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Quarterly Report on the Euro Area

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EUROPEAN ECONOMY

Economic and Financial Affairs

The **Quarterly Report on the Euro Area** is written by staff of the Directorate-General for Economic and Financial Affairs. It is intended to contribute to a better understanding of economic developments in the euro area and to improve the quality of the public debate surrounding the area's economic policy.

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Maarten Verwey
Director-General

Following the robust expansion registered in 2021 and the first half of 2022, the euro area economy has lost momentum since the middle of last year, with weakness especially in consumption and on the external side, and real GDP has remained broadly flat since then. Our Autumn Forecast projects a modest recovery starting in the final months of 2023 with GDP growth averaging 0.6% for 2023 as a whole before picking up to 1.2% in 2024 and 1.6% in 2025. Inflation is estimated to have reached a two-year low in October and is projected to continue declining, falling from 5.6% in 2023 to 3.2% in 2024 and 2.2% in 2025.

The surge in inflation since mid-2021 led to a considerable tightening of financing conditions in the euro area as well as other advanced economies. Overall, financial conditions continue to be tight and to constrain economic activity. As the ECB increased policy interest rates in reaction to the surge in inflation, long-term interest rates in the euro area also moved higher as investors priced in higher-for-longer policy rates. The recent episode of banking stress in the US and Switzerland also underscores the need to remain vigilant regarding financial stability and the links to the macroeconomy. Against this background, this issue of the Quarterly Report on the Euro Area looks at the possible macroeconomic consequences of tighter financing conditions from three different angles, banks, governments and households.

Concerning banks, the rapid increase in global interest rates since early 2022 has different consequences for banks depending on their jurisdictions and regulatory environment, their business models and the macroeconomic context. The first chapter of this volume explores the drivers of bank profitability in the euro area. The analysis is based on a vast dataset of euro area bank-level data over the period 2009-2022 and uses a framework based on quantile regressions to infer the probabilistic distribution of the profitability of a representative euro-area bank and how it responds to different economic shocks. The chapter finds that average bank profitability is positively driven by the level of short-term interest rates. Therefore, the model sees the recent steep increase in short-term interest rates counterbalancing the impact of the negative macroeconomic environment on bank profitability. However, the chapter shows that in case of a macroeconomic shock of a size similar to the one faced during the financial crisis, relatively high interest rates would not be sufficient to counterbalance the negative impact on bank profitability.

The second chapter explores how the high inflation-high interest rate scenario influences governments' balance sheets. The euro area sovereign debt-to-GDP ratio is set to continue to decline to 90,4% in 2023 mostly due to inflation, while higher interest rates on new debt issuances raise interest expenditure only gradually, thanks to the long maturity of public debts. In 2024 and 2025, the debt ratio is projected to broadly stabilise at just above 89%. Even if we do not see concrete risks at the moment, history shows that government debt can be affected by negative events in the banking sector. The chapter presents a methodology to assess the potential impact of banks' losses on public finances using the Systemic Model of Banking Originated Losses (SYMBOL), a micro simulation model developed by the European Commission. The model provides an analysis of government contingent liabilities risks stemming from the banking sector. More precisely, the model estimates the potential residual costs for public finances after all layers of the legal safety net of the EU regulatory framework have been deployed. Coherently with the findings of the previous chapter, overall, the chapter points to a significant resilience of the banking sector across the euro area as a whole, in case of future large shocks. Relatedly, (implicit) contingent liabilities' risks for the public sector are generally contained, with limited residual costs for public finances, reflecting the positive effects of the reforms initiated in the aftermath of the 2008 global financial crisis.

Finally, the chapter looks at how an environment of higher interest rates and slower income growth is also likely to affect private sector balance sheets and those of households in particular. Bank lending to households has continued to slow down at the euro area aggregate level and net lending flows turned negative in 2023 in a number of Member States. This is related to banks' heightened risk perceptions and lower risk tolerance as well as lower household credit demand due to increased credit costs. While a slowdown in credit growth has negative ramifications for economic activity in the short-term, it also has to be seen in the context of overall households' indebtedness. When large segments of the population are heavily indebted, this can pose systemic risks to the economy at large, as seen in the 2008 global financial crisis. The chapter provides a perspective on the development of households' debt in the euro area. It first shows that household debt in the euro area stabilised after the global financial crisis and, after surpassing again 95% of disposable income following COVID-19, returned below this level with the high inflation of 2022 and 2023. Vulnerabilities related to high household debt can be exacerbated in a context of increasing interest rates and declining growth, through the so-called "Fisher dynamics", which increase the debt burden. The chapter shows that income and interest rate developments have indeed contributed significantly to household debt developments in the euro area, at times leading to exacerbating additional borrowing to finance household primary expenditures and at other times undermining deleveraging efforts. Projections regarding future interest rates and growth indicate that stabilising aggregate euro area household debt at the current level will require households to keep their debt-financed primary expenditure below the average of the last five years and closer to its 2023 level.

I. Drivers of bank profitability in the euro area

By Mario Bellia and Guillaume Cousin (1)

Abstract: *Bank profitability matters for financial stability and for monetary policy transmission. At the same time, bank profitability is affected by monetary policy decisions and by the broader macroeconomic environment. Over the past years, macroeconomic conditions have changed fundamentally. From being too low, inflation became far too high, triggering a strong tightening of monetary policy. The related rapid increase in interest rates has had different consequences for banks depending on their jurisdictions and regulatory environment and on their business models. Focusing on the euro area, this chapter explores the drivers of bank profitability and highlights how changes in macroeconomic conditions can affect it. The analysis is based on a vast dataset of bank-level data over 2009-2022 and uses a framework based on quantile regressions. This econometric tool allows us to account for bank heterogeneity when analysing the drivers of bank profitability and to infer the probabilistic distribution of the profitability of a representative euro-area bank. The analysis allows us to assess how the profitability of this representative bank may respond to different economic shocks, with a focus on shifts in the interest rate environment economic activity and NPL ratios. We find that the average bank profitability is driven by the level of the short-term interest rates in the sample. Hence, we find that the recent steep increase in short-term interest rates benefits bank profitability. However, a macroeconomic shock of a size similar to the one faced during the financial crisis would negatively impact bank profitability, despite the higher level of interest rates.*

I.1. Introduction

Bank profitability has gained interest since the 2008 Global Financial Crisis, as a relevant macroeconomic variable. While bank profitability has been high in the recent period, from a historical perspective, exiting the low interest rate environment, the March 2023 bank turmoil in the United States and in Switzerland has highlighted the importance of banks' financial health for economic and financial stability. These recent episodes have indeed provided a reminder of the importance of policy measures, including bank regulation and supervision and monetary policy decisions, on banks' financial health. In this context, the impact of the global steep increase in interest rates is largely debated in the press and the academic community. This chapter highlights the main discussions related to bank profitability. The chapter then investigates the main determinants of bank profitability. The use of quantile regressions, which accounts for bank heterogeneity, allows us to estimate the profitability distribution of a representative euro-area bank and to assess how its profitability would react to different shocks, with a focus on shocks in interest rates, economic activity and NPL ratios. For this purpose, we use a framework previously developed for analysing the impact of central bank digital currencies on bank profitability (2) and estimate quantile regressions on a large panel of individual euro-area banks. By estimating a profitability distribution on a large sample of banks, we can assess how the profitability distribution changes when the drivers of bank profitability are affected by a shock. In particular, our analysis highlights how bank profitability may react to lower economic activity or to changes in the interest rate environment. After highlighting conceptual issues related to bank profitability in Section I.2, the paper describes the data and the methodology used in Section I.3. Section I.4 provides our analysis of the drivers of bank profitability using quantile regressions on a large sample of banks. The estimate of the profitability distribution of a representative euro area bank can thus be built based on the previous regressions. Such distribution can be used to highlight how bank profitability is affected in different macroeconomic scenarios. Section I.5 concludes.

I.2. Conceptual issues related to bank profitability: bank profitability, financial stability and monetary policy

Bank profitability can be measured with accounting non-risk-adjusted return ratios such as the return on asset (ROA) or the return on equity (ROE), with ROE being dependent on companies' leverage. There are also risk-adjusted measures, such as the return on risk-weighted asset (RORWA, or operating profit over risk-weighted assets). The ROA (ROE) is the ratio of net income (after taxes) divided by total assets (equity). Banks' net income can usually be decomposed as net interest income plus non-interest income

(1) The authors thank Matteo Salto, Leonor Coutinho, Eric Rucher, Stan Maes, Maria Tomova, Alberto Gilesi, and Markus Wintersteller, for their helpful comments. This chapter represents the authors' views and not necessarily those of the European Commission.

(2) Bellia, M. and Calès, L., (2023), Bank profitability and central bank digital currency, JRC Working Papers in Economics and Finance, 2023/6.

and changes in loan loss provisions. The net interest income results from the margin between banks' income on interest-bearing assets (loans, securities portfolios, central bank reserves) and their expense on interest-bearing liabilities (deposits, wholesale funding, central bank funding). Non-interest income comprises income from fees and commissions. The relative size of the different income streams depends on banks' business model, their risk profile and on macroeconomic conditions.

Banks play a key role in the transmission of monetary policy and their financial health matters for monetary policy transmission and for economic activity. In the euro area, the ECB has emphasised the importance of adequate bank profitability for monetary policy transmission ([3]) and stressed that weak profitability could be a concern for financial stability. ([4]) Less profitable banks tend to contribute more to systemic risk although banks' contribution to systemic risk also depends on their business models and sources of profit. ([5]) Indeed, profitability allows banks to absorb potential losses and to build capital buffers, thereby smoothing shocks to economic activity, but also to pay out dividends and/or to buy back shares. Profits can also be used to make investments and make banks more competitive and more resilient to shocks. Profits are also linked to banks' riskiness. High profits can reflect excessive leverage and/or high risk taking, which can increase risks for bank stability and for the financial system. However, protracted low profitability constrains monetary policy. In an easing cycle, it impedes banks' ability to transmit lower policy rates to bank lending interest rates or to increase lending volumes and ease their credit standards. In a tightening cycle, protracted weak profitability can threaten banks' ability to cope with their counterparts' deteriorated creditworthiness and to eventually absorb losses.

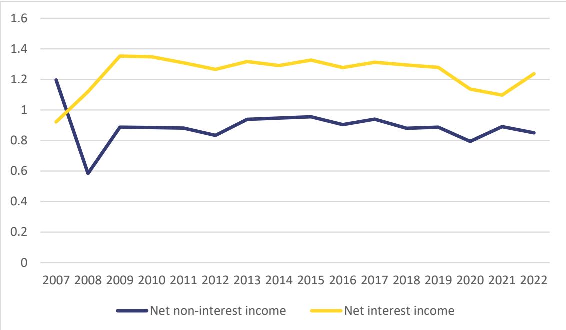
At the same time, monetary policy decisions have an impact on bank profitability. On the banks' funding side, central banks directly influence the cost of banks' refinancing operations, steer interbank market interest rates and influence the returns on banks' issued bonds and commercial paper and the remuneration of deposits. On the banks' asset side, monetary policy decisions influence the return on banks' central bank reserves and the returns of their assets, such as corporate and sovereign bonds, equity instruments, and loans with variable interest rates. Monetary policy decisions also, influence macroeconomic conditions, hence credit growth and households' and firms' creditworthiness. Overall, as institutions involved in maturity transformation, banks' interest income is sensitive to changes in the interest rate environment, although they can have opposite effects on banks' different sources of income. The level of short-term interest rates and the slope of the yield curve are usually positively associated to banks' net interest income. Higher interest rates improve banks' net interest income because interest rates on bank deposits cannot become negative – or only to a limited extent. Hence, the spread between the interest rate on deposits and the interest rate on loans tends to be smaller when rates are lower. Conversely, when interest rates increase, deposit rates tend to be sticky and to increase less than interest rates on loans. The slope of the yield curve also improves bank profitability due to banks' maturity transformation activity. At the same time, higher interest rates are also associated with higher loan-loss provisions due to higher risks of default. They are also associated with lower non-interest income, as higher rates can negatively impact the value of banks' securities portfolios (although the extent to which this is being reflected in a bank's accounts depends on accounting conventions and bank practices) and on securities' characteristics (including bonds maturity for instance). ([6]) Hence, the way interest rates affect bank profitability also depends on banks' business models, which translates in their balance sheet composition and their relative sources of income. ([7]) The overall impact of monetary policy decisions on bank profitability has been debated, not only in the low interest rate environment that followed the 2008 GFC, but also more recently when exiting the low interest rate environment. Some studies provided evidence that the low interest environment negatively affected bank profitability. ([8]) This impact is usually attributed to a decrease in banks' net interest margin. A study covering 3385 banks from 47 countries over

([3]) De Guindos, L. (2019), Challenges for bank profitability, Speech.
([4]) De Guindos, L. (2019), Euro area banks: the profitability challenge, Keynote speech
([5]) Xu et al. (2019), Bank Profitability and Financial Stability, IMF Working Paper N°2019/005.
([6]) Borio C. et al., (2015), The influence of monetary policy on bank profitability, BIS Working Paper N°514.
([7]) Bonaccorsi di Patti E., Palazzo F., (2018), Bank Profitability and Macroeconomic Conditions: Are Business Models Different?, Bank of Italy Occasional Paper N°436.
([8]) Borio C. et al., ibid.

2005-2013 estimated that a one percentage point decrease in interest rates implied an 8 basis points lower net interest margin. ([9]) While acknowledging that periods of low interest rates coincided with lower profitability, other studies argued that monetary policy easing was not conducive to lower profitability when considering the endogeneity of policy measures to the economic outlook. Thus, the association of lower rates and lower profitability would not reflect a causality from rates to profitability but would be the consequence of weak macroeconomic conditions. ([10]) A recent study emphasized that the way bank profitability reacted to low interest rates was not uniform across jurisdictions. ([11])

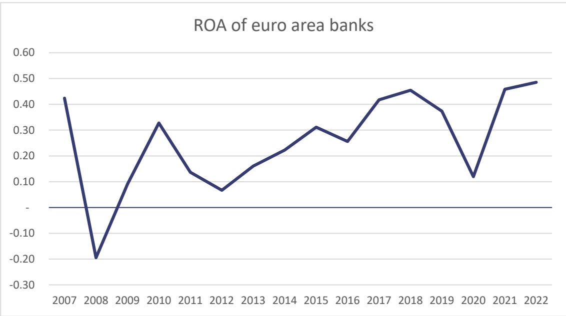
In the euro area, the aggregate net interest income decreased from 1.4% of banks' total assets in 2009 to 1.1% in 2021 before rebounding to 1.2% in 2022 (Graph I.1). Over the same period, banks' return on assets fluctuated with more volatility. It trended upward over 2012-2018 before decreasing abruptly in 2020 and recovering thereafter, reaching 0.48% in 2022 (Graph I.2). Despite the challenges posed by the COVID-19 pandemic, the EU banking system proved to be resilient, given also the support provided by EU regulatory bodies and supervisors. ([12])

Graph I.1: **Interest income and non-interest income**



(1) Euro area banks, as % of total assets
Source: ECB, CBD2 dataset

Graph I.2: **Return on assets**



(1) Euro area banks, as % of banks' total assets
Source: ECB, CBD2 dataset

Since 2022, the interest rate environment has changed fundamentally in the euro area. The ECB has tightened its monetary policy and proceeded to the steepest increase in its policy rates since the euro's inception. This chapter aims at highlighting how the profitability of euro-area banks might react to the new interest rate environment and to macroeconomic shocks more in general. Hence, we look at the drivers of bank profitability while taking into account the heterogeneity of banks.

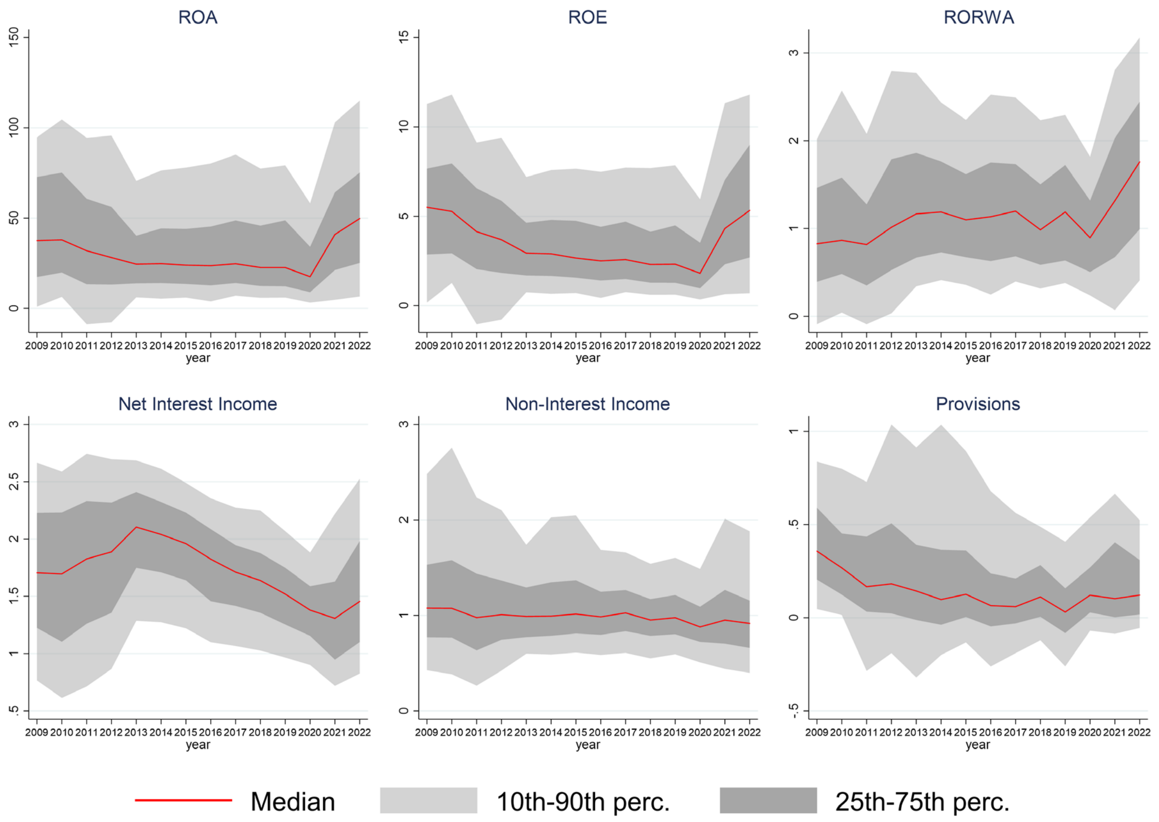
I.3. Database description and methodology

The following analysis focuses on a large cross-section of banks, sampled from the data provider Orbis Bankfocus, spanning the period from 2009 to 2022, at yearly frequency. We cover the 20 euro-area Member States, albeit the number of banks differs substantially across Member States given the different size of their banking systems and the presence of large banking groups that have subsidiaries across the euro area. We focus our analyses on commercial banks, cooperative banks, saving banks, bank holding companies, and Fintech banks, plus banks that are included in the list provided by the Single Supervisory Mechanism (SSM) included in the ORBIS database. We use the highest level of consolidation available, excluding subsidiaries, in order to avoid double-counting issues. We also impose to have at least 3 yearly

([9]) Claessens S. et al., (2018), "Low-For-Long" interest rates and banks' interest margins and profitability: Cross-country evidence, Journal of Financial Intermediation, Vol. 35, p.1-16.
([10]) Altavilla C. et al., (2017), Monetary policy and bank profitability in a low interest rate environment, ECB Working Paper Series N°2105
([11]) Windsor C. et al., (2023), The Impact of Interest Rates on Bank Profitability: A Retrospective Assessment Using New Cross-country Bank-level Data, Reserve Bank of Australia Research Discussion Paper 2023-05.
([12]) A detailed report on all measures and the impact on the banking sector is provided by EBA (2022) EBA closure report of Covid-19 measures Eba/rep/2022/32 16 December 2022.

observations per entity, and that the bank is still active. ([13]) We end up with 2016 entities that represents roughly 85% of the total assets of the euro area banking system.

Graph I.3: **Selected profitability measures, 2009-2022**



(1) averages across years of a set of selected measures of profitability for an unbalanced panel of 2160 banks. ROA values are in basis points of total assets. All other measures are in percentage of total assets.
Source: *Orbis B*

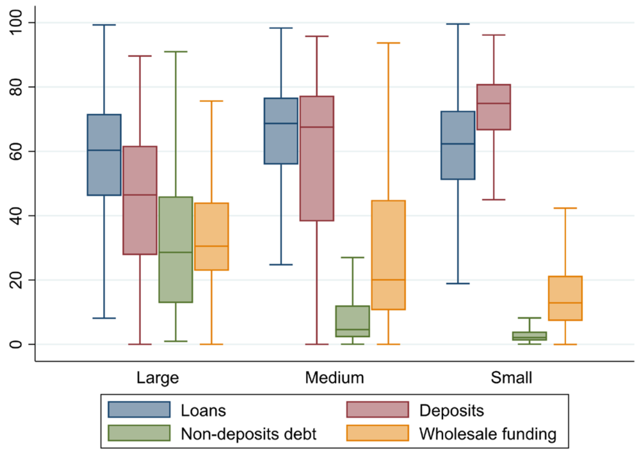
The sample of banks is quite heterogeneous in terms of size and business models. Our sample contains 99 large, 355 medium, and 1562 small banks. ([14]) Graph I.4 depicts the distribution of selected balance sheet ratios in our sample, in the period 2009-2022. In terms of loans to assets, most of the banks have a loan-to-asset ratio in the 50%-80% interval. The distribution of loan-to-asset ratio across bank size is quite homogenous, albeit medium and small banks have a slightly higher loan-to-asset ratios. The funding structure is the main source of difference across banks, in particular if one compares banks of different size. Small banks strongly rely on deposits for funding: the distribution of the deposit-to-asset ratio is quite concentrated between 70% and 80%. Large banks rely more on other sources of funding including non-deposit debt and wholesale funding. Notably, the dispersion of these variables is quite high across size categories, with the exception of non-deposit debt for small banks.

([13]) We acknowledge that there might be survivorship bias in our estimations of average profits, since we exclude the most problematic banks that failed or have been incorporated in other entities. Further, another source of upward bias could be state aids and public recapitalizations rolled over in the aftermath of the 2009 crisis.

([14]) Banks are categorised as small, medium, and large, applying a simple approach using EBA thresholds based on total assets. Large banks have total assets above EUR 30bn. Banks with total assets below EUR 3bn are considered small and banks with total assets between EUR 3bn and 30bn are considered medium.

We investigate the link between bank profitability and variables related to monetary policy and economic growth. As banks are heterogenous in terms of size, business models and sources of profits, such an analysis needs to account for bank heterogeneity, as shown by the literature on bank profitability. (15)

Graph I.4: **Sample characteristics and business model, 2009-2022**



(1) Note: distribution of balance sheet components for an unbalanced panel of 2160 banks. All measures are in percentage of total assets. Outliers are excluded from the plot.
Source

For this purpose, our econometric analysis is based on quantile regressions. (16) This estimation model is useful when there is substantial heterogeneity in the data, as the relationship between variables might change across different parts of the profitability distribution of the sample of banks. It has already been applied to analyses of bank profitability in order to take into account banks' heterogeneity. (17) In our case, quantile regressions are estimated using a Correlated Random Effects model (CRE) to account for unobserved heterogeneity for each unit in the sample (i.e., fixed effects). (18)

Once we have estimated the relevant parameters, we build the distribution of a representative bank's profitability as a function of the determinants specified in the previous regressions by fitting the quantile distribution obtained from the quantile regression with a parametric distribution. Once this distribution is estimated, it is possible to see how the different shocks to selected determinants of profitability impact the profitability of this representative euro-area bank. In particular, the shocks to the profitability determinants can be chosen to represent specific micro and macroeconomic shocks. A detailed explanation of the methodology is provided in Box I.1.

The determinants of profitability in our model are based on three group of variables: i) monetary policy developments, which are taken into account by including the overnight 3-months index swap rate (OIS 3M) as a proxy for short term rates and the country-specific slope of the yield curve, calculated as the difference between the ten-year and the two-year yields on sovereign bonds. For Member States where this indicator is not available, the average euro-area value is used. ii) macroeconomic and financial developments are controlled for by using the general equity market riskiness (the EURVIX, which is a volatility index based on the EUROSTOXX equity index) (19) and, as a measure of the economic activity, the real GDP growth rate from AMECO; iii) to take into account banks' business models and the strength of their balance sheets when analysing bank profitability, we include different bank-specific explanatory variables, namely the Equity to Asset ratio, the Non-Performing Loans (NPL) ratio, the Loans to Asset ratio, the Deposit to Asset ratio, and the Non-Interest Income to Asset ratio. We also control for banks' sizes by including the log of total assets in the model.

(15) Bonaccorsi di Patti E., Palazzo F., ibid.
(16) Unlike OLS regressions, which focus on the estimation of a conditional mean, quantile regressions allow to analyse the relationship in different "parts" of the profit distribution, especially in the tails. Quantile regressions do not make assumptions about the distribution of errors and provide robust estimates across different parts of the distribution.
(17) See for instance an analysis covering 109 SSM-supervised banks over the 2007-2016 period in Elekdag, S. et al., (2019), *Breaking the Bank? A Probabilistic Assessment of Euro Area Bank Profitability*, IMF WP/19/254.
(18) Wooldridge J. M., (2019), Correlated random effects models with unbalanced panels, Journal of Econometrics, Vol. 211-1, p. 137-150.
(19) These data are taken from Refinitiv.

Box I.1: **Modelling the conditional distribution**

This box details the methodology used to model the conditional distribution of the profitability of a representative bank. We first estimate the quantile distribution of banks' profitability by using panel data quantile regression. The resulting quantile distribution of banks' profitability is an estimate of the distribution of the profitability of a synthetic bank, which is representative of the banks in the sample. In other words, we estimate the quantile function ( ) of the profitability of a representative bank using as a proxy the results of the panel quantile regressions. More formally, we consider the following equation:

$$Y_{i,c,t}^{Q} = \alpha_i + \beta^Q X_{i,c,t-1} + \gamma^Q Z_{c,t} + \mu_i^Q + \epsilon_{i,c,t}^Q$$

where $Y_{i,c,t}$ represents different profitability measures used in the analysis for bank *i*, in country *c* and for year *t* at different quantiles Q, $X_{i,c,t-1}$ represents a set of bank-specific components lagged by one period (Equity to Asset ratio, Non-Performing Loans (NPL) ratio, Loans to Asset ratio, Deposit to Asset ratio, and Non-Interest Income to Asset ratio), $Z_{c,t}$ represents a set of country-specific explanatory variables that includes the overnight 3-months index swap, the slope of the term structure of sovereign yields, the Real GDP growth rate, and the EURVIX, a volatility index based on the EUROSTOXX index. μ_i are banks fixed effects. The quantile regressions are estimated by including the time averages of the covariates (Correlated Random Effects models, or CRE, in the spirit of Wooldridge, 2019) ([1]) to account for unobserved heterogeneity for each unit in the sample (fixed-effects). The regressions are estimated for quantiles Q that go from the 5th to 95th included.
Finally, we fit the quantile distribution with a parametric distribution to get a fully described distribution of a representative bank's profitability. ([2]) Practically, the distribution is fitted against the skewed t-distributions developed by Azzalini, A. and Capitanio, A. (2003) ([3]) which is chosen for its flexibility and its parsimony. Formally:

$$f(y;\rho,\sigma,\gamma,\upsilon) = \frac{2}{\sigma} t\left(\frac{y-\rho}{\sigma};\upsilon\right) T\left(\gamma \frac{y-\rho}{\sigma}\sqrt{\frac{\upsilon+1}{\upsilon+\left(\frac{y-\rho}{\sigma}\right)^2}};\upsilon+1\right)$$

where t(·) represents the probability density function (PDF) and T(·) the cumulative density function (CDF) of the Student's t distribution, and the parameters $\{\rho,\sigma,\gamma,\upsilon\}$ represent the location, the scale, the slant, and the degrees of freedom, respectively. As the skewness parameter γ and the degrees of freedom υ vary, this distribution can accommodate both skewness and heavy tails. The fit is obtained by choosing the four parameters which minimize the squared distance between the estimated quantile function and the quantile function of the skewed t-distribution to match the 5, 25, 75, and 95 percent quantiles. Finally, several shocks, described bellows, are applied. The resulting quantile distribution shows its potential impact on the profitability of the representative bank.

(1) Wooldridge J. M., (2019), *Ibid*
(2) The same methodology is used in Bellia, M. and Calès, L., Bank profitability and central bank digital currency - JRC Working Papers in Economics and Finance, 2023/6, European Commission, 2023, JRC133796; Elekdag, S., Malik, S., and Mitra, S. (2020). Breaking the bank? a probabilistic assessment of euro area bank profitability. Journal of Banking & Finance, 120:105949; Adrian, T., Boyarchenko, N., and Giannone, D. (2019). Vulnerable growth. American Economic Review, 109(4):1263–89.
(3) Azzalini, A. and Capitanio, A. (2003). Distributions generated by perturbation of symmetry with emphasis on a multivariate skew t-distribution. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 65(2): 367-389.

I.4. Results

I.4.1. Quantile regressions

We present our analysis on different measures of profitability, namely the Return on Assets (ROA), the Return on Equity (ROE), and a risk-adjusted measure, the Return on Risk-weighted Assets (RORWA). Results are similar and do not depend substantially on the measure chosen. Table I.1 shows the results for a subset of quantiles used in the analysis (from the 10th to the 90th). The coefficient of the short-term rate (OIS 3M) is positive and highly significant at all quantiles and monotonically increasing. This is also the case for real GDP growth. This indicates that an increase in the short-term rate tends to increase bank profitability and that bank profitability increases with economic activity. The effect is larger for banks that are more profitable (in the higher quantiles). In the same vein, Deposits to Assets and Non-Interest Income to Assets display a positive coefficient, albeit not monotonically increasing across quantiles. The regression coefficient before the slope of the yield curve is positive and significant for quantiles higher than the 30th, monotonically increasing. The volatility of the stock markets (EURVIX) is negatively associated to banks' ROA and coefficients are highly significant across quantiles (excluding the tails), showing that profitability tends to decrease when the riskiness of the financial market increases. The same applies to the NPL ratio: an increase in the share of non-performing loans tends to reduce substantially the ROA.

Table I.1: **Quantile regressions - Return on Assets (ROA)**

ROA	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
OIS 3M	1.844***	3.487***	4.504***	4.636***	4.997***	5.164***	5.117***	6.036***	4.972***
	(0.574)	(0.664)	(0.436)	(0.592)	(0.477)	(0.510)	(0.664)	(0.871)	(1.286)
Slope	0.000	0.008	0.017*	0.020**	0.038**	0.035***	0.045***	0.073***	0.076***
	(0.012)	(0.009)	(0.010)	(0.010)	(0.015)	(0.013)	(0.010)	(0.017)	(0.022)
Size	3.795**	-0.068	-1.270	-2.338*	-4.697***	-5.215***	-4.867**	-2.079	-1.288
	(1.475)	(1.550)	(1.431)	(1.386)	(1.673)	(1.936)	(1.987)	(2.212)	(4.895)
Real GDP Growth	0.630***	0.820***	0.847***	0.872***	0.964***	1.090***	1.305***	1.569***	1.507***
	(0.083)	(0.087)	(0.078)	(0.073)	(0.079)	(0.094)	(0.107)	(0.144)	(0.235)
Eurvix (-1)	-0.075	-0.114***	-0.102***	-0.120***	-0.084*	-0.166***	-0.238***	-0.249***	-0.119
	(0.048)	(0.042)	(0.037)	(0.045)	(0.044)	(0.053)	(0.066)	(0.075)	(0.108)
Equity to Assets (-1)	0.153	0.283	0.286	0.303	0.464*	0.483*	0.556	0.768**	0.564
	(0.196)	(0.213)	(0.217)	(0.247)	(0.257)	(0.290)	(0.378)	(0.368)	(0.476)
NPL Ratio (-1)	-0.227***	-0.354***	-0.333***	-0.327***	-0.298*	-0.258**	-0.382**	-0.387**	-0.352***
	(0.072)	(0.078)	(0.079)	(0.123)	(0.158)	(0.119)	(0.166)	(0.186)	(0.114)
Loans to Assets (-1)	0.060	0.034	0.122***	0.138***	0.204***	0.261***	0.228***	0.195***	0.035
	(0.047)	(0.047)	(0.043)	(0.052)	(0.051)	(0.063)	(0.064)	(0.074)	(0.104)
Deposits to Assets (-1)	0.109**	0.120*	0.154***	0.137**	0.168***	0.135**	0.140	0.140	0.140
	(0.050)	(0.066)	(0.052)	(0.059)	(0.061)	(0.061)	(0.085)	(0.108)	(0.161)
Non Inter. Income to Assets (-1)	0.173	-0.079	1.219***	1.613	0.621*	1.240	1.395***	1.212*	1.699
	(0.362)	(0.524)	(0.214)	(1.785)	(0.319)	(0.771)	(0.267)	(0.698)	(1.186)
R2	0.030	0.171	0.230	0.249	0.250	0.253	0.252	0.243	0.222
Obs	15282								
FE	By Bank								

Standard errors in parentheses
** p<0.10 ** p<0.05 *** p<0.01*

Source: Orbis Bankfocus, own calculations

Similar results in terms of interpretation and significance are presented in Table I.2 for the Return on Equity (ROE). The coefficient of the slope of the yield curve is positive and significant from the 40th to the 80th quantiles. Non-interest income to assets appears to be a less powerful predictor for ROE with respect to the ROA estimation.

Table I.3 reports the results for the RORWA. We notice that the significance of the variables is similar to the one of the ROE and ROA, albeit the coefficients display less variability across quantiles. The short-term rate (OIS 3M), real GDP growth, and NPLs are still good predictors for the RORWA, as well as the slope of the yield curve.

In our analysis, the slope of the yield curve, which is a measure of banks' intermediation margin, seems to matter less than the level of the short-term rate for bank profitability. A similar study covering the 2007-2016 period found that neither higher short-term rates nor a steeper slope of the yield curve were conducive of higher bank profitability. The relatively muted impact of the slope of the yield curve for bank profitability could reflect the fact that higher long-term rates reduce the valuation of long-term securities thus negatively impact profitability. [20] Our different assessment of the impact of short-term

[20] Elekdag, S. et al., ibid.

rates could relate to the different period we cover (2009-2022), as the large increase in banks' reserves from 2016 to 2022 should make bank profitability more sensitive to the level of the short-term rate.

Table I.2: **Quantile regressions - Return on Equity (ROE)**

ROE	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
OIS 3M	0.284***	0.336***	0.438***	0.580***	0.636***	0.682***	0.729***	0.754***	0.616***
	(0.063)	(0.067)	(0.068)	(0.064)	(0.062)	(0.072)	(0.082)	(0.084)	(0.118)
Slope	0.000	0.001	0.003	0.005***	0.007***	0.011***	0.012***	0.013***	0.007
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)
Size	0.408**	0.159	0.094	-0.054	-0.145	-0.160	0.087	0.282	0.341
	(0.169)	(0.205)	(0.147)	(0.167)	(0.180)	(0.200)	(0.259)	(0.292)	(0.387)
Real GDP Growth	0.082***	0.096***	0.097***	0.087***	0.098***	0.113***	0.145***	0.171***	0.157***
	(0.010)	(0.009)	(0.008)	(0.009)	(0.008)	(0.012)	(0.011)	(0.015)	(0.023)
Eurvix (-1)	-0.011*	-0.017***	-0.010**	-0.009*	-0.011*	-0.014**	-0.024***	-0.025***	-0.020
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.009)	(0.012)
Equity to Assets (-1)	-0.011	-0.082***	-0.128***	-0.182***	-0.224***	-0.227***	-0.259***	-0.278***	-0.293***
	(0.023)	(0.024)	(0.021)	(0.021)	(0.035)	(0.029)	(0.038)	(0.061)	(0.061)
NPL Ratio (-1)	-0.032***	-0.036***	-0.035***	-0.030**	-0.030*	-0.037*	-0.033	-0.048**	-0.035***
	(0.008)	(0.008)	(0.011)	(0.015)	(0.016)	(0.019)	(0.027)	(0.019)	(0.013)
Loans to Assets (-1)	0.007	0.006	0.015***	0.018***	0.026***	0.031***	0.027***	0.015	0.001
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)	(0.011)	(0.013)
Deposits to Assets (-1)	0.014**	0.010	0.013*	0.018**	0.015**	0.015	0.020**	0.025*	-0.004
	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.013)	(0.016)
Non Inter. Income to Assets (-1)	-0.022	0.002	0.118	0.095	0.061	0.092*	0.098	0.182	0.266***
	(0.042)	(0.034)	(0.168)	(0.212)	(0.091)	(0.048)	(0.092)	(0.178)	(0.053)
R2	0.006	0.090	0.155	0.174	0.185	0.186	0.182	0.178	0.164
Obs	15282								
FE	By Bank								

Standard errors in parentheses
** p<0.10 ** p<0.05 *** p<0.01*

Source: Orbis Bankfocus, own calculations

Table I.3: **Quantile regressions - Return on Risk-Weighted Assets (RoRWA)**

RoRWA	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
OIS 3M	0.107***	0.168***	0.197***	0.189***	0.192***	0.182***	0.185***	0.194***	0.174***
	(0.027)	(0.020)	(0.019)	(0.017)	(0.017)	(0.018)	(0.020)	(0.024)	(0.033)
Slope	0.000	0.000	0.001***	0.001***	0.001***	0.002***	0.002***	0.002***	0.003***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Size	0.035	0.061	0.086*	0.131***	0.129**	0.083	0.067	0.040	-0.152*
	(0.050)	(0.045)	(0.049)	(0.051)	(0.058)	(0.065)	(0.072)	(0.101)	(0.081)
Real GDP Growth	0.018***	0.022***	0.029***	0.033***	0.039***	0.042***	0.050***	0.057***	0.058***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
Eurvix (-1)	-0.000	-0.000	-0.002*	-0.004**	-0.004**	-0.003*	-0.004**	-0.006**	-0.003
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)
Equity to Assets (-1)	-0.001	-0.007	-0.007	-0.013	-0.016	-0.025**	-0.034***	-0.045***	-0.050***
	(0.005)	(0.005)	(0.007)	(0.009)	(0.010)	(0.010)	(0.009)	(0.016)	(0.011)
NPL Ratio (-1)	-0.007***	-0.009***	-0.010***	-0.013***	-0.012***	-0.015***	-0.017***	-0.018**	-0.021***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.005)	(0.006)	(0.007)	(0.003)
Loans to Assets (-1)	0.001	0.000	0.000	-0.000	0.001	0.003	0.003	0.004	-0.002
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Deposits to Assets (-1)	0.003*	0.004**	0.006***	0.008***	0.010***	0.011***	0.010***	0.011***	0.011***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)
Non Inter. Income to Assets (-1)	-0.005	0.002	-0.002	0.004	0.004	0.027**	0.024***	0.018	0.017
	(0.011)	(0.025)	(0.018)	(0.048)	(0.057)	(0.012)	(0.008)	(0.022)	(0.030)
R2	0.033	0.082	0.115	0.122	0.125	0.123	0.120	0.111	0.094
Obs	13746								
FE	By Bank								

Standard errors in parentheses
** p<0.10 ** p<0.05 *** p<0.01*

Source: Orbis Bankfocus, own calculations

I.4.2. Distribution fitting and shocks

We first estimate the average illustrative profitability distribution, which will be used as the baseline distribution for the purpose of understanding the impact of shocks on profitability. This profitability distribution is computed based on the variables included in the quantile regressions. In particular, the baseline is evaluated at sample means, where each explanatory variable takes the sample average over 2009-2022 as initial value. We use the quantiles estimation to calculate the values at different quantiles, and subsequently we fit a *t-skewed* distribution. The final parametric distribution can then be interpreted as the profitability distribution of a "representative bank" which has all characteristics set at the average in the sample. ([21])

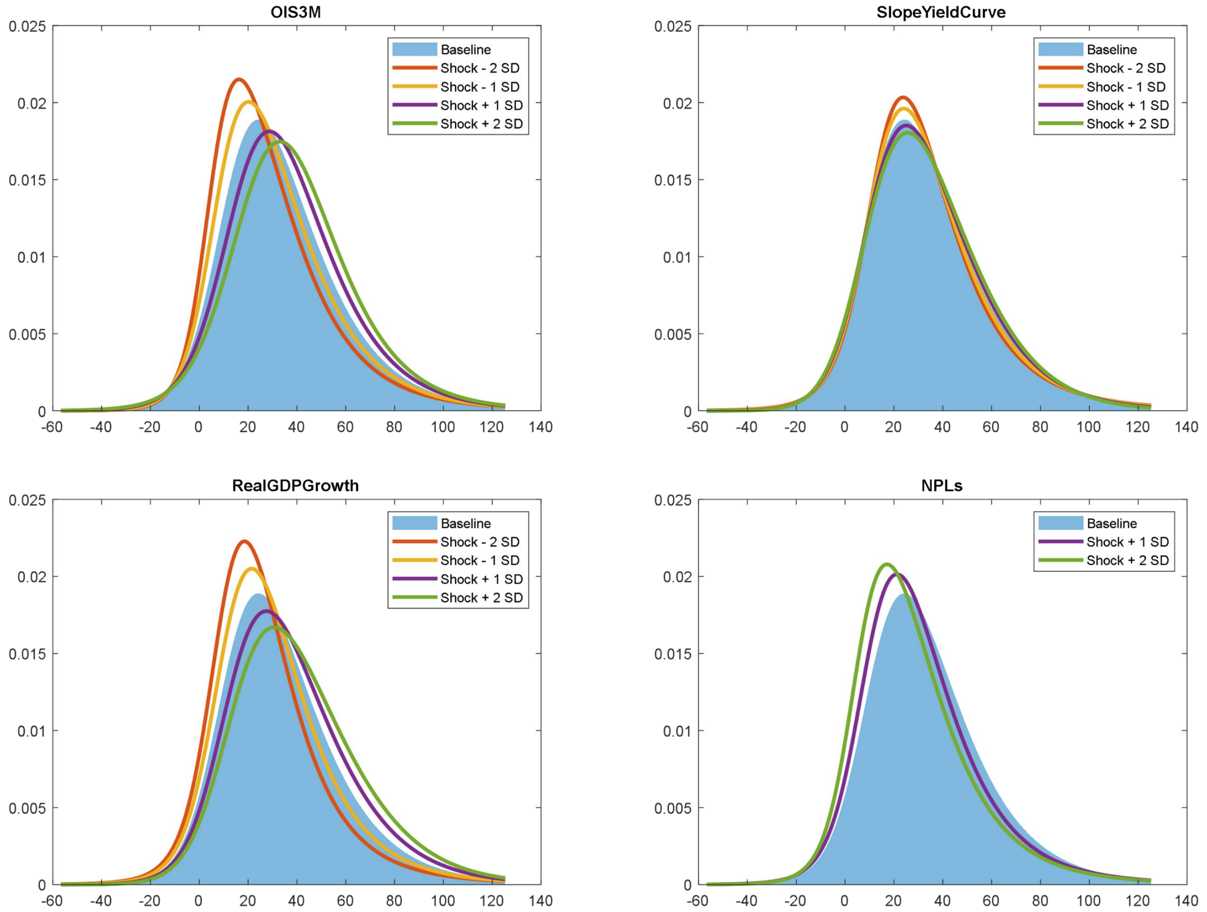
Once the baseline is set, one can apply shocks of different sizes to the selected relevant variables. As we are interested in the effect of potential macroeconomic shocks, we shock the OIS 3M, the slope of the domestic yield curve, real GDP Growth, and the NPL ratio. These four variables are representative of different exogenous shocks. In order to understand the functioning of the shock, Graph I.5 presents the impact of each shock separately on the profitability distribution. As said above, the shock on the OIS 3M is aimed at measuring the effect of monetary conditions on bank profitability. The slope of the yield curve, instead, could be related to changes in expectations about future interest rates and to unconventional monetary policy measures. A positive shock on these variables refers to an increase in interest rates (for the OIS 3M) or a steepening of yield curve. Both tend to lead to an increase in the profitability of the representative bank in our empirical estimation (in the quantile regressions), as the fitted distributions would be shifted to the right (or, conversely, to the left in case of a negative shocks). Similarly, a positive shock in terms of real GDP growth is clearly beneficial for bank profitability. On the contrary, a higher NPL ratio would reduce the overall profitability distribution of the representative bank. Given the current historical lower level of NPLs, we are only considering positive shocks to this variable (i.e. and increase of NPLs, and not a decrease of NPLs).

To show the order of magnitude of the impact on ROE, Graph I.5 plots the distribution under a shock in which each variable increases or decreases by one or two standard deviations. The standard deviation is calculated using our sample data and our time period. For example, the OIS 3M has an average value of -0.10%, with a standard deviation of 0.61. The different shocks would imply that the OIS 3M would stand at 0.51% (+ 1SD), 1.12% (+ 2SD), -0.71% (-1SD), or -1.32% (-2 SD). This calculation method applies the four different explanatory variables considered above, and illustrates how changes in these variables affect the profitability distribution. For the NPLs, as pointed out before, we are only considering an increase of the stock of non-performing exposures, given the statistics of our sample (average of 5.19% and SD of 8.06%). ([22])

([21]) i.e., all exogenous variables are set at their sample means.

([22]) According to Ari, Anil, Sophia Chen, and Lev Ratnovski. "The dynamics of non-performing loans during banking crises: A new database with post-COVID-19 implications." Journal of Banking & Finance 133 (2021): 106140 "In crises with high NPLs, the peak NPL ratio is 22 percent on average. In a few exceptional cases, the peak NPL ratios exceed 50 percent". Given the statistics of our sample, a 2 SD shock is about 16%, which added on top of the sample NPL ratio average yields 21.5%, a value close to the average peak reported from the authors.

Graph I.5: **Return on assets and estimated distributions**



(1) Estimated profitability distribution based on quantile regressions. ROA values are in basis points.
Source: *Orbis B*

There are several caveats that need to be considered before discussing the results. First, the results of the quantile regressions include three important crises (2009, 2011 and 2020). Second, the analysis should be considered as a static assessment of what might happen in case of a shock *ceteris paribus*. We are not considering the relation between changes in our explanatory variables, or potential reactions from banks or from Governments or other supervisors. The estimations are thus conditional on all the events and interventions that occurred from 2009 to 2022 and cannot be extended to forecast future profitability. Instead, they have to be taken as estimations of the profitability distribution conditional to several variables and conditional to historical economic conditions over the period. Furthermore, the model does not take into account possible lags in the crossed effects of the variables and their interaction, with the possible presence of multi-collinearity and omitted variables. This can imply, for instance, that the model cannot isolate the effects of higher interest rates or lower growth from that of higher NPLs on profitability, as those usually come later.

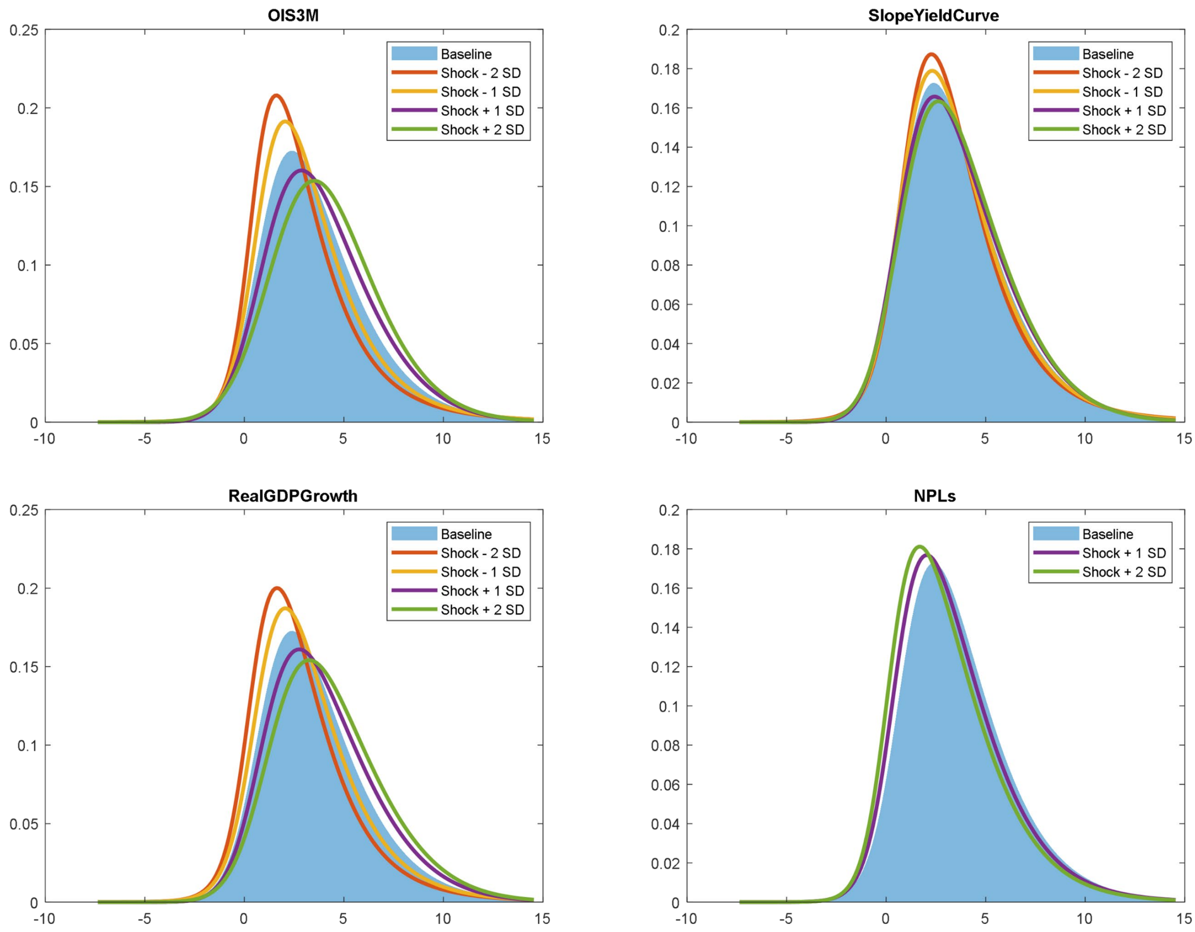
Table I.4 reports the average values of the profitability measures for the baseline (which are the averages of the fitted parametric distributions) and for the different shocks of ± 1 SD and ± 2 SD. The results show that the largest reduction in profitability is expected when there is a standalone strong contraction of economic activity. Changes in the slope of the yield curve have only a marginal effect on banks profitability. Instead, changes in the short-term interest rate (OIS 3M) and increases in the NPL ratio have a strong impact on bank profitability. Graph I.6 and I.7 depict graphically the resulting distributions for the ROA and the RORWA.

Table I.4: **Average profitability measures for the historical baseline and after shocks on selected variables**

	Baseline	-2 SD	-1 SD	+1SD	+2 SD
ROA	34.4				
OIS 3M		29.2	31.8	37.0	39.6
Slope		34.3	34.3	34.5	34.6
Real GDP Growth		27.9	31.1	37.7	41.0
NPL				31.6	28.8
ROE	3.6				
OIS 3M		3.0	3.3	3.9	4.2
Slope		3.5	3.5	3.6	3.7
Real GDP Growth		2.9	3.2	3.9	4.3
NPL				3.3	3.0
RORWA	1.2				
OIS 3M		1.0	1.1	1.3	1.5
Slope		1.2	1.2	1.2	1.3
Real GDP Growth		1.0	1.1	1.4	1.5
Deposits to Assets				1.2	1.1

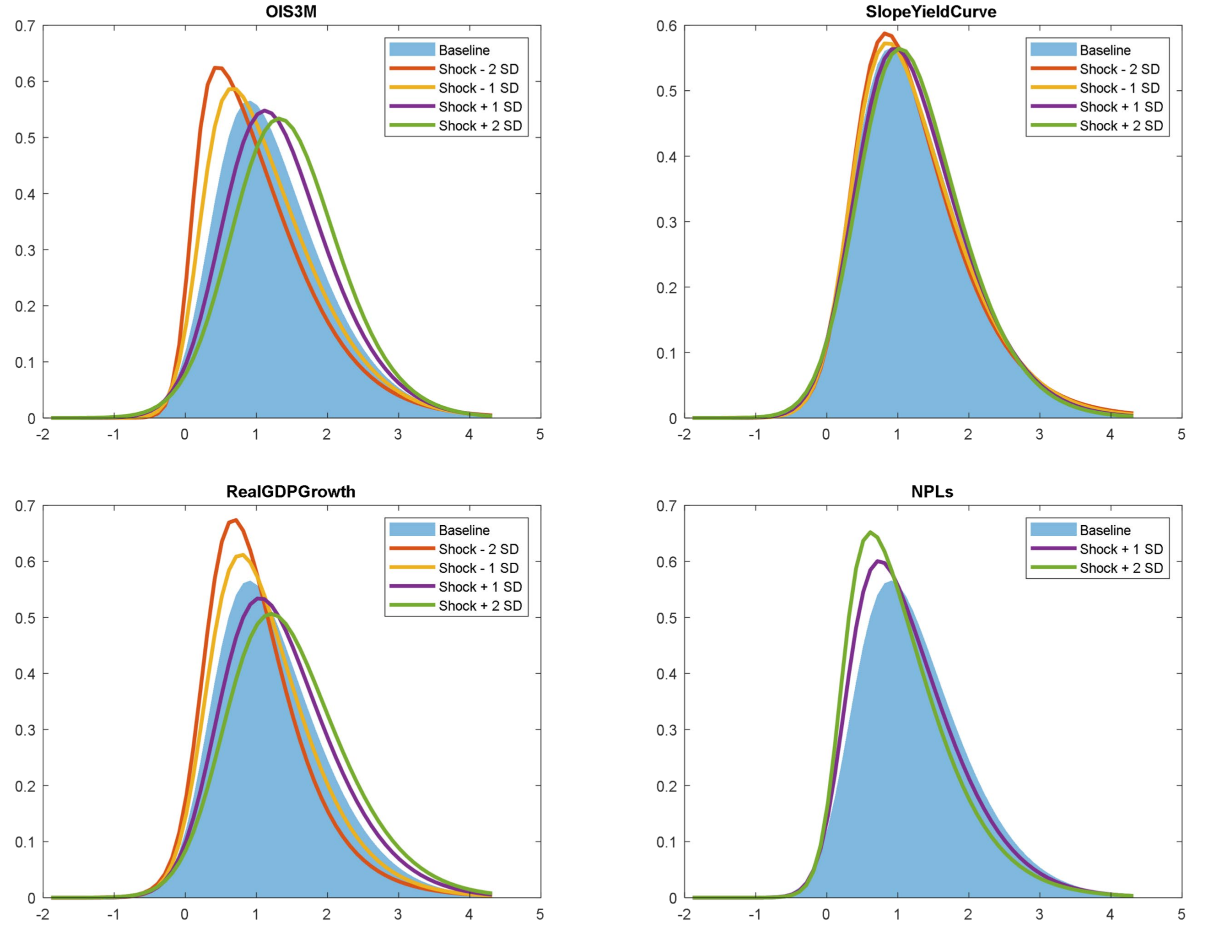
(1) ROA in bps; ROE in %
Source: Own calculations

Graph I.6: **Return on equity and estimated distributions**



Estimated profitability distribution based on quantile regressions. ROE values are in percentage. The baseline represents the profitability distribution estimated from historical data using quantile regressions.
Source: *Orbis Bankfoc*

Graph I.7: **Return on risk-weighted assets and estimated distributions**



(1) Estimated profitability distribution based on quantile regressions. RORWA values are in percentage. The baseline represents the profitability distribution estimated from historical data using quantile regressions.
Source: *Orbis Ba*

Table I.5: **Average profitability measures for the historical baseline and after combined shocks**

	Baseline	1 SD	2 SD
ROA	34.4		
Scenario 1		25.6	18.0
Scenario 2		31.0	27.6
ROE	3.6		
Scenario 1		2.7	1.8
Scenario 2		3.3	3.0
RORWA	1.2		
Scenario 1		0.9	0.7
Scenario 2		1.1	1.1

(1) ROA in bps; ROE and RoRWA in %. The baseline represents the profitability distribution estimated from historical data using quantile regressions.
Source: Own calculations

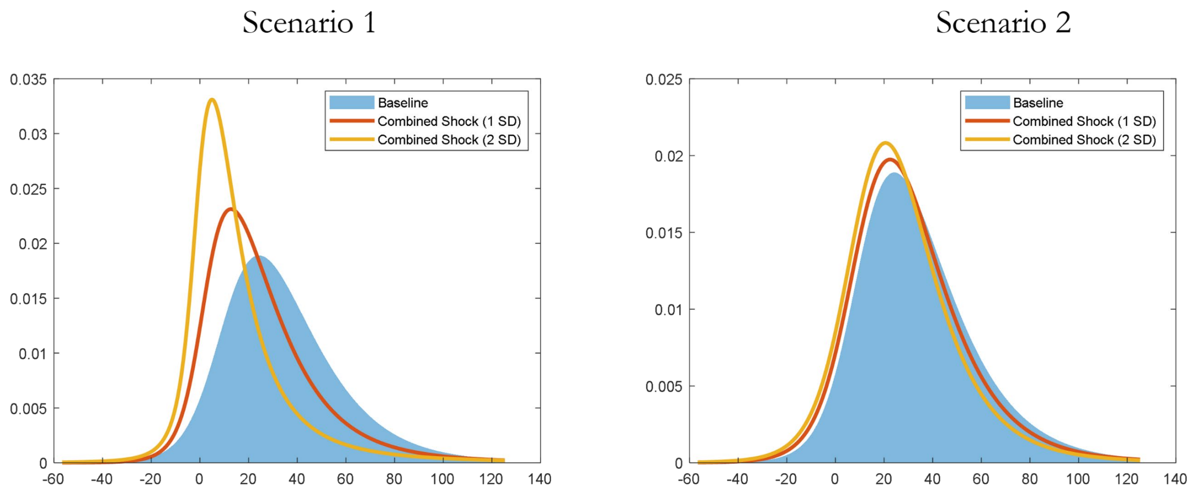
Once the impact of shocks to separate variables are understood, it is useful to build two alternative scenarios where all variables are simultaneously affected by coherent shocks. In particular, we selected two set of shocks, with the following characteristics:

Scenario 1 (a classical demand driven recession): OIS 3M decreases, slope decreases (flattening of the yield curve), negative shock to GDP Growth, increase of NPLs.

Scenario 2 (a supply driven slump): OIS 3M increases, the slope increases (steepening of the yield curve), negative shock to GDP Growth, increase of NPLs.

Scenario 1 can be seen as a worst-case scenario, where all variables are shocked in a way that reduces profitability. In Scenario 2, interest rates are increased (due for example to an increase in inflation) with a negative shock to economic growth and an increase of NPLs. In both cases, we consider shocks in which each variable is increased (or decreased) by one or two SD. The results are presented in Table I.5 for the averages of the representative distributions and graphically on Graph I.8 for the ROA. We anchor our discussion on the results of the ROA, since they are very similar to the results related to the ROE, and RORWA. Scenario 1 is the most severe. It implies a relative reduction of profits of around 25% (47%) when considering a 1 SD (2 SD) negative shock for the explanatory variables considered. The average value of the representative distribution moves from 34.3 bps to 18.1 in the 2 SD scenario. Graphically, the distribution is more skewed to the left, with more probability on the negative part of the distribution. The comparison between Scenario 1 and Scenario 2 shows that the favourable interest rate environment (at least from a bank perspective, with a positive rate shock and a steeper yield curve) is able to at least partially offset the impact of the negative shock on economic activity and preserve the actual profitability.

Graph I.8: **Combined scenario for the ROA**



(1) Note: Estimated profitability distribution after applying combined shocks. ROA values are in basis points. The baseline represents the profitability distribution estimated from historical data using quantile regressions.

Source: Own calculations

Finally, in order to have shocks that are internally coherent, we use the Commission forecasts data for 2024 for GDP and the underlying technical assumptions for interest rates, and a scenario that mimics the historical conditions in the aftermath of the GFC as of end 2009. The input data, as well as the results of our model, are reported in Table I.6. As we can see from the input data presented in the top block of the table, the current economic environment is completely different with respect to the historical averages, in particular for interest rates. Indeed, over the last three years the OIS has risen substantially (from a negative value to 2.3% in 2022), as well as GDP growth. Banks' profitability has increased accordingly. ROA and ROE have almost doubled between 2019 and 2022.

Table I.6: **Estimated profitability in different macroeconomic conditions**

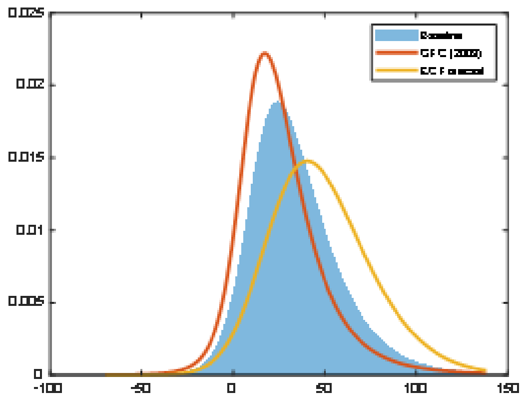
Input data	Year 2019	Year 2020	Year 2021	Year 2022	GFC (2009)	EC forecasts and assumptions (2024)
OIS 3M	-0.4	-0.47	-0.5	2.3	0.4	3.6
Slope	0.28	0.31	0.78	0.6	1.9	-0.9
Real GDP Growth	1.6	-4.67	5.6	3.3	-4.5	1.3
ROA	33.5	25.3	45.3	52.1	26.6	48.4
ROE	3.3	2.6	4.9	5.8	2.8	5.4
RORWA	1.3	1	1.4	1.7	1.0	1.9

(1) The first three columns represent the averages for 2019 (pre-COVID), 2021 and 2022 for our sample. We compare these past macroeconomic conditions to the expected economic conditions as in our Commission 2023 Summer Interim Forecast for the year 2024. ROA in bps; ROE and RoRWA in %. In the GFC scenario, we assume a +2SD increase in NPLs.
Source: European Commission 2023 Summer Interim Forecast, Ameco, Refinitiv, own calculations

When comparing different scenarios, our model allows us to understand the factors that can explain the recovery of bank profitability from its GFC level to its 2022 level for instance. Bank profitability in 2009 was roughly half the 2022 level. The main determinants of this difference are the low short-term interest rate, the negative GDP growth, and the level of NPLs in 2009 compared to 2022. The slope of the yield curve, despite being at its highest level, only marginally counterbalanced these factors. The results for 2020, when the COVID pandemic led to a severe economic downturn, also show how negative GDP growth is associated to weaker bank profitability.

The model can also be used to roughly assess how bank profitability could evolve in a more favourable scenario as the one emerging from the Commission Summer 2023 interim macroeconomic forecasts. Under this scenario and underlying assumptions, the results show that profitability, as an average of the profitability distribution, would be expected to be slightly lower in 2024 than in 2022 but larger than the historical fitted baseline estimation. The baseline has shorter tails [23] and is more concentrated around the average value (see Graph I.9). The average ROA under the expected conditions for 2024 from the Commission 2023 summer interim forecast scenario would stand at 48.3 bps, with respect to 34.3 bps for the historical baseline distribution, and 52.1 bps under the economic conditions of 2022 in our sample (see the comparison in Table I.6). The underlying reason is that the inverted slope of the yield curve and the lower economic growth have a large negative impact on a part of the banks on the left tail of the distribution. Notably, despite a projected lower economic growth and an inverted yield curve, high short-term interest rates appear to at least partially counterbalance the effects of the economic slowdown and the peculiar term structure of interest rates.

Graph I.9: **Return on assets - GFC and EC Forecast scenarios**



(1) Estimated profitability distribution after a shock comparable to the 2009 GFC and using EC forecast data for he 2024. ROA values are in basis points. The baseline represents the profitability distribution estimated from historical data using quantile regressions.
Source: Own calculations

The above results should however be interpreted with caution since there are several important caveats and model limitations, as already indicated. First of all, the estimated quantile regressions are based on a sample period that span at least three financial crises, with subsequent extraordinary measures in terms of liquidity provision and low (negative) interest rates. In addition, state aids and banks' recapitalizations with public money could have altered substantially the average bank profitability, especially in the aftermath of the 2009 GFC. Given that we are only including banks that have not failed, there might also be a survivorship bias in our data sample. Further, the analysis is a static assessment based on econometric estimations, without any causal interpretation. Finally, we are not considering any reaction from the banks, which might change their business model or adapt in different ways to the new environment.

I.5. Conclusion

Banks play a pivotal role in the transmission of monetary policy, and their profitability is of substantial significance in this context, influencing monetary policy transmission. Profitability allows banks to absorb potential losses and build capital buffers, effectively mitigating shocks to the broader economic landscape, but it may also be used to pay out dividends, buy back shares, or to increase banks resilience. However, higher profits could also reflect excessive risk-taking, posing issues for the stability of the banking system.

The global surge in interest rates has had divergent impacts on banks, contingent upon their unique business models and regulatory contexts. This chapter summarises historical trends in euro area bank profitability and delves into their principal determinants. To achieve this, we estimate a set of quantile regressions on a large dataset of individual European banks. This allows us to gauge how shifts in the

[23] The measure of how tails are heavy or not is called kurtosis. Tail heaviness or lightness suggests whether the data distribution is flatter or less flat. Heavier tails suggest the presence of large outliers, while short tails usually imply less outliers.

drivers of bank profitability, triggered by various shocks, alter the distribution of profitability. Specifically, our analysis shows how bank profitability is affected by economic downturns and changes in the interest rate environment.

With important caveats, our findings suggest that the most substantial reduction in profitability occurs during a pronounced economic contraction accompanied by a low interest rate environment. Scenario analyses demonstrate that a favourable interest rate environment, characterised by a positive short-term interest rate, can partially offset the impact of a slowdown of the economy and help maintain profitability. Furthermore, a shock comparable to the 2009 GFC would reduce substantially (by one half) the profitability of the representative bank. ([24]) Instead, by using Commission forecasts data for 2024, our model suggests that all measures of profitability would be slightly lower with respect to the profits reported for 2022. High interest rates appear to at least partially counterbalance a slower projected economic growth.

([24]) Even if this is modelled using a large, unbalanced panel of EA banks, it does not prevent that a significant number of banks might have negative profitability measures. In fact, in the fitted distribution the probability of having a negative ROA is about 5%, and almost double to 9% when considering a GFC scenario.

II. When it rains, does it still pour? Quantifying contingent fiscal liabilities risks stemming from EU banks in times of severe stress

By Mario Bellia, François Courtoy and Adja Awa Sissoko ([25])

Abstract: *This chapter presents a methodology to assess the potential impact of banks' losses on EU public finances using the Systemic Model of Banking Originated Losses (SYMBOL), a micro simulation model developed by the European Commission's Joint Research Centre (JRC) and Directorate General Financial Stability, Financial Services and Capital Markets Union (DG FISMA). In the context of the Commission's debt sustainability analysis, SYMBOL can provide a complementary analysis of government contingent liabilities risks stemming from the banking sector. By inferring the probability of EU banks' losses in the event of a major banking crisis, the model estimates the potential residual costs for public finances after all layers of the legal safety net of the EU regulatory framework have been deployed (i.e., capital, bail-in and resolution funds). The analysis also illustrates how financial vulnerabilities could affect public debt developments in times of severe stress in the EA and the EU. Overall, the results point to a significant resilience and, in case resolution is ultimately needed, to enough buffers in the banking sector across the EU and the EA as a whole, in case of future large shocks. Relatedly, (implicit) contingent liabilities' risks for the public sector are generally contained, with limited residual costs for public finances. This analysis notably reflects the financial reforms initiated in the aftermath of the 2008 global financial crisis. Despite this, there could be differences across countries.*

II.1. Introduction

Government contingent liabilities are defined as a potential financial obligation for the general government that depends on the possible occurrence of future events. These contingent liabilities are not included in the general government debt (*i.e.*, Maastricht debt) since it concerns only possible future and not actual liabilities. It is only in the case of the realisation of uncertain future events that the government takes the loan on its books. These liabilities can be either embedded into explicit contracts like loan guarantees or be implicit unwritten obligations for instance to cover bank losses and recapitalisation needs to safeguard financial stability. Both types of contingent liabilities, if called, will eventually feed general government's deficit and/or debt. The high recourse to off-budget measures like contingent liabilities during the 2008 global financial crisis (GFC) and more recently during the COVID-19 pandemic has shown the important role contingent liabilities play for policy, given the large government support, including State guaranteed loans, during these crisis episodes. Estimating and understanding their size is particularly relevant as a high level of contingencies may indicate a significant level of fiscal risks for the general government. While severe crises, such as the GFC and the COVID-19 crisis, are exceptional events, and episodes of materialisation of CLs are not so frequent, ([26]) it remains that their potential impact on public finances and other economic fundamentals can be large, often resulting in sizeable surges in general government debt. In this context, to get a more comprehensive assessment of fiscal risks, banking stress scenarios have proven to be useful.

With the benefit of some insights from the latest crises over the last 15 years notably the GFC and the COVID-19 crisis, this chapter assesses government contingent liabilities' risks linked to the banking sector, and explores how the public debt dynamic could be affected by a severe banking crisis in the EU/EA. The rest of the chapter is organised as follows: Section II.2 summarises the EU current financial regulatory framework, Section II.3 describes the methodology used to estimate government contingent liabilities' risks linked to the banking sector, based on the SYMBOL model, Section II.4 shows model results based on recent data, Section II.5 provides a quantification of the projected impact of the realisation of such continent liabilities on the public debt dynamic at euro area level. Section II.6 concludes.

([25]) This chapter represents the authors' views and not necessarily those of the European Commission.
([26]) Bova, E, M Ruiz-Arranz, F Toscani, and H E Ture (2016), "The Fiscal Costs of Contingent Liabilities: A New Dataset", IMF Working Paper WP/16/14.

II.2. The EU current financial regulatory framework

The 2008 Global Financial Crisis (GFC), unfolded in the EU amid a fragmented landscape of co-existing national banking supervisory and regulatory frameworks. The EA had no common financial backstops for sovereigns nor banks, and no harmonised resolution framework for distressed banks. Banking supervision was characterised by a limited exchange of information at the EU level with no binding effect. Such situation exposed some Member States to adverse banks-sovereign feedback loops.

In the aftermath of the GFC, and in parallel with the Basel III reform (27) on the global level, a comprehensive reform of the European banking regulatory framework and supervisory architecture has been implemented to make the European financial system more resilient. The aim was primarily to ensure the consistent application of the regulatory banking framework across the EU and to enhance banks' loss absorbing capacity (with the creation of the Single Rulebook, the Single Supervisory Mechanism and the implementation of the Basel standards). (28) To this end, in 2012, European Union co-legislators decided to set up a Banking Union (BU) as one of its flagship reforms following the financial system crisis and euro area sovereign debt crisis. The creation of the BU is a structural reform of first order importance in the EU, as it fundamentally alters the regulatory, supervisory, and recovery and resolution frameworks in the geographical area comprised of its participating Member States. The aim of the BU is to place the banking sector on a sounder footing, to break the sovereign-bank nexus and to increase the resilience of the Economic and Monetary Union to adverse shocks, by facilitating private risk-sharing across borders, while at the same time reducing the need for public risk-sharing. The BU creates a common supervision mechanism and a common resolution mechanism, which allow for deeper financial integration underpinned by a stable financial system, where taxpayers are not required to bail out banks in distress. It aims to reinforce financial stability both within the Member States participating in the BU, within the geographical area comprised of its participating Member States, and in the European Union as a whole.

The BU is firmly anchored on the Single Rulebook, which provides a single set of harmonised prudential rules applicable in all EU Member States. The Single Rulebook defines the common regulatory framework for prudential supervision and bank recovery and resolution for all EU banks. The ECB is the common supervisor and directly supervises the 115 significant credit institutions, including all EU Global Systematically Important Banks (G-SIBs) and also on a solo basis their credit institution subsidiaries within the BU. The Single Resolution Board (SRB) is responsible for common resolution actions based on a common legal framework (Single Resolution Mechanism Regulation (SRMR) and the Bank Recovery and Resolution Directive (BRRD)). The Single Resolution Fund (SRF) is at the disposal of the Single Resolution Board (SRB) for use in resolution actions and a common public backstop from the European Stability Mechanism (ESM) was agreed in 2022. The BU spans a single market, which is buttressed by a single currency, the Eurosystem's common monetary policy, and the central judicial oversight by the Court of Justice of the EU. Evidence from the literature supports the conclusion that benefits of the financial reforms in response to the GFC were greatly beneficial. (29)

In April 2023, the Commission adopted a proposal to adjust and further strengthen the existing EU bank Crisis Management and Deposit Insurance (CMDI) framework and increase the resolution authorities' ability to organise an orderly market exit for failing banks of any size and business model, including

(27) Basel III introduced a number of key reforms of international standards for the banking sector, including a strengthening of capital requirements and liquidity metrics and the curbing of the banks' leverage ratio.

(28) A single rulebook was introduced in 2009 to lay down capital requirements for banks, provide better protection to EU depositors, and regulate the prevention and management of bank failures. The Banking Union was also created with three pillars: (i) the Single Supervisory Mechanism (SSM), (ii) the Single Resolution Mechanism (SRM) and (iii) the European Deposit Guarantee Scheme (EDIS), which is currently under discussion (European Commission, 2014c).

(29) See, for instance, Galliani, C. and S. Zedda (2014), "Will the Bail-in Break the Vicious Circle Between Banks and their Sovereign?", Computational Economics Vol. 43 No. 4, pp. 597-614., Benczur *P., Cannas G., Cariboni J., Di Girolamo F. E., Maccaferri S. and Petracco Giudici M.* (2017) "Evaluating the effectiveness of the new EU bank regulatory framework: A farewell to bail-out?" Journal of Financial Stability, 2017, vol. 33, issue C, 207-223, and F. Fiordalisi, F. Minnucci, D.A. Previati, O. Ricci, "Bail-in regulation and stock market reaction", Econ. Letters, Elsevier, Volume 186 (2020), Article 108801.

smaller banks. ([30]) This proposal aims at providing resolution authorities with more effective tools and more available resolution funding using industry-funded safety nets enabling better outcomes of resolution processes while still shielding depositors from bank crises by, for example, transferring them from an ailing bank to a healthy one. Such use of safety nets complements the banks' internal loss absorption capacity (LAC), which remains the first line of defence. However, some risks for public finances stemming from the banking sector may still persist, awaiting the completion of the BU with the establishment of EDIS, and calling for a close monitoring of the fiscal risks arising outside the realm of public finances. ([31])

II.3. Quantifying government implicit contingent liabilities' risks from the banking sector in the EU: the approach

II.3.1. Methodology

To assess to which extent vulnerability from the financial side of the economy can affect public finances in the EU, banking stress test scenarios are performed based on the Systemic Model of Banking Originated Losses (SYMBOL). SYMBOL is a micro simulation model that was first developed during the aftermath of the GFC by the European Commission's Joint Research Centre (JRC) and Directorate General Financial Stability, Financial Services and Capital Markets Union (DG FISMA). ([32]) This model has been routinely used in the context of the Commission Debt Sustainability Analysis. In practice, by exploiting the information from EU banks' balance sheets and accounting for the existing legal safety nets (*i.e.*, capital, bail-in, resolution funds), the model allows to simulate – in the event of a systemic banking crisis - the *size* of residual banking losses and recapitalisation needs that may need to be absorbed by the public sector. It also estimates at country level, the *probability* that public finances are significantly hit by such losses and recapitalisation needs. In the context of the Commission's debt sustainability analysis (DSA), those simulated (residual) banks' losses and recapitalisation needs, represent general government's implicit contingent liabilities.

In addition, using a microsimulation model like SYMBOL to run a debt projection stress test provides the important advantage of allowing incorporating features of the national banking systems, while remaining within a unified conceptual framework across EU Member States. In particular, the stress scenario takes into account the distribution of the size (total assets), the asset quality (risk-weighted assets or RWA), and the capitalization (regulatory and total capital) of each Member State's banking sector. As discussed below (in sub-section 4), these elements can lead to important cross-country differences in terms of simulated losses and recapitalisation needs pointing to heterogeneous level of fiscal risks stemming from the banking sector.

SYMBOL also allows distinguishing between excess losses and recapitalisation needs (before and after the safety nets). ([33]) This provides differentiated impacts of these two types of funding needs on national public finances. Bank losses in excess of capital, usually covered by capital injections (subsidies) in the banking sector, are considered to affect public deficit and debt. As for recapitalisation needs, they are assumed be recouped (and thus "reintegrating" public finances at a later stage) as government receives

([30]) The SYMBOL results presented in this section do not take into account in the safety net cascade the Common Backstop to the SRF recently added to the existing arsenal.

([31]) See, for instance (i) ECB (2020), 'Liquidity in resolution: estimating possible liquidity gaps for specific banks in resolution and in a systemic crisis. Occasional Paper Series No 250 / November 2020, and (ii) BIS (2020) Bank failure management in the European banking union: What's wrong and how to fix it. Occasional Paper No 15, July 2020.

([32]) Since its original version (see De Lisa R., Zedda S., Vallascas F., Campolongo F., Marchesi M. (2011), 'Modelling Deposit Insurance Scheme Losses in a Basel II Framework', Journal of Financial Services Research, Volume:40:3, 123-141.), the SYMBOL model has been further developed in numerous ways, taking into account developments in the regulatory framework and improving its methodology. See for instance, Benczur P., Berti K., Cariboni J., Di Girolamo F., Langedijk S., Pagano A., Petracco Giudici M. (2015), 'Banking Stress Scenarios for Public Debt Projections', European Commission Directorate-General for Economic and Financial Affairs, Economic Papers no. 548, Brussels; and Bellia, M., Di Girolamo, F., Orlandi, F., Pagano, A., Pamies, S. and Petracco Giudici, M. (forthcoming 2023), Assessing risks for public finances stemming from banks in volatile times, European Commission Discussion Paper.

([33]) Under all scenarios, the required level of recapitalisation is set at 10.5% of RWA for each bank. This represents the minimum level of capital and capital conservation buffer set by the Capital Requirement Directive IV (CRDIV). The extra capital buffers built for Global Systematically Important Institutions (G-SIIs) are also to be recapitalised.

shares in the bank in exchange. Consequently, recapitalisation needs affect only gross debt (through the stock-flow adjustment). Specifically, following Benczur et al (2015) and the 2022 Debt Sustainability Monitor, the approach used for the SYMBOL stress tests can be broadly described as follows: ([34])

First, the scenarios are calibrated to reproduce the severity of the 2008-2012 crisis, *i.e.*, a severe and systemic banking crisis. ([35])

Second, the scenarios consider the latest available data on banking balance sheets and account for the quality of banking assets in the short-term. Over the longer-term, non-performing loans (NPLs) are assumed to be reduced to negligeable levels.

Third, the scenarios take into account, in addition to banks' resources, safety nets for bank recovery and resolution (DGS, resolution funds – RF and bail-in) to partly cover banks' losses and recapitalisation needs. ([36])

Fourth, banks' excess losses (*i.e.,* losses in excess of the available total capital of a bank) and recapitalisation needs (*i.e.,* funds necessary to restore the bank's minimum level of capitalisation) that cannot be covered by legal safety net are assumed to fall on national public finances.

Fifth, the safety nets are assumed to prevent the onset of any further contagion effects. ([37])

Finally, in the main scenario, non-significant banks are assumed to be liquidated in case of residual losses and recapitalisation needs, while significant banks might be recapitalised or liquidated. ([38])

We report results for two alternative scenarios, namely:

Reference stress test scenario: In this scenario, the simulations are run without the modelling for '*fire sales' mechanism*. The losses due to NPLs (as per balance sheet) are calculated by using a constant recovery rate (RR). ([39])

Severe stress test scenario: This scenario includes a '*fire sales'* mechanism, involving a correlation among assets and underpinning the asset value. NPL losses are modelled by linking the level of recovery rates to the size of the common shock. Hence, the higher the correlation, more important are the losses (see Box II.1 on SYMBOL). This reflects the markets' pressure to clean up balance sheets during a financial crisis, and to what extent the dynamics are correlated across countries.

([34]) It is worth stressing that in this exercise, to estimate the banking loss and recapitalisation needs that each Member States would be expected to face in case of a future major financial crisis, the focus is on the extreme realisations of the common factor (including recapitalisation needs) obtained from SYMBOL. See for more information the European Commission 2022 Debt Sustainability Monitor.

([35]) Bank losses and recapitalisation needs triggered by the last crisis are proxied by state aid data, in particular the total recapitalisation and asset relief provided to banks over 2008-12 (around 615 bn euro), see European Commission (2014), State Aid Scoreboard 2014, and Benczur et al (2015) op.cit.

([36]) The safety net cascade does not include the Common Backstop to the SRF recently added to the banking crisis management arsenal. Moreover, it should be borne in mind that the focus of the SYMBOL model being the banking sector, it assumes that the banks' losses and recapitalisation needs (partly) disappear once the safety nets are applied. In practice, these losses and recapitalisation needs are transferred to other sectors (e.g., domestic insurance, pension funds or households, or foreign sector) that hold bail-inable bonds and related contingent liabilities.

([37]) In the SYMBOL model, potential contagion across banks through bail-in is disregarded due to scarce data. Moreover, the model assumes that contagion across global systemically important banks (GSIBs) due to the bail in has been already addressed by the EU banking reform package, where crossholdings of total loss-absorbing capacity (TLAC) instruments are to be deducted between G-SIBs.

([38]) In line with the 2022 Debt Sustainability Monitor, this assumption is consistent with the fact that entities under direct ECB supervision do not go automatically into resolution, as the SRB decides on a case-by-case basis the resolution of the bank. In practice, most of the SRB's banks (82% of the total number of SRB banks accounting for 97% of total exposure at risk) are earmarked for resolution. In contrast, liquidation is foreseen for 18% of the banks, which account for 3% of total exposure at risk, mostly made up of public development banks and smaller banks with a specific business model. This assumption is thus more favourable to resolution funds than the standard assumptions were either that only significant institutions go into resolution, or that all banks go into resolution, as a share of the significant banks (20%) is now supposed to go into liquidation.

([39]) Based on the period considered with data affected by the COVID-19 pandemic, the stressed economic condition is assumed to roll back banks condition to the pre-pandemic situation by adjusting the data sample to account for the effects of the support COVID-19 related measures.

Box II.1: **The SYMBOL modelling framework for assessing public finances risks**

This Box presents the main feature of the systemic model of banking-originated losses (SYMBOL), a micro simulation model developed jointly by the European Commission's JRC and DG FISMA to simulate banking crises and estimate the distribution of banking sector losses at country level, accounting for all the cushioning layers of the legal safety net available to absorb shocks (capital, bail-in, resolution funds). SYMBOL can use to assess how losses originating in banks' balance sheets potentially affect public finances due to government interventions to recapitalise banks. As input, it considers a rich dataset covering unconsolidated balance sheet data of banks in EU Member states. See for more information, the European Commission 2022 Debt Sustainability Monitor. Assessing risks for public finances with SYMBOL involves the following steps:

1. Simulating banks' losses

Starting from the estimated average probability of default of the asset portfolio of each bank, SYMBOL generates realisations for each individual bank's credit losses using the Basel Foundation Internal Rating Based (FIRB) loss distribution function. More formally, the output of the model is a matrix of losses, $L_{n,i}$:

$$L_{n,i} = LGD \cdot N\left[\sqrt{\frac{1}{1-R_i}}N^{-1}(IOPD_i) + \sqrt{\frac{R_i}{1-R_i}}N^{-1}(\alpha_{n,i})\right]$$

where *n* denotes a simulation run, *i* indicates the bank, *LGD* is the Loss Given Default, $IOPD_i$ is the average implied obligors' probability of default, R_i is the coefficient of correlation among different obligators of $Bank_i$, and *N* is the normal distribution function, $N-1(\alpha_{n,i})$ are correlated normal random shocks with correlation ρ.
The correlation structure among the simulated shocks across different financial institutions assumes that the different banks are hit in the national system, due to their common exposure to a common factor, i.e. the business cycle. That correlation is reinforced by including a '*fire sales* mechanism', which intensity is linked to size of the common shock underpinning the degree of asset correlation and eventually the asset value. This reflects that during a major crisis, many banks will be jointly engaged in asset selling activity to keep their liquidity positions, resulting in an overall deterioration of the asset values in all banks, that in turn would generate further losses and liquidity needs. Specifically, the correlated normal random shocks $\alpha_{n,i}$ includes a bank-specific element and a common factor across financial institutions, as follows:

$$N^{-1}(\alpha_{n,i}) = \; l \times Z_n + \sqrt{1-l^2} \times W_{n,i}$$

2. Determining banks' insolvency event and obtaining the aggregated distribution of losses

Based on the matrix of correlated losses, the failure of a bank is determined by comparing the size of simulated losses L_i and the regulatory capital available to absorb the shocks. A $bank_i$ is assumed insolvent and has excess losses $ExL_{n,i}$, when simulated losses ($L_{n,i}$) exhaust the sum of expected losses (EL_i) and total actual capital K_i, as follows:

$$\text{Failure} \equiv L_{n,i} - EL_{n,i} - K_i > 0$$
$$ExL_{n,i} = max(L_{n,i} - EL_{n,i} - K_i + 8\% \cdot RWA_i, 0)$$

In line with the Basel rules, recapitalization needs (i.e. funds necessary to restore the bank's minimum level of capitalisation) up to 10.5% of risk weighted assets (RWA) are also factored in the losses in excess of capital. Aggregate losses and recapitalisation needs are obtained by summing the losses in excess of capital plus recapitalization needs of all distressed banks at country level (both failed and undercapitalised banks) in each simulation $_{j}$,.

(Continued on the next page)

Box (continued)

3. Accounting for asset quality and non-performing loans

SYMBOL takes into account how current stocks of non-performing loans (NPLs) would contribute to losses in national banking systems. Namely, it assumed that non-collateralised NPLs would turn into loan losses for a Member States in case of systemic banking event, while the collateralised NPL are redeemable subject to a recovery rate. This mechanism generates extra losses, which might materialize even for banks not yet failed, and are added to those coming from the SYMBOL simulations before the intervention of any safety net tools. Specifically, for each $bank_i$ and each $country_j$ potential loans losses from NPLs are as follows:

$$NPLLosses_i = (1 - CollShares_i) \times NPL_i + Collshares_i \times NPL_i \times (1 - RR_i) - Provisions_i$$

where *RR* is the recovery rate, *Collshares* represents the proportion of total loans covered by collateral. *Provisions* and *NPL* are respectively, the amount of provisions and gross non-performing loans declared by banks in their balance sheet.

4. Estimating banks' losses hitting public finances

Wen estimating the impact of potential bank losses on public finances, SYMBOL implement the loss allocation cascade according to the legislation currently into force with tools (e.g. own funds, bail-in of eligible liabilities and Resolution Fund interventions), intervening to partly cover banks' excess losses and recapitalisation needs before the involvement of general government.

II.3.2. Input dataset

The main data source on banks' financial statements is Orbis Bank Focus. (40) The sample covers roughly 75% of all EU banking assets. The sample ratio changes per each Member States ranging from 27.5% in Ireland to higher than 100% in Estonia. This variability calls for a cautious reading of the results, notably for countries with a low coverage ratio (*i.e.,* low share of total assets) and small number of banks as any change in the data could have large effects on results. For the reference year 2021, unconsolidated data for commercial, saving and cooperatives banks are included. (41) The data provided by Orbis Bank Focus occasionally lack information on specific variables for some banks in the sample (*e.g.*, capital, Risk Weighted Assets (RWA), provisions, NPLs). In those cases, complementary data sources are used, and statistical methodologies are used to impute missing data. (42)

(40) Orbis a commercial database of the private company Bureau van Dijk (part of Moody's analytics).
(41) The caveats about the data series used for the analysis is discussed in the Commission 2022 Debt Sustainability and in Bellia et al. (forthcoming 2023), op. cit.
(42) Capital is imputed via a robust regression by using common equity, while RWA are approximated using the total regulatory capital ratio (at bank or country level). Missing values for provisions have been estimated by country aggregates coming from the EBA dashboard (https://www.eba.europa.eu/risk-analysis-and-data/risk-dashboard), while missing values for NPLs have been imputed by applying a robust regression using provisions as explanatory variable. Recovery rates (country aggregates) are taken from the World Bank (2020 Doing Business report 2020). See the 2022 Debt Sustainability Monitor for further details.

Box II.2: Data adjustments for SYMBOL

This box presents adjustments to the input data for SYMBOL-based simulations to address specificities in the aftermath of the COVID-19 crisis, whose economic and financial affect the data sample use for the analysis. The government COVID-19-related measures had a significant impact on a set of key banking indicators. In order to consider this, data adjustments were made as regards the information related to risk weighted assets (RWA), loans under public guarantees and loans under (expired) moratoria. See for more information, the European Commission 2022 Debt Sustainability Monitor.

1. Regulatory measures and representativeness of the actual risk weighted assets

Balance sheet data for Q4 2021 show that the riskiness of bank's portfolios declined in 2020. To account for a potential bias on the reported RWAs, a correction to the RWA coefficients were applied, ensuring that, in the short term, riskiness of banks is in line with the adverse scenario depicted by EBA (EBA stress test released on 30 July 2021).

2. Public guarantees scheme

Loans guaranteed schemes by the government bear a zero-risk weight in the banks' balance sheets, while losses on such loans would directly affect public finances. However, in response to the pandemic, most Member States introduced programmes providing public guarantees to loans. The heightened risks associated to such loans has been taken into account in the simulation of losses, via an adjustment of the banks' RWAs, relying on EBA aggregated data on new loans under guarantee as of Q4 2021.

3. Loans under moratoria and NPLs

NPLs, on average, have continued to decline in the almost all Member States since 2019. Part of this decline is due to the regulatory measures introduced in response to the pandemic, such as the allowed flexibility about the classification of debtors in the event of moratoria. These measures, including the ones related to capital and liquidity relief, were only been lifted on February 2022. Hence, to address the potential under-reporting of NPLs due to moratoria, which still might affect the banks' balance sheets in 2021, the SYMBOL simulations considered 'Stage 2' loans (i.e. loans where credit risk has increased significantly, though they are not yet registered as NPLs) to adjust the NPL stock.

II.4. Quantifying government implicit contingent liabilities' risks from the banking sector in the EU: the simulation results

This Sub-section illustrates the impact of potential banks' losses on public finances in times of crisis.

Table II.1: **Government implicit contingent liabilities from banks' excess losses and recapitalisation needs, after the safety net cascade, based on the current situation (% of GDP 2021)**

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT
Reference stress scenario	0.1%	0.1%	0.1%	0.3%	0.1%	0.0%	0.2%	0.6%	0.6%	0.4%	0.1%	0.5%	0.5%	0.0%	0.0%
Severe stress scenario	0.8%	0.3%	0.3%	0.8%	0.4%	0.2%	1.2%	2.3%	2.2%	1.5%	0.3%	1.8%	3.5%	0.2%	0.2%
	LU	**HU**	**MT**	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	**EU**	**EA**	**5 EA MS_Agg**
Reference stress scenario	2.0%	0.1%	0.2%	0.2%	0.2%	0.5%	0.4%	0.1%	0.1%	0.7%	0.1%	0.1%	0.3%	0.3%	0.6%
Severe stress scenario	8.1%	0.4%	0.9%	1.0%	1.1%	1.9%	2.1%	0.3%	0.7%	1.7%	0.5%	0.1%	1.2%	1.2%	2.5%

Note: '5 EA MS_Agg' refers to a set of 5 EA Member States (Cyprus, Greece, Spain, Luxembourg and Portugal) with significant financial vulnerabilities according to the model results.
Source: Debt Sustainable Monitor (2022), European Commission.

Overall expected impacts are limited thanks to the safety nets. Based on the current situation ([43]) assuming a duly application of the legal safety nets, SYMBOL results point to limited (implicit) contingent liabilities risks coming from the banking sector for governments.

Table II.2: **Leftover financial needs after safety nets (% of GDP 2021),**
based on the current situation –
Severe stress test scenario

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT
Excess loss	0.3%	0.3%	0.1%	0.2%	0.7%	0.1%	0.3%	3.8%	0.7%	0.9%	0.1%	1.0%	2.2%	0.1%	0.1%
Excess losses plus recap	1.7%	0.5%	0.6%	1.0%	1.6%	0.3%	1.5%	4.4%	3.8%	4.9%	0.5%	3.6%	7.5%	0.3%	0.4%
Excess losses plus recap after bail in	1.0%	0.5%	0.5%	1.0%	0.5%	0.3%	1.5%	3.4%	2.8%	1.9%	0.5%	2.4%	5.3%	0.3%	0.2%
Excess losses plus recap after RFs	0.8%	0.3%	0.3%	0.8%	0.4%	0.2%	1.2%	2.3%	2.2%	1.5%	0.3%	1.8%	3.5%	0.2%	0.2%
	LU	**HU**	**MT**	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	**EU**	**EA**	**5 EA MS_Agg**
Excess loss	1.5%	0.1%	0.7%	0.3%	1.2%	0.5%	0.7%	0.1%	0.2%	0.4%	0.2%	0.1%			
Excess losses plus recap	14.5%	0.5%	1.4%	1.7%	2.4%	2.1%	3.6%	0.3%	1.0%	2.3%	1.0%	0.4%	2.6%	2.9%	4.4%
Excess losses plus recap after bail in	10.8%	0.5%	1.1%	1.2%	1.5%	2.1%	2.9%	0.3%	1.0%	2.1%	0.6%	0.1%	1.5%	1.6%	3.3%
Excess losses plus recap after RFs	8.1%	0.4%	0.9%	1.0%	1.1%	1.9%	2.1%	0.3%	0.7%	1.7%	0.5%	0.1%	1.2%	1.2%	2.5%

'5 EA MS_agg' refers to a set of 5 EA Member States (Cyprus, Greece, Spain, Luxembourg and Portugal) with signifcant vulnerabilities according to the model results.
Source: Debt sustainable Monitor (2022), European Commission

Risks are limited overall, with few exceptions in case of more adverse conditions. SYMBOL provides additional contingent liability risk measure by reporting the *theoretical* probability that public finances are significantly (*i.e.*, by at least 3% of GDP) affected by a systemic banking crisis, as shown in Table II.3.

Table II.3: **Theoretical probabilities of public finances being hit by more than 3% of GDP, based on the current situation**

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV
Reference stress scenario	0.02%	0.01%	0.01%	0.19%	0.01%	0.00%	0.06%	0.11%	0.15%	0.06%	0.00%	0.06%	0.15%	0.00%
Severe stress scenario	0.38%	0.09%	0.14%	0.55%	0.12%	0.02%	0.65%	1.50%	1.28%	0.65%	0.09%	0.79%	2.50%	0.02%
	LT	**LU**	**HU**	**MT**	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	
Reference stress scenario	0.01%	1.45%	0.02%	0.04%	0.08%	0.01%	0.02%	0.07%	0.00%	0.00%	0.04%	0.03%	0.03%	
Severe stress scenario	0.03%	5.62%	0.12%	0.46%	0.59%	0.43%	0.80%	1.18%	0.02%	0.21%	0.71%	0.29%	0.07%	

Note: Green: low risk (probability lower than 0.50%), Yellow: medium risk (probability between 0.50% and 1%), Red: high risk (probability higher than 1%).
Source: Debt Sustainable Monitor (2022), European Commission.

SYMBOL-based estimates point to overall *low* theoretical probabilities of having contingent liabilities of significant size (*i.e.*, higher than 3% of GDP) hitting public finances in the event of a severe crisis (Table II.3). As already noted earlier, these probabilities are affected by the magnitude of existing contingent liabilities but also by other factors such as the degree of concentration of the banking sector in each Member States. These estimates show that the risk of a significant impact on public finances in case of a major banking crisis is limited (*i.e.*, less than 1%) for all Member States but Luxembourg. Yet, under the more extreme (stressed) scenario, five Member States (i.e., Cyprus, Spain, Greece, Luxembourg and Portugal) show a significant risk for their public finances to be hit by losses of (at least) 3% of GDP.

II.5. Projecting the impact of a banking crisis on debt dynamics in times of severe stress

Banking stress-test scenario modelling is useful to monitor the potential adverse impact on public finances due to the materialisation of contingent liabilities in case of a major banking crisis. Indeed, one of the lessons learnt from the GFC is that economic policy surveillance needs to adopt a holistic approach, ensuring that interconnections between the different strands of the economy - private and public sectors

([43]) The 'current situation' refers to the 'short-term' results - occurring in one-year time - (as reported in the 2022 Debt Sustainability report) assuming constant bank balance sheets (end of 2021) in line with the current situation where there is a full implementation of the EU financial Regulation, including the treatment of non-performing loans as explained in Box II.2.

as well as financial and the real sectors- are properly monitored, in view of identifying risks early on and support the design of timely corrective actions.

In order to assess potential debt sustainability risks due to the banking sector, the SYMBOL results of the previous section are used in the context of the European Commission's Debt Sustainability Analysis (DSA) risk framework to derive public debt projections. (44) The results are shown for the EA as a whole and for an aggregate of the potentially most affected EA Member States – according to SYMBOL. (45)

SYMBOL's ability to allow for a breakdown between bank's losses and recapitalisation needs is also relevant for the design of stress-test debt projections to illustrate the impact of a banking crisis. It allows distinguishing between the impact on the government budgetary balance and on public debt (through stock-flow adjustments). This distinction is particularly relevant since financial assets bought by the government to support the banking sector tend to be sold at a later stage, meaning that the part of the increase in the debt-to-GDP ratio related to the coverage of bank recapitalisation needs is recouped (partly or fully) at a later stage. As a result, the stress-test debt projections reflect the fact that banks losses are assumed to have a permanent impact on public finances, while recapitalisation needs have only a transitory effect.

II.5.1. Debt projection results under a banking stress test scenario: the approach

Following Benczur et al (2015), the banking stress-test on public debt projections based on SYMBOL assumes the following elements:

A severe banking crisis unfolds in the first projection year (currently 2024 – *i.e.,* one year beyond the Commission autumn 2022 forecast horizon, consistently with the 2022 Debt Sustainability Monitor).

The SYMBOL-based estimated country-specific bank losses in excess of bank capital are assumed to lead to a reduction in the projected government budgetary balance in the year of the banking shock (due to subsidies to the banking sector). The estimations used are those corresponding to the most adverse SYMBOL scenario ("severe stress scenario").

The SYMBOL-based estimated country-specific bank's recapitalisation needs are assumed to lead to an increase in the gross public debt via the stock-flow adjustments in the year of the banking shock (due to the acquisition of banks' financial assets).

The public funding used for banks' recapitalisations is assumed to be gradually recovered in full (through the sale by the government of the acquired financial assets), within five years following the year of the banking shock, thus leading to a reduction in the gross public debt all else being equal (through a decrease in the projected stock-flow adjustments) over those years. (46)

A banking crisis also affect GDP growth, (relative to the baseline). (47) As a novelty in SYMBOL compared with Benczur et al (2015) and the 2022 Debt Sustainability Monitor, the debt projections also account for the impact that a banking crisis has on the economic activity. (48) Concretely, in the debt

(44) The approach follows the one introduced Benczur et al (2015) *op.cit.* and used the 2022 Debt Sustainability Report (and in Bellia et al (2023) op.cit.). The potentially more affected countries are those identified by SYMBOL (highlighted in red in Table II.3).

(45) The Member States that compose the aggregate of the potentially most affected EA Member States – according to are Greece, Portugal, Cyprus, Spain and Luxembourg. The selection of the countries was made *a priori* based on Table II.3 on the SYMBOL theoretical probabilities of public finances being hit by more than 3% of GDP, in the event of a severe crisis.

(46) The rationale of the full recovery of bank recapitalisations come from the fact SYMBOL simulations split banking recapitalisation needs into two parts: (i) a part that is not recoverable as it covers true capital shortfalls to the extent that the value of assets is below the value of liabilities, and (ii) a part that reflects a capital injection to increase the banks' capital to a (regulatory) minimum level to cover operations. The full recovery assumption applies to this latter part of the bank recapitalisation.

(47) It is assumed a persistent impact (higher in the case of the stressed scenario with no safety nets) on the budget balance corresponding to the bank losses (as the recapitalisation needs are assumed to be recouped). All else being equal, the long-term impact on debt depends on the sign of the interest-growth rate differential, thus, largely driven by the GDP effect in our simulations.

(48) A banking crisis also affect inflation and interest rates; however, the latter considerations are beyond the scope of this paper, yet accounting for it would imply a more adverse debt dynamic. Hence, the results need to be understood all else being equal.

projection, at the onset of a banking crisis, it is assumed an immediate and permanent loss of the GDP level of (i) 2 pps. in absence of safety nets, and (ii) 0.8 pp. in case of a duly application of the current legislation. Such a calibration of the GDP impact is in line evidence provided by the relevant literature. ([49])

The path of the debt ratio obtained for the banking crisis stress-test scenario is plotted alongside the path obtained under the baseline to highlight the potential impact of a banking contingent liability shock. Public debt projections under the stress-test scenario are derived using the Commission's standard debt projection model, from which a debt-to-GDP ratio path over a 10-year projection horizon is derived as follows:

$$d_t = \alpha^n d_{t-1} \frac{1+i_t}{1+g_t} + \alpha^f d_{t-1} \frac{1+i_t}{1+g_t} \frac{e_t}{e_{t-1}} - b_t + c_t + f_t$$

where *dt* is the debt-to-GDP ratio in year t, a^n is the share of public debt denominated in national currency, a^f is the share of public debt denominated in foreign currency, it is the nominal implicit interest rate on government debt in year t, *gt* is the nominal GDP growth rate in year t, *et* is the nominal exchange rate in year t, *bt* is the general government primary balance over GDP in year t, *ct* is the change in age-related costs over GDP in year t relative to the base year, and *ft* is the stock-flow adjustment over GDP in year t.

Debt projections are based on the European Commission's forecasts up to the 2-year forecast horizon, *i.e.,* 2022 autumn forecast. Beyond that, we use GDP growth projections agreed with the Economic Policy Committee (EPC) – Output Gap Working Group (OGWG). For inflation (GDP deflator) and the real long-term interest rate, we use the long-run convergence assumptions agreed with the EPC. Baseline projections are based on a "no-fiscal policy change" assumption, *i.e.*, the general government structural primary balance (SPB) is assumed to be only modified - beyond the last forecast year (*i.e.,* T+2 corresponding to the end of projections) – by projected ageing costs, as from the latest (2021) Ageing Report. The cyclical component of the general government balance is calculated using standard (country-specific) semi-elasticities over the period until the output gap closes.

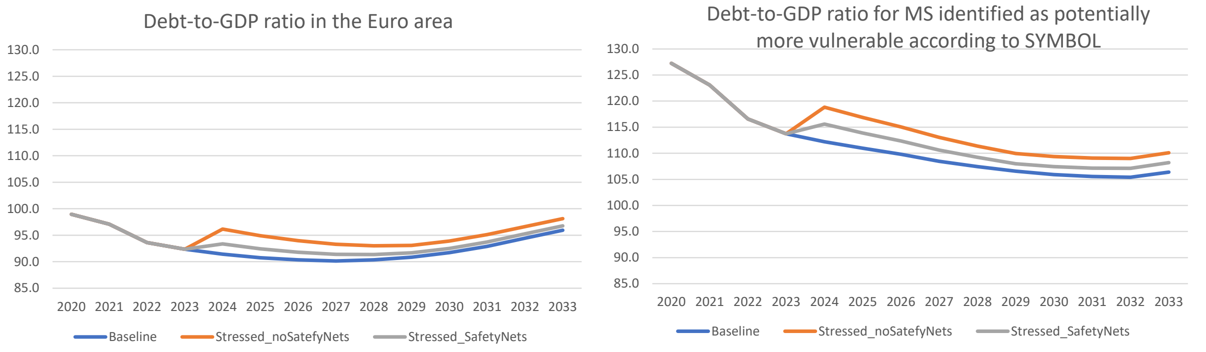
II.5.2. Debt projection results under a banking stress test scenario: the results

Graph II.1, left-hand side shows the debt dynamics for the EA as whole in the event of a major banking crisis, alongside the baseline debt projections. The baseline shows how a gradual debt reduction followed by an increase in the debt ratio from the middle of the horizon onwards, driven by raising ageing costs and less favourable financing conditions. By design, the impact (*i.e.*, related to the baseline) of the banking shock is strongest in 2024, which is the year of the banking crisis in the simulations. That year public finances are hit by banks' losses plus the full extent of the recapitalisation needs. Thereafter, recapitalisation needs are gradually recouped (*i.e.*, within five years), as the government sells its participation to the banks' capital. In this scenario, the impact of a banking crisis on the debt-to-GDP level in the EA as whole would amount to about 2 pps. at the onset of the banking crisis (grey line in Graph II.1) assuming a duly application of the current legislation. This effect is limited by the existence of safety nets. Otherwise, the impact would be more than doubled, amounting to 5 pps. (*i.e.*, orange line in

([49]) For instance, See Breuss, F., W. Roeger and J. in't Veld (2015), "The Stabilizing Properties of a European Banking Union in Case of Financial Shocks in the Euro Area", European Economy, Economic Paper No 550; (http://ec.europa.eu/economy_finance/publications/economic_paper/2015/pdf/ecp550_en.pdf). They report impacts of a banking crisis using QUEST-based simulations aiming at replicating the GFC event while accounting for available safety-nets for euro-area Member States. The latter framework is fully in line with the SYMBOL setup and thus provides a key reference for calibrating our GDP impact channel. Breuss et al (2015) illustrate the beneficial impact of regulatory reforms enacted beyond 2008, providing useful evidence on the magnitude of banking crisis channels in the EU, suggesting that a euro area Member States experiencing a banking crisis would post a -2 pps. and 0.8pp permanent GDP loss in case of a duly application of the current legislation and if absence of safety nets respectively. In the same vein, see Jorda, O, M Schularick and A Taylor (2011): "When credit bites back: leverage, business cycles and crises", Federal Reserve Bank of San Francisco, Working Papers, no 2011-27. They also referred to 2 pps. GDP adverse impact in the context of their study based on a large sample including 5 global financial crises over the time span of 140 years and across 14 countries. It should be, nevertheless, noted that we assume a permanent shock of 2% on the GDP level based on the literature however the literature suggests that the magnitude of the shock on GDP will be higher in the short term.

Graph II.1, left-hand side). After the first year, the impact on the debt projections would decrease as governments progressively resale the financial assets acquired to meet the banks' recapitalisation needs. Over the medium term, the remaining effect relates to banks *excess losses* and permanent adverse GDP impact. Hence, by 2032, the EA debt-to-GDP level would be 1 pp. and 2 pps. higher than in the baseline in case of safety nets intervention and in absence safety nets respectively. ([50])

Graph II.1: **Public debt projections**
- Severe stress test scenario for bank-related contingent liability risks



Note: The group of EA Member States identified as potentially more vulnerable by SYMBOL includes Cyprus, Greece, Spain, Luxembourg, and Portugal.
Source: European Commission.

Turning to the aggregate of potentially most affected EA Member States – according to SYMBOL, the baseline shows a gradual debt reduction with the debt dynamic only starting to reverse at the end of the horizon onwards. ([51]) The results show a higher impact (*i.e.*, related to the baseline) of the crisis on the debt ratio and the role play by the safety nets, compared with the EA as whole (Graph II.1, left-hand side). In absence of safety nets (*i.e.*, orange line in Graph II.1, right-hand side), (*i.e.,* in 2024) the impact of a severe banking crisis on the aggregated debt-to-GDP level would reach about 7 pps. at the onset of the banking crisis (versus about 5 pps for the EA as whole). In case of a due application of the current regulation (*i.e.*, grey line in Graph II.1, right-hand side), the impact would be reduced to about 3 pps. (versus about 2 pps in for the EA as whole). Over time, the impact on the debt projections would decrease as governments progressively resale the financial assets acquired to meet the banks' recapitalisation needs. Over the medium term, the remaining effect relates to banks excess losses and permanent adverse GDP impact. Hence, by 2032 the aggregated debt-to-GDP ratio would be higher compared with the baseline by about 2 pps. and 4 pps. in case of safety nets intervention and in absence of safety nets respectively. Given the strongly declining trend of debt in these countries, such a shock would not durably alter the debt dynamic.

II.6. Conclusions

The assessment of general governments' contingent liability risks stemming from the banking sector is an important element complementing the European Commission debt sustainability analysis framework. The

([50]) As regards the results a number of caveats should be borne in mind: First, these results are obtained within a framework assuming no further contagion effects - thanks to the safety nets, and no feedback loops on sovereign rates, hitting back banks' balance sheets. Moreover, the adopted approach assumes a permanent impact on the GDP level at the onset of the crisis meaning that the budget balance is deteriorated via direct baking losses. Hence, the fact that the budget balance would be affected due to the shock on GDP level would probably further amplify the ultimate impact on debt. Finally, the focus of the SYMBOL model being the banking sector, it also assumes that the banks' losses and recapitalisation needs (partly) disappear once the safety nets are applied. In practice, these losses and recapitalisation needs are transferred to other sectors (i.e., domestic insurance, pension funds or households, or foreign sector) that hold bail-inable bonds and related contingent liabilities. See for instance, Cariboni J., Fontana A., Langedijk S., Maccaferri S., Pagano A., Petracco Giudici M., Rancan M. and Schich S. (2016), 'Reducing and sharing the burden of bank failures', OECD Journal: Financial Market Trends, volume 2015/2. Overall, considering the aforementioned elements could have increase tge risks for the public finances.

([51]) The difference in terms of debt reduction between sample with the EA as a whole and the one with the 5 selected EA Member States can be explained by the specific features of country groups, with, for instance, differences in underlying primary balance assumptions, rise in ageing costs dynamics as well as macro-financial conditions.

key role played by the banking sector during the global financial crisis and lately during the COVID-19 crisis has illustrated this fact and pointed at the need to properly monitor the channels via which the banking sector may affect public finances in a context of crisis.

The present section discusses the potential impact of banks' losses on EU public finances using the Systemic Model of Banking Originated Losses (SYMBOL), which is a microsimulation model applied to analyse risks for public finances stemming from the banking sector during a period of financial stress. In the context of the Commission's debt sustainability analysis, SYMBOL provides interesting features that make it well suited for supporting the design of stress test debt scenarios and the assessment of related impacts on debt-to-GDP paths amid a banking crisis by (i) distinguishing between simulated bank losses (with a deficit and debt impact) and bank recapitalisation needs (with a debt impact), (ii) using bank-level data and accounts for national banking systems differences, and (iii) taking into account the current layers of the legal safety nets (like Bail-in and the Resolution Funds).

Overall, for the EA as whole, the results indicate that, based on the current situation, involving a duly application of the current regulation, no further contagion effects, nor feedback loops on sovereign rates and banking balance sheets, the (implicit) contingent liabilities risks that could stem from a systemic banking crisis are limited. This is thanks to the legal safety nets, in line with the reform agenda that was set into motion in the aftermath of the 2008 global financial crisis over a decade ago. Under the *Reference stress scenario*, in case of full phasing-in of the banking regulation, the expected budgetary impact of a banking crisis would be negligible for most Member States with combined excess losses and recapitalisation needs not exceeding 1% of the GDP. Under the more adverse scenario (involving a 'fire-sale' mechanism), the potential losses and recapitalisation needs are projected to be more significant, reaching up to 2-3% of GDP in a number of Member States, and even beyond (up to 8% of GDP) in one case, while the safety nets are fully in place. Using the SYMBOL results to assess potential debt sustainability risks due to the banking sector in the context of the European Commission's Debt Sustainability Analysis (DSA) risk framework, also confirm the key role of the safety nets.

The impact of a severe banking crisis on the debt-to-GDP level at the onset of the banking crisis (*i.e.*, in 2024) is projected to reach for the EA as whole about 2 pps and 5 pps. in case of a due application of the current legislation and without the safety nets being in place respectively. Focussing on a selected number of EA Member States that are more affected according to the model, the results show a more significant projected impact of a severe crisis on the aggregated debt ratio, at the onset of the banking crisis, reaching about 7 pps and3 pps, in absence of safety nets and once the safety nets are fully in place, respectively. Over the medium term (*i.e.*, by 2032), the overall impact would be lower, reaching about 2 pps and 4 pps (against about 1 pp and 2 pps for the EA as whole) in case of a due application of the regulation and in absence of safety nets, respectively.

Finally, it is worth stressing that severe banking crises are exceptional events, and the materialisation of government contingent (implicit) liabilities is not frequent. Yet, although the overall extent of the estimated risks for public finances (and the debt ratio in particular) appear limited for the EA as whole - having taken in due consideration the SYMBOL model's caveats - the magnitude of the potential impact nevertheless calls for a continuous monitoring, as the impact is expected to be higher for a few Member States that the model identifies as more affected, which tend to be characterised by already high debt ratios and/or very large banking sectors relative to the rest of the economy, both known as aggravating factors in event of crisis.

III. Euro Area Household Debt

By Leonor Coutinho, Vitor Martins and Matteo Salto (52)

Abstract: *Excessive household debt has potentially large negative consequences for the macroeconomy, especially in periods of stress. When large segments of the population are heavily indebted, this can pose systemic risks to the economy at large, as seen in the 2008 global financial crisis, when the housing market collapse triggered widespread debt default and even political instability. After increasing fast before the global financial crisis, household debt as a percentage of disposable income the euro area stabilised, increased again following the COVID-19 shock to diminish with the inflationary shock. Although in aggregate the stock of euro area household debt is backed by a considerable stock of financial assets, the evolution of aggregate net financial wealth is not indicative of the macrofinancial vulnerabilities associated with high household debt. These vulnerabilities can be exacerbated in a context of increasing interest rates and declining growth, which increase the debt burden through its effects on the effort needed to service accumulated debt, the so called "Fisher dynamics". This chapter shows that "Fisher dynamics" have contributed significantly to household debt developments in the euro area, both exacerbating additional households' borrowing and undermining their deleveraging efforts in crisis periods. In the euro area, in crisis times such as the global financial crisis and COVID-19, "Fisher dynamics" have even become the driving factor of changes in debt. Projections regarding future interest and growth indicate that "Fisher dynamics" will be unfavourable in the medium-to-long term and will require euro area households to reduce their credit-financed primary expenditures relative to the average of the last five years to ensure household debt sustainability.*

III.1. Introduction

It is widely acknowledged that rising household debt-to-GDP ratios before the great financial crisis have been one of the factors driving the subsequent asymmetric euro area crisis. This experience has reinforced the view that gross household debt, as a ratio to some measure of household borrowing capacity, is relevant for macroeconomic stability.

The relationship between household debt and economic growth may entail trade-offs between the short and the long run. In the short run, one expects the accumulation of household debt to be associated with credit booms and high aggregate demand as it can be related to higher consumption and household investment (housing). Indeed, the relationship between GDP growth and household debt in the short/medium term is expected to be positive. (53)

In the long term, however, there is evidence that rising household indebtedness may be detrimental to growth. On the one hand, if consumers spend to accumulate human capital this should support long-term growth, but on the other hand, if household investment is not productivity enhancing, as is the case of housing, there may be a trade-off between the allocation of credit to households and to firms. This is shown in the overlapping generations model of Japelli and Pagano (2014), in which lower household debt leads to higher national savings, higher financing of firm investment and higher economic growth in the long term. (54) Although Beck et al. (2012) find no relationship between household credit and long-term growth in real GDP per capita, they do find a positive relationship for credit to firms. (55) Finally, the IMF (2017) finds that the positive short-term effects of an increase in household debt on growth and its negative effects on unemployment are reversed in three to five years. (56)

(52) The authors would like to thank Grzegorz Janowicz and Giulia Maravalli for the excellent statistical assistance, as well as Eric Ruscher and Sven Langedijk for helpful comments. This chapter represents the authors' views and not necessarily those of the European Commission.

(53) See IMF (2017), "Global Financial Stability Report: Is Growth at Risk?", International Monetary Fund. https://www.imf.org/en/Publications/GFSR/Issues/2017/09/27/global-financial-stability-report-october-2017; and Beck, Levine, and Loayza (2000), "Finance and Sources of Growth", Journal of Financial Economics 58, 261–300.

(54) See Jappelli, T., & Pagano, M. (1994), "Saving, growth, and liquidity constraints", The quarterly journal of economics, 109(1), 83-109.

(55) Beck, T., Büyükkarabacak, B., Rioja, F. K., & Valev, N. T. (2012), "Who gets the credit? And does it matter? Household vs. firm lending across countries", The BE Journal of Macroeconomics, 12(1).

(56) IMF (2017) op. cit. See also Mian and Sufi (2018), "Finance and Business Cycles: The Credit Driven Household Demand Channel", Journal of Economic Perspectives 32(3), 31–58.

The experience with the global financial crisis suggests that high household debt can also be detrimental to long-term growth through its impact on macro-financial vulnerabilities. Indeed, the IMF (2017) finds that higher growth in household debt is associated with a greater probability of banking crises, with negative spillovers to the rest of the economy and important feedback loops, which can lead to prolonged recessions and increased economic uncertainty and volatility. With high debt, household balance sheets become vulnerable to shocks that affect income and wealth. In the case of a negative shock, the inability by households to fulfil their financial obligations will affect other sectors of the economy, including financial intermediaries and firms and dampen credit and growth in the long term. ([57]) More in general, cross-country studies also indicate that increases in household debt help to predict lower future income growth and financial crises in the medium term. ([58])

In the euro area context, household debt had been increasing to unprecedented levels prior to the global financial crisis of 2008-2009, in great part due to financial integration, innovation and de-regulation. ([59]) The relevance of the large accumulation of private debt for the impact of the crisis has been widely recognised. ([60]) This has been reflected in a strengthening of economic surveillance in the euro area and the EU and in the creation of the Macroeconomic Imbalance Procedure (MIP). ([61]) It has also led to the strengthening of macroprudential regulations in the EA and the EU to help maintain private debt within sustainable levels and reduce the macro-financial risks stemming from excessive debt. Additionally, there have also been numerous initiatives to strengthen the financial system in the euro area, with the overhaul of banking supervision and important steps towards further financial integration, in the form of the Banking Union and the Capital Markets Union. ([62])

Risks associated with high household debt are exacerbated in periods of high interest rates combined with low growth, due to the so-called "Fisher dynamics". ([63]) When debt is high, the increase in leverage (debt to income) is not only determined by credit-financed household primary expenditures (active leveraging). There is also the need to cover interest payments on past accumulated debt and the additional mechanical effect of changes in income on the debt-to-income ratio. These mechanical (snowball) effects of changes in interest rates and income acting on the previously accumulated stock of debt relative to income, which Mason and Jayadev (2014) have labelled "Fisher dynamics" can be particularly relevant in the current context of a high household debt stock, higher interest rates, real growth slowdown and declining inflation. ([64])

In this chapter we analyse euro area household debt developments and estimate the contribution of the "Fisher dynamics" to these developments. We also use available projections for interest rates and income to simulate how these "Fisher dynamics" may drive household debt in the future, for different scenarios regarding households' future primary expenditures.

([57]) See Mian, A., Rao, K., and Sufi, A. (2013), "Household balance sheets, consumption, and the economic slump", The Quarterly Journal of Economics, 128(4), 1687-1726; and Mian, A., & Sufi, A. (2011), "House prices, home equity–based borrowing, and the US household leverage crisis", American Economic Review, 101(5), 2132-2156. More recent research, in Leclaire, J. (2020), "Does Household Debt Matter to Financial Fragility?" Review of Political Economy, Volume 35, 2023 (2): 434-453, confirms the findings.

([58]) Jordà, Ò., Schularick, M., & Taylor, A. M. (2016), "The great mortgaging: housing finance, crises and business cycles", Economic Policy, 31(85), 107-152.

([59]) Several studies have documented the role of financial integration, innovation, and deregulation in household credit growth. See for instance Gerardi, K. S., Rosen, H. S., and Willen, P. S. (2010), "The impact of deregulation and financial innovation on consumers: The case of the mortgage market", The Journal of Finance, 65(1), 333-360; Boz, E., and Mendoza, E. G. (2014), "Financial innovation, the discovery of risk, and the US credit crisis", Journal of Monetary Economics, 62, 1-22; and Loutskina, E., and Strahan, P. E. (2015), "Financial integration, housing, and economic volatility", Journal of Financial Economics, 115(1), 25-41.

([60]) See Berti, K., M. Salto and M. Lequien (2012), "An early detection index of fiscal stress for EU countries", European Economy Economic Papers, No. 475; and ECB (2013), "Financial fragility of euro area households", ECB Financial Stability Review 2013, Box 2.

([61]) European Commission (2016), "The Macroeconomic Imbalance Procedure. Rationale, Process, Application: A Compendium", Institutional Paper 39.

([62]) For references to and explanations of the various aspects of the legislations relative to the Banking Union and the Capital Market Union see https://commission.europa.eu/business-economy-euro/banking-and-finance_en.

([63]) Irving Fisher was one of the first economists to analyse the implications for debt burdens of the interaction between real income growth and real interest rates. See Fisher, I. (1933), "The Debt-Deflation Theory of Great Depressions." Econometrica 1 (4): 337–57

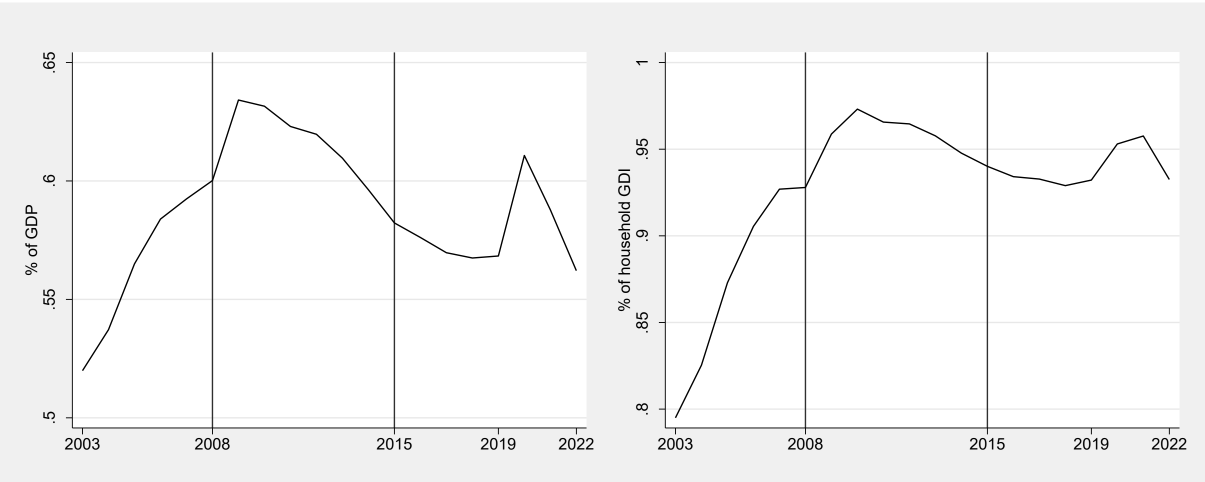
([64]) Mason, J. W., and Jayadev, A. (2014). "Fisher dynamics' in US household debt", 1929–2011. American Economic Journal: Macroeconomics, 6(3), 214-234.

The remainder of this chapter is organised as follows. Section III.2 describes trends in euro area household indebtedness and provides arguments for analysing developments in gross household debt, rather than simply looking at net debt. Section III.3 introduces the methodology and data for the analysis. Section III.4 decomposes euro area household debt developments over the period 2001-2021 into credit-financed household primary expenditures (primary deficit) and "Fisher dynamics". It also zooms in on the developments observed over the pandemic period. Section III.5 uses available projections for interest and growth and alternative scenarios for developments in credit-financed household primary expenditure to simulate the medium-to-long terms effects of "Fisher dynamics" on euro area household debt. Section III.6 concludes.

III.2. Gross versus net debt in the euro area

Graph III.1 shows household gross debt for the euro area, as a ratio to GDP (left panel) and as a ratio to household gross disposable income (GDI, right panel), over the period 2000-2022. The bulk of this debt (about 97%) is long-term loans, the great majority of which are mortgage debt (see below). In the aftermath of the global financial and the European debt crisis, households' debt decreased significantly under both metrics, thanks to a combination of factors, including the improving economic situation, declining interest rates and negative net credit transactions, which contributed to the adjustment of balance sheets after the crisis. The decrease has been interrupted by the COVID-19 crisis. The swings observed in output and income during the acute phase of the COVID-19 pandemic and the subsequent phase of recovery were more pronounced for GDP than for household GDI. As a result, the fluctuations in debt over this period were more pronounced for debt relative to GDP than relative to GDI.

Graph III.1: **Household debt in the euro area**



(1) Household gross disposable income (GDI) is calculated before interest paid and interest received is adjusted for FISIM, as explained in the Section III.3
Source: Eurostat, own computations

In the euro area in aggregate, household debt is backed by a large stock of financial assets. However, as argued by Mason and Jayadev (2014) the experience with the global financial crisis has shown, developments in net financial assets or net debt, in aggregate, are not good signals for macro-financial vulnerability. [65] In the euro area total debt is only about 30% of the total financial assets of households and about 70% of liquid financial assets (currency, deposits and debt securities). However, these aggregate numbers hide important differences between households with debt and households without debt and among income quintiles. The ECB Household Finance and Consumer Surveys (2017 and 2021 waves) show that the distribution of liabilities and financial assets across the euro area is hardly even and that the ratio of debt to financial assets is significantly higher for households with debt, particularly those with high

[65] Op. cit.

debt (see Box III.1). Euro area households also hold a substantial stock of residential real estate, but a large share of these are primary residences and are overall less liquid, particularly in crisis times. Another argument to focus on the analysis of gross debt is that in the presence of large shocks, also the value of financial assets can be uncertain. For instance, in the case of stock market crashes and bank failures (and bail-in requirements), there can be large corrections in asset values, even relatively liquid ones. (66) From a theoretical perspective, Tirole (2011) shows that gross debts (or leverage measures, such as debt-to-income) matter when credit constraints and illiquid assets may prevent agents from achieving their preferred allocation of income across periods, constraints that are likely to hold in financial crises and recessions. (67)

III.3. The debt equation and its components

Making a parallel with the accounting identity used to analyse the evolution of government debt, the change in the household debt ratio can be decomposed into a "primary deficit", a "Fisher dynamics" term and a stock-flow component, i.e.

$$b_t - b_{t-1} \equiv \Delta b_t = d_t + \underbrace{\frac{(\mathrm{i}_t - g_t - \pi_t)}{(1 + g_t + \pi_t)} b_{t-1}}_{\textit{Fisher dynamics}} + \mathrm{sf}_t \qquad (1)$$

Concerning the general government, b_t is the debt-to-GDP ratio at (the end of) period t, d_t is the ratio of primary deficit to GDP incurred in t, i_t is the implicit nominal interest rate paid in t on existing debt, g_t is the real growth rate of GDP in t, π_t is inflation and sf_t the stock-flow ratio over GDP. The Fisher effect captures the contribution of $(\mathrm{i}_t - g_t - \pi_t)$ to the increase in growth. This can be rewritten both as the difference between the nominal interest rate and the nominal growth rate of income $(\mathrm{i}_t - g_t^n)$ or as the difference between the real interest rate and real growth $(\mathrm{r}_t - g_t)$, where $g_t^n = g_t + \pi_t$ and $\mathrm{r}_t = \mathrm{i}_t - \pi_t$. When the interest rate is above income growth, debt continues to increase even if there is no additional net borrowing, and the reverse applies when the interest rate lies below income growth. However, when applying the accounting analysis to the evolution of households' debt, it is necessary to appropriately choose the relevant corresponding variables.

Debt

In national accounts data, loans constitute around 90 percent of the total liabilities of euro area households and non-profit institutions serving households (NPISH). Debt-securities are relevant in a limited number of euro area countries but are also typically taken into account in the definition of household debt. The remaining item in the liability side of the household sector balance sheet is other payable accounts, which is significant in a limited number of euro area countries but is very volatile. (68) This chapter adopts the Macroeconomic Imbalance Procedure (MIP) definition of debt, which comprises loans and debt securities. In 2021, 96% of household debt was long-term debt. When applying this type of accounting analysis to the evolution of households' debt, it is necessary to appropriately choose the relevant corresponding variables.

(66) Claessens, S. and M. A. Khose (2013), "Financial Crises: Explanations, Types, and Implications", CAMA Working Paper 06/2013.
(67) Tirole, J. (2011), "Illiquidity and All Its Friends", Journal of Economic Literature 49 (2): 287–325. Prior to the global financial crisis, the common assumption regarding household debt was that it matters only to the extent that it is reflected changes in household net wealth (Benito et al. 2007), however Mason and Jayadev (2014), op. cit., argue that the global financial crisis has changed these.
(68) Other payables comprises tax liabilities due to the government and trade credits among other items. It has a very irregular behaviour and therefore is not comprised in the definition under the MIP, which we decide to follow.

Box III.1: **Households' resilience to debt and debt inequality in the euro area**

The total stock of gross debt of the euro area household sector in aggregate is only about 30% of total financial assets and is also lower than the aggerate stock of currency and deposits. This observation could misleadingly lead to the conclusion that household debt in the euro area does not pose any macrofinancial risk and that widespread household debt default is unlikely even in the event of a large shock. However, the aggregate numbers hold important asymmetries in the distribution of debt and financial assets among households. While yearly, comprehensive disaggregated data are not available, the ECB conducts every three years a "Household Finance and Consumption Survey" (HFCS), ([1]) which contains sufficient information to give a picture of where debt and assets are concentrated. The most recent vintages of the HFCS correspond to the years 2017 and 2021.

Graph 1 shows that the ratio of debt to total assets, including real estate, for all indebted household in 2021 was 23% and that the same figure increases to 96% if one focusses on the most indebted households (at the 90th percentile of the debt distribution). Moreover, as shown in the right column, financial assets, which are presumably a more liquid part of assets, only constitute 20% of the assets for the total survey population. Thus, should about the same proportion hold for every household the debt of indebted families would be larger than their financial assets rising to a ratio of around 500% for the median high-debt family. Even if the situation has been improving in comparison with 2017, it should be noted that around 40% of all households have debt, which implies a major economic and societal risk. ([2])

Another perspective on the existence of possible fault lines that justify focussing on gross debt is income inequality. It is well known that higher-income households own more debt in absolute value than lower-income households. However, Graph 2 shows that financial assets held by high-income households, had a value close to the value of their outstanding debt, while the debt owned by the lowest-income households had a value close to 2.5 times the value of their financial assets. Even if these figures refer to the entire population of households and not only to the indebted ones, they make clear that, in absence of more detailed data, the dynamic of aggregate gross debt is relevant from a macrofinancial stability perspective.

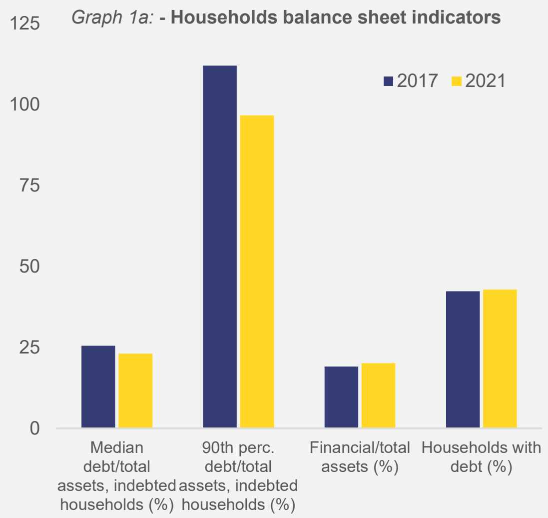
Regarding the distribution of debt by income groups, the most leveraged income group among the indebted households, are those between the percentiles 80 to 90 of the income scale, with a debt-to-income ratio of 92.5%, while the less indebted relative to income are the households in the percentiles 20 to 40 with a ratio of 47.5% (Graph 3). The bottom income group also has a high debt-to-income ratio, at 69%. Moreover, lower-income households have the highest debt burden (Graph 4), as measured by the median debt service to income ratio. The high percentage of their income devoted to servicing debts, coupled with the fact that they do have less financial assets than higher-income households to help in case of need, makes low-income households more vulnerable to financial distress when facing economic shocks or rising interest rates than high-income ones.

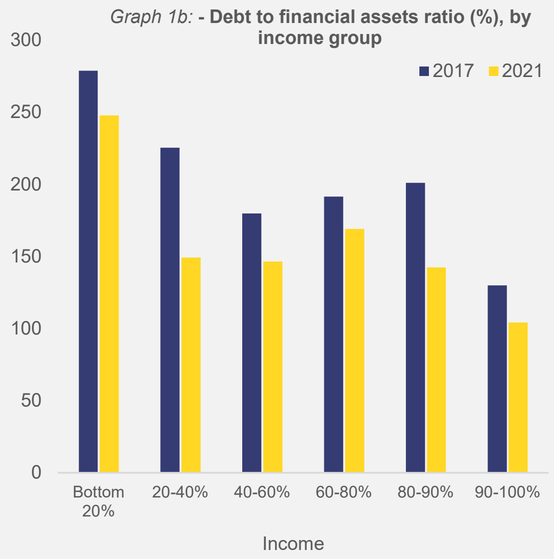
(1) See Household Finance and Consumption Network (2020), "The Household Finance and Consumption Survey: Methodological report for the 2017 wave. ECB Statistics Paper Series No 35, and "The Household Finance and Consumption Survey: Methodological report for the 2021 wave", ECB Statistics Paper Series No 45.

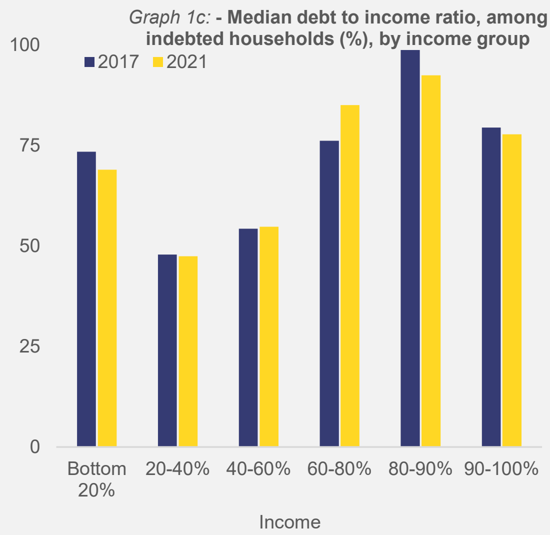
(2) This share varies significantly across income levels that for 2021, in the bottom 20% only 25.5% of households had debt, while in the top 10% the percentage of households holding debt was 61%.

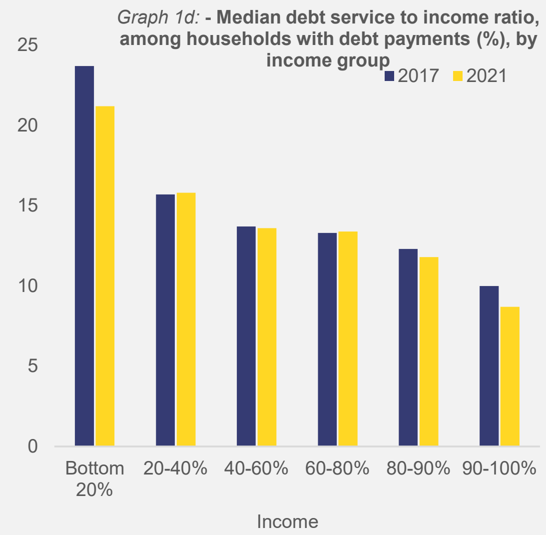
(Continued on the next page)

Box (continued)









Source: Household Finance and Consumption Survey 2017 and 2021 waves and European Commission services

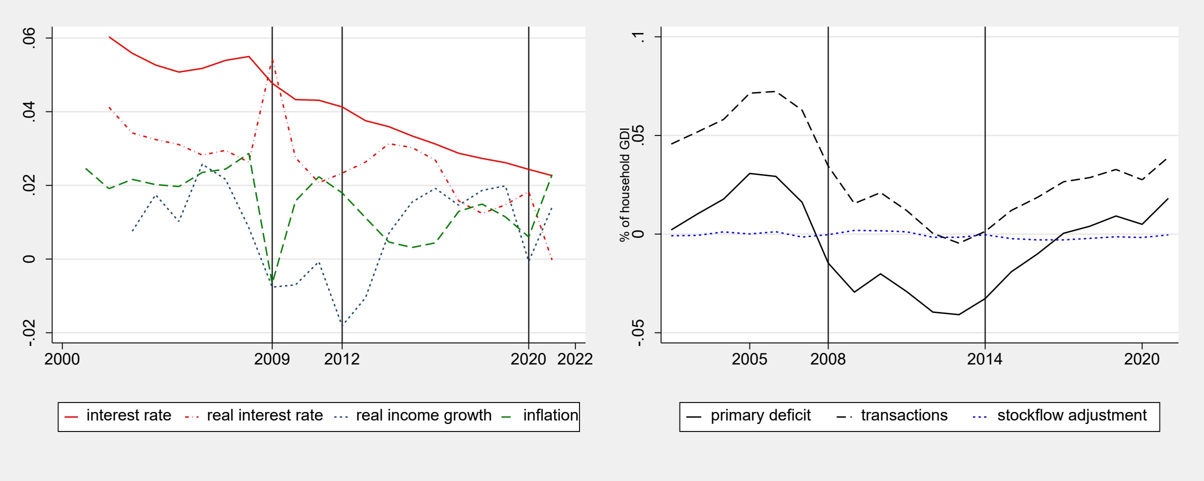
Interest rate

Similar to what is done in the case of the government, we compute the implicit or effective interest rate as the ratio of interest paid by households to the previous year's stock of household debt. It is appropriate to use gross interest paid rather than net interest because interest income will be included in the household disposable income. The implicit rate represents the average interest rate on the current debt stock, not the marg inal rate on new borrowing. Developments in the average rate are affected by monetary policy and market developments only via new loans, and their ratio to total outstanding loans, and depending on the average fixation period of the rate., with fix rated being in general prevalent.

Note however that we use interest paid before the allocation of financial intermediation services indirectly measured (FISIM), because this corresponds to the amount effectively paid by the households (which comprises indeed indirect fees). We consider this a better approximation of interest for households when one wants to measure the capacity of reimbursing a loan. The difference between the implicit interest rate derived from interest payments including FISIM and that derived from interest payments deducting FISIM corresponds to financial intermediation services paid by borrowers.

Financial intermediation services charged to borrowers are estimated to be relatively constant and to correspond to a couple of basis points in general over the period considered, with a decline in the periods in which monetary policy takes a more restrictive stance. In 2021 financial intermediation services corresponded to about half of the interest paid on average by euro area households on their debt.

Graph III.2: **Fisher variables, primary deficit and stockflow adjustment**



(1) Interest is the implicit rate comprising FISIM. The primary deficit equals liability transactions excluding interest payments. The stock-flow adjustment is estimated as the difference between changes in stocks and net transactions.
Source: Eurostat and own calculations

Interest, income, and prices

When applied to public debt, equation (1) usually features the ratio of gross debt to GDP. For a similar decomposition of non-financial corporation debt, it would probably be more appropriate to define debt as a ratio to a measure of assets or wealth (stock), as this would also capture future corporate income. In the case of households, it is more appropriate to define debt as a ratio to income, as labour income still represents the largest share of income for households and future labour income cannot be captured by any stock with an observable market value (Mason and Jayadev, 2014). (69) Furthermore, disposable income also includes property income. While governments have the entire GDP as a potential source of income, in the case of households, disposable income is the total amount of money households have available for spending and saving after subtracting income taxes and pension contributions. As the gross disposable income found in the sectoral national accounts for households and NPISH includes net property income, in order to have a comprehensive estimate of what households have available to repay debt in each period, interest paid is added to the gross disposable income, while FISIM is deducted from the interest received. This last adjustment accounts for the fact that savers receive de facto the reference interest rates minus FISIM, which is attributed to the financial sector for their services. (70) To compute real income, we deflate this estimate with the consumption deflator. (71)

The left panel of Graph III.2 shows the behaviour of the variables contributing to the Fisher dynamics component of the debt-to-income developments in equation (1). The almost continuous decrease in nominal implicit interest rates reflects the observed decreasing trend in long-term rates over the period

(69) Op. cit.
(70) Adjusted gross disposable income before actual interest paid is computed as disposable income plus the difference between interest paid and received plus the interest received (comprising FISIM). Using ESTA codes: B6G+D41_PAID-D41_RECEIVED+ D41G_RECEIVED
(71) As discussed in Mason and Jayadev (2014), op. cit., the ideal measure of inflation would be the one that exactly reflects the change in household income attributable to inflation. To the extent that the various possible indexes move broadly in line, results should not be very sensitive to the choice.

and the evolution of monetary policy, with the effects of the first hiking cycle by the ECB visible after 2005. The smooth developments in the implicit average interest rate reflect in part the fact that euro area household liabilities are largely long term ([72]) and prevalently at fixed rather than variable rates. The ECB provides data on the share of new household loans at fixed and variable rates, according to which, the share of variable rate loans in total new loans for house purchase in the euro area has declined from an average of around 45% between 2003 and 2010 to an average of around 18% in the period 2015-August 2023. ([73]) According to the same ECB data, in the first semester of 2022, the share of new mortgage loans with an interest rate fixed for more than 10 years was about 60%. From this data is not easy to infer the share of variable rate loans in total loans stocks, however Tzamourani (2021) estimates that the interest rate exposure of euro area households on the liability side remains significant. ([74])

The evolution of real income in the same chart (Graph III.2, left panel) reflects the developments of the euro area economy, with the vertical bars indicating crisis years (the great financial crisis, the sovereign debt crisis and the COVID-19 crisis). Although the implicit nominal interest rate is relatively stable, the real interest rate has experienced more variation, negatively correlated to changes in the rate of inflation. Throughout most of the period the real interest rate (r) is above the real growth rate of income (g).

Table III.1 shows descriptive statistics for the implicit nominal interest rate (i), inflation (p), the real interest rates (r), the real household income growth rate (g) and r-g, by sub-periods. Although r-g has been mostly positive throughout the sample, it was close to zero in the period 2015-2019 and negative in 2021, both periods when the real interest rate was relatively low compared to growth. In highest r-g is observed in the period of the global financial crisis, when r was relatively high, and the growth rate of income was negative. Dividing the sample between crisis and non-crises periods, r-g comes out significantly higher for crisis periods, contributing to, potentially substantial, debt-increasing Fisher dynamics during crisis episodes.

Table III.1: **Fisher variables**

	i	π	r	g	r-g
2001-2008	5.4	2.3	3.9	1.5	1.6
2009-2014	4.1	1.1	4.8	-0.6	3.7
2015-2019	2.9	0.9	1.2	1.8	0.2
2020	2.4	0.6	2.5	-0.1	1.9
2021	2.3	2.3	0.9	1.4	-1.4
Normal times (2003-2008 and 2015-2019)	4.4	1.8	2.6	1.6	1.0
Crisis times (2009-2014 and 2020)	3.9	1.0	2.9	-0.5	3.4
Full sample (2001-2021)	4.1	1.5	2.6	0.8	1.8

Source: Eurostat, own calculations

([72]) We are not aware of data on average maturity of outstanding loans or debt for households, but in 2020, according to the OECD, the average duration at issuance of mortgages in the euro ranged between the 30+ of Portugal and the 15 of Belgium with Germany, France, Italy and Spain being between 20 and 25 years. Report available at https://www.oecd-ilibrary.org/docserver/e91cb19d-en.pdf?expires=1698676300&id=id&accname=oid031827&checksum=1DAB4C35076B2272962F337D3E5FC217)

([73]) ECB MIR database, share of variable rate loans in total loans for house purchase. According to ECB data available at https://data.ecb.europa.eu/data/datasets/RAI/RAI.M.U2.SVLHPHH.EUR.MIR.Z in the euro area in 2022, 16% of loans have fixation up to 1 year, 8% between 1 and 5 years, 17% between 5 and 10 and 59% over 10 years. Usually, variable rate loans are loans with a rate fixation period of up to 1 year.

([74]) Tzamourani, (2021) uses the euro area Household Finance and Consumption Survey (2017 wave) to estimate the maturing liabilities of euro area households, which according to Auclert (2019) are the liabilities exposed to interest rates changes. She finds that for the euro area these amounted to around 45% of income on average, while the median debt to income ratio for the universe of households in the survey is around 71%. See Tzamourani, P. (2021), "The interest rate exposure of euro area households", European Economic Review, 132, 103643; and also Auclert, A. (2019), "Monetary policy and the redistribution channel", American Economic Review, 109(6), 2333-2367.

Primary deficit and stock-flow adjustment

The concept of "primary deficit" is perhaps the one for which it is more difficult to make a parallel between the government and the household sector. While the government covers any expenditure that is not financed by taxes with new borrowing, the concept of expenditures and income for the households is more fluid as households may purchase assets and dispose of at least some assets at any point in time. Mason and Jayadev (2014) propose to interpret the "primary deficit" of households as their credit-financed primary expenditures, that is, the expenditures that are not financed by household disposable income. ([75]) This implies extending the concept of "expenditures" to the acquisition minus disposal of financial assets and is consistent with the focus on gross rather than net debt. ([76]) In many instances, the aggregate household "primary deficit", will be actually negative and reflect instead a "primary surplus". This will occur in periods when the household sector in aggregate will be financing other sectors of the economy, even though individual households may still be incurring in new debt to finance their expenditures.

Empirically the household "primary deficit" will be computed as net debt liability transactions, available from the Eurostat financial accounts, minus the household interest payments. The remaining item in equation (1), the stock-flow adjustment, can be obtained as the residual difference between the change in the total debt stock and net transactions. Stock-flow adjustment thus bundles together other changes in debt (which may include, for instance debt write-offs, debt-to-asset swaps or capitalisation of interest due) and valuation effects (which may refer for instance to changes in the value of debt due to exchange rate fluctuations). Isolating other changes in debt from valuation effects is difficult because the data is not available. The stock-flow adjustment is typically small in the case of the euro area, consistent with the fact that the bulk of euro area household debt comprises mortgage loans in euros (Graph III.2, right panel).

III.4. Decomposition of the evolution of debt

Over the Full Sample

To understand developments in the household debt-to-GDI ratio in the euro area, one can apply the household sector variables described above to equation (1). To recall, this equation highlights the role of the different types of factors affecting the debt ratio: the primary deficit, the "Fisher dynamics" and a stock-flow adjustment factor (Graph III.3, left panel). The first term reflects households' decision to accumulate new liabilities or repay debt in net terms. ([77])The second, the so-called "Fisher dynamics" reflects how, given the already accumulated debt stock, the debt-to-income ratio mechanically evolves due to the evolution of income and interest rates, two variables that are typically considered as being out of the control of households. The final factor is the stock-flow adjustment, which is negligible for the euro area as shown earlier. It is however important to stress that borrowing decisions are likely endogenous to economic developments, with new credit being demanded by households and supplied by banks in periods of positive economic growth (at least in expected terms) and depending on market interest rates.

A first stylised fact, emerging from this decomposition, is that the "Fisher dynamics" component is visibly important. Despite this, the primary deficit (reflecting new additional debt or repayment) has been in general the dominant factor determining the sign of the change in euro area household debt, as in almost every year the sign of the change in the debt ratio corresponds to the sign of the primary deficit. However,

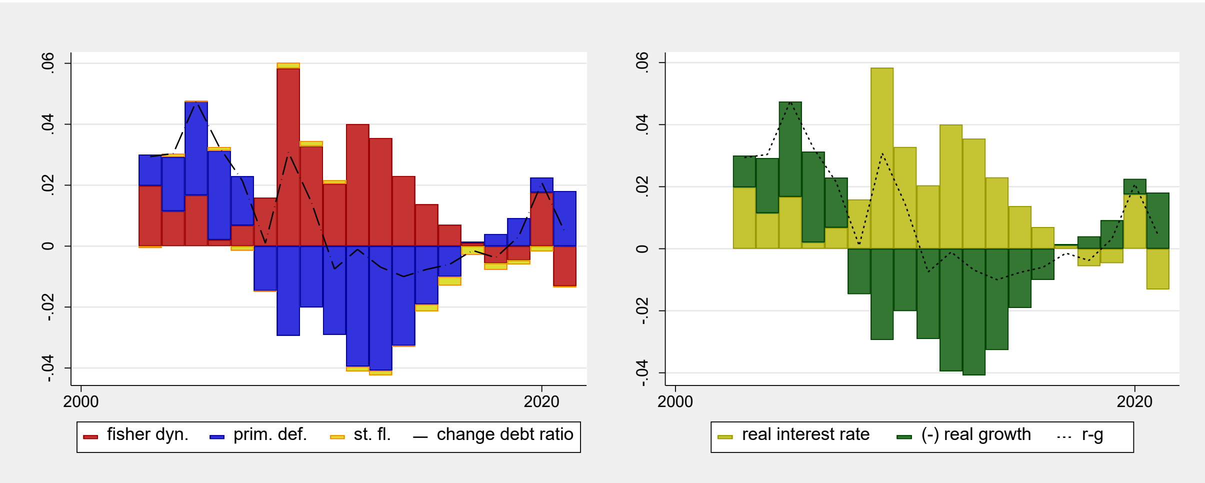
([75]) Op. cit.

([76]) It is useful to compare the concept of primary deficit used here with households' savings. Gross savings are computed from non-financial accounts by deducting the final consumption expenditure from gross disposable income and adjusting for the change in pension entitlements. When further deducting gross capital formation (mostly new dwellings), capital consumption and the difference between acquisitions and disposals of non-financial non-produced assets, one obtains net lending (B9 in statisticians' parlance), which is also the definition of deficit used to analyse government's debt sustainability. Net lending corresponds to (the negative of) the net financial transactions (B9F in statisticians' parlance), i.e. the difference between net acquisition of financial assets and net incurrence of liabilities, as households use the remaining of their budget constraints after consumption and investment plus the new (net) financial liabilities to acquire new (net) assets. This happens in theory. Unfortunately, in general, as the two data are built from different sources, the two numbers do not coincide.

([77]) Note that the "conscious decision" involves both the decision of households to demand credit and the decision of banks to grant credit.

"Fisher dynamics" have worked to either exacerbate the dynamics or dampen it in an important manner and have also been dominant in particular periods, something that Mason and Jayadev (2014) also find for the US over the period 1929–2011. (78)

Graph III.3: **Decomposition of the change of the household debt-to-income ratio and of Fisher dynamics**



(1) The primary deficit equals (net) transactions in liabilities excluding interest payments. The stock-flow adjustment is estimated as the difference between changes in stocks and transactions. Variables for the Fisher dynamics are described above. Inflation is measured by the deflator of actual individual consumption of households.
Source: Eurostat and own calculations

In periods of crises in particular, "Fisher dynamics" can be the dominant factor in explaining debt developments. In the immediate aftermath of the global financial crisis, debt repayments were fully offset by the increase in the debt ratio through the "Fisher dynamics", which was very high and positive and undermined deleveraging efforts for some time. If one considers the global financial crisis period between 2008 and the peak in debt (2010) the Fisher effect explains more than 3/4th of the total increase in the debt ratio. Also in 2020, with the pandemic-driven recession, the Fisher dynamics contributed to the increase in debt substantially more than the primary deficit.

Looking more closely at the differential between real rates and income growth in the euro area, this has been positive most of the times (Graph III.3, right panel). Exceptions are 2018-2019, when positive and relatively large income growth rates became larger than real interest rates, whose decrease was driven to some extent by the easing of monetary policy. Another exception is 2021, when the post-pandemic recovery drove up real growth and inflation.

Zooming in on the impact of the COVID-19 pandemic

The 2020 crisis impacted debt developments, even if to a lesser extent than the global financial crisis and the euro area sovereign debt crisis. Differently from the previous crises, net credit transactions remained positive in 2020, supported by government policies, complemented by ECB measures to ensure liquidity. Government support policies included moratoria on debt payments, which reduced repayments, income support and credit guarantees, while ECB measures included the pandemic emergency purchase programme (PEPP) and the temporary relaxation of capital requirements. These policy measures by euro area governments and the ECB encouraged both credit demand and credit supply over the pandemic period. As a results, in 2020, the household primary deficit experienced only a moderation instead of the sharp contraction into surplus, observed during the global financial crisis. The moderation in the

(78) Op. cit.

household sector primary deficit of 2020 was reversed in 2021 when credit-financed primary expenditures exceeded 2019 levels, possibly reflecting pent-up demand for credit. ([79])

Government support and monetary policy intervention did not prevent the appearance of adverse Fisher dynamics in 2020, driven by the sharp recession which led to a decline in income levels and an increase in real interest rates, as inflation declined faster than nominal rates. However, the contribution of the "Fisher dynamics" reversed in 2021 with the steep recovery and thanks to a fall in real interest rates, resulting from the combination of persistently low nominal interest rates with rising post-pandemic inflationary pressures. Overall, in 2021, the size of credit-financed household (primary) expenditure drove the evolution of debt so that households exited the pandemic with a further increase in the stock of debt compared with 2020 as shown in Graph III.3.

The dynamics of household debt during COVID-19 differs whether it is analysed as a ratio to household GDI or as a ratio to GDP. As a ratio to GDP, household debt experienced a sharper increase in 2020, since government measures supporting household income (short-term working schemes, and unemployment insurance, for instance) cushioned the fall in household GDI relative to GDP. In 2021, when household debt transactions recovered, debt as a ratio to GDI continued to increase even as GDI recovered, while as a ratio to GDP, debt adjusted slightly downwards, as the recovery of GDP, from a more significantly decline, was steeper. In 2022, the high growth of both nominal GDP and nominal household income, stirred in great part by high inflation, drove both ratios down to close to their 2019 levels, as can be seen in Graph III.1.

III.5. Projecting the impact of future "Fisher dynamics" on household debt

In 2023, following the COVID-19 pandemic, Russia's invasion of Ukraine and the energy-price driven inflation surge, the euro area economy appears to have entered a period of higher nominal interest rates and nominal income growth slowdown, trends that can potentially lead to a permanently higher r-g and adverse "Fisher dynamics". How much can this impact euro area household debt in the long term? To assess this, this section uses available long-term projections that can be used to simulate the potential size of the effect using equation (1). For that one needs projections of interest rates, income growth and primary deficit, assuming zero stock-flow adjustments.

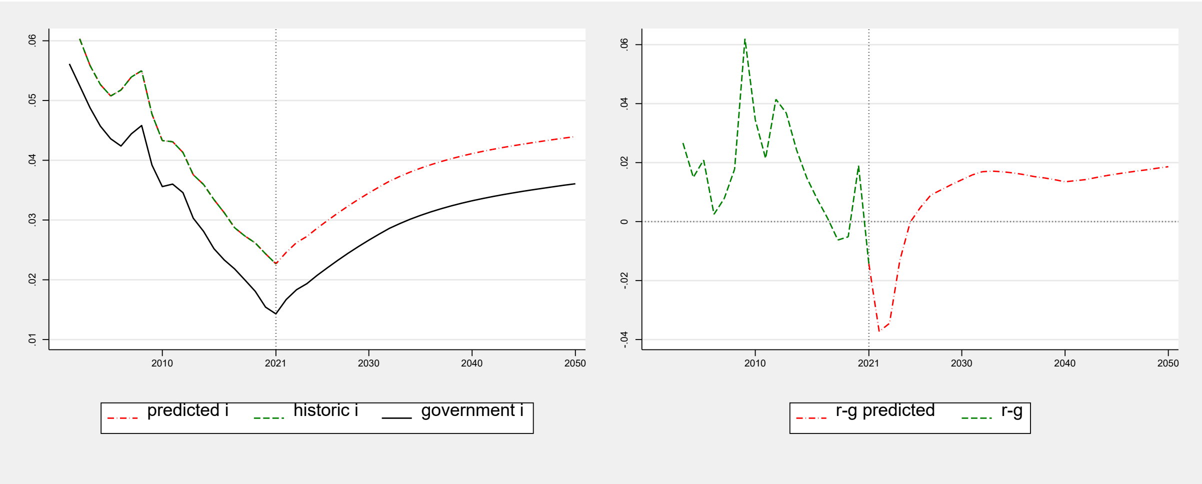
III.5.1. Projecting r-g for households

Projections for interest rates and income growth will be based on existing projections used by the European Commission in the context of the Debt Sustainability Analysis. Long-term projections of the implicit interest rate paid by households are difficult to obtain using projections of monetary policy rates, as the transmission of monetary policy to interest rates paid by households depends on detailed data on the stock of household loans regarding maturity, and type of contract (fixed or variable rate), which is not available as discussed above. Instead, to project the household implicit interest rates, we make use of an empirical observation that the spread between these and the implicit interest rates paid by their sovereigns has been rather stable over time for the euro area (Graph III.4). As projections for sovereign implicit interest rates, we use DSA projections through 2070. ([80]) The projections of the implicit interest rates

([79]) Developments in net credit flows differed between households and NFCs in the period 2020-2021. While in the case of households net credit flows moderated in 2020, in the case of NFCs net credit flows increased significantly, as the government moratoria and guarantees allowed NFCs to increase debt to cover sudden revenue losses and liquidity shortages resulting from the pandemic. This was followed by a moderation in NFCs net credit flows in 2021. See European Commission (2022), "Alert Mechanism Report 2023", Staff Working Document (2022) 381.

([80]) European Commission (2023), "Debt Sustainability Monitor 2022", Institutional paper 199. In the DSA the implicit interest rate on government debt at year t is a weighted average of market short-term and long-term interest rates and of the implicit interest rate on outstanding long-term debt in year $t-1$, with the weights depending on the maturity structure of government debt and the ratio of variable rates. Hence, depending on the weight of outstanding debt in total government debt, an increase of market interest rates will transmit more or less quickly to the implicit interest rate on government debt. Regarding market interest rates, the assumptions are that the short and long-term interest rates will converge linearly within 10 years (i.e. by 2033 in our case) to the short-term and 10-year forward rates respectively. After ten years, the long-term market interest rate converges linearly to 4% in nominal terms (2% in real terms) for all countries in an horizon of 20 paid by households are therefore computed as the government implicit interest rate, as projected by the DSA, plus the average spread between the two rates computed from the available sample.

Graph III.4: **Projected interest rates and r-g**



(1) Implicit nominal rates are named "i". The implicit rate for households is projected as the European Commission DSA government interest rate plus the average historical spread between the implicit rates paid by households and the one paid by government. Income growth is taken from the DSA by the European Commission.
Source: Eurostat, European Commission (DSA) and own calculations

Graph III.4 (left panel) shows the results of these projections alongside the historic implicit rates. In the euro area, implicit household interest rates are projected to increase, following the projected increasing path of the implicit rates for euro area sovereigns. The latter are projected to reach 3% by the mid-2030s, continuing to increase thereafter towards close to 4%. Notice that the average of the spread between the implicit rate paid by households on their debt and the implicit rate on sovereign is positive and relatively stable over the sample.

To project r-g, which is the variable driving the endogenous debt dynamic, a projection for the growth rate of income is needed on top of the projection of interest rates. To this purpose, we assume that household nominal income growth is equal to the nominal growth rate of wage income projected by the European Commission in the context of the analysis of ageing costs for the DSA analysis. The right panel of Graph III.4 uses this projection, together with the projections for the interest rate to obtain projections for $r_t - g_t = i_t - g_t^n$. The resulting Fisher multiplier is projected to remain negative in the first years, due to a combination of resilient nominal wage growth and slow pass through of monetary policy rates to implicit interest rates, but over the years, the projected increase in implicit interest rates and decrease in nominal income growth should push r-g towards just below 2%.

III.5.2. Projecting households' primary deficit

Estimates of the primary deficit for 2022 and 2023 can be obtained using quarterly sectoral accounts data, which is available for net euro area debt transactions until 2023 Q2. To estimate the reminder of 2023, it is assumed that the year-on-year changes observed in the first half of the year also apply to the second half. ([81]) In addition, an estimate of interest payments, calculated using the previous stock of debt and the implicit interest projections, is deducted from these net transactions, to obtain the primary deficit for 2022

years (2053 in our case); the short-term market rate is supposed to converge linearly to the long-term market rate times a coefficient corresponding to the historical (pre-crisis) euro area yield curve (currently 0.5) for all countries by the chosen horizon.

([81]) The figures for debt and net transactions for 2022 and 2023 are reconstructed based on the quarterly series available in the Eurostat website, where the two missing quarters for 2023 are computed as the value of the corresponding quarter of 2022 times the ratio of the value of Q2/23 to Q2/22.

and 2023. [82] From 2023 onwards, projections are more difficult to obtain. A scenario keeping constant the primary deficit is a good reference point for household debt projections. To avoid being too influenced by the last figures (arguably reflecting exceptional times and estimates), the primary deficit in this scenario has been set equal to the average of 2019-2023. [83] Another indicative scenario is one in which the household primary deficit is constant and such that their debt-to-income ratio stabilises by 2050 at its 2023 value, which corresponds to maintaining a primary surplus (negative primary deficit) only slightly lower than that estimated for 2023. [84]

Alternative scenarios may instead try to take into account the endogeneity of the household primary deficit. As credit-financed primary expenditures, resulting from consumption and asset accumulation decisions, the household primary deficit should in principle take into account the evolution of interest rates and the growth rate of disposable income. To have a broad assessment of the endogenous reaction of the primary deficit to economic conditions, the primary deficit was regressed on the lagged primary deficit, implicit real interest rates, income growth (or the difference between the two) and lagged debt. [85]

Table III.2: **Determinants of households' primary deficit**

	(1) **Primary deficit**	(2) **Primary deficit**	(3) **Primary deficit**
L.Primary deficit	0.697*** (0.020)	0.699*** (0.021)	0.662*** (0.038)
r-g	-0.357*** (0.077)		
L.Debt ratio	-0.012*** (0.003)	-0.012*** (0.004)	-0.014*** (0.002)
L.r-g		-0.192*** (0.049)	
Real income growth			0.398*** (0.085)
Real interest rate			-0.263** (0.118)
Constant	0.016*** (0.004)	0.016*** (0.004)	0.013*** (0.004)
Observations	321	321	321
Countries	18	18	18
Overall R2	0.74	0.69	0.75
Sargan-Hansen p-value	0.35	0.45	0.14

Note: Dependent variable: primary deficit. Robust standard errors in parenthesis
* p<0.10, ** p<0.05, *** p<0.01
Source: own calculations

Table III.2 presents the regression results. Column (1) will be used as the baseline for projections. The regression shows that on average the primary deficit is persistent, as the coefficient of the primary deficit

(82) Quarterly data for interest payments including FISIM was not available for the euro area at the time of writing, otherwise the projections for interest payments could have been based on this data.

(83) Adjusting this average to a different period, like for example 2017-2021 did not significantly change the pattern of the projection. While in 2023, credit to households contracted significantly, it expanded significantly in 2019, hence developments average out.

(84) The constant debt stabilizing primary deficit is given by $d^* = \frac{1-\prod_{j=23+1}^{50} m_j}{1+\sum_{k=25}^{50}\left(\prod_{j=k}^{50} m_j\right)} b_{23}$, where b_{23} is the debt-to-income ratio in 2023 and $m_j = \frac{(i_j-g_j-\pi_j)}{(1+g_j+\pi_j)}$ is the Fisher dynamics multiplier in period j as described in equation (1).

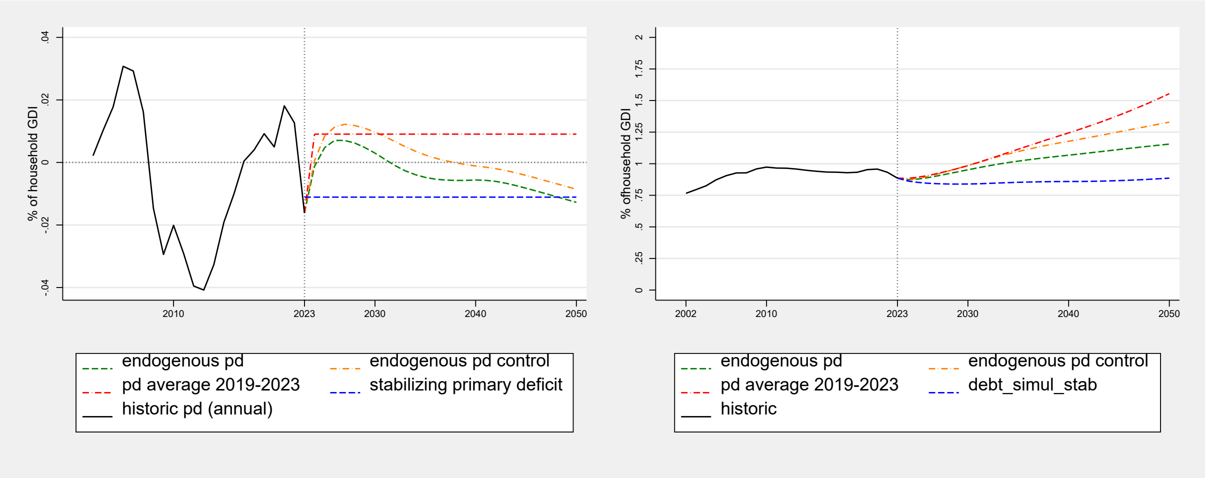
(85) The estimates are run using a two-step GMM estimator, in which the primary deficit and r-g are instrumented by their own lags on pooled data from euro area countries after 2002. In particular the estimate is provided by the Stata command ivreg29, options cluster and gmm2, which provides estimates efficient for arbitrary heteroskedasticity and clustering on country and statistics robust to heteroskedasticity and clustering on country. The 2SLS estimate would be efficient only for homoskedasticity. The 2SLS estimates do not differ substantially from the GMM estimates. Alternatively, one could proxy new borrowing by households with pure new mortgage loans and try to forecast it using a similar model. However, data on pure new mortgage loans (excluding interest and amortization repayments) is only available from the ECB since 2017 for euro area countries and with gaps. In addition, to move from the projections for new loans to a projection for the primary deficit would also require a projection for amortization payments and this would be more difficult to obtain with the available data.

of the previous year is around 0.7. Moreover, an increase of the interest-income differential by 1 pp reduces the primary deficit by around 0.36 pp. Finally, an increase of the debt ratio by 1pp, decreases the primary deficit by around 0.01 pp. [86]

The second column of Table III.2 shows a control regression in which the lagged r-g is used, instead of the contemporaneous one, to have some comfort that the endogeneity issue is corrected by the instruments used in the main regression. The coefficients remain similar. Projections will be made on the basis of both scenarios (on top of the scenario in which the primary deficit is kept at the average of the last five years).

The third column shows the same regressions in which the coefficient of the interest rate and of income growth have not been constrained to be identical. First, it should be noted that the other coefficients remain substantially unchanged. Second, while the coefficient of income growth is higher than the constrained coefficient and the one of interest rates lower (in absolute value), a $\chi 2$ test shows that the two cannot be distinguished from a statistical point of view. The advantage of constraining them to be equal is that projecting r-g does not require projections for the consumer price deflator over a long horizon.

Graph III.5: **Projections of households' primary deficit and debt**



Source: Eurostat, European Commission (DSA) and own calculations

The left panel of Graph III.5 compares the primary deficit under the alternative scenarios considered. [87] The fact that the primary deficit in 2023 was relatively low moderates the average of the previous 5 years, however this scenario still corresponds to the highest primary deficits. In the two endogenous scenarios, the primary deficit is assumed to respond to changes in r-g (current or lagged). The relatively low r-g in the beginning of the projections yields an increasing primary deficit. As both the stock of debt and r-g increase, the primary deficits decline and eventually turn into surpluses (just after 2030 for the baseline scenario and just before 2040 for the control scenario). In the remaining scenario, households would maintain a primary surplus only slightly lower than the one estimated for 2023, at a level that allows debt stabilization by 2050.

(86) It should be noted that the coefficient of the constant of the same regression without debt is very similar to the sum of the constant and the debt coefficient in column (1), which, for a debt ratio of 1 makes the primary deficit predicted by two regressions very similar. This means that it is safe to interpret 0.003 as the increase in primary deficit that households still posted historically at this level of debt.

(87) We present an 'exogenous' scenario in which the primary deficit is kept constant at the average of the past five years (under the name "2019-23 pd average" in the legends), and two endogenous scenarios, a scenario in which the primary deficit is projected to evolve according to column one of Table III.1 ('Endogenous pd') and a scenario in which the primary deficit evolves according to column two ('Endogenous pd control'). Note that the graph also shows a bar for the value of primary deficit of 2023.

Debt simulations through 2050 can now be assessed following a methodology akin to the one that it is followed in the DSA to analyse the evolution of government debt, applying equation (1), describing the change in the debt-to-income ratio.

The results from this exercise can be read in the right panel of Graph III.5. The latter shows that households' net borrowing will have to decline in the euro area to avoid that the gross debt-to income ratio increases significantly. Indeed, following a brief period of negative r-g, debt would be on an increasing path and above the 100% income threshold already by 2030 under all scenarios, except the one which by construction stabilises the household debt-to-income ratio at its 2023. The unfavourable debt dynamics would be particularly rapid under the assumption that new net transactions equal the average of the last five years, but it should be noted that considering the historical correlations of the primary deficit, as estimated in Table III.2 only curbs this dynamic, especially in case households react to the current r-g, but this is not sufficient to revert the increasing trend by 2050, pointing to the necessity of households diminishing their credit-financed primary expenditures beyond what has been observed historically, to counter the adverse "Fisher dynamics" that are projected and ensure long-term debt sustainability.

III.6. Conclusion

High household debt can have potentially large negative consequences for the macroeconomy, especially in periods of stress. When large segments of the population are heavily indebted, it can pose systemic risks to the economy, as seen in the 2008 global financial crisis when the housing market collapse triggered a widespread debt crisis and even political instability. The euro area household sector in aggregate does have a substantial stock of financial assets, but these are not evenly distributed among households in proportion to their debt levels, leaving large debt exposures uncovered.

The paper has shown that household debt developments in the euro area are significantly affected by the so-called "Fisher dynamics" (snowball effects resulting from financing needs generated by interest payments on debt accumulated in the past). Although most of the times the sign of the change in the debt-to-income ratio tends to correspond to the sign of the primary deficit, "Fisher dynamics" have contributed significantly to household debt developments in the euro area, at times exacerbating additional borrowing to finance household primary expenditures and other times undermining deleveraging efforts, just as previous findings for the US. In the euro area, in crisis times such as the global financial crisis and COVID-19, "Fisher dynamics" have even become the driving factor of changes in debt.

Assuming that aggregate household borrowing dynamics (primary deficit financing) follows past relationships with the key economic variables, debt by euro area households is projected to be once more on an increasing path, due to the unfavourable "Fisher dynamics" that result from r-g projections. To curb this debt dynamics, it will be necessary that euro area households, in aggregate, maintain primary surpluses at a level slightly lower than what estimated for 2023 on the basis of the data of the first months. While traditionally household net borrowing declines when the debt-income ratio becomes excessive, continuing past borrowing patterns would still leave debt on an increasing path, admittedly at a decreasing pace, at least for the next 20 years. Even if household balance sheets may be in a better position than in 2007, prudence and policies that encourage debt repayment are probably the best responses. To conclude, it is important to note, though, that the results apply to the euro area as a whole and hide existing heterogeneity across euro area countries, which is worth exploiting but is beyond the scope of the present paper.

Annex. The euro area chronicle

The Commission, the Economic and Financial Affairs Council and the Eurogroup regularly take decisions that affect how the Economic and Monetary Union works. To keep track of the most relevant decisions, the QREA documents major legal and institutional developments. This issue covers developments between end-June and end-September 2023.

So far, 17 euro area countries have submitted REPowerEU chapters to their Recovery and Resilience Plans (RRPs). Over the third quarter 2023, eleven euro area countries submitted a REPowerEU chapter. ([88]) The REPowerEU chapters include in particular measures to facilitate investment in renewable energy, like by streamlining and accelerating permitting procedures, measures to develop green financial products and to boost green skills in both the public and private sector. The investments that are planned in those chapters include measures to strengthen the national energy networks, to increase the energy efficiency of residential buildings, to boost sustainable mobility and expand renewable energy capacity. The Commission has already endorsed the modified RRPs for Portugal, Spain, the Netherlands and Slovenia; while the process of the modified plans of the other Member States is ongoing. The Council has, as a rule, four weeks to endorse the Commission's assessment.

About €162 billion have been disbursed under the RRF to euro area Member States until now. ([89]) In the meantime, Estonia, Greece, Croatia, France, Ireland, Slovenia, Germany, Slovakia, Belgium and Portugal, together with Italy, have made further payment requests. At the same time, disbursements to the Member States by the Commission under the RRF continued, with EUR 18.5 billion (EUR 10 billion in grants and EUR 8.5 billion in loans) transferred to Italy on 9 October. ([90]) Italy had submitted to the Commission the third request for payment under the RRF on 30 December 2022, including reforms – in areas such as competition law, the justice system, public and tax administration – and investments to foster the digital and green transition, and to improve support for research, innovation and education. On 28 July 2023, the Commission adopted a positive preliminary assessment of Italy's request. ([91])

On 13 July 2023, the Eurogroup adopted a statement on the euro area fiscal stance for 2024. ([92]) In light of persistent inflation and higher borrowing costs, the Eurogroup considered that a strategy of determined, gradual and realistic fiscal consolidation is warranted. At the same time, implementing structural reforms as well as safeguarding and increasing investment, through public, private and EU financing sources – such as the RRF – remains an essential goal, in particular given common priorities such as the green and digital transitions and defence capabilities. On 16 June, the Council had agreed on differentiated fiscal recommendations to Member States for 2023 and 2024, and that, absent renewed energy price shocks, the euro area should wind down energy support measures as soon as possible in 2023 and 2024. The Eurogroup agreed to avoid permanent deficit-increasing measures, to facilitate lasting deficit and debt reduction, and to achieve the necessary overall restrictive fiscal stance in the euro area for 2024. The Eurogroup committed to continue to closely monitor economic and fiscal developments regularly and adjust the policy advice as needed, including adapting it to economic circumstances.

([88]) Lithuania, the Netherlands, Austria, Slovenia, Belgium, Italy, Greece, Croatia, Cyprus, Latvia and Finland. Previously, Estonia, France, Malta, Slovakia, Portugal and Spain had submitted their revised RRPs between March and June 2023.
([89]) Including prefinancing.
([90]) https://ec.europa.eu/commission/presscorner/detail/en/mex_23_4842
([91]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4025
([92]) https://www.consilium.europa.eu/en/press/press-releases/2023/07/13/eurogroup-statement-on-the-euro-area-fiscal-stance-for-2024/

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