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Household resilience to expenditure and debt service channels under current inflationary conditions

Tamanna Adhikari and Fang Yao

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Tamanna Adhikari¹ and Fang Yao²

Central Bank of Ireland

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Abstract

This *Note* uses household survey data to estimate distress rates in Ireland based on a financial margin approach. We explore the role of both the expenditure and debt service channels in determining household borrowers' financial distress. In our baseline scenario, where inflation is expected to gradually recede, nominal income growth remains robust and unemployment does not increase, we find the debt-servicing channel to be more important than the expenditure channel in explaining the increase in distress amongst mortgaged households. Under this scenario to the end of this year, distress rates are modelled to increase only from 8.3 to 9.6 per cent. The distress rate is modelled to increase to 12.7 per cent under our most severe adverse scenario, which incorporates higher inflation, higher interest rates and a significant increase in unemployment. The increase in distress is disproportionately concentrated amongst low-income and high debt cohorts as well as borrowers with tracker loans.

1 Introduction

The sharp increase in the cost of living has led to increased financial pressures for households. Global inflation has become more persistent and broad-based, requiring central banks globally – including in the European Central Bank (ECB) – to raise interest rates to bring inflation back to its medium-term target. Indeed, in response to building inflationary dynamics, the ECB's monetary policy tightening cycle has been rapid and pronounced (FSR II 2022). This *Note* aims to quantify the impact of these combined inflationary and debt service shocks on the resilience of households with mortgages in Ireland.

In our analysis, we apply detailed information from the Household Finance and Consumption Survey (HFCS) to a micro-simulation model to simulate the impact of multiple macroeconomic shocks on household financial distress. We use information on expenditure and income to characterise households that are particularly exposed to adverse macroeconomic shocks related to inflation, interest rates and unemployment levels. The micro-simulation² model allows us to consider

¹ Economist, Macro-financial Division, Central Bank of Ireland

² Senior Economist, Macro-financial Division, Central Bank of Ireland

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the impact of the shocks separately by allowing us to analyse the marginal contribution of each shock. Further, by using household balance sheet data on savings and financial assets, we can also assess the availability of financial buffers in different household groups.

The present work extends the analysis of Adhikari (2022), which considers the impact of inflationary shocks on residual income left for households to service their mortgage after taking basic living expenses. It finds that scenarios in which inflation significantly exceeds nominal income growth, could lead to distress levels increasing by one-quarter to one-third respectively. Our augmented model presented in this paper also allows households to respond to shocks by covering debt service with savings, at least in the short run. Byrne et al. (2023) find that there is substantial variation across mortgage borrowers in their exposure to the interest rate shock. The top quintile is experiencing average repayment increases of 41% over 2022-23, even though the average increase is just 13.4%, with the most-exposed groups most likely to have drawn down loans between 2004-2008, when credit conditions in Ireland were at their most loose.³

Measures of debt servicing capacity such as debt service to income (DSTI) ratios are typically used when assessing household resilience to shocks. However, ongoing inflationary conditions pose a challenge to these traditional indicators of financial vulnerability, because an increase in expenditure and erosion of real incomes can reduce the debt servicing capacity of households in ways which cannot be captured by these conventional indicators. To address this challenge, we employ a *financial margin* approach which captures changes in both income and expenditure including debt servicing and has emerged as a useful tool to analyse households' financial distress (see Gross et. al., 2022; Johanson and Persson (2006) for Sweden; Hollo and Papp (2007) for Hungary; Albacete et. al. (2014) for Austria).

In this Note, we find that – in the baseline scenario examined – the inflationary shock (expenditure channel) alone has a relatively small impact on the share of mortgaged households with a negative financial margin. Overall, the share of households in distress increases from 8.3 per cent in 2021 to 9.6% by end of 2023 under the baseline scenario. Of that, 0.6 pp is from inflation and 1.1 pp is from interest rates. Income growth offsets these negative macroeconomic shocks by 0.4pp in the baseline scenario. The distress rate increases to 11.7 per cent in the adverse scenario, which incorporates higher inflation, higher interest rates and a moderate increase in unemployment by end of 2023. In a longer-term scenario that additionally incorporates a more severe deterioration in the labour market, the overall household financial distress could rise to 12.7 per cent.

When breaking down the distress rates based on household characteristics, we find significant heterogeneity in distress rates across household cohorts. We show that lower-income mortgage borrowers began with the highest repayment burdens and are most exposed to the combined shocks currently being experienced. In both the baseline and adverse scenarios for 2023, those most at risk from the combined shock are lower-income, higher-debt households. However, they account for a small share of total mortgage lending. In addition, borrowers with a tracker-rate loan show higher distress rates than other interest rate types. This is primarily because the interest rate pass-through for tracker-rate loans is highest and fastest, leaving them with less scope to adjust to the interest rate shock. The interest rate shock is partially mitigated by the fact that tracker

³ The top quintile borrowers typically originated before 2008, continue to have nearly 20 years left on their mortgage, have tracker rate or interest-only mortgages, and have among the highest historic levels of non-performing loans and forbearance.

borrowers in general have a higher income, higher savings and benefited from the low interest rates for much of the past decade.

The structure of this Note is as follows: Section 2 explains the model specifics. Section 3 describes the data while section 4 details the macroeconomic scenarios in the simulation. Section 5 outlines our main results while Section 6 concludes.

2 Model

In this Note, we model the impact of inflation and interest rate shocks using a micro-simulation model, based on Gross and Poblacion (2017). This model combines household survey data with macroeconomic projections to study the heterogeneous impacts of macroeconomic scenarios on household resilience. The advantage of this approach is that we can take many relevant dimensions of household finance into consideration while studying the impact of macroeconomic shocks, allowing us to analyse heterogeneous effects on individual groups. We briefly outline the structure of the model below.⁴

2.1 Micro Block

The micro block of our simulation model takes advantage of detailed information on household characteristics and personal finances from the Household Finance and Consumption Survey (HFCS). We focus only on households with a mortgage. A household in the survey consists of individuals who either are employed or earn a social security payment. Households as a whole make decisions on consumption, savings and service their debts. The comprehensive coverage of household finance and consumption data allow us to build a realistic scenario for the simulation directly on variables affected. As a result, we can take into account changes in work status, income, expenditure, and mortgage servicing costs as a result of macro shocks. Our household level simulation comprises of four steps:

1) At the individual level, using variables on personal characteristics, we estimate changes in work status, wage and social benefit payment when labour market conditions change due to macroeconomic shocks.

2) In case of a change in the aggregate unemployment rate, we run Monte Carlo simulations of employment status at the individual level and a new income is calculated based on household's characteristics and the regression coefficients in Step 1.

3) After simulating the employment status, we aggregate individual incomes to the household level and apply other shocks to different components of the household budget and balance sheet. In the expectation of different pass-through of ECB interest rates to mortgage payments, depending on the type of product, we assume pass-through of 100 percent of changes in ECB rates to tracker rate mortgages and of 60 per cent to mortgages with a variable rate.⁵ Fixed-rate customers are assumed to have zero pass-through by the end of our simulation horizon in 2023.⁶

⁴ See Gross et al. (2022) for a more detailed description of the model.

⁵ The assumption of 60% pass-through is based on consultation of previous international literature and internal modelling of historical behaviour of retail interest rates of Irish banks. It is also used in a range of internal Central Bank stress-testing models.

⁶ Some fixed rate customers may ultimately face higher interest rates when rolling off short fixed term periods. Byrne et al. (2023) shows that approximately 11% of mortgage loans are due to roll off their current fixed rate by June 2023.

4) Once all variables on household balance sheets are determined, we calculate the resilience indicator – financial margin (FM) – given by the following equation:

$$FM = \frac{\text{Liquid assets} + \text{Disposable income} - \text{Expenditure} - \text{Debt payment}}{\text{Disposable income}}$$

Disposable income is calculated using gross income reported in the HFCS and the income tax code in Ireland. We classify households as distressed when $FM < 0$, i.e. a household cannot cover their expenses with their income and liquid assets over the year. This metric estimates the sufficiency of financial buffers available to households in the face of adverse economic shocks.

2.2 Macro Block

The macro projections used as an input to our micro simulation model come from European Banking Authority baseline and adverse stress test scenarios released in January 2023.⁷ We incorporate projections on inflation, interest rates and unemployment into our micro simulation model. Those forecasts will affect the consumption expenditure, interest payments and work status of households in the simulation. In addition, we take forecasts of the sectoral income growth into account to determine the income growth at the individual level, sourced from the Earnings, Hours and Employment Costs Survey conducted by the Central Statistics Office. Lastly, we account to some degree for changes in household behaviour in light of high inflation. Details of this are outlined in Section 4.

3 Data

We use data from the latest HFCS, conducted in 2020 for Irish households.⁸ This contains a snapshot of household finances during the COVID-19 pandemic, which induced significant changes to the balance sheet of households. The survey gathers detailed information on households' assets, liabilities, income, and consumption, as well as demographic questions pertaining to all members of the household. Table 1 outlines some key individual and household characteristics in our data set.

Table 1: Key Characteristics of Mortgaged Households in the Sample

Variable	Median	Standard Dev.
Household Net Income*	67,779	28,656
Total Expenditure*	24,000	19,730
Savings*	9,950	99,126
Total Mortgage Debt	137,024	237,047
Interest Rate**	2.3%	1.1%
Annual Debt Payment**	13,734	18,476
Age of reporting person	47	10

⁷ Information on the stress test scenarios can be found [here](#).

⁸ For more information about the HFCS, please see the following [website](#).

Debt Service Ratio	22%	
Current Loan-to-Income Ratio	2.6	

Notes: * computed on an annual basis; **Average Interest rate on Total Debt
Source: Authors' own calculations using HFCS (2020)

Note that the HFCS reports gross income at the individual level. Using characteristics such as number of earners within each household and their incomes, we compute net income at the household level. For our simulation, we further classify household expenditure into essentials and non-essentials to reflect the impact of basic living costs on household budgets.

As mentioned in Section 2.1, we classify a household as being “distressed” if its Financial Margin is below zero. Based on this definition of financial distress, Table 2 shows key variables of interest by mortgage borrowers’ financial resilience position based on HFCS (2020). By our metric, 10% of mortgage borrowers were “at-risk” of falling behind on their mortgage payments due to a negative financial margin in 2020. For context, the percentage of mortgage accounts in arrears in 2020 was 8%.⁹

Table 2: Median values of key Variables by households’ financial position (2020)

	Distressed	Not Distressed
Household Net Income	32,252	71,074
Household Expenditure	20,172	23,112
Debt Service Ratio	81%	21%
Current Loan to Income	5.4	2.2
Age of reporting person	42	48
Annual Interest Payment	21,840	13,212

Notes: Income, expenditure, and interest payments are reported here on an annual basis
Source: Authors' own calculation using HFCS (2020)

Distressed households have typically lower net income and are highly indebted. In the following analysis, we will simulate changes to household financial margins under different macroeconomic scenarios.

4 Scenarios

The base year of our simulation is the end of 2021. To update household financial conditions as measured in 2020 to the economy of 2021, we use actual inflation and sectoral weekly earnings growth (listed in Table A1) to recalculate expenditure and labour income across households.

To guide our simulations, we use the latest (January 2023) [economic scenarios](#) released by the European Banking Authority. Table A1 in the Appendix outlines a baseline and an adverse scenario for our income growth, inflation, interest rate, and unemployment rate until the end of 2023. We also consider a sharper adverse scenario where the EBA’s adverse unemployment path for end-

⁹ [Mortgage and Repossessions Statistics](#), Central Bank of Ireland

2024 materialises during our projection horizon, with the unemployment rate increasing by 5%. This last scenario captures the risk of a further, material labour market deterioration.

Additionally, we also incorporate cost-of-living supports for Irish households as announced in Budget 2022¹⁰. This includes a universal €600 energy credit per household to help reduce the impact of electricity bills, and changes to the income tax bands.

To capture the endogenous response of household spending to higher prices, we separate total household expenditure into essential (food and energy spending) and non-essential items. We assume that households respond to higher prices by cutting back 20 per cent of spending on non-essential goods. This response is motivated by the estimates of marginal propensity to consume in Baker (2018).

5 Results

5.1 Main results

Table 3 reports the simulation results, focusing on the aggregate distress rate of mortgage borrowers, under baseline and adverse conditions within the scenarios outlined in Section 4 for the period up to the end of 2023. It further reports the distress rate under a severely adverse scenario which can be interpreted up to the end of 2024.

Based on our definition of financial distress, in 2021, owing to mild inflation and robust income growth, the distress rate of mortgage holders is estimated to have fallen to 8.3% from 10% in 2020. These estimates are in line with findings in Arrigoni et al. (2022), who show that in 2020, over 85 per cent of households were able to meet regular spending out of income or cash savings.

Table 3: Distress rate of household borrowers

2020	10%	
2021	8.3%	
Scenarios	Baseline	Adverse
End-2023	9.6%	11.7%
End-2024	-	12.7%*

Notes: *Scenario 2 is under a severely adverse unemployment shock over a longer term

Looking to end-2023, in our baseline scenario, the proportion of households at risk increases to 9.6%. In the adverse end-2023 scenario, this proportion increases to 11.7%. In the final scenario, where we assume that the unemployment rate rises by 5% in the longer term, around one out of eight mortgage borrowers would be in financial distress and face difficulties in paying their mortgages, an increase in the share of distressed households by one half from the starting point. These distress estimates incorporate current government supports to the household sector.

¹⁰ More information on cost-of-living supports can be found [here](#).

Table 4: Marginal Contribution of individual shock to change in overall distress rate

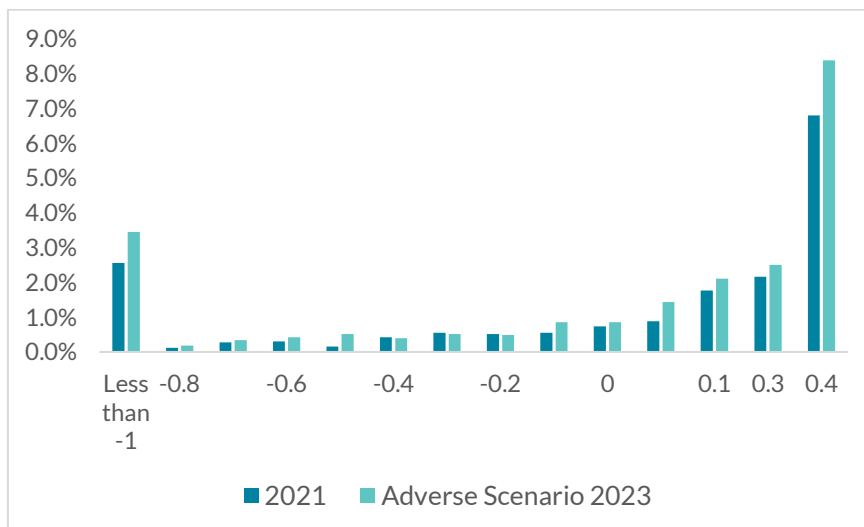
	Baseline	Adverse
Change in Distress Rate between 2021 and 2023	+1.3	+3.4
Contribution of each shock (pp)		
Inflation	0.6	0.7
Interest rate	1.1	2
Income Growth	-0.4	0.5
Unemployment	0	0.2

These scenarios run till end of 2023

Table 4 gives the marginal contribution of each shock to the overall increase in distress rate for the first two scenarios till end of 2023. In the baseline scenario, where inflation is expected to gradually recede, nominal income growth remains robust and unemployment does not increase, we find the debt-servicing channel to be more important than the expenditure channel in explaining the increase in distress amongst mortgaged households.

Focusing on the shift of financial margins across households in the adverse scenario (Figure 1), we find that cost-of-living shocks would be expected to not only push already-distressed household borrowers into deeper negative financial margins, but would also increase the proportion of mortgage holders who are in danger of falling into distress. This is highlighted by the bars at the financial margin value of 0.1, which refers to the group of households that have less than 10% of the net income as their financial buffer.

Figure 1: Distribution of Financial Margin under end 2023 adverse scenario



Note: A financial margin of 0.1 means that the household has 10% of their income as buffer for meeting their ordinary expenses and interest commitments. The FM distribution is truncated at 40% for visual purposes as the remaining density of households (67%) lie in this region and are deemed to be at “low risk” of default.

5.2 Heterogeneity in Household Distress

To understand the drivers of financial distress in the simulation, we assess distress rates across subgroups. Table 5 decomposes distressed mortgage borrowers by income quintiles. We find that distress is not evenly distributed among households. In particular, it occurs disproportionately among households in the lowest quintile of income of mortgage borrowers, who are also the most indebted as shown by the debt servicing ratio.

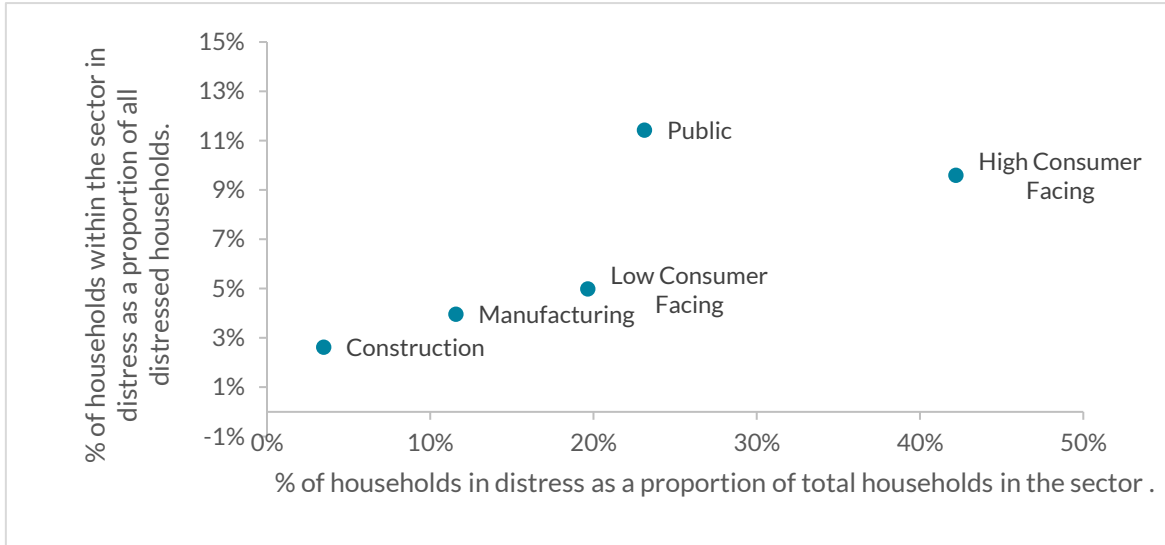
Table 5: Share of mortgage borrowers with negative financial margins by income quintile

Income Quintile	Median DSR	2021	End-2023 Baseline	End-2023 Adverse
Quintile 1	60%	32%	39%	42%
Quintile 2	27%	3%	2%	4%
Quintile 3	23%	2%	4%	5%
Quintile 4	22%	2%	1%	1%
Quintile 5	18%	1%	1%	2%

Note: Distress rates for Quintile 4 reduce, albeit marginally, in the baseline and adverse scenario due to higher income growth observed in this quintile.

Figure 2 further decomposes the proportion of distressed households under our end-2023 baseline by sector of employment of the household reference person. The two axes show the sectoral heterogeneity using two different proportionality concepts. On the x-axis, we show the within sector distress rate while the y-axis shows the contribution of these sectors to the overall distress rates amongst all mortgaged households by taking into account the size of the sector. For example, approximately 40% of all households in our sample employed in the “High consumer facing” sector could be deemed as being “in distress” however, this contributes only 9% to the overall distress rates due to the relative size of the sector in terms of number of mortgaged households engaged in this sector. By contrast, the public service sector has a relatively low distress rate compared to the high consumer facing sector, but it contributes the most to overall distress, because it has the largest share of mortgage borrowers. The sectors shown in the figure collectively account for only 33% of the overall distress rates.

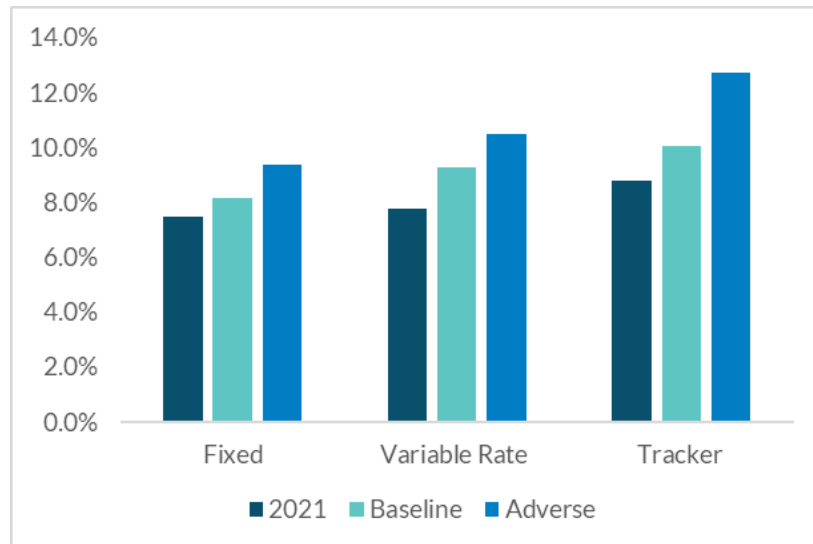
Figure 2: Distribution of Distress Rates over selected Sectors of Employment of Household Reference Person



Notes: For brevity, these distress rates refer to the baseline simulation up until end of 2023. The Y-axis does not sum up to 100 due the presence of missing values and a large “others” category in sector of employment which makes the individual sectors indistinguishable

Our analysis suggests that the interest rate shock leading to increase in monthly payments, is a key risk currently facing mortgage borrowers. However, the effect of the interest rate shock is not evenly distributed across different types of mortgages in the near term. Fixed-rate customers are assumed to have zero pass-through by the end of our simulation horizon in 2023.¹¹ We show that the distress rate among tracker rate borrowers would increase most significantly under the combined shocks, in part due to the complete pass-through of ECB interest rates.

Figure 3: Share of households with negative financial margin by interest rate type



Notes: For brevity, these distress rates refer to the simulations under the baseline scenario up until end of 2023.

¹¹ Some fixed rate customers may ultimately face higher interest rates when rolling off short fixed term periods. Byrne et al. (2023) shows that approximately 11% of mortgage loans are due to roll off their current fixed rate by June 2023.

5.3 Dominance Analysis

This section provides a new way to formally explore the relative importance of households' economic variables in the terms of their predictive power of financial distress. We apply a dominance analysis (DA) framework to estimate how changes in the variables listed below explain the probability of a household being in distress (see Grömping 2007 and Luchman 2021 for a discussion). DA can be thought of as an extension of standard methods of estimating relative Importance in linear regression based on variance decomposition. In the context of a linear prediction model, a DA amounts to determining the relative importance of independent variables based on each variable's contribution to an overall model fit.

Table 5: Top 5 contributors in explaining household financial distress

Dependent Variable: Probability of Distress	Standardized Dominance Statistics	Ranking
Total Household Income	52.2%	1
Interest Payment	11.1%	2
Total Expenditure	10.8%	3
Mortgage Debt	9.9%	4
Education of household head	8.6%	5

Table 5 reports the top five contributors in explaining household financial distress. The ranking reflects the relative importance in terms of their contribution to the over-all model fit (middle column). Household income is ranked first and explains over 50% of financial distress. Change in interest payments and the level of mortgage debt combined, explain about 20% of the change in probability of distress, which can be associated with debt servicing channel. Interest rate payment captures the change in interest burden, while mortgage debt is to capture the level of indebtedness of household. Household expenditure by itself is ranked the third important contributor, accounting for around 10% of the overall fit.

6 Conclusion

This Note develops a microsimulation model for assessing household borrower distress based on a financial margin approach in Ireland. We use information on wealth, spending and income to identify mortgage borrowers that are particularly exposed to a range of macroeconomic shocks related to incomes, interest rates, inflation, and the unemployment rate. As we introduce these shocks in an incremental fashion, the model allows us to analyse the impact of these expenditure and debt service channels distinctly.

The micro-simulation model highlights the importance of taking income as well as the full balance sheet information of households into account in the risk assessment of mortgaged households. We show that, on average, an increase in the proportion of "at-risk" households of by 16% (End 2023 baseline scenario) to one half (End- 2024 adverse scenario). Considering the marginal effect of these channels to the overall distress we conclude that main contributors to financial distress are household income, the debt servicing channel and to a less extent the expenditure channel.

As for most micro-simulation models, caveats apply to our study. One important limitation of our study is that it does not consider a feedback effect. If households take collective action to cut spending and/or reduce labour supply, they would in turn affect prices and wage growth in the economy. These effects are only captured in our work, to the extent that they explicitly feature in the EBA scenario generation process. The second area where the simulation can be improved is to model household endogenous behaviours, such as demand elasticity and labour supply decisions, in richer detail. These are areas to explore in future work.

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Appendix

Table A1: Macroeconomic Scenarios used for the Microsimulation

	Real GDP		Inflation		Interest Rate		Unemployment Rate		Government Supports
	Baseline	Adverse	Baseline	Adverse	Baseline	Adverse	Baseline	Adverse	
2021 Assumptions	Sectoral Level (EHECS, CSO)		2.4%		NA		6.3%		NA
Scenario 1 (End 2023)	4.9	-1.3	6.6	8.4	+1.0	+2.2	-	+1%	- Energy and Tax credit
Additional Adverse Unemployment Scenario simulated till end of 2024									
Scenario 2 (End 2024)		-3.3		7.7		-	-	+5%	



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