of the country’s resilience. Moreover, the State has introduced a range of innovative measures including a new social protection system targeting those who became sick, those who were made unemployed or those who remained in precarious employment. Measures comprised both public-sector delivery mechanisms such as new subsidies, but also measures delivered through the private sector such as pauses in mortgage repayments and breaks in childcare payments.

II. Methodology

Our approach relies on modelling the distributional impact of the COVID-19 crisis and the policy measures introduced to flatten the curve and to mitigate some of the economic impacts of the crisis.\textsuperscript{7} These impacts are highly asymmetric, affecting people in different ways and dimensions.

The key methodological challenge is the lack of up-to-date household survey data that contain the income situation of households. Understanding the characteristics of households, including real-time estimates of their incomes, enables policies to be targeted to mitigate the impacts of the crisis at least cost. Existing methods are relatively crude: they apply price inflation factors

\textsuperscript{4}O’Donoghue et al., 2020.
\textsuperscript{5}https://www.gov.ie/en/publication/f4c60c-covid-19-statistics/.
\textsuperscript{6}Sologon et al., 2018.
\textsuperscript{7}See O’Donoghue et al. (2020) for the detailed approach.
and change proportionally the employment rate in specific industries, and then use a tax-benefit model to explain the policy consequences. 8

We overcome this challenge by proposing a more nuanced approach based on a ‘nowcasting’ methodology, 9 which combines data from the latest available European Union Survey on Income and Living Conditions (EU-SILC) with recent data on employment and prices to calibrate a microsimulation model of household incomes, taxes and benefits to produce a real-time picture of the population and to identify who is affected differentially. 10 Our approach explains the heterogeneity of changes in the population by estimating a system of equations that model the income generation process by utilising a dynamic modelling approach to update the data. 11 We use the generic household income-generation model (IGM) developed by Sologon et al. (2018), which simulates the labour market and household market income distribution as a function of personal and household attributes, and generates counterfactual distributions under alternative scenarios. Taxes and benefits are simulated using the NUI Galway microsimulation model developed for studying the impacts of an economic crisis. 12

In this paper, we simulate counterfactual real-time income distributions as a function of more timely Live Register, Price and LFS data to predict the distributional impact of the COVID-19 crisis. Fundamentally, this involves the simulation of the core welfare variable of interest and its components. In most microsimulation analyses, disposable income is the main welfare variable, which depends upon market income, benefits and taxation, which are in turn dependent upon personal skills, family characteristics and tax-benefit parameters. However, given the nature of the shock, and the multi-faceted impact on household living standards, it is necessary to utilise an augmented version of disposable income, which also takes into account work-related expenditures (childcare, commuting), housing costs and capital losses. 13

Projections are based upon a set of external calibration control totals that are available for more recent time periods than the microdata from income surveys and that reflect the changes in the macroeconomic climate in Ireland over the period of the outbreak, particularly in relation to the structure of the labour market. To do this, we draw upon the dynamic microsimulation literature, using an alignment or calibration technique described in Li and O’Donoghue (2014). The objective of calibrating a microsimulation model is to ensure that the simulated output matches exogenous totals. 14 In short, we

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8 Navicke, Rastrigina and Sutherland, 2014.
9 O’Donoghue and Loughrey, 2014.
10 Atkinson et al., 2002.
11 Bourguignon, Fournier and Gurgand, 2001; Li and O’Donoghue, 2014.
12 O’Donoghue, Loughrey and Sologon, 2018.
13 The treatment of these components in the simulation are discussed in O’Donoghue et al. (2020).
14 Bækgaard, 2002.
build up our microdata to the present and we calibrate the IGM data to external control totals reflected in the macro trends. This will ensure that the IGM is describing the targeted period. We then use the infrastructure by introducing various shocks (e.g. factoring sector-specific impacts, differentiated by age, macro changes, fiscal responses) and we create counterfactual distributions and costs under alternative scenarios.

III. Data

In order to apply the microsimulation methodology, two types of data are needed:

- microdata, on which to perform estimations and simulations; and
- calibration data to align microdata with the recent changes in labour market and income growth.

Our source of microdata is the 2017 version of the Irish component of the EU-SILC. The EU-SILC data set collects information on incomes, labour-market characteristics, demographics and living conditions, and it is widely used to undertake analyses on poverty, inequality and deprivation. The Irish component relies partially on survey data and partially on register data. Around 80 per cent of respondents allowed their national social security number to be used to assess administrative data in relation to their benefit entitlement.¹⁵ A national weighting methodology is utilised to achieve representativeness of the data set with respect to gender, age, region and household composition. The main advantage of the EU-SILC for our analysis is that it has the appropriate variables required for tax-benefit modelling. There are, however, a number of challenges to utilising the EU-SILC for microsimulation modelling, as discussed in detail in O’Donoghue, Loughrey and Morrissey (2013). In this paper, we follow their strategy to address these challenges.

Underpinning our analysis is a set of calibration control totals reflecting the changes in the macroeconomic climate in Ireland over the period that elapsed between 2017 and the current COVID-19 crisis. In order to account for these changes, we adjust the EU-SILC data using control totals for the current employment situation, the provision of pandemic wage subsidies, requests for mortgage deferral, shifts in work-related expenditures, and changes in the stock market. The following data are used to produce control totals:

- nowcasting information on employment is drawn from the Labour Force Survey, Live Register data and official statistics provided by the Irish Central Statistics Office;

¹⁵Callan et al., 2010.
changes in employment post-crisis draw upon weekly updates in relation to recipients of Pandemic Unemployment Payments by age and sector.

When people are working at home during the COVID-19 crisis, a number of work-related expenses are not incurred. These include expenses such as commuting costs and childcare costs. In order to estimate commuting costs, the Household Budget Survey from 2016 was used. The average modelled total commuting cost per week constitutes €9.17 for one worker, €14.42 for two workers and €23.82 for three workers. It should be noted that those who do not work also have transport costs for other purposes.

The onset of the COVID-19 crisis saw a large fall in stock markets across the world. The Irish index, ISEQ, fell by 32 per cent from 1 January to 1 April, 2020. The holding of shares is quite variable across both the income distribution and the age distribution. The Irish Household Finance and Consumption Survey in 2018 reports that the top 20 per cent of incomes are eight times more likely to hold shares than the bottom 20 per cent of households. In addition, the value of financial assets for those who hold shares is nine times higher. The average value of shares held per household varies with age, but is not monotonic.

IV. Policy instruments

Individuals are eligible for a COVID-19 Pandemic Unemployment Payment (PUP) if they lose their job. This instrument provides a payment of €350 per week, available to workers who have lost their job on (or after) 13 March due to the COVID-19 crisis. Those who become sick as a result of COVID-19 are eligible, if they are of working age, for a COVID Enhanced Illness Benefit (CEIB). The benefit is paid at the enhanced rate of €350 per week when a worker is told to self-isolate by a doctor or the Health Service Executive (HSE) because they might be a possible source of infection or have been diagnosed with COVID-19. These instruments will be in place for the duration of the crisis.

The State agreed with the main Irish banks that they would allow freezing of up to three months on loan and mortgage repayments for customers financially affected by the COVID-19 crisis. As of 28 March, 28,000 applications had been made to defer mortgage payments, with approximately

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16The commuting costs that we deduct from disposable income are only those for essential travel related to work. Non-essential travel is not considered in our definition of commuting cost and adjusted disposable income. More than 80 per cent of these commuting costs fall on motor fuels. We perform a Monte Carlo simulation and we predict commuting costs from the current distribution observed in Household Budget Survey. Note, while the actual cost of commuting for work may be higher, it is assumed that there would be some substitution if an individual were not working.
a further 7,000 being approved per day. This resulted in a total of 45,000 mortgage deferrals by 12 April.

The State announced measures to support childcare providers and parents during COVID-19 closures, to provide sustainability to the childcare sector and to ensure that parents do not have to pay childcare fees during this COVID-19 crisis, while providing them with reassurance that they will maintain their childcare places.\(^\text{17}\) The Household Budget Survey reports the distribution of childcare costs per family type and by disposable income distribution.

In order to incentivise employers to retain their work force during the COVID-19 crisis, the state introduced a COVID-19 Temporary Wage Subsidy Scheme on 24 March, 2020. It aims to keep employees registered with their employers, so that they will be able to get back to work quickly after the pandemic. Businesses with a minimum of a 25 per cent decline in turnover between 14 March 2020 and 30 June 2020 are eligible for the scheme. The scheme was initially based upon an employee’s net earnings (after income tax, Pay Related Social Insurance and Universal Social Charge) and is paid up to a maximum ceiling of €410 per week.

On 15 April, changes were announced to the temporary wage subsidy:

- the subsidy is 85 per cent of previous earnings for employees with a previous average take-home pay below €412 per week;
- the subsidy will be €350 per week for employees with a previous average take-home pay between €412 and €586 per week;
- a tiered system has been introduced for employees with a previous average take-home pay of over €586 per week;
- employees who were taking home more than €960 per week will be able to avail themselves of the scheme, with tapers depending upon the proportion paid by the employer.

The wage subsidy will have a relatively minimal distributional impact as the State subsidises the payments received by employees from employers. It does, however shift the balance between private-sector and public-sector expenditure.

V. Results

Figures 1(a) and 1(b) summarise the absolute and relative change in the distributional characteristics of different types of incomes during the COVID-19 crisis, compared with the period before the crisis. The deciles used are based upon household disposable income adjusted for work, housing

\(^{17}\)https://www.gov.ie/en/press-release/e37415-minister-katherine-zappone-announces-measures-to-support-childcare-p/
FIGURE 1

Change in different types of monthly incomes by decile

(a) Euros per month per adult equivalent

Decile

Absolute change

-2000.0
-1500.0
-1000.0
-500.0
0.0
123456789 1 0

| Decile | Market income | Gross income | Disposable income | Disposable income* |
|--------|---------------|--------------|-------------------|-------------------|
| 1      | -50.0         | -40.0        | -30.0             | -20.0             |
| 2      | -40.0         | -30.0        | -20.0             | -10.0             |
| 3      | -30.0         | -20.0        | -10.0             | 0.0               |
| 4      | -20.0         | -10.0        | 0.0               | 10.0              |
| 5      | -10.0         | 0.0          | 10.0              | 20.0              |
| 6      | 0.0           | 10.0         | 20.0              | 30.0              |
| 7      | 10.0          | 20.0         | 30.0              | 40.0              |
| 8      | 20.0          | 30.0         | 40.0              | 50.0              |
| 9      | 30.0          | 40.0         | 50.0              | 60.0              |
| 10     | 40.0          | 50.0         | 60.0              | 70.0              |

(b) Percentage change compared with the pre-crisis level

Decile

% change

-50.0
-40.0
-30.0
-20.0
-10.0
-0.0
10.0
20.0
30.0
40.0
50.0

| Decile | Market income | Gross income | Disposable income | Disposable income* |
|--------|---------------|--------------|-------------------|-------------------|
| 1      | -50.0         | -40.0        | -30.0             | -20.0             |
| 2      | -40.0         | -30.0        | -20.0             | -10.0             |
| 3      | -30.0         | -20.0        | -10.0             | 0.0               |
| 4      | -20.0         | -10.0        | 0.0               | 10.0              |
| 5      | -10.0         | 0.0          | 10.0              | 20.0              |
| 6      | 0.0           | 10.0         | 20.0              | 30.0              |
| 7      | 10.0          | 20.0         | 30.0              | 40.0              |
| 8      | 20.0          | 30.0         | 40.0              | 50.0              |
| 9      | 30.0          | 40.0         | 50.0              | 60.0              |
| 10     | 40.0          | 50.0         | 60.0              | 70.0              |

Note: ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.

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expenses and capital losses. Looking at the change in the absolute size of market income first, we can see that it has decreased across all deciles of the disposable income distribution. In absolute terms, the decrease was larger at the top than at the bottom of the distribution. In relative terms, however, the opposite holds, suggesting an overall increase in market income inequality during the COVID-19 crisis, compared with the period before the crisis.

A substantial increase in the size of benefits during the crisis partially compensated the loss of market income for all individuals regardless of their place in the distribution of household disposable income (see Figures 2(a) and 2(b)). In both absolute and relative terms, however, benefits grew the most for individuals in the upper tail of the income distribution. The drop in market income was also accompanied by a decline in taxes paid. Although the decrease in taxes occurred across all deciles of the disposable income distribution, it was more sizable at the top than at the bottom. In general, neither changes in benefits nor changes in taxes allowed individuals across all deciles of the income distribution to maintain their pre-crisis level of disposable income (Figures 1(a) and 1(b)). The decline in household disposable income was relatively small among the bottom four deciles but was rather large in the upper tail of the distribution.

A relevant measure to analyse while trying to trace changes in the real standard of living of individuals is disposable income adjusted for housing costs, work-related expenditures and capital losses. The COVID-19 crisis has pushed a substantial share of employees to work from home or to take up temporary unemployment, which resulted in a decline in work-related expenses. Some individuals also took up the opportunity to put on hold interest payment on their mortgages, which induced a decline in current housing costs. Taken together, a decline in these two types of expenditure (see Figures 2(a) and 2(b)) helped individuals in the lower tail of the income distribution to end up with even higher adjusted household disposable income during the crisis than in the pre-crisis period (see Figures 1(a) and 1(b)). For households in the upper tail of the income distribution (above the 6th decile), the adjusted disposable income was still lower during the crisis than prior to it, but nevertheless the decline in housing and work-related resources helped them to soften the drop in conventional disposable income.

Figures 1(a) and 1(b) indicate that losses to household equivalised disposable incomes were attenuated during the early weeks of the crisis, thereby avoiding the same size of losses we observe for market incomes. This cushioning occurred via a mix of private and public measures, which deviated from the standard social insurance–income maintenance mechanisms. Under private measures, we consider work-related (childcare expenses, commuting costs) and housing (mortgage interests, rent payments) costs, which individuals have to pay from their disposable income every month. Under public measures, we consider new types of benefits and wage
FIGURE 2
Change in benefit gains, tax reductions and reductions in housing costs and work-related expenses

(a) Euros per month per adult equivalent

(b) Percentage change compared with the pre-crisis level

Note: ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.

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FIGURE 3

Change in housing costs and work-related expenses (percentage change compared with the pre-crisis level)

Decile

| Decile | Childcare expenses | Commuting expenses | Mortgage interest |
|--------|-------------------|--------------------|-------------------|
| 1      |                   |                    |                   |
| 2      |                   |                    |                   |
| 3      |                   |                    |                   |
| 4      |                   |                    |                   |
| 5      |                   |                    |                   |
| 6      |                   |                    |                   |
| 7      |                   |                    |                   |
| 8      |                   |                    |                   |
| 9      |                   |                    |                   |
| 10     |                   |                    |                   |

Note: ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.

subsidies, which were introduced during the crisis to soften a decline in market incomes. In what follows, we discuss these private and public measures in terms of their impacts on incomes along the entire distribution of household disposable income adjusted for housing and work-related expenditure.

Figure 3 describes the distributional change in private income-support measures (childcare expenses, commuting costs, mortgage interests and rent payments) during the crisis compared with the period before the crisis. It documents a decrease in all these expenses along the entire distribution of disposable income during the crisis, except for rents, which did not change. Childcare expenses recorded the largest decrease among all types of expenses and across all deciles, except the 7th and 10th deciles, with the size of decrease ranging between 68 and 98 per cent. The relative decline in commuting expenses was also substantial and more homogeneous along the distribution falling between 75 and 88 per cent. Mortgage interests decreased at various rates across the distribution, ranging between 11 and 33 per cent, larger in the middle.

Figures 4–6 show the breakdown of employment shares, the average weekly work income, and proportions of individuals receiving different types of public income-support schemes by deciles of the disposable income distribution, adjusted for housing and work-related expenses. Figure 4 documents that
employment shares are lower for the bottom than for the top deciles of the income distribution. In the bottom half of the distribution, the most affected in terms of employment rates are the 3rd and 4th deciles. However, this is not reflected in the average weekly work income, which is not the lowest among the bottom deciles (Figure 5). Among the top half of the deciles, the rank in disposable incomes is positively associated with the average weekly work income, whereas among the bottom half of the deciles the trend is unclear, most probably due to commuting costs (those with higher commuting costs are at the bottom of the income distribution).

Figure 6 shows that the highest prevalence of PUP is in the top half of the distribution, where the percentage of employees who receive PUP varies between 13.1 and 17.4 per cent. In contrast, at the bottom of the income distribution, the percentage of employees who receive PUP lies between 9 and 12.6 per cent. Overall, we find a positive relationship between the prevalence of PUP and income deciles. Given our simulation assumptions, as expected, the distribution of CEIB across income deciles follows the age distribution.

Table 1 summarises changes in inequality of different types of incomes during the crisis compared with the pre-crisis period. It identifies the contributions of benefits, taxes, and work-related and housing costs to these changes. The contribution of benefits to redistribution is derived as the difference in the Gini coefficients calculated for gross and market incomes. The contribution of taxes to redistribution is derived as the difference in the Gini coefficients calculated for disposable and gross incomes. The

Note: ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.
**FIGURE 5**

*Average weekly work income by decile, in euros*

| Decile | Income (€) |
|--------|------------|
| 1      | 332.3      |
| 2      | 418.7      |
| 3      | 507.0      |
| 4      | 488.9      |
| 5      | 519.0      |
| 6      | 537.1      |
| 7      | 671.3      |
| 8      | 767.5      |
| 9      | 871.6      |
| 10     | 1582.1     |

*Note:* ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.

**FIGURE 6**

*Percentage of employees receiving COVID-19 related income-support schemes by decile*

| Decile | PUP | CEIB |
|--------|-----|------|
| 1      | 10.8| 0.4  |
| 2      | 9.8 | 1.3  |
| 3      | 9.0 | 0.2  |
| 4      | 10.0| 0.7  |
| 5      | 12.6| 0.5  |
| 6      | 14.2| 0.2  |
| 7      | 13.1| 1.0  |
| 8      | 17.4| 0.8  |
| 9      | 16.9| 0.6  |
| 10     | 15.0| 2.1  |

*Note:* ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses. Deciles are defined within the distribution of this income.
TABLE 1

*Gini coefficient before and during the crisis (bootstrapped standard errors in parentheses)*

|                      | Market income | Gross income | Disposable income | Disposable income* |
|----------------------|---------------|--------------|-------------------|--------------------|
| **Gini coefficient** |               |              |                   |                    |
| Before the crisis    | 0.499 (0.004) | 0.355 (0.004) | 0.295 (0.003)     | 0.317 (0.003)      |
| During the crisis    | 0.602 (0.005) | 0.346 (0.005) | 0.288 (0.003)     | 0.296 (0.004)      |
| **Change**           | +0.103        | –0.009       | –0.007            | –0.021             |

| Redistribution       | Benefits      | Taxes        | Work-related expenses and housing costs |
|----------------------|---------------|--------------|----------------------------------------|
| Before crisis        | –0.144        | –0.060       | 0.022                                  |
| During crisis        | –0.256        | –0.058       | 0.008                                  |
| Change               | –0.112        | +0.002       | –0.014                                 |

Note: ‘Disposable income*’ stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses.

The contribution of work-related and housing costs to redistribution is derived as the difference in the Gini coefficients for disposable income adjusted for work-related and housing expenditures and disposable income without these adjustments.

Table 1 shows that inequality in market income increased by 0.103 points during the crisis as compared to the period before. In contrast, inequality in gross income, disposable income, and disposable income adjusted for work-related and housing costs decreased by 0.009, 0.007 and 0.021 points, respectively. Among three redistributive instruments (i.e. benefits, taxes, and work-related and housing expenditures), the changes in benefits contributed the most to the decline in inequality, followed by the changes in work-related and housing costs. The redistributive role of taxes decreased slightly during the crisis compared with the pre-crisis period.

Table 2 summarises the changes in inequality of different types of incomes using the Theil index. The findings are consistent with the ones based on the Gini index; they show an increase in market income inequality during the COVID-19 crisis but a decrease in inequality in gross, disposable and adjusted disposable incomes due to a stronger redistributive role of public benefits and changes in work-related and housing costs.

VI. Discussion and conclusions

Our analysis shows how the combination of crisis-induced income-support policy innovations combined with existing progressive elements of the tax-benefit system were effective in mitigating an increase in income inequality in the early stage of the COVID-19 emergency. We find evidence of declines in
TABLE 2
Theil coefficient before and during the crisis (bootstrapped standard errors in parentheses)

|                      | Market income | Gross income | Disposable income | Disposable income* |
|----------------------|---------------|--------------|-------------------|--------------------|
| **Theil coefficient**|               |              |                   |                    |
| Before crisis        | 0.449 (0.013) | 0.225 (0.009) | 0.145 (0.004)     | 0.171 (0.005)      |
| During crisis        | 0.668 (0.020) | 0.221 (0.011) | 0.141 (0.005)     | 0.149 (0.005)      |
| Change               | +0.219        | −0.004       | −0.004            | −0.022             |

| Redistribution       | Benefits    | Taxes        | Work-related expenses and housing costs |
|----------------------|-------------|--------------|----------------------------------------|
| Before crisis        | −0.224      | −0.080       | 0.026                                  |
| During crisis        | −0.447      | −0.080       | 0.008                                  |
| Change               | −0.223      | 0            | −0.018                                 |

Note: Disposable income* stands for household equivalised disposable income adjusted for housing, work-related expenses and capital losses.

market incomes across the income distribution, which were more pronounced (in relative terms) at the bottom than at the top. These declines were attenuated by public policy measures aiming to (at least partially) preserve the incomes of those who lost jobs or became sick. We find that all deciles experienced an increase in benefits during the crisis. The size of benefit increases was not sufficient to fully offset the loss in market incomes, but they helped the poorest 50 per cent to avoid substantial losses in gross incomes. At the same time, there was a decline in taxes paid along the distribution, with the decline being more pronounced among the more affluent part of the distribution.

Despite the increase in benefits and the decline in taxes, the size of disposable incomes (unadjusted for housing costs and work-related expenditures) decreased for all individuals except the poorest. Once we account for the decline in housing and work-related expenses, we find that households situated among the bottom 60 per cent of the distribution improved their financial situation, whereas losses are recorded among the top 40 per cent. This indicates that the poorest 60 per cent of the distribution gained under the policy measures introduced during the COVID-19 crisis. We find that inequality in market income increased during the crisis, whereas inequality in gross and disposable incomes decreased. Overall, the crisis has had an equalizing real-time effect.

On a methodological level, our analysis shows how an approach that combines microsimulation and nowcasting can provide real-time information to policymakers on the income-distribution implications of economic shocks and policy responses, even where the availability of survey data comes with unavoidable lags.
This approach could have significant value as governments move to reopen the economy gradually and possibly adjust income-support policies to improve targeting. The methodology is well designed to explore the relaxation of the shutdown in targeted sectors (which will affect employment rates in those sectors) as well as changes in benefit generosity and subsidy rates. Using the model, policymakers could explore a menu of policy combinations in terms of their impact on key welfare measures and fiscal costs.

References

Atkinson, T., Bourguignon, F., O’Donoghue, C., Sutherland, H. and Utili, F. (2002), ‘Microsimulation of social policy in the European Union: case study of a European minimum pension’, *Economica*, vol. 69(274), pp. 229–243.

Bækgaard, H. (2002), ‘Micro–macro linkage and the alignment of transition processes. Some issues, techniques and examples’, National Center for Social and Economic Modelling, Technical paper no. 25.

Baldwin, R. and Weder di Mauro, B. (2020), ‘Mitigating the COVID economic crisis: act fast and do whatever it takes’, London: Centre for Economic Policy Research.

Beirne, K., Doorley, K., Regan, M., Roantree, B. and Tuda, D. (2020), ‘The potential costs and distributional effect of COVID-19 related unemployment in Ireland’, Economic and Social Research Institute, Budget Perspectives 2021 – no. 1.

Bourguignon, F., Fournier, M. and Gurgand, M. (2001), ‘Fast development with a stable income distribution: Taiwan, 1979–94’, *Review of Income and Wealth*, vol. 47(2), pp. 139–163.

Callan, T., Keane, C., Walsh, J. R. and Lane, M. (2010), ‘From data to policy analysis: tax-benefit modelling using SILC 2008’, *Journal of the Statistical and Social Inquiry Society of Ireland*, no. 40.

Gaspar, V. and Mauro, P. (2020), ‘Fiscal policies to protect people during the coronavirus outbreak’, Blog, International Monetary Fund, 5 March (https://blogs.imf.org/2020/03/05/fiscal-policies-to-protect-people-during-the-coronavirus-outbreak/).

Li, J. and O’Donoghue, C. (2014), ‘Evaluating binary alignment methods in microsimulation models’, *Journal of Artificial Societies and Social Simulation*, vol. 17(1), 15.

Navicke, J., Rastrigina, O. and Sutherland, H. (2014), ‘Nowcasting indicators of poverty risk in the European Union: a microsimulation approach’, *Social Indicators Research*, vol. 119, pp. 101–119.

O’Donoghue, C. and Loughrey, J. (2014), ‘Nowcasting in microsimulation models: a methodological survey’, *Journal of Artificial Societies and Social Simulation*, vol. 17(4), 12.

—, — and Morrissey, K. (2013), ‘Using the EU-SILC to model the impact of economic crisis on inequality’, *IZA Journal of European Labor Studies*, vol. 2, 23 (https://izajoels.springeropen.com/articles/10.1186/2193-9012-2-23).

—, — and Sologon, D. M. (2018), ‘Decomposing the drivers of changes in inequality during the great recession in Ireland using the fields approach’, *Economic and Social Review*, vol. 49(2), pp. 173–200.

—, Sologon, D. M., Kyzyma I. and McHale, J. (2020), ‘Modelling the distributional impact of the COVID-19 crisis’, *IZA Discussion Paper no. 13235.*

Sologon, D. M., Van Kerm, P., Li, J. and O’Donoghue, C. (2018), ‘Accounting for differences in income inequality across countries: Ireland and the United Kingdom’, LISER Working Paper no. 2018-01.

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