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Interest Rate Snapback and the Impacts on the Irish Economy

Paul Egan[a,b]   Eoin Kenny[a]   Conor O'Toole[a,b]

a: Economic Analysis Division, Economic and Social Research Institute
b: Department of Economics, Trinity College Dublin
* Corresponding author: Conor O'Toole. Email: conor.otoole@esri.ie

ABSTRACT

In this paper, we explore the impact of recent interest rate increases on the Irish economy and chart out the potential impact using scenarios for the period 2023-2025. We use the COSMO macroeconometric model of the Irish economy to test the impacts through credit markets and the real economy, separately modelling the impact on consumer, corporate and mortgage markets. We also use micro data from the Household Finance and Consumption Survey (HFCS) to test the impact on mortgage affordability of the interest rate increases. Our scenarios are drawn from the European Banking Authority (EBA) stress tests which provide base and adverse outcomes for the policy rate. These are compared to a pre-Ukraine war baseline. We find notable effects on the mortgage market and house prices as well as sizable impacts on key macroeconomic aggregates such as investment, consumption and output. We also observe an increase in housing payment to income ratios but no major increase in mortgage affordability distress as measured by the residual income approach.

1 INTRODUCTION

The onset of the global energy market crisis in 2022 following the Russian invasion of Ukraine, and the pandemic-related supply chain bottlenecks, have fueled a resurgence of international inflationary pressures driven by supply-side dynamics. Global headline inflation reached 8.7 per cent in 2022 and the IMF expect it to remain elevated for 2023 (IMF, 2023). These supply-side pressures have been made even more acute when coupled with the rebound in demand following the ending of pandemic restrictions and accommodative fiscal policies in some large economies such as the US. Thus inflation has become embedded in many major economies and core inflation rates (excluding food and energy) continue to remain stubbornly high.

To attempt to bring inflation back towards targeted levels, international Central Banks began a process of steep rises in policy interest rates and a reversal of the highly accommodative monetary policy that has been a feature of the global financial system since the 2007-2009 financial crisis. The Federal Reserve effective funds rate currently stands at just over 5 per cent while the ECB has increased their main refinancing operations rate from 0 per cent in the summer of 2022 to 3.75 per cent on the 10th May 2023. The higher cost of credit aims to subdue economic activity by slowing consumption and investment activity by households and firms. By acting as a counterweight to the demand-side pressures, Central Banks are aiming to restore price stability in the short to medium term. While meeting this objective is a mandated activity for many monetary policy authorities such as the ECB, Bank of England and US Federal Reserve, moving the economy from a context of lower interest rates to an environment with much higher rates is costly, with many trade-offs. Indeed, the extent to which policy rates feed through to economic activity will depend on the relationship between credit markets and the real economy in each jurisdiction.

Given this context, this paper aims to explore the impact on the Irish economy of the increase in policy rates that has occurred since 2022 as well as presenting scenarios for the potential impact of higher rates in the period ahead. We use the ESRI's model of the Irish economy, COSMO (see Bergin et al. (2017) for details) to identify the pass-through of increased ECB policy rates on the economy through market-specific lending rates and credit activity related to investment, consumption and the housing market. Our model contains three credit markets (mortgage market, consumer lending, and non-financial corporations) and policy rates heterogeneously pass through to lending rates in each of these three areas.

COSMO has been applied in a similar manner to assess the economic impact of Brexit (see Bergin et al. (2019)) and COVID-19 (see Garcia-Rodriguez et al. (2021)). The model has also undergone a number of modifications recently including the inclusion of a construction sector (see Egan & Bergin (2022)) and an updated financial block (see Egan, O' Toole, & McQuinn (2022)) thus our research is novel given the set of production sectors (traded, non-traded, construction, and the government) which all experience sector specific reactions to the policy rate changes. We also allow global demand effects from the interest rate increases to pass through to the Irish economy through trade channels by using the NIGEM model to determine international activity for given rate paths.

To calibrate forward looking interest rate scenarios for the period 2022-2025, we draw on the European Banking Authority (EBA) 2023 stress tests and use a base case and adverse scenario from this exercise.[1] Our results therefore capture three specific scenarios: a) a pre-Ukraine war counterfactual; b) an EBA-base case; c) and an EBA-adverse shock. The impulse responses of a range of macroeconomic and financial variables for the Irish economy are presented under each of these hypothetical outcomes.

In addition to the above macro-financial channels which we explore in detail, we undertake a more granular exploration into the impact of higher interest rates on mortgage market affordability for existing borrowers in Ireland. Affordability shocks have been found to be a historical source of fragility for mortgage holders (Lyndon & McCarthy, 2013; O'Toole & Slaymaker, 2021) and can lead to increases in mortgage repayment distress. A number of research papers have considered the impact of interest rate increases on mortgage distress in Ireland (Byrne et al., 2022; Fahy et al., 2018; Slaymaker et al., 2018) and our work complements this research by exploring the impact of the current rate snapback on mortgage affordability. More specifically, we use the Household Finance and Consumption Survey (HFCS) to calculate the mortgage debt-service ratio (DSR) faced by households (mortgage repayment to net income ratio) and then identify the proportion of households who face high housing cost using two international benchmarks (30 per cent housing cost to income rule and the residual income approach). To test the impact of the interest rate increases on the Irish mortgage market, we then simulate in the microdata each of the aforementioned scenarios and explore how our housing affordability indicators vary across these interest rate paths.

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[1] More information on the EBA 2023 stress tests can be found here: https://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing

A number of findings emerge. First, the simulations show that over the period 2022-2025 in the EBA Base (EBA Adverse) scenario the residential mortgages rate, the corporate lending rate and consumer lending rate are elevated by as high 150, 180 and 185 (230, 260 and 280) basis points above the pre-war baseline.[2] This points to a significant shock to Ireland's domestic interest rates with knock on impacts to the real economies as well as significant impacts to the financial economy. The simulations presented in the paper show significant downward pressure on house prices, completions and mortgage demand due to higher interest rates. These impacts can be explained by the dynamics presented in COSMO's financial block as outlined in Egan, McQuinn and O'Toole (2022). The shock to Euribor has a significant impact on both the mortgage market rate and the rate offered to non-financial corporations. The mortgage interest rate impacts house prices through the affordability variable in the house price equations. As completions are determined by house prices, a decrease in house prices leads to a decrease in the number of new dwellings. The level of completions is also more directly impacted by the change in interest rate with an increase in the interest rate for non-financial making borrowing to bring properties to the market more costly. Finally, mortgage demand is determined by both the price of and supply of houses and therefore experiences downward pressure from both house price and the level of completions. Mortgage arrears also rise with an estimated peak in 2024 at 0.54 (0.94) per cent higher than the pre-war baseline in the EBA Base (EBA Adverse) scenario.

On the corporate side, the increased corporate interest rate decreases investment activity by firms and increases the rate of financial distress as measured by insolvencies. By the end of the estimation period in 2025, investment in the construction and domestic sectors have fallen 3.9 per cent and 2.5 per cent respectively in the EBA Base scenario and as low as 5.4 per cent and 3.5 per cent below the pre-war baseline in the Adverse scenario. This fall in investment has knock on effects across the production sectors with employment in both the construction and domestic sector falling over 1.2 per cent below the pre-war baseline under the EBA Base scenario and over 1.8 per cent below the EBA Adverse scenario by the end of the estimation period. Finally, the level of production in both the construction and domestic sectors falls by comparable magnitudes across both interest rate paths. Modified Domestic Demand (MDD) and Gross Domestic Product (GDP) also fall below the pre-war baseline, with MDD falling significantly more than GDP.

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[2] This relates to the average rate across different mortgage types including fixed term, standard variable and tracker rates. Some borrowers will face notably higher increases depending on their individual circumstances.

From a labour market perspective, the fall in employment from the shocks to the individual sectors (as discussed) will cause the overall level of employment to drop; this in turn causes unemployment to reach 0.11 per cent and 0.16 per cent above its pre-war baseline by 2025 in the EBA Base and Adverse scenario respectively. This shock to the labour market has knock-on impacts on the level of disposable income and ultimately the level of personal consumption which falls by 1.1 per cent (EBA Base) and 1.6 per cent (EBA Adverse) by 2025.

Over and above these domestic effects, we explore the impact of the broader global economic environment which is likely to be more subdued under the higher rate environment than under the pre-Ukraine war base case. This is done by feeding the EBA's interest rate scenarios into NIESR's National Institute Global Econometric Model (NiGEM), which in turn provides COSMO with projections of key external variables, such as world demand. Unsurprisingly, the addition of the changing external economic outlook has a much more significant impact on the production sectors of COSMO. The simulations show that the level of investment in both the construction and domestic sectors is noticeably lower vis a vis the pre-war baseline when the global demand channel is incorporated.

In terms of the mortgage market deep-dive, a number of findings emerge. Across both shocks, we observe an increase in payments and a rise in DSRs. We also find an increase in the share of households with their housing payment taking up more than 30 per cent of net income. However, this does not correspond into any major increase in affordability distress as measured by the residual income approach; this approach explores whether households have sufficient income after housing cost of afford a basic standard of living. There are a group of mortgage holders with distressed affordability but this appears to have been the case before the interest rate increases. This finding suggests that while housing costs do rise, and before interest rate increases ,there was a portion of the mortgage market which experience mortgage affordability challenges, the interest rate increases do not necessarily increase this substantially. Many households are therefore able to internalise the cost of the increases and still have sufficient income to afford a basic standard of living.

The rest of this paper is structured as follows: Section 2 outlines the existing literature and economic backdrop. Section 3 presents the modelling and scenarios. Section 4 outlines the discussion. Section 5 presents the mortgage market analysis while Section 6 concludes.
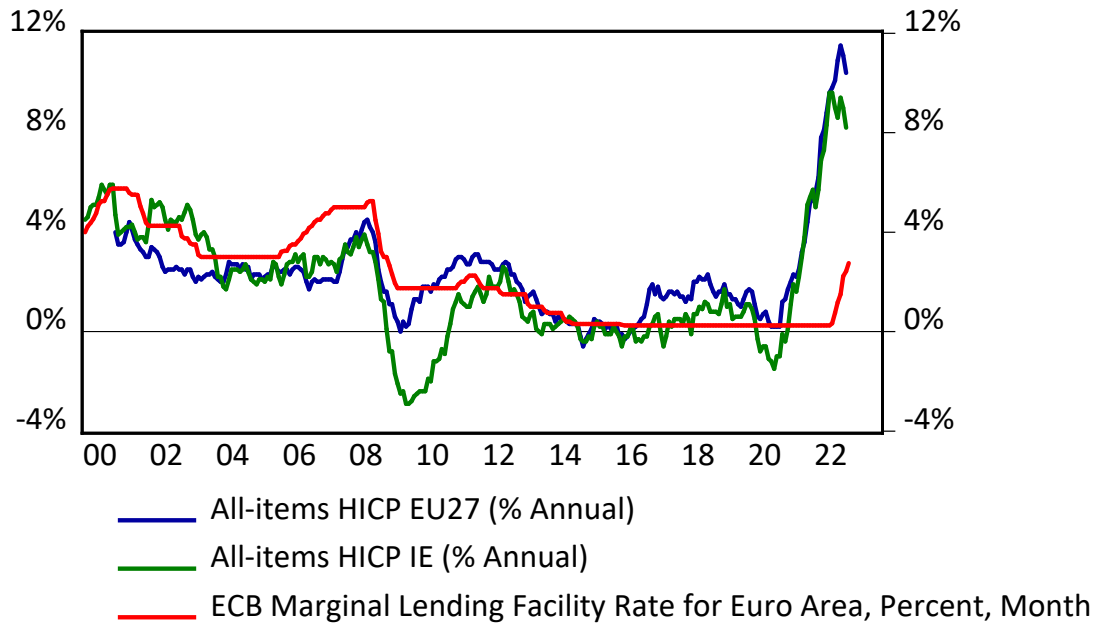
2 BACKGROUND AND CONTEXT

2.1 ECONOMIC BACKDROP

The current economic environment has brought to the fore considerations around the impact of monetary policy on economic and financial channels as economists, policymakers, and households seek to understand the consequences of the recent tightening of monetary policy interest rates on the macroeconomic and the financial sector. This policy has been triggered by inflationary developments internationally. This began with a rapid recovery of demand as the significance of the COVID-19 pandemic lessened. The speed of the recovery of demand led to inflation due to supply chain disruptions after public health restrictions halted the supply of goods all over the world. This led to whiplash effects which was the initial cause of inflation. Given inflation was initially due to damaged supply chain issues, the expectation was that the continued improvements in dealing with COVID-19 and eventual recovery of supply chains would make this a short-term problem.

However, inflation became a much more significant issue at the beginning of 2022 following the invasion of Ukraine by Russia. Given that Russia is a large supplier of gas and oil to Europe and indeed the world, this had a large effect on energy prices. The development of the HICP for the EU27 and for Ireland is shown below, as well as the ECB policy rate. One can clearly see the large levels of inflation since 2021 as well as the subsequent policy rate increases.

Figure 1: HICP and ECB Policy Rate

All-items HICP EU27 (% Annual)

All-items HICP IE (% Annual)

ECB Marginal Lending Facility Rate for Euro Area, Percent, Month

Due to the scale of the energy price shocks, as well as the other pandemic related effects, inflation no longer appears to be a short-term problem that shall resolve itself as economies continue to recover. In December 2022, the Central Statistics Office (CSO) estimated an annual increase in the CPI of 8.2 per cent. The most notable changes in the year were increases in Housing, Water, Electricity, Gas & Other Fuels (+25.9 per cent), Food & Non-Alcoholic Beverages (+11.7 per cent). In an attempt to halt these price increases which are being experienced in most countries, central banks have raised interest rates. It is hoped that this will dampen demand and put downward pressure on prices. However, there are substantial impacts of interest rate increases on households. These impacts are the focus of this paper.

2.2 EXISTING LITERATURE

Our research is related to a large number of studies that consider the impact of monetary policy transmission and the impact of interest rates on economic activity. A common finding across the literature is that increases/decreases in interest rates lead to lower/higher incomes and consumption at the aggregate level, re-

spectfully. Grigoli & Sandri (2022) have shown that increased interest rates have a significant negative impact on credit card spending in both value terms and volume terms. However, at the household level, the effect of interest rate changes depends greatly on the income level of households as well as the composition of household balance sheets. Cloyne et al. (2015) examine the effects of an interest rate decrease across tenure groups - renters, homeowners with a mortgage, and outright homeowners. They find that the two groups who have limited liquid asset holdings, i.e. renters and mortgage-holders, are affected to a greater degree than those with sufficient liquid assets, i.e. outright owners, with mortgage-holders accounting for the vast majority of the aggregate consumption response. Holm et al. (2021) echoes these findings with respect to an increase in interest rates. They order households into a liquid asset distribution and find that those at the lower end of the distribution tend to decrease their consumption as their disposable income declines, while households with intermediate liquid asset holdings tend to reduce savings or increase borrowing before adjusting their consumption levels. Finally, it appears that households at the top of the liquid asset distribution increase their consumption in response to rising interest rates due to a rise in interest income from financial assets and/or savings. This heterogeneity across certain types of households is a feature of the literature Romer & Romer (2003), Bonifacio et al. (2021), Auclert (2019)) which highlights the importance of analysing the effects of monetary policy at a distributional level.

Another closely related literature is that of monetary policy and financial distress. As mentioned above, effects of interest rate changes are heavily influenced by income as well as household balance sheets and it is often low-income households and mortgage-holders who face the greatest challenges posed by monetary contraction Cloyne et al. (2015), Holm et al. (2021), Bonifacio et al. (2021). Morell et al. (2022) and Adhikari (2022) highlight the risks posed to Irish households by inflation, particularly to lower income households. These households spend approximately 60 per cent of their income on essentials, whereas higher income households spend approximately 40 per cent on essentials. Therefore, lower income households have much less budgetary space to adjust their consumption in the face of inflation and increasing borrowing costs compared to higher income households as they spend a larger share of their income on necessities. This could lead to financial distress and an inability to meet debt servicing costs.

Morell et al. (2022) also discuss increasing interest rates and note that although fixed-rate mortgages have been popular in recent years, over half of Irish mortgages are currently Standard Variable Rate (SVR) mortgages or Tracker

mortgages, hence many borrowers remain exposed to rising policy rates. However, when analysis on mortgage servicing burden relative to gross income is carried out, it becomes clear that it is, once again, lower income households that are at a greater risk of defaulting on their mortgage. Higher income households are more likely to have fixed rates and higher levels of savings to insulate them from increased cost of living and repayments. If repayments were to increase for lower income households, however, this would increase the risk of financial distress significantly, particularly in an environment of high inflation, as discussed.

A number of other studies have considered the impact of interest rates on aspects of the Irish economy, in particular the mortgage market. Byrne et al. (2022) uses a quasi-natural experiment to identify the impact of interest rates on mortgage default. They find a strong, statistically significant, impact of interest rates on default; a 1% increase in the mortgage instalment (repayment) is associated with a 5.8% increase in the likelihood of default. They also find evidence that negative equity amplifies the increase in default risk caused by higher interest rates. Fahy et al. (2018) consider what the impact of a rise in ECB policy rates would mean for the Irish mortgage market. They undertake a number of exploratory analyses including examining the structure of the Irish mortgage market in terms of interest rate contract types and explore the link between the mortgage rate and the policy rate. They also model scenarios exploring the impact of interest rate rises on the arrears rate for particular groups of Irish households. Their research suggests a 25 basis point increase in the policy rate would lead to a 0.1 percentage point increase in new missed mortgage payments. They also find heterogeneous effects across households with younger, lower income households who are at an earlier stage in their mortgage contract are more at risk, as are households on tracker interest rates who have a contractual pass-through from the policy rate to the lending rate. This work is expanded on in more detail in Slaymaker et al. (2018).

3 MODELLING AND SCENARIOS

3.1 MARCO-FINANCIAL LINKAGES IN COSMO

This paper uses the ESRI's model of the Irish economy, COSMO (see Bergin et al. (2017) for details) to identify the pass-through of increased ECB policy rates. COSMO has undergone a number of modifications recently including the inclusion of a construction sector (see Egan & Bergin (2022)) and an updated financial block (see Egan, O' Toole, & McQuinn (2022)). Figure 2 provides a

simplified dependency graph of the macro-financial linkages within COSMO. It should be noted that a number of variables as well as intermediate paths have been omitted for simplicity. Therefore, this figure is for illustrative purposes only.
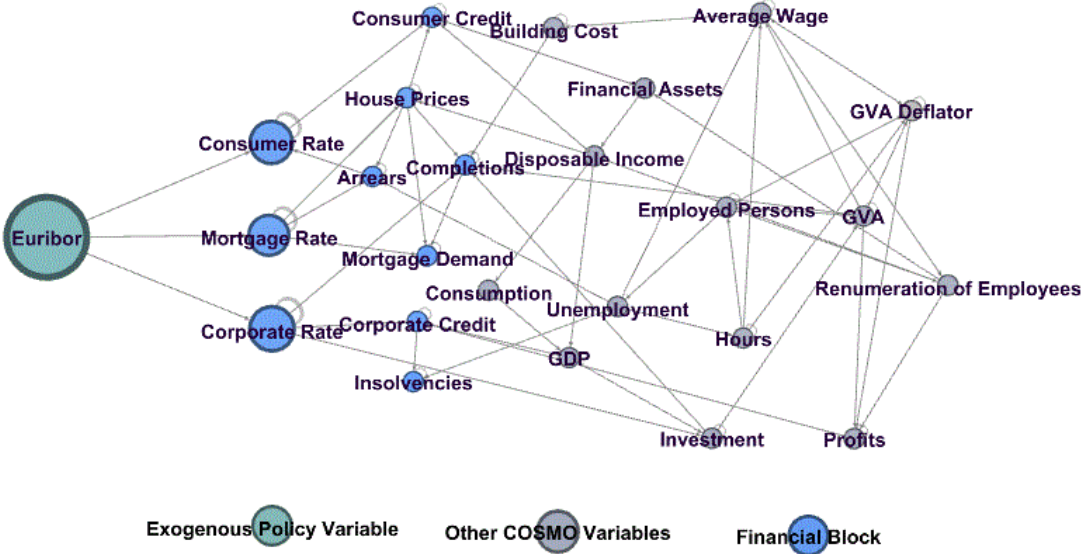

Figure 2: Key Macro-Financial Linkages in COSMO

As shown in Figure 2, the main channels through which the ECB policy rate enters the model are through investment in the main production sectors within COSMO (namely traded, domestic, construction and government) [3] as well as within the recently developed financial satellite model (see Egan, O' Toole, & McQuinn (2022)), with direct impacts on the cost of credit in the residential, corporate and consumer markets. Within this financial block, an increase in policy rates will initially impact the residential mortgage rate. This has knock on effects on the level of house prices, the level of mortgage demand and mortgage arrears. Changing house prices influences the number of completions which then has a broad effect on the Irish economy as the shock propagates through the recently developed construction sector of COSMO. The construction sector is given specific focus as it is more heavily affected by financial developments and demographic factors. It also tends to have a different labour intensity than other

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[3] Figure 2 provides a simplified version of the dependencies. Within the model itself, interest rates enter the production side of the economy through changes in the corporate lending rate ($nfcrat$), which in turn impacts the user cost of capital (rpr), a determinant of investment across the four sectors of the economy.

firms operating in the domestic market (Egan & Bergin (2022)). COSMO's construction sector shows that a drop in completions would lead to decreases in Gross Value Added (GVA) in the construction sector, as well as decreases in wages and employment in the sector. These effects would, as mentioned, feed back into the general economy, specifically with regard to employment, disposable income, and domestic demand. The mechanisms of the effects on corporate and consumer interest rates are also outlined in Figure2. The change in ECB policy rates will impact the rate for corporate credit which in turn impacts the level of investment in all four production sectors of COSMO through the user cost of capital. The change in the corporate lending rate also has an impact on the level of completions in the financial block, representing the cost of credit for property developers building new homes, which feeds back into the real economy through the construction sector. Finally, the change in consumer rate, resulting from the changing Euro area interest rate environment, alters the level of consumption in the economy through the change in household financial assets owing to a change in the level of overall consumer credit.

Modelling the transmission of policy rates to lending rates separately in each market is critically important given varying levels of market-specific pass through. Figure 4 below highlights the breakdown in the relationship between the policy rate and domestic rates, as domestic rates did not decline to the same degree as the policy rate and indeed remained quite stable throughout the 2010s despite continued decreases in the ECB policy rate. This points to a weakening of the pass-through of policy rates but also of market specific pass through parameters. There have been a range of factors which are potentially affecting the pass through to lending rates including the level of risk and arrears, the cost of funds, new regulatory costs and banking competition.[4]

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[4] The balance of the impact of these factors has been explored in a number of papers including CentralBankofIreland (2015) and Goggin et al. (2012).

**Figure 3: Irish Interest Rates and ECB Policy Rate**
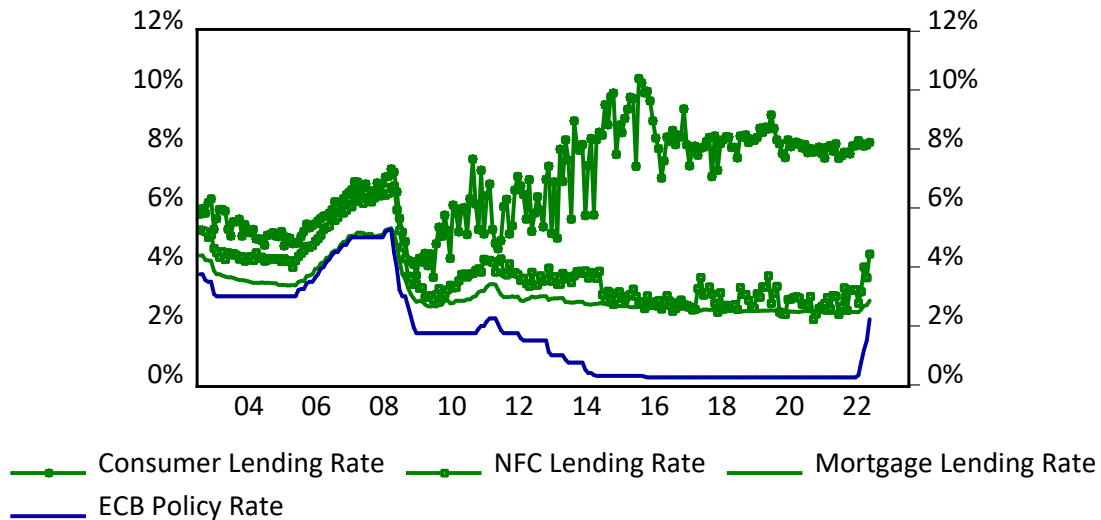
These aforementioned factors have led to higher rates in Ireland compared to other European countries, particularly in recent years. As mentioned, the Irish domestic rates for mortgages as well as for NFCs initially declined before flat-lining. However, in other European countries, rates continued to decline as the policy rate declined, leading to Ireland having higher interest rates than many other European countries in the latter half of the 2010s (as shown in Figure 4)

3.2   INTEREST RATE PATH SCENARIOS

To analyse the impact of the changing interest rate environment, the future path of key ECB policy rates need to be chosen. The interest rate paths chosen in this paper are based on the European Banking Authority's (EBA) 2023 EU-wide stress test and related macroeconomic scenarios which were released on the 31st of January 2023.[5] These EU-wide stress test scenarios are designed to provide valuable input for assessing the resilience of the European banking sector in the current uncertain and changing macroeconomic environment. The EBA provide both a Base and Adverse scenario for the period 2023-2025. The EBA Base scenario can be seen as a situation where ECB policy rates remain on their current path while the EBA Adverse scenario is based on a narrative of hypothetical heightened geopolitical tensions, with high inflation and higher

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[5]   Avaiable at https://www.eba.europa.eu/eba-launches-2023-eu-wide-stress-test-0

Figure 4: Irish vs. Eurozone Economies
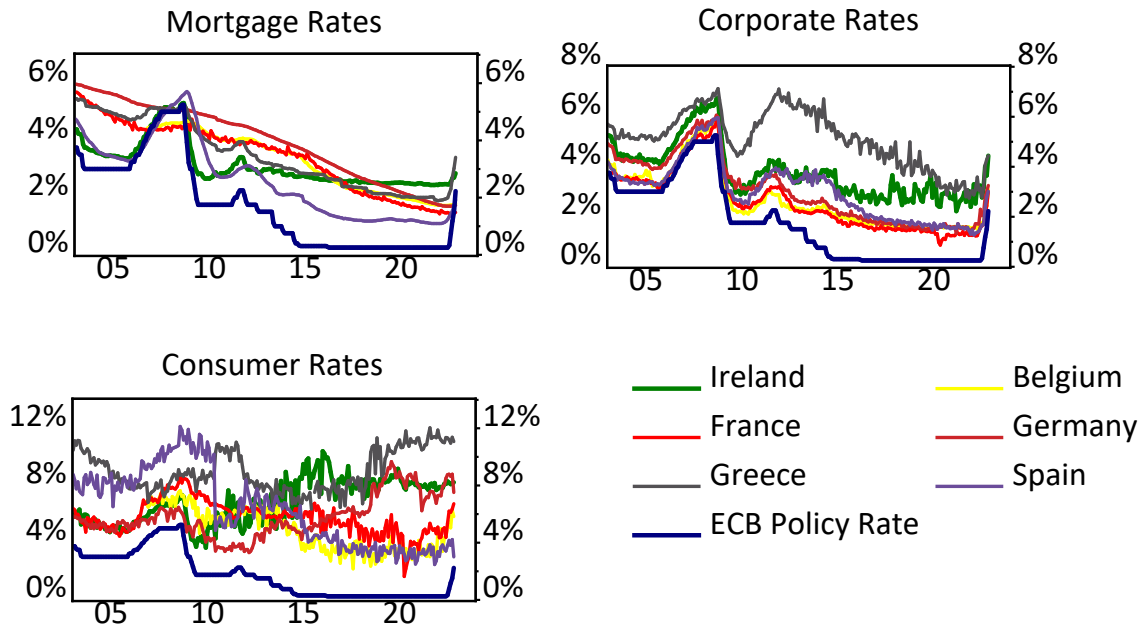
interest rates having strong adverse effects on private consumption and invest-ments, both domestically and globally. We apply the Base and Adverse scenario for the 3-month Euribor swap rate as provided by the EBA as our proxy for the ECB policy rate shock. We then consider these two interest rate paths in the context of the direct impacts to the Irish economy as well as the indirect impacts of the changing interest rate environment in the global economy. The latter is done by feeding the two interest rate scenario paths into NIESR's National Institute Global Econometric Model (NiGEM) [6]. This in turn will provide COSMO with projections of key external variables such as world demand.

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[6] Developed and maintained by NIESR, NIGEM is the leading global macroeconomic model, designed to model & forecast the impact of different economic events.

Figure 5 plots the path of the Euribor across the various scenarios. Note that the interest rate paths illustrated in Figure 5 appear as quarterly values despite the fact that the EBA interest rate paths are published as an annual series. The interest rate paths are converted into quarterly data for entry into COSMO using a quadratic match average interpolation function. The quarterly values average to the annual rates of 2.9, 2.7 and 2.5 per cent in the base and 4.4, 3.9 and 3.5 per cent in adverse scenarios in 2023, 2024 and 2025 respectively. The 2023Q2 value in the EBA base path is 3.2 per cent which is broadly in line with the average of the Euribor 3-month rate for April, May and June. Based on these interest rate paths, we consider a number of different scenarios which can be characterised as the following;

- *Deviation from EBA Base from Pre-War Base*: In this scenario, we examine the simulated impact of the deviation in the COSMO pre-Ukrainian war Euribor rate with the actual outturn for 2022. The EBA Base scenario rate is then applied for 2023-2025 onwards. We apply this interest rate path in two ways. Firstly, we look at the direct impact on the domestic economy and hold all external variables constant.[7] Secondly, we apply the interest rate shock to the global environment through NiGEM and feed key variables such as world demand back into COSMO.

- *Deviation from EBA Adverse from Pre-War Base*: This scenario is calibrated in the exact same way as the EBA Base path scenario but the more severe EBA stress testing Adverse scenario is applied for the interest rate shock from 2023-2025. Once again, we will analyse the impacts with and without the changing global environment.

- *Deviation of EBA Adverse from EBA Base*: This scenario examines the impact on the Irish economy if interest rates move from their current path i.e. EBA's Base scenario, to the higher EBA Adverse scenario. As with the previous two scenarios, we also examine the impact in terms of both the domestic economy in isolation as well as the domestic plus global effects.

As mentioned, the EBA's interest rate paths will be passed through NiGEM. The global outputs from NiGEM are then fed into COSMO model to produce simulations for the Irish economy. These outputs include the impacts on monetary policy rates as well as economic indicators for the US, UK and euro area.

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[7] In this case, the shock is propagated through COSMO only and does not take into account the global impacts of the changing interest rate environment via NiGEM,. Therefore, some variables which are more sensitive to the external environment e.g. variables within the traded sector and price levels, are not reported in this analysis.

Crucially, in the context of this paper, it also includes a measure a world demand for Irish exports which will be impacted by the changing ECB policy rates, representing a slowdown in Ireland's Euro area trading partners. Figure 6 illustrates the path of world demand in response to the EBA's interest rate paths described. The simulation in NiGEM suggests that this proxy for the global demand for Irish exports will fall by as much as 0.8 and 1.3 per cent from its pre-war baseline in the EBA Base and EBA Adverse interest rate scenario paths respectively.
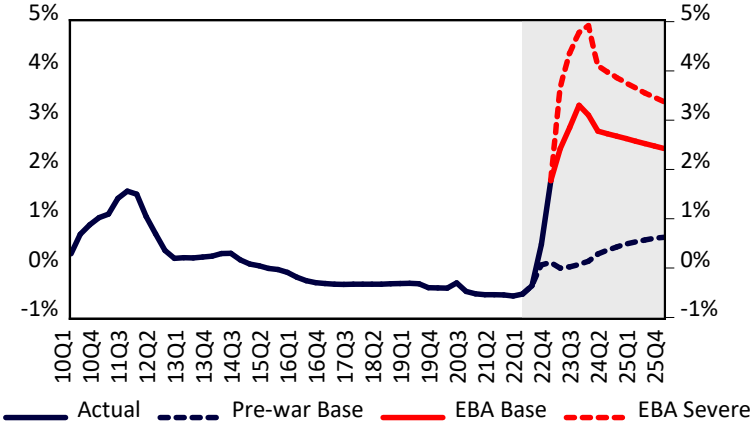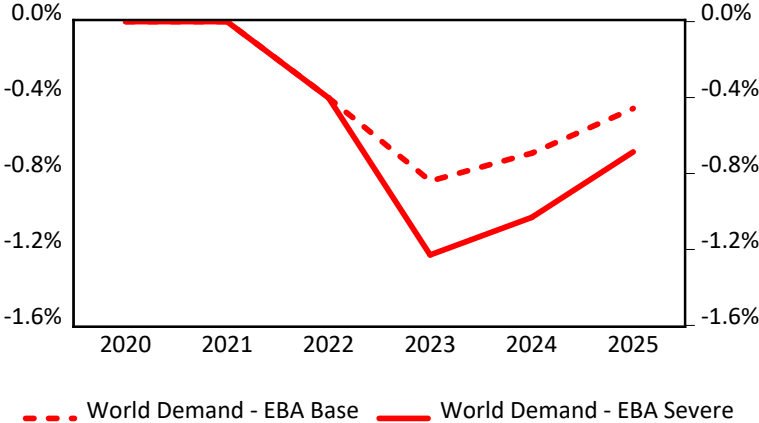
Figure 5: Euribor Rate Path Scenarios

Figure 6: Corresponding NiGEM World Demand (Deviation from pre-war baseline)

4 RESULTS AND DISCUSSION

In this Section we examine the results of our simulations based on the interest rate scenarios discussed in Section 3.2. As the two EBA interest rate scenarios discussed will be applied with and without the external shocks from the global economy, we will examine the impact of both interest rate paths with domestic only impacts as well as domestic plus global impacts. Across all scenarios, we analyse the reaction of key variables in COSMO's financial block, the key production sectors as well as the macroeconomy as a whole.

4.1 DEVIATION OF EBA PATHS FROM PRE-WAR BASELINE (DOMESTIC IM-PACTS)

Figures 7, 8 and 9 illustrate the resulting domestic impact of higher ECB policy rates to the Irish financial, sectoral and macro economy respectively, while Table 5 presents the corresponding figures.

In the financial block, the first three panels of Figure 7 illustrate the path of the residential mortgage, corporate, and consumer lending rates in response to increased ECB policy rates respectively. The simulations show that over the period of 2022-2025 in the EBA Base (EBA Adverse) scenario the residential mortgages rate, the corporate lending rate and consumer lending rate are elevated by as high 150, 180 and 185 (230, 260 and 280) basis points above the pre-war baseline. This points to a significant shock to Ireland's domestic interest rates. This shock in turn propagates across the rest of COSMO's financial block in the manner outlined in Figure 2. The higher residential mortgage rate leads to downward pressure on house prices. This mechanism is discussed in more detail in McQuinn and O'Reilly (2008) as well as Egan, O' Toole, & McQuinn (2022). It is important to note, however, that this is not a prediction of lowering house prices. It is simply showing that when all other elements of the market are kept constant, the increased mortgage rates arising from ECB policy rate rises would put downward pressure on house prices.[8]

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[8] This is true of all of the effects reported in this paper.

Figure 7: Financial Block - Deviation from the Baseline (Domestic Impacts)
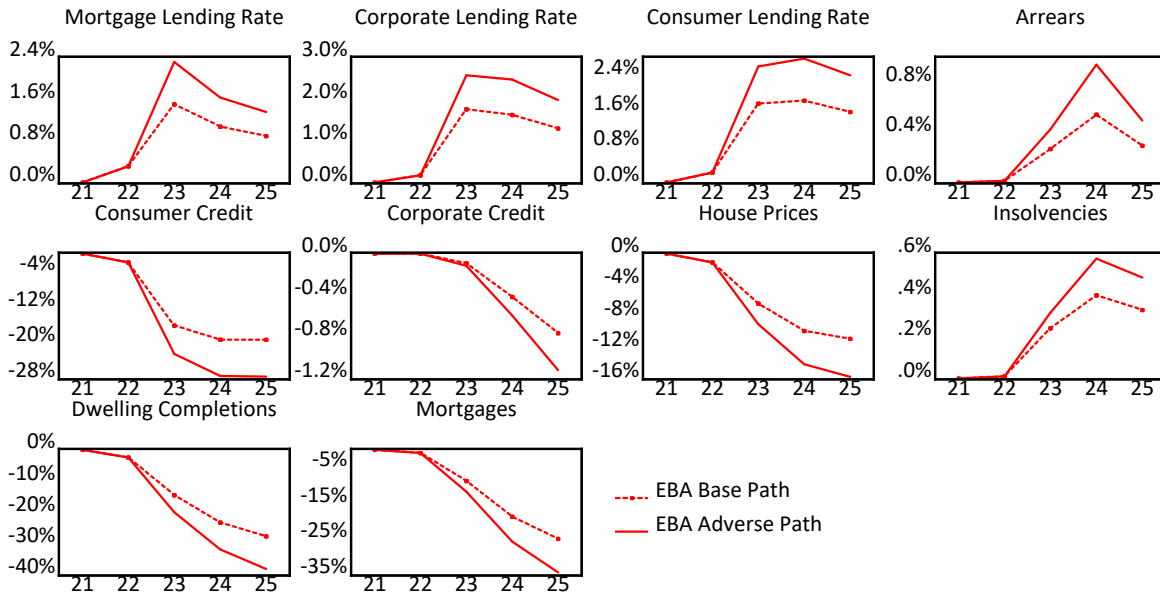
Another byproduct of higher mortgage rates will be lower levels of mortgage demand and higher levels of mortgage arrears. The higher rates will see payments increase for those mortgage holders on adjustable rate mortgages, a topic we return to in detail in Section 5. Under the EBA's Base interest rate assumptions, the increase in arrears is estimated to peak in 2024 at 0.54 per cent higher than the pre-war baseline. However, this increase relative to the pre-war baseline could reach 0.94 per cent under the more severe Adverse path assumptions.

The simulations also indicate that the higher corporate lending rate from the shock to ECB policy rates will have a significant impact on businesses, with the demand for corporate credit decreasing due to this higher cost of borrowing. The simulations also suggest a significant negative impact on the corporate sector through the rise in the number of insolvencies. This is estimated within COSMO's financial block which measures liquidity as corporate deposits divided by the corporate lending rate. If the level of corporate deposits is held constant and the lending rate increases, liquidity will decrease leading to more insolvencies. This reflects the fact that the smaller the share of internal funds relative to external debt, the higher the risk of insolvency for the enterprise. COSMO simulates that insolvencies will rise by as high a 0.4 per cent above the pre-war baseline using the EBA's Base assumptions or by as much as 0.58

per cent higher using the EBA's Adverse interest rate path. This would be a damaging economic development, particularly for SMEs, who are much more susceptible to rising costs leading to them having a higher risk of insolvency Kren et al. (2022). Additionally, Irish SMEs borrow and invest less compared to their European counterparts, hence it is likely that credit demand and investment in Ireland will remain suppressed in the face of higher corporate lending rates (Gargan et al., 2018; Martinez-Cillero et al., 2023).

There are also effects of rising corporate lending rates on the housing market. As outlined in Egan, O' Toole, & McQuinn (2022), the corporate lending rate has a negative relationship with new dwelling completions. This reflects the additional cost of borrowing for property developers building new homes. Therefore, increases in housing supply will likely be delayed as a result of higher rates. This, coupled with the fall in construction investment, which will be discussed later, and the fall in house prices mean that new dwelling completions fall by as much as 28 per cent from the pre-war baseline by 2025 in the EBA Base scenario and as much as 38 per cent in the Adverse scenario.

Figure 8 illustrates the impact of the higher interest rate environment on the sectors within COSMO. The simulations show that both the construction and domestic sectors are significantly impacted by the rising corporate rate which causes investment to fall as the cost of borrowing money from financial institutions increases. By the end of the estimation period in 2025, investment in the construction and domestic sectors have fallen 3.9 per cent and 2.5 per cent respectively in the EBA Base scenario and as low as 5.4 per cent and 3.5 per cent below the pre-war baseline in the Adverse scenario. This fall in investment has knock on effects across the production sectors with employment in both the construction and domestic sector falling over 1.2 per cent below the pre-war baseline under the EBA Base scenario and over 1.8 per cent below the EBA Adverse scenario by the end of the estimation period. Finally, the level of production in both the construction and domestic sectors fall by comparable magnitudes across both interest rate paths.

Figure 8: Production Sectors - Deviation from the Baseline (Domestic Impacts)
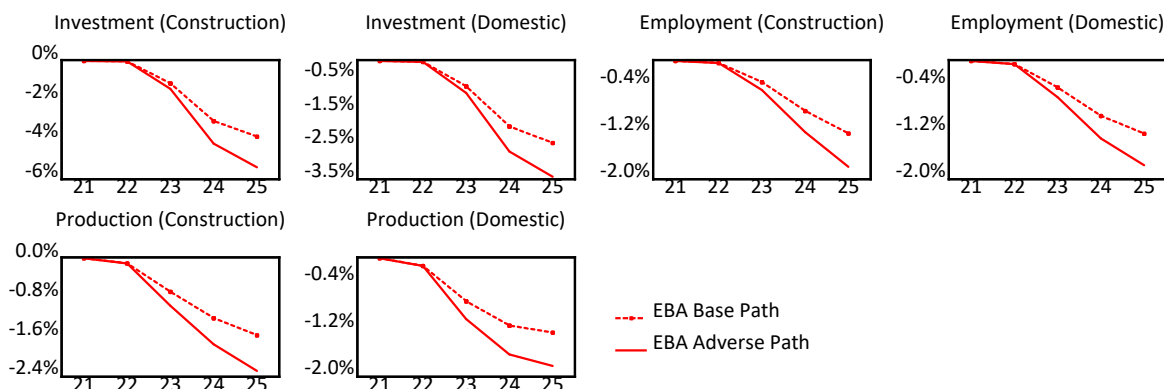
Another channel in which the production side of the economy in COSMO is impacted indirectly by the corporate rate is through the level of completions. As pointed out by Egan, O' Toole, & McQuinn (2022) and Egan & Bergin (2022), the level of new dwelling completions is determined, in part by changes, in the corporate lending rate. Completions itself is then a determinant of the level of production in the construction sector. Therefore, a negative shock to the level of completions will lower the level of production and employment in the sector also.

Finally, Figure 9 examines some of the overall impacts of the higher domestic interest rates on some key macroeconomic variables. The fall in employment from the shocks to the individual sectors as discussed will cause the overall level of employment to fall which in turn causes unemployment to reach 0.11 per cent and 0.16 per cent above its pre-war baseline by 2025 in the EBA Base and Adverse scenario respectively. This shock to the labour market has knock-on impacts on the level of disposable income and ultimately the level of personal consumption which falls by 1.2 per cent (EBA Base) and 1.6 per cent (EBA Adverse) by 2025. Modified Domestic Demand (MDD) and Gross National Domestic (GDP) also fall below the pre-war baseline with MDD falling significantly more than GDP. It must be noted, however, that the impacts on GDP do not yet include shocks to the external variables in NiGEM such as world demand which will be added in Section 4.2.

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Figure 9: Other Macro Variables - Deviation from the Baseline (Domestic Impacts)
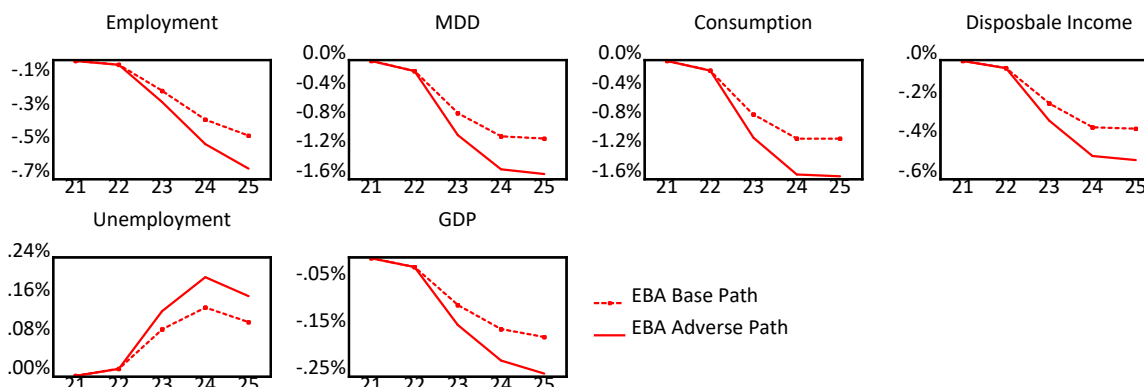
4.2 DEVIATION OF EBA PATHS FROM PRE-WAR BASELINE (DOMESTIC + GLOBAL)

The analysis in Section 4.1 examined the dynamics of higher ECB policy interest rates in the context of their direct impact on the Irish economy only. In this section, we also take into account the indirect impact on the Irish economy through the global economies reaction to these higher rates. This is done by feeding the EBA's interest rate scenarios into NIESR's National Institute Global Econometric Model (NiGEM), which in turn provides COSMO with projections of key external variables, such as world demand. This enables us to simulate the indirect implications for the Irish economy of a higher interest rate environment in the wider Euro area.[9]

As with the previous section, we examine the changes across the financial block, key production sectors and other macro variables. The deviations are presented in Figures 10,11 and 12 while the corresponding data is presented in Table 6. As we now include an external global element, we can add variables which are strongly determined by external factors in our analysis such as developments in the traded sector as well as price levels. Figure 10 first shows the impact to the financial block to the domestic plus global shock is largely the same as domestic shock in isolation from Section 4.1 across both interest rate paths, with only minor increases in magnitude. There are more significant moves in a few variables, however. For example, on the corporate side, both the demand for corporate lending and the number of insolvencies is noticeably

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[9] As we are focusing on an ECB policy shock only, we do not make any assumptions on other central bank interest rates such as those in the US and the UK. Therefore, some key external variables relating to non-ECB interest rates, bi-lateral exchange rates and competitiveness are held constant.

higher with both domestic and global impacts accounted for. This is likely due to the fact that the key determinants of these variables, such as GDP and unemployment, are related to the overall macroeconomy which would be more exposed to global factors introduced through NiGEM.

Figure 10: Financial Block - Deviation from the Baseline (Domestic + Global Impacts
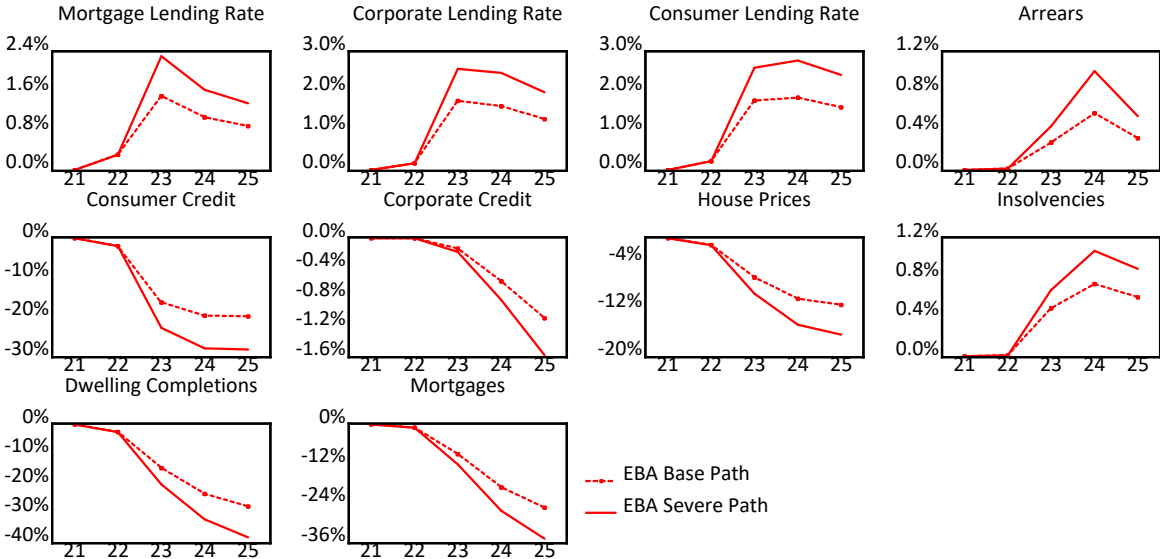
Unsurprisingly, the addition of the changing external economic outlook has a much more significant impact on the production sectors of COSMO.[10] Figure 11 illustrates the deviations of the two interest rate scenarios from the pre-war baseline for the domestic and construction sectors as before but now also includes the traded sector. The simulations show that the level of investment in both the construction and domestic sectors is noticeably lower vis a vis the pre-war baseline than those presented in Figure 8. By 2025 for example, investment in construction has fallen 4.9 and 6.9 per cent from the pre-war baseline under the EBA Base and Adverse interest rate assumptions respectively. The domestic sector also sees a significant increase in the fall from the pre-war baseline

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[10] The domestic + global impacts includes external exogenous variables such as a measure of world demand for Irish exports, which will be impacted by the changing ECB policy rates, representing a slowdown in Ireland's Euro area trading partners. These are determined exogenously in NiGEM. As these external variables are key determinants in variables such as the overall price level and production in the traded sector, we only present deviations from the baseline in these variables in the global and domestic case. Presenting these for domestic shocks would be misleading as they would omit the shift in the key exogenous variables. For this reason, we only report the results of deviations in variables which are largely determined by these exogenous variables such as production in the traded sector and price levels in the domestic and global shocks (e.g. Figure 11 & 12 and Tables 6 & 8).

across the interest rate paths. In the EBA Base scenario, domestic investment falls by close to 1 per cent more owing to the addition of the global shock and over 1.2 per cent more in the EBA Adverse scenario. The more severe impact to investment across both sectors has the expected knock-on effects into the corresponding labour and production elements of the sectors.

Interestingly, there are significant differences in the magnitude of the response to the shocks across the traded and domestic sector for investment, employment and production. The cumulative fall in production from the pre-war baseline over the 2022-2025 period for the domestic sector is -4 and -5.7 per cent in the EBA Base and Adverse scenarios respectively. This is compared to -2.1 and -3.1 in the traded sector. This indicates that the domestic sector is more sensitive to this external shock than the traded sector in the medium term. It must be highlighted however, that some of the external variables which are key drivers of the traded sector, such as bilateral exchange rates and competitors trade prices, are held constant in order to isolate the impact of the changing ECB policy rates.

Figure 11: Production Sectors- Deviation from the Baseline (Domestic + Global Impacts
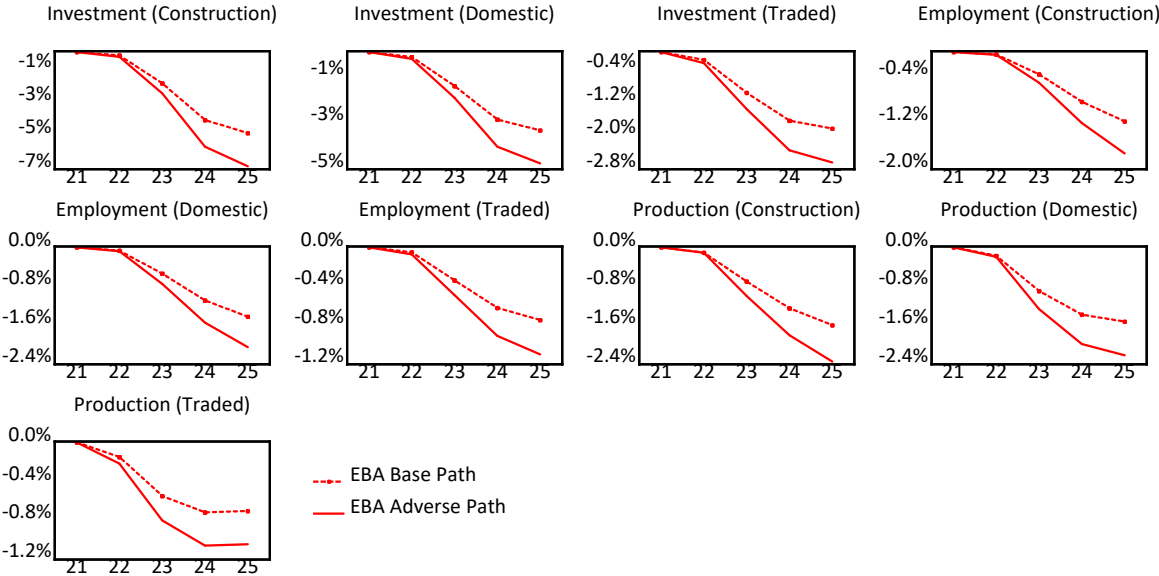
Finally, Figure 12 shows the impact of the domestic and global interest rate shocks on the macroeconomic variables. The decrease in production across all the economy's key sectors outlined in Figure11 ultimately leads to a fall in the level of overall employment, with a deviation from the pre-war baseline of -0.7

per cent and -1.1 per cent in the EBA Base and Adverse scenarios respectively by 2025. This leads to a subsequent fall in both disposable income and the level of consumption. Finally, the overall domestic economy, represented by MDD, experiences a substantial decline relative to a counterfactual pre-war baseline over the medium-term (by 2025) with a deviation of -1.3 per cent in the EBA Base scenario and almost a -2 per cent in the Adverse scenario.

Figure 12: Other Macro Variables - Deviation from the Baseline (Domestic + Global Impacts)
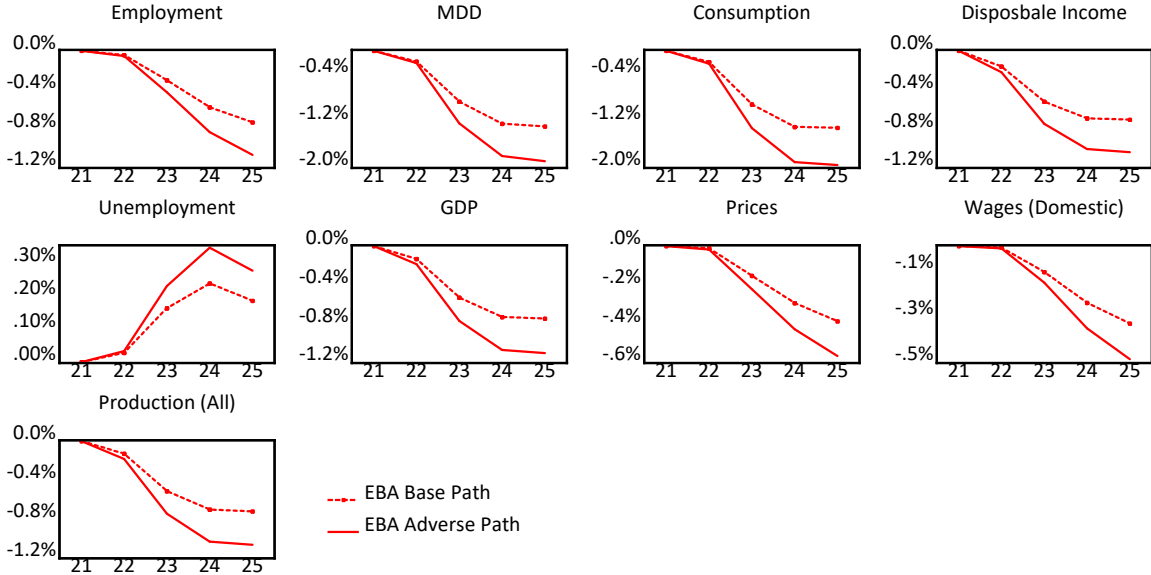
4.3 DEVIATION OF EBA ADVERSE PATH FROM EBA BASE PATH (DOMESTIC AND DOMESTIC + GLOBAL)

The simulations presented so far in this paper in Sections 4.1 and 4.2 related to the deviation from COSMO's pre-war baseline using the EBA's stress testing interest rate scenarios. As the EBA's Base scenario can be seen as the 'current' path for interest rate movements, this section examines the impact of moving from this path to the EBA's Adverse interest rate path. We do so by simply calculating the difference between the pre-war deviations of the two EBA scenarios discussed in Sections 4.1 and 4.2 for the periods 2023-2025.

As with the previous analysis, we will compare the impacts with and without the reaction of global factors to the changing interest rate environment. Figures 13, 14 and 15 illustrate the deviations of variables from the EBA Base to Adverse

path in the financial block, production sectors and the wider macroeconomy respectively while Tables 7 and 8 presents the corresponding data.

Figure 13 shows the the impact of moving from the EBA's Base interest rate path to the Adverse path across Ireland's financial block in COSMO. The peak increase in mortgage, corporate and consumer rates correspond to around 0.8, 0.9 and 0.95 per cent respectively. The increase in the mortgage rates would cause a large drop in the demand for mortgages which would fall by around 10 per cent by 2025. House prices also fall significantly, by as much as 5 per cent by the end of the simulation period while completions also fall by around 10 per cent by 2025. Mortgage arrears would rise by as much as 0.4 due to the disruption in the residential property market. As before, the variables related to Ireland's housing market remain relatively unaffected by the addition of global factors.

On the corporate side, the demand for corporate credit would fall by 0.6 per cent cumulatively over 2023-2025 in the EBA Base scenario with only domestic factors accounted for. The cumulative fall over the same period once global impacts are also added would be 0.8 per cent. Corporate insolvencies would also rise, peaking at 0.18 in 2024 without the global impact and almost doubling once the external impact is added.

Figure 13: Financial Block - Deviation of EBA Adverse from EBA Base (Domestic + Global Impacts

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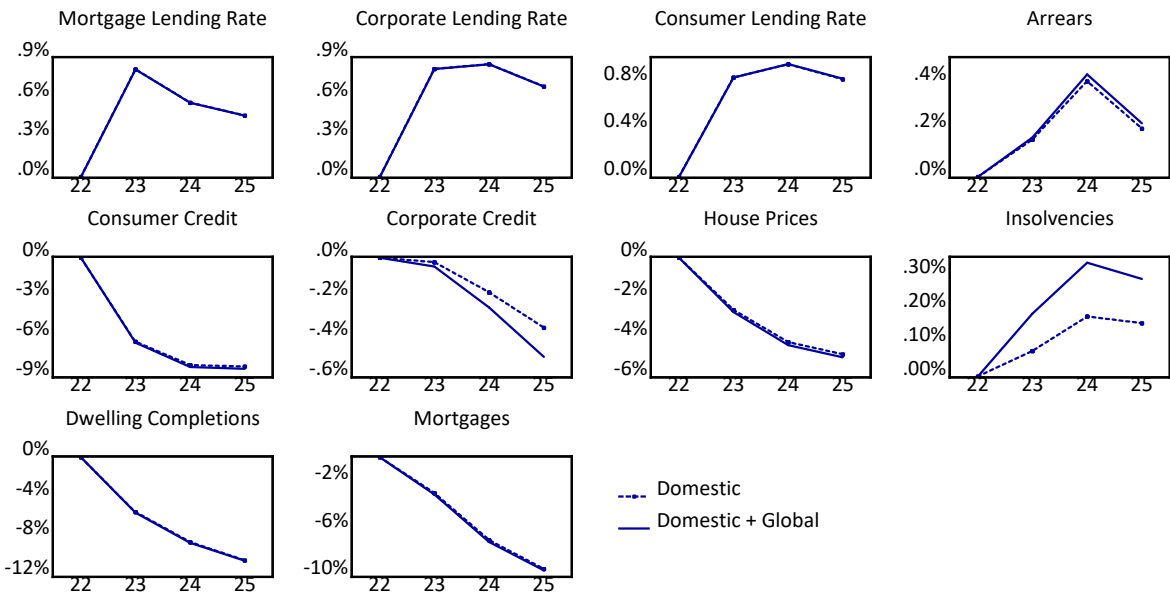
As illustrated in Figure 14, moving from the 'current' interest rate path to a more adverse path would see investment in the construction and domestic sectors fall by 1.6 per cent and 1 per cent by 2025 respectively. This increases to a 2 per cent and 1.4 per cent fall once the global factors are included, with production in the traded sector falling by 0.8 per cent by 2025. When the global impact of the interest rate shocks are taken into account, employment across all three sectors would fall by 0.6, 0.6 and 0.4 for the construction, domestic and traded sectors respectively by 2025. Production across all three sectors also falls by similar magnitudes.

Figure 14: Production Sectors- Deviation of EBA Adverse from EBA Base (Domestic + Global Impacts)
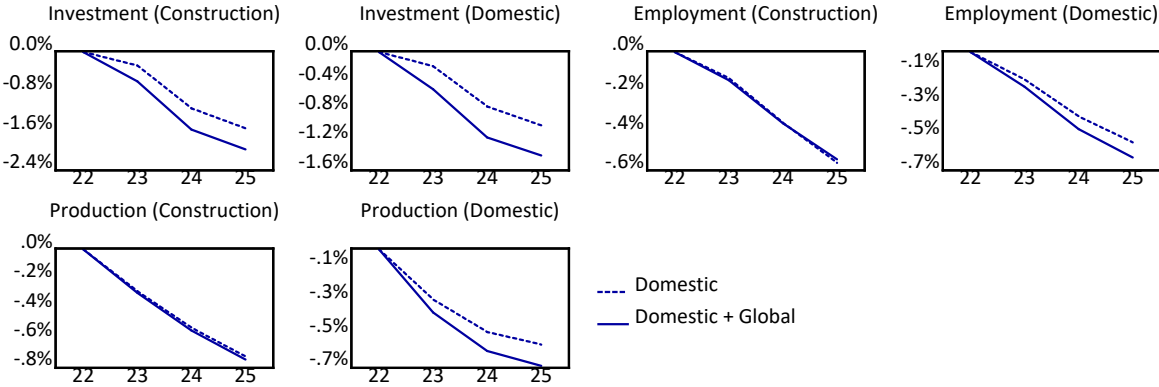
Finally, Figure 15 illustrates the fall in macroeconomic variables. The level of employment falls between -0.2 (domestic) and -0.33 (domestic plus global) while consumption falls by over 0.5 percent in both cases. The simulations also suggest that the Adverse interest rate path would cause MDD to be around 0.5 percent lower under the domestic shock, rising to 0.6 once the global impacts are accounted for.

Figure 15: Other Macro Variables - Deviation of EBA Adverse from EBA Base (Domestic + Global Impacts
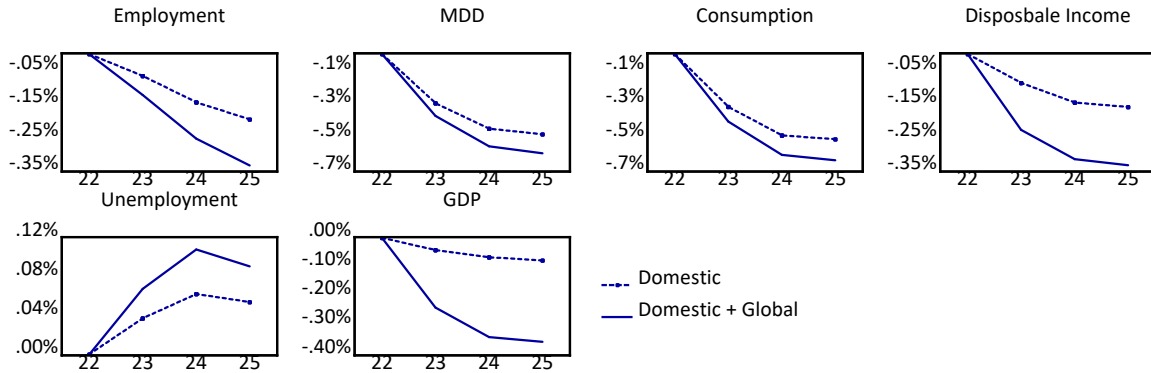
5 EXPLORING THE IMPACT OF INTEREST RATE INCREASES ON MORTGAGE MARKET AFFORDABILITY

While the preceding sections of this research have reviewed the macroeconomic impacts of interest rate increases on the Irish economy, this section takes a deeper dive into the impact of rate rises on the mortgage market. More specifically, we combine the interest rate shocks in our scenarios above, coupled with the impacts on disposable income of households to explore how mortgage affordability is affected under each of the shocks. This will provide us with information on the extent to which the interest rate snapback may materialise into repayment distress for households.

5.1 DATA AND MEASUREMENT

To undertake this assessment, we draw on the HFCS dataset which is a household survey of income, wealth and other characteristics that is collected by the Central Statistics Office in Ireland as part of a broader network of surveys run by the European Central Bank. The latest data for Ireland was collected for the year 2020. A detailed appendix is included with this paper which documents the survey in more detail as well as providing information on the calculations undertaken.

Within the HFCS, information is available on households current mortgage repayments, outstanding balance, interest rate, remaining terms and income-related information. We can use these variables to create a number of indicators

of housing cost repayment burden. We can also combine these data with the information from the macroeconomic impacts to simulate changes to housing cost repayment burdens under the different scenarios. Using these elements, we can create a debt-service ratio for each mortgaged household i in the survey as follows:

$$DSR_i = \frac{p_i}{NDI_i} \tag{1}$$

where p_i is the mortgage payment for the household and NDI_i is net disposable income.

To understand the extent to which these households are facing mortgage-affordability stress, we define a number of indicators which are drawn from the literature (Corrigan et al., 2019) and leverage the information in the DSR calculation. The first indicator we use is a simple high-housing cost rule which is standard in existing studies. We determine that a household faces high housing cost if their debt-service ratio is greater than or equal to 30 per cent:

$$HHC_i = \begin{cases} 0, & \text{if } DSR_i < 0.3 \\ 1, & \text{if } DSR_i \geq 0.3 \end{cases} \tag{2}$$

One limitation with this indicator that has been suggested in the literature is that higher income households could decide to allocate a greater share of their income to housing expenditure but still have sufficient resources available to maintain consumption on other goods and services. In an attempt to address this issue, the second indicator that we use is a residual income variable. For this variable, we combine the households income and mortgage payment with information from the Vincentian Partnership in Social Justice on minimum expenditures required to maintain a normal standard of living or MESL. We can thus create a residual income sufficiency variable which is defined as follows:

$$SI_i = \begin{cases} 0, & \text{if } \frac{AHCI}{MESL} > 1 \\ 1, & \text{if } \frac{AHCI}{MESL} \leq 1 \end{cases} \tag{3}$$

where AHCI (After Housing Cost Income) is equal to net disposable income minus the mortgage payment. This indicator takes the value of 1 if a household has insufficient income after their mortgage is paid to cover the MESL level of spending that is determined as a minimum level to have a normal standard

Table 1: Summary Statistics for Sample Variables (All Euro Unless Stated) - HFCS

	Mean	Median	N
Net Income (euro)	71,358	67,696	2066
Household Gross Income (Euro)	89,826	82,000	2066
Dummy for Ratio > 30%	0.146	NA	2066
Dummy for MESL < 1	0.222	NA	2066
Total Mortgage Payment (Euro)	899.13	800	2066
DSR (%)	23.22	15.42	2066
Interest Rate (%)	2.564	2.75	2066
Outstanding Mortgage Debt (Euro)	179,787	132,315	2066

of living for that specific household taking into account the composition of the household (number of adults, children, pensioners)[11]

Table 1 presents the summary statistics for the sample of approximately 2,200 mortgaged households. The median net income for households is 67,500 euro while the median mortgage payment is 800 euro per month. In terms of the DSR, the median in the sample is 15 per cent which indicates that at least half of the households have a DSR well below the 30 per cent threshold that we are using for a high housing cost indicator. The typical interest rate in the data is 2.3 per cent and the median outstanding mortgage balance, across all households, is 132,000 euro.

5.2 HIGH HOUSING COST INDICATORS AND SIMULATIONS

To explore the impact of the interest rate increases on the mortgage indicators, we first re-calculate the payment for each household under the shocked interest rate level. In our data, there is not an explicit identification of households as having fixed rate mortgages versus adjustable. We therefore use analysis from the Central Bank of Ireland (Byrne et al., 2023) to identify the proportion of the mortgage market that is composed of fixed rate mortgages for two years or more. This proportion was 41 per cent. Hence, 41 per cent of the mortgages in the sample were randomly assigned as being fixed. Importantly, we can also identify tracker loans using an identification strategy based on the level of the interest rate. This is outlined in more detail in appendix 1. The proportion of trackers identified using this method was similar to the proportion of tracker mortgages estimated by Byrne et al. (2023).

Naturally, not all of the policy rate increase will be passed through to variable rate customers but tracker borrowers will be exposed to the full increase

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[11] For more information on the MESL's used in this analysis please see Appendix A.

Table 2: Interest rate and income inputs to shocks

	Pre War Base to EBA Baseline		
	Interest rate change (p.p)		Income (per cent change)
	Tracker	Rest	α_t
2023	2.9	1.5	-0.22
2024	2.7	1.07	-0.34
2025	2.5	0.89	-0.35
	Pre War Base to EBA Adverse		
	Interest rate change (p.p)		Income (per cent change)
	Tracker	Rest	α_t
2023	4.43	2.31	-0.31
2024	3.92	1.63	-0.49
2025	3.51	1.35	-0.51

in the ECB's main refinancing operations rate. We therefore differentiate between tracker and non-tracker borrowers in terms of the level of rate increases deployed across the scenarios. These are as follows:

Using these interest rates we then recalculate the repayments for each household under the shocks using the following formula:

$$Payment(s)_{it} \; = \; OutstandingBalance_{it} * \frac{r_s(1+r_s)^\tau}{((1+r_s)^\tau)-1} \qquad (4)$$

In equation 4, s relates to the scenario, τ the term of the mortgage and the original loan balance is as reported. Once the new payment has been calculated, we can then re-calculate the DSR with the shocked payment value:

$$DSR(s)_{it} \; = \; \frac{Payment(s)_{it}}{\alpha_t(NDI_{it})} \qquad (5)$$

and then calculate the HHC and SI indicators for year t and shock s. It must be noted that we also adjust the incomes data by the parameter α which is the deviation from baseline for disposable incomes in the scenarios from the macroeconomic modelling exercise. This ensures that we are consistent in our change of interest rates and incomes for households.

Firstly, we reproduce the payment for each household in the data (relative to what is reported by the household themselves). These data are presented in Table 3. The median payment reproduction is identical to the median reported

Table 3: Simulated Payment

	Mean	Median	N
Total Mortgage Payment	1046.21	802.35	2066

Table 4: Shock Outcomes for Key Mortgage Variables

	2023	2024	2025
Pre-War Base to EBA Base			
Payment (mean)	1157.94	1127.32	1114.48
Payment (median)	932.64	900.7	885.97
DSR (average)	0.2646	0.2674	0.2556
DSR (median)	0.1829	0.1782	0.1753
% Over 30% DSR	0.1903	0.1798	0.1767
% with MESL/Income < 1	0.2326	0.2311	0.2311
Pre-War Base to EBA Adverse			
Payment (mean)	1217.19	1167.29	1147.18
Payment (median)	976.71	941.03	922.24
DSR (average)	0.2793	0.2685	0.264
DSR (median)	0.1962	0.1856	0.1814
% Over 30% DSR	0.2145	0.1949	0.1858
% with MESL/Income < 1	0.2356	0.2326	0.2326

data. The mean is somewhat higher as some extreme values are produced from the reproduction but the majority of the values are nearly identical.

We then deploy the interest rate shocks and income changes into the microdata and the simulation results across the indicators are presented in Table 4. Under the scenario, Pre-War to EBA base, the payments rise typically by 121 euro in 2023 relative to the base case. The base case DSR has a mean (median) of 23% (15%) and this rises to 26% (18%) in 2023 moderating to 25.5% (17.5%) in 2025. Considering the indicator for the high housing cost, the base data indicated approximately 15 per cent of households had a DSR above 30 per cent. This increases to over 21 per cent in 2023 under the shock but then declines to just over 18.5 per cent. While these shocks do pass through to increased DSR, there is a more muted effect on the residential income (MESL) indicator. In the base data, the proportion of households with an after housing cost income that is sufficient to afford a basic standard of living was 22 percent or just over one-in-five. This rises to 23.5 per cent under the shocks which is not a major increase.

Considering the more severe outcome scenario, which compares the base case to the EBA adverse scenario, the payments rise typically by just under

200 euro in 2023 relative to the base case, dropping to just under 1150 euro in 2025 as the interest rates taper downwards. The base case DSR has a mean (median) of 23% (15%) and this rises to 28% (19.6%) in 2023 moderating to 26.4% (18%) in 2025. The indicator for the high housing cost increases to 21.4 per cent in 2023 under the shock but then declines to just under 19 per cent in 2025.

Across both of these shocks, we observe an increase in payments and a rise in debt service ratios. However, this does not correspond into any major increase in affordability distress as measured by the residual income approach. There are a group of mortgage holders with distressed affordability but this appears to have been the case before the interest rate increases. This finding suggests that while housing costs do rise, and before interest rate increases there was a portion of the mortgage market which experience mortgage affordability challenges, the interest rate increases do not necessarily increase this substantially. Many households are therefore able to internalise the cost of the increases and still have sufficient income to afford a basic standard of living.

A number of caveats must be noted to this simulation exercise. First, in our analysis of the MESL data, we have assumed that income growth and inflation are equal to identify the interest rate channel. However, this assumption may be too restrictive for many households on fixed incomes in particular. Second, the base data was surveyed in 2020 which may mean that Covid-19 crisis related effects on income and employment are driving some of the results of the research. If this is the case, the existing figures are likely to over estimate the effects.

6   CONCLUSION

In this paper, we aim to explore the impact on the Irish economy of the increase in policy rates that has occurred since 2022 as well as present scenarios for the potential impact of higher rates in the period ahead. We use the ESRI's model of the Irish economy, COSMO (see Bergin et al. (2017) for details) to identify the pass-through of increased ECB policy rates on the economy through market-specific lending rates and credit activity which impact investment, consumption and the housing market. Our model contains three credit markets (mortgage market, consumer lending, and non-financial corporations) and policy rates heterogeneously pass through to lending rates in each of these three areas.

We explore the impact across a range of interest rate scenarios relative to a pre-Ukraine war base case. The results indicate sizeable impacts on the Irish economy of the increases in interest rates seen to date relative to the no-war

baseline as well as further impacts across the two EBA scenarios deployed for the forward-looking path. These impacts apply to all sectors but in particular affect output in the construction sector, house prices and mortgage demand. We also observe a rise in mortgage arrears as well as increase firm level distress (as measured by insolvencies).

While the calculation relative to the no-war baseline provides an interesting analysis of the costs of the interest rate path in 2022, the EBA baseline scenario captures the present trajectory of interest rates. However, given inflation appears to be remaining stubbornly high, there is a possibility that the higher interest rate path under the EBA Adverse outcome could materialise. By comparing the two EBA outcomes, it is possible to identify the additional impact on the economy if that were to occur. If this is the case, mortgage, corporate and consumer rates are projected to rise as high as 0.8, 0.9 and 0.95 per cent respectively. This would lead to a further 10 per cent drop in mortgage demand, 10 per cent lower completions and 5 per cent lower house prices. Financial distress indicators for mortgage arrears and insolvencies would rise by as high as 0.4 an 0.18 per cent respectively. Investment in the construction and domestic sectors would be expected to fall by 1.6 per cent and 1 per cent by 2025 respectively and this increases to a 2 percent and 1.4 per cent fall once the global factors are included. The impact on modified domestic demand (MDD) would be around 0.5 percent lower under the domestic shock, rising to 0.6 once the global impacts are accounted for.

In addition to the above macro-financial channels which we explore in detail, we undertake a more granular exploration into the impact of higher interest rates on mortgage market affordability for existing borrowers in Ireland. We find an increase, across both of the shocks, in mortgage payments as well as debt service ratios. Indeed, the share of households with mortgage payments accounting for more than 30 per cent of income increases. However, we do not find any major increase in those in housing affordability distress as measured by the residual income approach. This suggests that, while there are a group of mortgage holders who face repayment challenges in general, this does not increase notably with the interest rate rises. The fact that the mortgage market has become more concentrated with higher income borrowers over the past number of years has likely provided a resilience in the ability to absorb repayment shocks.

While the impact of the interest rate increases on the macroeconomy in Ireland is documented as being material, in particular in the housing market, the costs of inflationary pressures continuing are also sizable. In particular the impact of cost of living pressures on low income and fixed income households is

likely to cause ongoing challenges in terms of day to day financial pressures. Therefore demand management is likely to be continued to be deployed until such time as the broader inflationary environment becomes more benign. In the meantime, to avoid re-enforcing inflationary pressures, fiscal policy should attempt to cushion the impact on affected groups using tailored and targeted policies, while not reinforcing inflationary spirals.

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7   Appendix 1: HFCS Sample and Micro-Analysis

The Household Finance and Consumption Survey (HFCS) is conducted under the auspices of the European Central Bank's Household Financial and Consumption Network (HFCN). The HFCS is a household survey which collects data on household consumption and finances. It covers areas such as demographics, real and financial assets, liabilities, consumption and saving, income and employment, and so on.

This paper analyses data from the 2020 wave of the HFCS. There are three datasets for three different types of variables within the HFCS. The first dataset comprises of household level variables (H dataset); the second comprises of individual level data for each person aged 16 and above in the household (P dataset); and the final dataset comprises of individual level data for each person in the household regardless of age (R dataset). There is also a set of variables labelled 'D variables' which specify how to calculate certain variables at the household level, such as total outstanding balance on household liabilities.

For each dataset, relevant variables were identified and renamed. When all of the relevant variables were identified, the datasets had to be collapsed. This is because the HFCS provides multiple imputed values to cover for item non-response via stochastic imputation. For each missing value, five imputed values are provided. Therefore, each dataset was collapsed by mean in order to get one observation per household in the H dataset, and one observation per person in the P and R datasets. A head of household indicator was then used to allow personal variables to be analysed at the household level.

At this point, each dataset had one observation for each household, hence the next stage of the data preparation was to merge the datasets. This gave one main dataset.

Finally, certain variables with outliers were winsorized – this sets extreme outliers to a specified percentile of the data. The percentile chosen was the 1st and 99th percentile. The data was then ready for analysis.

8 Appendix 2: MESL Calculations

When examining the impacts of interest rate changes and subsequent mortgage payment increases on financial distress of affected households, Minimum Essential Standard of Living budgets from the Vincentian Society were used to calculate each household's minimum required level of expenditure required for an essential standard of living. These are produced for several different household compositions. If a household's residual income was less than this MESL budget, it was deemed to be in financial distress.

To calculate these MESLs, the number of adults, children and pensioners in each household was first estimated. MESL budgets for different compositions of adults, children and pensioners in households were then matched to the households in the sample. A minimum expenditure 'per adult', 'per child' and 'per pensioner' was then calculated using the MESL budgets. This allowed households that did not match the compositions provided by the MESL budget data to also be assigned a minimum expenditure by multiplying the value by the number of adults, children and pensioners in the household.

It should be noted that MESL budgets are provided for both rural and urban households. Since we had no data, on the location of households in the sample, the average of the rural and urban values were taken.

Table 5: Deviation from Pre-War Base - Actual Out-turn (2022) and EBA Interest Rate Scenarios (2023-2025)
Domestic Impacts

		2022		2023		2024		2025	
		Actual	Actual	EBA Base	EBA Adverse	EBA Base	EBA Adverse	EBA Base	EBA Adverse
Sector	Investment (Construction)	-0.03	-0.03	-1.16	-1.44	-3.08	-4.23	-3.88	-5.44
	Investment (Domestic)	-0.03	-0.03	-0.76	-0.96	-1.96	-2.70	-2.45	-3.46
	Employment (Construction)	-0.04	-0.04	-0.36	-0.50	-0.85	-1.22	-1.24	-1.81
	Employment (Domestic)	-0.06	-0.06	-0.45	-0.62	-0.94	-1.32	-1.24	-1.78
	Production (Construction)	-0.11	-0.11	-0.69	-0.97	-1.23	-1.76	-1.57	-2.30
	Production (Domestic)	-0.13	-0.13	-0.74	-1.04	-1.15	-1.64	-1.27	-1.83
Macro	Employment	-0.02	-0.02	-0.18	-0.25	-0.35	-0.50	-0.45	-0.64
	MDD	-0.14	-0.14	-0.71	-1.01	-1.03	-1.48	-1.06	-1.54
	Consumption	-0.13	-0.13	-0.73	-1.05	-1.06	-1.55	-1.06	-1.57
	Disposable Income	-0.04	-0.04	-0.22	-0.31	-0.34	-0.49	-0.35	-0.51
	Unemployment	0.01	0.01	0.09	0.13	0.14	0.20	0.11	0.16
	GDP	-0.02	-0.02	-0.10	-0.14	-0.15	-0.22	-0.17	-0.25
Financial	Mortgage Rate	0.31	0.31	1.50	2.31	1.07	1.63	0.89	1.35
	Corporate Rate	0.17	0.17	1.76	2.57	1.62	2.47	1.30	1.98
	Consumer Rate	0.22	0.22	1.76	2.60	1.83	2.78	1.58	2.40
	Mortgage Arrears	0.01	0.01	0.27	0.42	0.54	0.94	0.29	0.49
	Consumer Credit	-1.99	-1.99	-16.16	-22.54	-19.31	-27.47	-19.35	-27.61
	Corporate Credit	0.00	0.00	-0.09	-0.12	-0.42	-0.59	-0.76	-1.12
	House Prices	-1.13	-1.13	-6.41	-9.06	-9.91	-14.19	-10.92	-15.81
	Insolvencies	0.01	0.01	0.24	0.32	0.40	0.58	0.33	0.48
	Dwelling Completions	-2.51	-2.51	-14.53	-20.07	-23.36	-31.95	-27.78	-38.22
	Mortgages	-0.93	-0.93	-8.75	-11.77	-18.77	-25.76	-25.00	-34.41

Table 6: Deviation from Pre-War Base - Actual Out-turn (2022) and EBA Interest Rate Scenarios (2023-2025)
Domestic + Global Impacts

		2022		2023		2024		2025	
		Actual	Actual	EBA Base	EBA Adverse	EBA Base	EBA Adverse	EBA Base	EBA Adverse
Sector	Investment (Construction)	-0.21	-0.21	-1.89	-2.49	-4.11	-5.70	-4.89	-6.88
	Investment (Domestic)	-0.21	-0.21	-1.47	-1.98	-2.91	-4.08	-3.37	-4.79
	Investment (Traded)	-0.20	-0.20	-0.98	-1.37	-1.66	-2.37	-1.85	-2.66
	Employment (Construction)	-0.04	-0.04	-0.39	-0.53	-0.86	-1.22	-1.20	-1.75
	Employment (Domestic)	-0.07	-0.07	-0.55	-0.76	-1.10	-1.56	-1.44	-2.07
	Employment (Traded)	-0.05	-0.05	-0.34	-0.49	-0.63	-0.92	-0.75	-1.11
	Production (Construction)	-0.11	-0.11	-0.71	-1.01	-1.27	-1.82	-1.62	-2.37
	Production (Domestic)	-0.18	-0.18	-0.91	-1.28	-1.39	-2.00	-1.54	-2.23
	Production (Traded)	-0.15	-0.15	-0.55	-0.81	-0.72	-1.07	-0.71	-1.05
Macro	Employment	-0.04	-0.04	-0.31	-0.43	-0.59	-0.84	-0.74	-1.07
	MDD	-0.19	-0.19	-0.88	-1.25	-1.26	-1.81	-1.30	-1.90
	Consumption	-0.19	-0.19	-0.92	-1.33	-1.31	-1.92	-1.33	-1.97
	Disposable Income	-0.16	-0.16	-0.53	-0.75	-0.70	-1.02	-0.71	-1.05
	Unemployment	0.03	0.03	0.16	0.23	0.24	0.34	0.18	0.28
	GDP	-0.13	-0.13	-0.53	-0.77	-0.73	-1.07	-0.75	-1.11
	Prices	-0.01	-0.01	-0.15	-0.22	-0.30	-0.43	-0.39	-0.57
	Wages (Domestic)	-0.01	-0.01	-0.11	-0.16	-0.25	-0.35	-0.33	-0.49
	Production (All)	-0.13	-0.13	-0.52	-0.75	-0.71	-1.04	-0.73	-1.07
Financial	Mortgage Rate	0.31	0.31	1.50	2.31	1.07	1.63	0.89	1.35
	Corporate Rate	0.17	0.17	1.76	2.57	1.62	2.47	1.30	1.98
	Consumer Rate	0.22	0.22	1.77	2.60	1.84	2.79	1.59	2.42
	Mortgage Arrears	0.01	0.01	0.28	0.44	0.58	1.01	0.32	0.55
	Consumer Credit	-2.01	-2.01	-16.37	-22.82	-19.71	-28.00	-19.88	-28.30
	Corporate Credit	0.00	0.00	-0.14	-0.19	-0.59	-0.84	-1.08	-1.59
	House Prices	-1.18	-1.18	-6.65	-9.39	-10.27	-14.69	-11.30	-16.34
	Insolvencies	0.01	0.01	0.49	0.67	0.74	1.07	0.60	0.89
	Dwelling Completions	-2.59	-2.59	-14.76	-20.38	-23.59	-32.25	-27.88	-38.34
	Mortgages	-0.97	-0.97	-9.06	-12.21	-19.23	-26.39	-25.42	-34.95

Table 7: Deviation of EBA Severe from EBA Base (Domestic Impacts)

		2023	2024	2025
Sector	Investment (Construction)	-0.28	-1.15	-1.56
	Investment (Domestic)	-0.20	-0.74	-1.00
	Employment (Construction)	-0.13	-0.36	-0.57
	Employment (Domestic)	-0.17	-0.39	-0.54
	Production (Construction)	-0.29	-0.53	-0.73
	Production (Domestic)	-0.30	-0.49	-0.57
Macro	Employment	-0.07	-0.15	-0.20
	MDD	-0.30	-0.45	-0.48
	Consumption	-0.32	-0.49	-0.51
	Disposable Income	-0.09	-0.15	-0.16
	Unemployment	0.04	0.06	0.05
	GDP	-0.04	-0.07	-0.08
Financial	Mortgage Rate	0.81	0.56	0.46
	Corporate Rate	0.82	0.85	0.68
	Consumer Rate	0.83	0.95	0.82
	Mortgage Arrears	0.16	0.40	0.20
	Consumer Credit	-6.38	-8.16	-8.26
	Corporate Credit	-0.02	-0.18	-0.36
	House Prices	-2.65	-4.27	-4.89
	Insolvencies	0.07	0.18	0.16
	Dwelling Completions	-5.54	-8.59	-10.44
	Mortgages	-3.03	-7.00	-9.41

Table 8: Deviation of EBA Severe from EBA Base (Domestic + Glabal Impacts)

		2023	2024	2025
	Investment (Construction)	-0.60	-1.59	-1.99
	Investment (Domestic)	-0.51	-1.16	-1.41
	Investment (Traded)	-0.39	-0.71	-0.82
	Employment (Construction)	-0.14	-0.36	-0.55
Sector	Employment (Domestic)	-0.21	-0.46	-0.63
	Employment (Traded)	-0.15	-0.29	-0.35
	Production (Construction)	-0.30	-0.55	-0.75
	Production (Domestic)	-0.38	-0.61	-0.69
	Production (Traded)	-0.25	-0.34	-0.34
	Employment	-0.12	-0.25	-0.33
	MDD	-0.37	-0.55	-0.60
	Consumption	-0.41	-0.61	-0.64
	Disposable Income	-0.23	-0.32	-0.33
Macro	Unemployment	0.07	0.11	0.09
	GDP	-0.24	-0.34	-0.36
	Prices	-0.07	-0.14	-0.18
	Wages (Domestic)	-0.05	-0.11	-0.15
	Production (All)	-0.23	-0.33	-0.34
	Mortgage Rate	0.81	0.56	0.46
	Corporate Rate	0.82	0.85	0.68
	Consumer Rate	0.83	0.95	0.83
	Mortgage Arrears	0.16	0.43	0.22
Financial	Consumer Credit	-6.45	-8.28	-8.43
	Corporate Credit	-0.05	-0.25	-0.50
	House Prices	-2.75	-4.42	-5.04
	Insolvencies	0.18	0.33	0.29
	Dwelling Completions	-5.62	-8.66	-10.47
	Mortgages	-3.15	-7.15	-9.54