The impact of an interest rate normalisation on the private non-financial sector in the euro area from a balance sheet perspective

In the wake of the global financial and economic crisis and of the European debt crisis, some sizeable balance sheet constraints became apparent in the private non-financial sector. Households and non-financial corporations responded to these by scaling back their debt and curbing their expenditure. The standard and non-standard monetary policy measures taken by the Eurosystem pushed down interest rates, helping to significantly reduce the interest burden on the private non-financial sector and ease balance sheet restrictions. This article explores whether and to what extent the balance sheet indicators of the euro area's private non-financial sector – measured on the basis of net interest income and debt service – could deteriorate again if interest rates were to return to normal, and whether this might result in any significant negative repercussions for the real economy.

The research suggests that, all in all, balance sheet indicators are only likely to deteriorate moderately as a result of an interest rate normalisation. This is mainly because debt levels in a number of sectors and countries have been pared back significantly over the last few years and, in contrast to the last interest rate tightening phase (2005-08), are not expected to rise again markedly over the next few years. At the same time, compared with previous phases of interest rate increases and decreases, a considerably more gradual rise in interest rates is anticipated.

Empirical analyses suggest that a rise in debt service ratios, in particular, could be accompanied by a persistent decline in household consumption and investment by non-financial corporations. Given that the changes to the balance sheet indicators derived from the simulations are rather modest and that interest rates will probably return to normal in a favourable economic environment, this should not, in itself, have any major impact on the real economy.

■ Introduction

Recent crises have highlighted relevance of balance sheet indicators

The global financial and economic crisis and the European debt crisis highlighted the relevance of the private non-financial sector's balance sheet indicators to real economic growth in the euro area. Reduced earnings as a result of the crises and a revaluation of assets led to sizeable balance sheet constraints in some cases. Households and non-financial corporations responded by scaling back their debt and curbing their consumption and investment.[1] However, the lower interest rates stemming from the Eurosystem's expansionary monetary policy significantly reduced the interest burden on the private non-financial sector in the euro area. This eased balance sheet constraints and ultimately supported growth in consumption and investment.

Potential impact of interest rate normalisation on net interest income and debt service

This article explores whether and to what extent balance sheet indicators in the private non-financial sector – measured here on the basis of net interest income and debt service – could deteriorate again if interest rates were to return to normal. Because changes in the euro area aggregate mask sometimes significant differences between countries, we examine the four large Member States (Germany, France, Italy and Spain) individually in addition to the euro area as a whole. The main findings can be summarised as follows.

– Overall, an interest rate normalisation is not likely to cause any serious deterioration in the private non-financial sector's balance sheet indicators.

– This is first and foremost due to the progress made in deleveraging in individual sectors and countries since the height of the European debt crisis and the anticipation of a very gradual normalisation of interest rates.

– Potential balance sheet constraints resulting from an interest rate normalisation are unlikely to be accompanied by a considerable slowdown in the real economy.

The following section explains in detail how these results were obtained. First, the role of balance sheet indicators in monetary policy transmission is discussed. Stylised empirical correlations are then drawn between the balance sheet indicators and real economic variables for the euro area. The article also provides an overview of developments in the balance sheet indicators during the period of monetary policy easing. Finally, scenario analyses showing the potential path of the balance sheet indicators under various interest rate normalisation scenarios are presented and then used to derive possible macroeconomic implications.

■ The role of interest income and wealth effects in monetary policy transmission
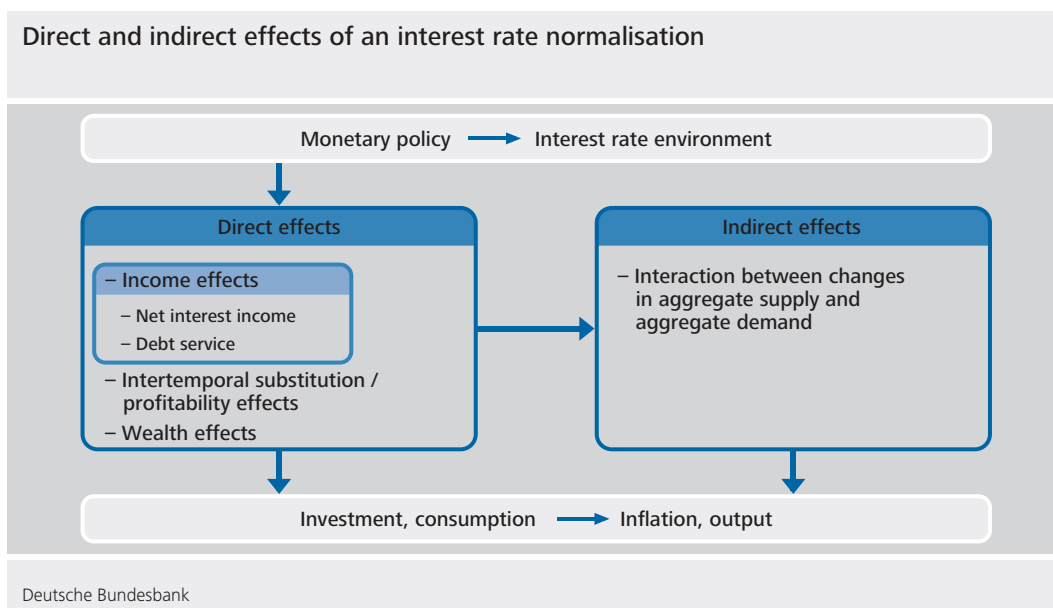
Conceptual considerations

Monetary policy influences the real economy via direct and indirect effects

Theoretical studies on monetary policy transmission examine how a monetary policy-induced change in interest rates affects the consumption and investment decisions of the private non-financial sector. These studies distinguish between direct and indirect effects – direct effects encompass the immediate response of consumption and investment to a changing interest rate environment, while indirect effects have an impact via the interaction between changes in supply and demand in the different sub-markets of the economy. One example of an indirect effect of this kind would be a reduction in wage income caused by an increase in unemployment, which in turn dampens consumer spending.[2] Direct effects typically focus on substitution and profitability aspects. The idea is that changes in interest

1 See Deutsche Bundesbank, Private debt – status quo, need for adjustment and policy implications, Monthly Report, January 2014, pp. 53-65; and Deutsche Bundesbank, Recent developments in the indebtedness of the private non-financial sector in selected euro area countries, Monthly Report, January 2017, pp. 41-58.
2 For more information, see G. Kaplan and G. Violante (2018), Microeconomic heterogeneity and macroeconomic shocks, Journal of Economic Perspectives, 32(3), pp. 167-194.

Direct and indirect effects of an interest rate normalisation

Monetary policy → Interest rate environment

Direct effects

– Income effects
  – Net interest income
  – Debt service
– Intertemporal substitution / profitability effects
– Wealth effects

Indirect effects

– Interaction between changes in aggregate supply and aggregate demand

Investment, consumption → Inflation, output

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rates influence the relative attractiveness of current consumption and the profitability of investments. In addition to this, direct effects via changes in interest and investment income also emerge as a key factor in the transmission of monetary policy (see the chart above). These have become a focal point of the theoretical debate, especially in the wake of the global financial and economic crisis.[3]

Focus on (financial) income effects

The following section focuses exclusively on the direct effects caused by a change in income associated with financial assets and liabilities. These income effects are measured at the macroeconomic level, mostly on the basis of net interest income and debt service. Net interest income is the difference between interest earnings and interest payments. As well as interest payments, debt service also includes the redemption payments associated with debt.

Income effects influenced by structure of financial balance sheets

The direction and magnitude of these income effects depend on the structure of the financial balance sheets of the agents involved. With regard to net interest income, it is interest rate-sensitive assets and liabilities in the private sector portfolio that are particularly important.[4] In the case of net borrowers, which non-financial corporations usually are, net interest income goes down in an environment of rising interest

rates if interest payments increase more sharply than interest earnings over matching interest rate fixation periods. This reduces the amount of internal funds available to non-financial corporations, which in itself tends to weaken investment activity.[5] The argument is similar for households with relatively high levels of debt. Here, too, a rising interest rate leads to higher interest payments and a drop in disposable income. This is particularly pronounced for loans

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3 See A. Mian and A. Sufi (2010), Household Leverage and the Recession of 2007-09, IMF Economic Review 58 (1), pp. 74-117; and A. Mian, K. Rao and A. Sufi (2013), Household Balance Sheets, Consumption, and the Economic Slump, The Quarterly Journal of Economics 128 (4), pp. 1687-1726. Furthermore, changes in asset prices are considered to be direct effects of monetary policy transmission. Because empirical studies for the euro area show that wealth effects induced by asset price fluctuations have only a limited impact on consumer spending decisions, no further consideration is given to them here. For more information, see C. Guerrieri and C. Mendicino (2018), Wealth effects in the euro area, ECB Working Paper No 2157; and G. de Bondt, A. Gieseck and Z. Zekaite (2018), Income and wealth effects: a thick modelling approach for euro area private consumption, mimeo.
4 See A. Auclert (2019), Monetary policy and the redistribution channel, American Economic Review, forthcoming. In this context, the author refers to "unhedged interest rate exposure".
5 For more information, see J. Lewellen and K. Lewellen (2016), Investment and Cash Flow: New Evidence, Journal of Financial and Quantitative Analysis 51 (4), pp. 1135-1164; P. Bolton, H. Chen and N. Wand (2011), A unified theory of Tobin's q, corporate investment, financing and risk management, The Journal of Finance, 66 (5), pp. 1545-1578; and O. Lamont (1997), Cash Flow and Investment: Evidence from Internal Capital Markets, The Journal of Finance, 52 (1), pp. 83-109.

with floating rates. By contrast, net interest income increases for households with large stocks of interest-bearing assets and debt levels that are low or that characteristically consist of fixed rate loans.

Debt service also includes redemption payments

While net interest income takes into account both assets and liabilities, debt service focuses on the interest-bearing liabilities of the private non-financial sector. Interest payments, which together with redemption payments equate to the debt service, are particularly heavily influenced by the interest rate level and therefore the monetary policy stance.[6] A higher debt service implies that a growing proportion of disposable income will have to be used to service interest and redemption payments, limiting the scope for consumption and investment spending.

Sensitivity of real economic variables depends on financial frictions

In turn, the sensitivity of consumption and investment behaviour in response to changes in net interest income or debt service depends largely on financial frictions at the household and corporate level. These include liquidity and financing constraints, in particular. High payment obligations in relation to the stock of liquid assets mean that agents respond much more strongly to temporary income fluctuations via their current consumption and their investment, as they do not have sufficient liquid assets to use as a buffer.[7]

Income effect particularly strong where illiquid assets are financed through borrowing

Based on these considerations, direct income effects are particularly likely to have a significant impact in cases where economic agents finance illiquid assets through borrowing, including, for instance, purchases of real estate by households or fixed assets by companies. Whether loan contracts have a variable rate of interest also has a bearing.[8] A rising interest rate level will then translate significantly faster into a higher current interest burden, eating into the resources available for consumption and investment. If the new interest rate environment also entails a general reduction in asset prices and thus the value of the assets underlying the debt contracts as collateral, economic

agents' levels of indebtedness may also increase to a burdensome or even unsustainable level. A debt overhang of this kind further decreases willingness to spend owing to the need for deleveraging.[9]

Stylised empirical results for the euro area

To illustrate the previous conceptual considerations, stylised empirical relationships between the two key balance sheet indicators – net interest income and the debt service ratio – as well as real economic indicators are identified below. Here, we use impulse-response func-
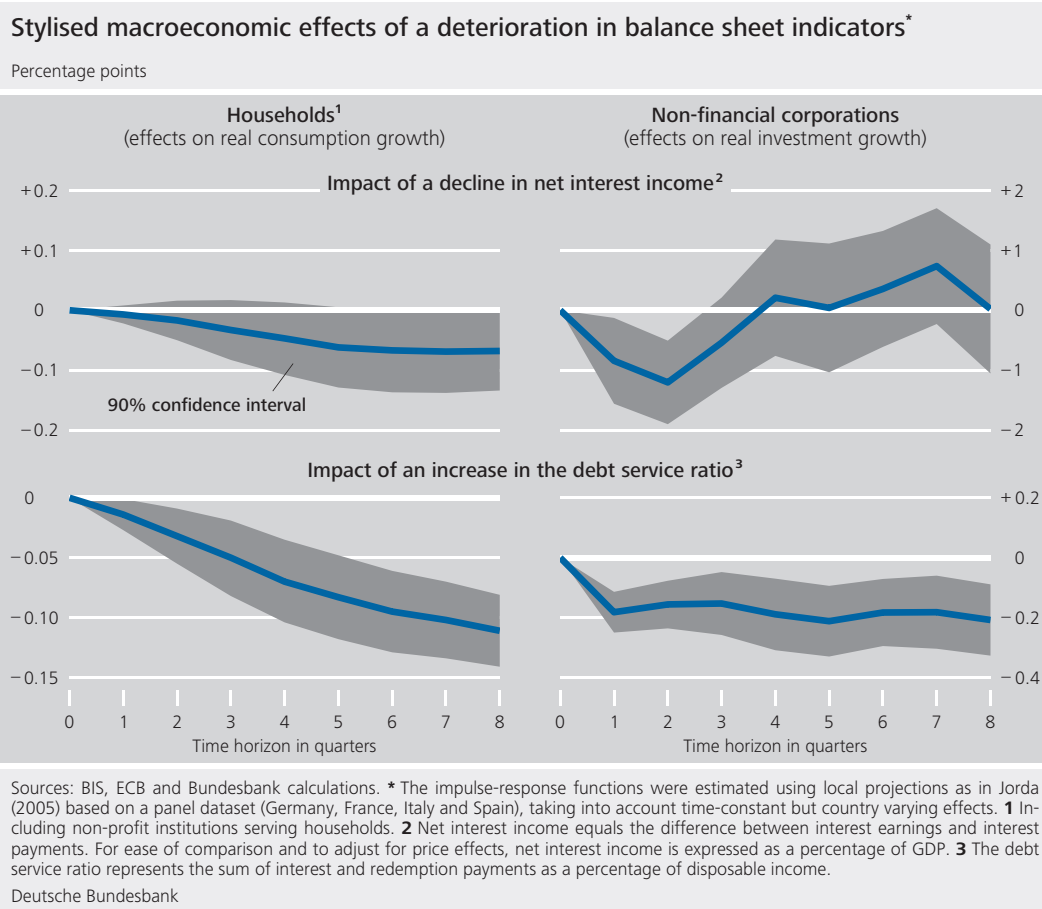
Empirical estimations of importance of balance sheet indicators for real economy …

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6 See B. Hofmann and G. Peersman (2017), Is there a debt service channel of monetary transmission?, BIS Quarterly Review, December 2017. For information about the transmission of changes in the debt service ratio to the real economy, see M. Drehmann, M. Juselius and A. Korinek (2018), Going With the Flows: New Borrowing, Debt Service and the Transmission of Credit Booms, NBER Working Paper No 24549.

7 In this context, households are also referred to as "hand-to-mouth" consumers. On the one hand, these can be households with low net wealth and few liquid assets. On the other, it includes households with high net assets, but those of a particularly illiquid kind such as real estate. For more information, see G. Kaplan, L. Violante and J. Weidner (2014), The wealthy hand-to-mouth, Brookings Papers on Economic Activity, 48 (1), pp. 77-138. For information about the role of precautionary saving in this context, see also C. Caroll (2001), A theory of the consumption function with and without liquidity constraints, Journal of Economic Perspectives, 15 (3), pp. 23-45.

8 For more information, see J. Cloyne, C. Ferreira and P. Surico, Monetary policy when households have debt: new evidence on the transmission mechanism, The Review of Economic Studies, forthcoming; M. di Maggio, A. Kermani, B. J. Keys, T. Piskorski, R. Ramcharan, A. Seru and V. Yao (2017), Interest rate pass-through: mortgage rates, household consumption and voluntary deleveraging, American Economic Review, 107 (11), pp. 3550-3588; M. Flodén, M. Kilström, J. Sigurdsson and R. Vestman (2017), Household debt and monetary policy: revealing the cash-flow channel, Swedish House of Finance Research Paper, No 16-8; and A. Hedlund, F. Karhan, K. Mitman and S. Ozkan (2017), Monetary policy, heterogeneity, and the housing channel, Society for Economic Dynamics 2017 Meeting Papers, No 1610.

9 See S. Alpanda and S. Zubairy, Household debt overhang and transmission of monetary policy, Journal of Money, Credit and Banking, forthcoming. The weak economic growth by international standards seen in the euro area after the financial crisis was probably due, at least in part, to this pronounced tendency to repay debt using current income. For more information, see Deutsche Bundesbank (2017), Recent developments in the indebtedness of the private non-financial sector in selected euro-area countries, op. cit.

Stylised macroeconomic effects of a deterioration in balance sheet indicators*

Percentage points

Households[1]
(effects on real consumption growth)

Non-financial corporations
(effects on real investment growth)

Impact of a decline in net interest income[2]

90% confidence interval

Impact of an increase in the debt service ratio[3]

Time horizon in quarters

Sources: BIS, ECB and Bundesbank calculations. ***** The impulse-response functions were estimated using local projections as in Jorda (2005) based on a panel dataset (Germany, France, Italy and Spain), taking into account time-constant but country varying effects. **1** Including non-profit institutions serving households. **2** Net interest income equals the difference between interest earnings and interest payments. For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of GDP. **3** The debt service ratio represents the sum of interest and redemption payments as a percentage of disposable income.

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tions for a panel of the four major euro area Member States – Germany, France, Italy and Spain – to show how macroeconomic variables might respond to a deterioration in these balance sheet indicators. More specifically, it is assumed that net interest income declines and the debt service ratio increases.[10] Real investment growth for non-financial corporations and real consumption growth for households are used as real economic indicators and thus dependent variables. The impulse-response functions are calculated using an estimation model based on local projections.[11] These show how the macroeconomic variables evolve over time following a one-time deterioration of the balance sheet indicators amounting to one standard deviation. The chart above presents the results of the empirical analysis.

In principle, the stylised findings generated using this method support the theoretical considerations and show that a deterioration in the two indicators may be linked to negative ef-

10 For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of gross domestic product (GDP).

11 See O. Jorda (2005), Estimation and inference of impulse responses by local projections, American Economic Review, 95(1), pp. 161-182. A series of equations is estimated in which the dependent variable is continuously shifted further into the future. The parameter estimated in this way for each point in time for the relevant explanatory variable – net interest income or the debt service ratio – then corresponds to the local projection of consumption or investment for the corresponding point in time, assuming that the variable to be considered deteriorates by one unit. Specifically, the following correlations are estimated separately for consumption growth (for the household sector) and investment growth (for the non-financial corporations sector): $y_{i,t+h} = \alpha_{i,h} + \beta_h\, indicator_{i,t-1} + \gamma_h\, X_{i,t-1} + \varepsilon_{i,t+h}$. Here, y describes the dependent variable (real investment or consumption growth in country i at time $t{+}h$), $indicator$ either the net interest income or the debt service ratio of the non-financial corporations or households in country i at time $t{-}1$ and X corresponding country-specific macroeconomic control variables including real GDP growth, the inflation rate, growth in real house prices and a short-term shadow interest rate as well as lagged values for the dependent variable. The estimation period runs from Q4 1999 to Q1 2016. This enables us to produce projections for up to eight quarters. At the same time, it ensures that the projections are based on the same data base, regardless of their horizons. Because the error terms are, given their construction, autocorrelated, Newey-West standard errors are computed.

Interest-bearing assets and liabilities of the private non-financial sector in the euro area[*]

As a percentage of GDP, Q2 2018
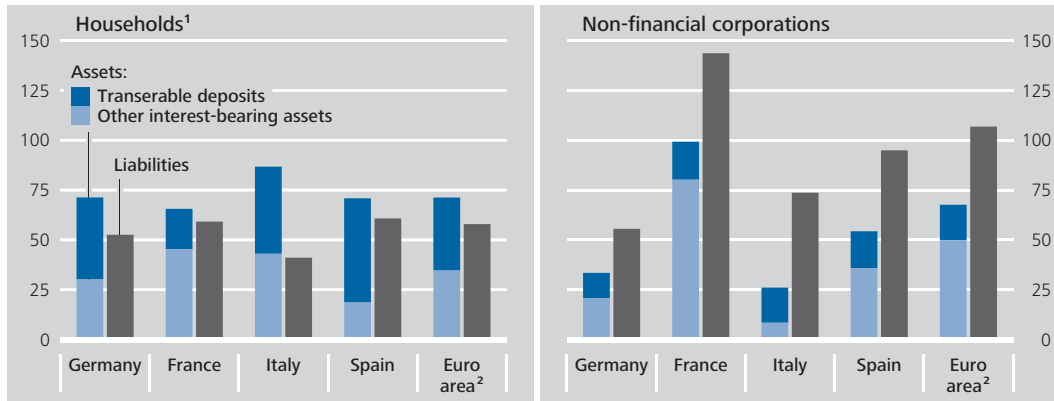
Sources: ECB and Bundesbank calculations. ***** Interest-bearing assets and liabilities include deposits, debt securities and loans. **1** Including non-profit institutions serving households. **2** The share of transferable deposits for the euro area corresponds to the weighted country average of Germany, France, Italy and Spain.

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… show, in line with the theory, that a deterioration in balance sheet indicators is accompanied by a decline in consumption and investment

fects on the real economy. These materialise in the context of net interest income, mostly in the form of a clear, but only short-term, decline in investment growth by non-financial corporations. The response of household consumption is also negative, but tends to be statistically insignificant. Furthermore, an increase in debt service ratios, in particular, appears to be linked to perceptible and sustained negative effects. This is true for both non-financial corporations and households. The main reason for the high level of persistence is probably that, as experience has shown, the primary response to an increase in the debt service ratio is an extended period of deleveraging, hampering economic growth in the long term.[12] On the whole, the results suggest that balance sheet constraints, linked to negative feedback effects for the real economy, could first and foremost appear in the form of a higher debt service ratio.

The balance sheet position of the private non-financial sector in the euro area

The analysis above has shown that changes in balance sheet indicators such as net interest income and debt service can have an impact on the real economy. Stylised information on the

private non-financial sector's balance sheet situation can be obtained using data from the financial accounts and national accounts. As well as the euro area as a whole, the four large Member States of Germany, France, Italy and Spain are also considered in the following analyses.

Balance sheet indicators measured using data from the financial accounts

The chart above shows that, in absolute terms, the interest-bearing assets of households significantly exceed the corresponding liabilities in all the countries analysed.[13] This means that households' net financial assets as relevant to interest income, i.e. the difference between interest-bearing assets and liabilities, are posi-

Interest-bearing net financial assets: negative for non-financial corporations, positive for households

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12 For information about persistence in debt dynamics, see M. Drehmann, M. Juselius and A. Korinek (2018), op. cit.; and R. Adalid and M. Falgiarda (2018), How repayments manipulate our perceptions about loan dynamics after a boom, ECB Working Paper, No 2211.

13 According to the European System of Accounts 2010 (ESA 2010), deposits, debt securities, loans and other accounts receivable/payable are interest-bearing. Since the latter are subject to a certain degree of statistical uncertainty, they are excluded from the following analysis. Here, the definition of the debt instruments used to calculate the debt service ratios also includes loans and debt securities. Deposits are not relevant because they do not play a role in the external financing of the private non-financial sector. In addition to this, there are non-interest-bearing assets and liabilities such as shares and other equity, as well as claims on insurance corporations. Although a guaranteed interest rate is often agreed for the latter, they are considered a non-interest-bearing form of investment under ESA 2010. In the national accounts, the income they generate is recorded as other investment income rather than as interest.

tive. Across the countries, interest-bearing net financial assets are particularly high in Italy. Interest-bearing assets are therefore likely to benefit disproportionately from a rise in the interest rate level. The situation is different for non-financial corporations, which have significantly more interest-bearing liabilities. Again, Italy stands out here with a large difference between the two figures. Thus, net financial assets as relevant to interest income are negative in all the countries analysed, meaning that a return to normal interest rates would probably have a larger impact on liabilities. Interest-bearing assets account for just over 30% and 40% of the total financial assets (including non-interest-bearing assets) of non-financial corporations and households respectively. The liabilities of households are almost exclusively interest-bearing, whereas those of non-financial corporations are predominantly non-interest-bearing.

Clear heterogeneity at individual household level

The situation described at the aggregate sectoral level may conceal heterogeneous developments within the sectors. For instance, at the individual household level in the euro area, it is evident that, in the event of an interest rate normalisation, households with lower net wealth or income are especially likely to experience a heavier interest payment burden owing to the composition of their portfolios (see the box on pp. 20 ff.).

Transmission of changes in the general interest rate environment depends on maturities …

As well as the interaction between interest-bearing assets and liabilities, other aspects also influence how changes in the general interest rate environment affect net interest income and debt service. The maturities of deposits and debt instruments as well as the fixed-term interest rates for loans are particularly important in this context. They determine interest rate levels and how quickly changes in interest rates are transferred to the various financial instruments. A glance at the balance sheets of the private non-financial sector in the countries analysed shows that the maturities of interest-bearing assets generally tend to be shorter, while those for interest-bearing liabilities tend to be com-

paratively long. Taking into account the maturity structure, a return to normal interest rates would probably therefore tend to be transmitted more quickly to assets than to liabilities.

There is an important difference between households and non-financial corporations in terms of the interest rate fixation periods for bank loans. For floating rate loans, interest payments are usually linked to a short-term market benchmark that adapts rapidly to changes in the monetary policy stance.[14] With longer interest rate fixation periods, however, changes in the interest rate level will not be felt until an expiring loan agreement is replaced by a new one. This may delay the effect on borrowers' interest payment obligations. Because a larger share of floating rate loans is granted to non-financial corporations than to households in the euro area as a whole, generally speaking, an interest rate hike would probably tend to become evident more quickly on the liabilities side for non-financial corporations. At the same time, at the country level, the repercussions would probably be felt more promptly overall in Italy and Spain, which have a larger share of floating rate loans, than in Germany or France.[15]

… and interest rate fixation periods

Developments in net interest income

Net interest income is the difference between the interest income generated by the interest-bearing assets and the interest payments related to the interest-bearing liabilities. Changes in this variable can be broken down into a pure interest rate effect and a portfolio effect.[16] The

Changes in net interest income can be broken down into interest rate and portfolio effects

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14 Here, floating rate loans comprise loans with an original or residual maturity of less than 12 months as well as loans with an interest rate adjustment date of up to 12 months.
15 For information on the structure of lending rates for non-financial corporations, see Eurosystem Working Group (2013), Corporate Finance and Economic Activity in the Euro Area, Occasional Paper 151, p. 37. For households, see ECB (2009), Housing Finance in the Euro Area, Structural Issues Report, p. 26.
16 See also ECB (2017), Lower interest rates and sectoral changes in interest income, Economic Bulletin, Issue 5, pp. 31-35.

The interest rate exposure of euro area households

A change in the policy interest rate, to the extent it is passed through to deposit and lending rates, has a direct effect on the amount of interest received or paid by households. And since interest-bearing assets and liabilities are distributed differently across households, these households can be affected very differently by an interest rate change. The composition of households' portfolios in terms of interest-bearing assets and maturity structure determines the extent to which households' interest income flows are affected by interest rate changes in a given time interval.

A recent study by Tzamourani (2019) estimates the interest rate exposure of euro area households.[1] The metric used is the unhedged interest rate exposure (URE), i.e. the difference between maturing assets and liabilities, as defined by Auclert (2019).[2] It is a welfare metric, which captures the extent to which households respond to changes in real interest rates and reflects the direct gains and losses in their net interest income after such a change.

Using survey data, the URE for one year can be defined for each household i as

$$URE_i = Y_i - C_i + A_i - L_i,$$

where Y_i stands for household income, C_i for consumption, A_i for maturing assets and L_i for maturing liabilities in that year.

The URE is thus the resource flow available for investment, or the amount to be financed, over the year, and so in effect represents the amount that is exposed to interest rate changes. Households with a positive URE, with typically many investments in short-term instruments, such as deposits, would initially benefit from an increase in interest rates (assuming constant inflation). On the other hand, households with a negative URE, with typically adjustable-rate mortgages (ARMs) and smaller investments in deposits, would lose from an interest rate increase.

The study uses the Eurosystem's Household Finance and Consumption Survey (HFCS), which provides representative and detailed data on assets, debt, income and consumption of euro area households.[3] Based on these data, Tzamourani estimates in her study the URE for the euro area as a whole and for the individual euro area countries. Based on the HFCS data,[4]

- Y_i is net household income from all sources.

- C_i is the sum of non-durables expenditures, plus rent, plus durables expenditures.

- A_i is the sum of all sight deposits, 80% of saving deposits, all mutual fund shares invested in money market instruments, the country-specific percentage of bonds assumed to be maturing, plus 90% of managed accounts.[5]

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1 See P. Tzamourani (2019), The interest rate exposure of euro area households, Deutsche Bundesbank Discussion Paper No 01/2019.
2 See A. Auclert (2019), Monetary policy and the redistribution channel, American Economic Review, forthcoming.
3 The data source for the study is the second (and latest) available wave of the household survey. The following reference periods were used: 2014 for Germany, end 2014/beginning 2015 for France, 2015 for Italy and end 2011/beginning 2012 for Spain.
4 Other data sources are used to impute some information that is not available in the HFCS, such as net income for certain euro area countries.
5 The assumptions and basic principles behind these definitions are explained in Tzamourani (2019).

– L_i is the sum of all ARMs, all non-mortgage credit plus the fraction of fixed-rate mortgages maturing in the year after the survey plus all loan payments. These are all measured annually.

– To compare results across individual countries and groups of households, the URE is scaled with the average gross income of the country or group it refers to.[6]
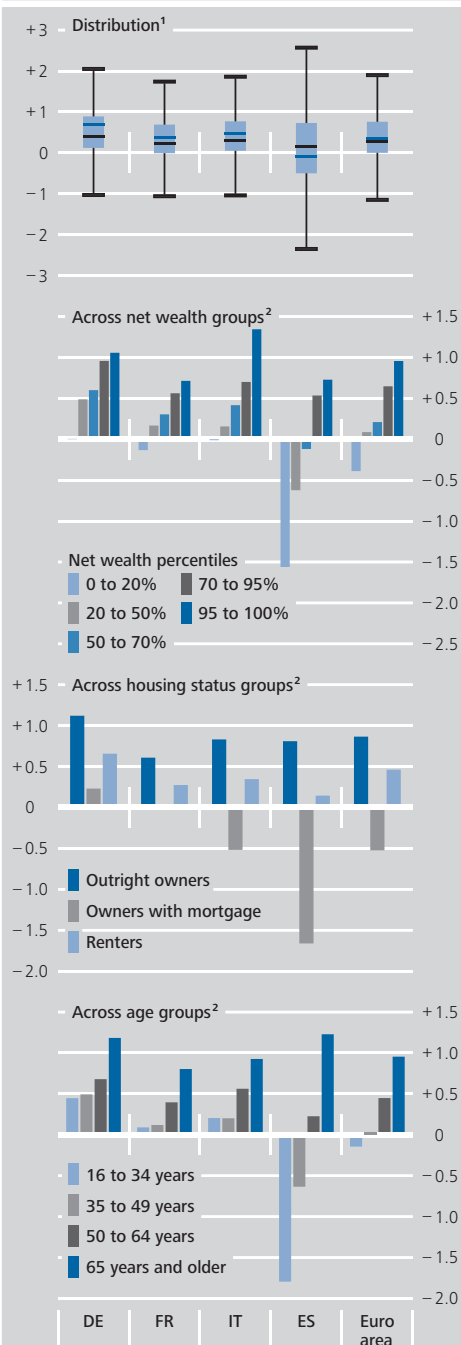
The top diagram in the adjacent chart shows, using boxplots, the distribution of UREs across the euro area and in the four largest euro area economies, i.e. Germany, France, Italy and Spain. The study finds that the median household (black line) in the euro area and in the individual countries considered has a positive interest rate exposure. Assuming an equal pass-through of policy rate changes to deposit and loan rates, and all other things being equal, the median household would gain from a rise in interest rates. The chart also shows that the means of the distribution (blue lines) across countries display greater heterogeneity. Whereas households in France, Germany and Italy have a positive URE on average, households in Spain have a negative URE. This heterogeneity is driven mainly by the differences in the structure of households' liabilities, and particularly by the differences in the prevalence of ARMs (see the table on p. 22).[7]

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6 Thus, the calculated measure when comparing countries, for example, gives the interest rate exposure of households as a share of the respective country's average gross income. Multiplying this figure by a policy interest rate change in percentage points, and assuming an equal pass-through for loan and deposit rates, one obtains the net increase or reduction in households' interest income as a percentage of the average gross income of the country in question as a result of the change in the policy interest rate.
7 Tzamourani (2019), op. cit., provides further evidence of the heterogeneity across the euro area countries.

Unhedged interest rate exposure

relative to gross income

Net wealth percentiles
- 0 to 20%
- 20 to 50%
- 50 to 70%
- 70 to 95%
- 95 to 100%

Across housing status groups[2]
- Outright owners
- Owners with mortgage
- Renters

Across age groups[2]
- 16 to 34 years
- 35 to 49 years
- 50 to 64 years
- 65 years and older

DE FR IT ES Euro area

Source: Tzamourani (2019), based on the Household Finance and Consumption Survey, 2014. **1** The boxplots represent the distribution of unhedged interest rate exposure (URE) at the household level for the four selected countries and the euro area. The blue line indicates the mean, the black line within the box indicates the median, and the upper and lower boundaries of the box indicate the quartiles. The lines outside the box extend in each case to the maximum data point, which is less than one and a half times the interquartile range (the size of the box) away from the box. For ease of comparison, the UREs have been standardised using the country-specific gross income. **2** The UREs depicted represent the mean of each group and have been standardised using the gross income of the group they refer to.

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Indebtedness and portfolio composition of households in the euro area and selected euro area countries

Country/country group	Percentage of households with debt	Percentage of households with mortgage	Households with ARM as a percentage of all households with mortgage	Households with ARM as a percentage of all households	Deposits as a percentage of total wealth
Germany	45.1	20.4	14.5	3.0	29.4
France	47.2	24.3	12.0	2.6	16.9
Italy	21.2	10.1	53.9	5.4	13.0
Spain	49.3	35.0	80.3	28.1	11.0
Euro area	42.4	23.3	46.8	10.6	19.6

Source: Tzamourani (2019), op. cit., based on the Household Finance and Consumption Survey, 2014.
Deutsche Bundesbank

The countries with a distinctly positive mean URE, such as Germany and France, have a low prevalence of ARMs, whereas in countries with a highly negative mean URE, such as Spain, the percentage of households holding an ARM is higher. In Italy, the prevalence of ARMs among mortgagors is not as low as in Germany or France. However, since the percentage of households with a mortgage is very small, the percentage of Italian households with an ARM is also very low, leading to a positive mean URE. Another factor which plays a role in shaping the heterogeneity in the interest rate exposure of households across countries is the difference in the ratio of deposits to total wealth, as deposits are more exposed to changes in interest rates than other wealth components.

As further shown in the study, there is also considerable national heterogeneity across wealth, income, age and housing status, leading to different UREs in the various countries.

The diagram second from the top on p. 21 depicts the mean interest rate exposure for net wealth groups in the euro area and the selected four euro area countries.[8] On the whole, low net wealth households have a negative URE, as they are more heavily indebted. The URE increases, on average, across net wealth groups, as households in higher wealth groups are less indebted and have accumulated more assets.

In the euro area, as well as in France and Italy, it is only the households in the lowest 20% of the net wealth distribution that have, on average, a negative URE. In Spain, on the other hand, where households are more indebted and mortgages are predominantly ARMs, the households in the middle net wealth groups also have, on average, a negative URE. These households would be hurt by an increase in interest rates, all other things being equal.

Since the holdings and the amount of ARMs are, given their construction, important determinants of the URE, there is substantial heterogeneity in interest rate exposure between households with different housing status. The diagram second from the bottom on p. 21 depicts the mean interest rate exposure for outright homeowners, homeowners with a mortgage and renters in the euro area and in the four selected euro area countries. Predictably, homeowners with a mortgage have, on average, a negative URE, whereas outright homeowners have, on average, a positive URE. Germany and

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8 The depicted UREs are standardised by the gross income of the group in question.

France are exceptions in this respect, as the percentage of households with ARMs among mortgagors is very low in these countries.

There is also heterogeneity in interest rate exposure across age groups (see the bottom diagram on p. 21). As households grow older, they accumulate more and more assets, including interest-bearing deposits, and pay off their debt. In the euro area as whole, the youngest age group (16-34 years, as determined by the age of the household reference person) has on average a negative interest rate exposure. By contrast, in France, Germany and Italy, the youngest age groups have, on average, a positive URE, though it is close to zero in France. In Spain, the average interest rate exposure for the two youngest groups is negative.

interest rate effect comprises changes in interest earnings and payments, assuming that stocks of assets and liabilities remain constant. The portfolio effect, on the other hand, ignores changes in interest rates and results from shifts in the structure of assets and liabilities.[17] The upper chart on p. 24 shows the cumulative change in net interest income, including the interest rate and portfolio effect, from the third quarter of 2008 to the current end. The starting point for this analysis is the beginning of the monetary policy easing phase in the euro area.

Barely any change in net interest income of euro area households during period of low interest rates …

At the aggregate level, euro area households' net interest income largely moved sideways. This is because the fall in interest income was almost completely offset by interest payments, which underwent a similar decline. The difference between the interest rate effect on the assets side and the liabilities side was therefore close to zero. Only in recent years has net interest income slipped slightly below its 2008 level, mainly as a result of the recent sharp decline in

interest earnings. At the country level, households show a certain degree of heterogeneity: while developments in Germany and France were broadly in line with those in the euro area as a whole, the diminishing interest rate level had a particularly strong impact in Spain in the form of lower financing costs and an overall
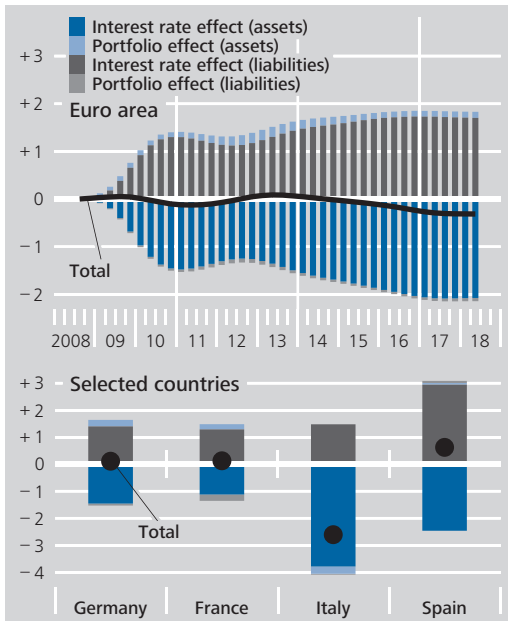
[17] The breakdown into interest rate and portfolio effects requires sectoral information on the average maturity and interest rate fixation period of the interest-bearing financial instruments. This information is included indirectly in the sector-specific implicit average interest rates, which can be calculated using information from the financial accounts and the national accounts. More specifically, the implied average interest rate is calculated via the ratio of interest payments and interest earnings to the nominal value of the corresponding interest-bearing financial instruments. To calculate the interest rate effect, the stocks of the relevant financial instruments at the beginning of monetary policy easing (Q3 2008) are multiplied by the corresponding implied average interest rate. Any changes to the net interest income over and above this then represent the portfolio effect. In this context, the information about interest payments and interest earnings reflects the situation after the allocation of financial intermediation services indirectly measured (FISIM) to the relevant sector. Since the figures shown in the financial accounts are usually based on market values, nominal values are proxied using cumulative transactions since 1999.

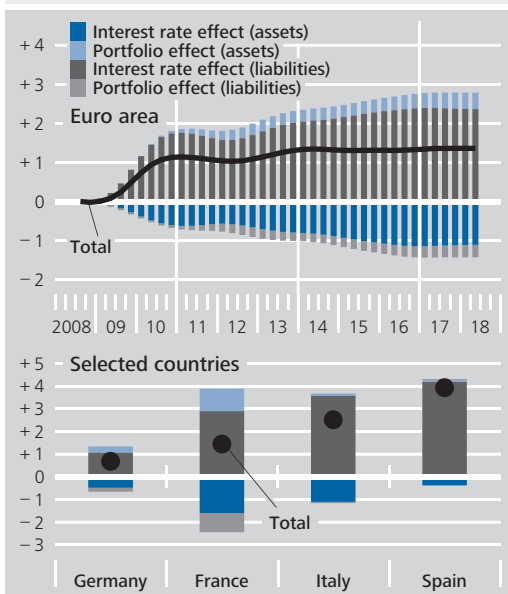## Contributions to changes in the net interest income of households*

Cumulative changes in percentage points, Q3 2008 to Q2 2018

Sources: ECB and Bundesbank calculations. * Including non-profit institutions serving households. Net interest income equals the difference between interest earnings and interest payments. For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of GDP.

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Contributions to changes in the net interest income of non-financial corporations*

Cumulative changes in percentage points, Q3 2008 to Q2 2018

Sources: ECB and Bundesbank calculations. * Net interest income equals the difference between interest earnings and interest payments. For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of GDP.

Deutsche Bundesbank

increase in net interest income. This was mainly due to the relatively high share of floating rate loans and the relatively low volume of interest-bearing net financial assets. In Italy, by contrast, the share of debt securities in the portfolio of households at the start of the monetary policy easing phase was far higher than in the other Member States. As a result of this, the decline in interest earnings, which formed part of an interest rate effect on the assets side, reduced net interest income very sharply here. Unlike the interest rate effect, portfolio effects did not play a significant role.

Unlike households, non-financial corporations in the euro area as a whole and in each of the countries analysed have experienced an increase in net interest income since the beginning of the monetary policy easing phase (see the lower chart). This was primarily driven by the decline in interest payments, and thus the interest rate effect on the liabilities side. In some countries, the portfolio effect was slightly more pronounced for non-financial corporations than for households. In Germany, and especially in France, the accumulation of interest-bearing assets (including deposits, in particular) also contributed to a rise in net interest income. In addition to this, over the reporting period as a whole, non-financial corporations in France increased their liabilities more strongly than those in other countries. This was accompanied by higher interest payments and reduced net interest income per se.

… in contrast to significant rise for non-financial corporations

Developments in debt service ratios

Developments in the sectoral debt ratios likewise reflect both the balance sheet structure of the relevant sector and interest rate developments. The debt service ratio includes the interest and redemption payments to be made in relation to the outstanding debt instruments by the sector in a given period of time. In relation to the income available for debt service, it represents the share of income that is needed in

Debt service ratio includes both interest and redemption payments

order to service a debt.[18] Developments in the debt service ratio are influenced by the average interest rate payable on the debt. In addition, levels of indebtedness and disposable income also play a role.[19] The adjacent chart shows cumulative developments in debt service ratios for households in the four large Member States and the euro area as a whole since the third quarter of 2008.[20] It also reveals the contributions of the three components mentioned above to changes to the debt service ratio.

Taken in isolation, monetary policy easing reduced debt service ratios of households …

The debt service ratio of households in the euro area as a whole has declined steadily since 2008. This was mainly the result of the falling interest rate level, which drove down ratios in Italy and Spain, in particular. The fact that the falling interest rate burden had a particularly strong impact in these two countries was due to the high share of floating rate credit liabilities, as was pretty much the case for net interest income. Moreover, while the household debt service ratio went down in Germany also as a result of increases in disposable income, in Spain, it was primarily the outcome of a reduc-
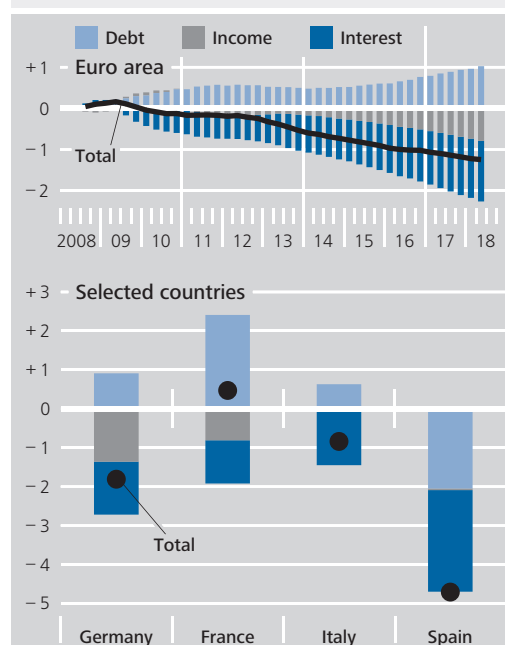

Contributions to changes in the debt service ratio of households*

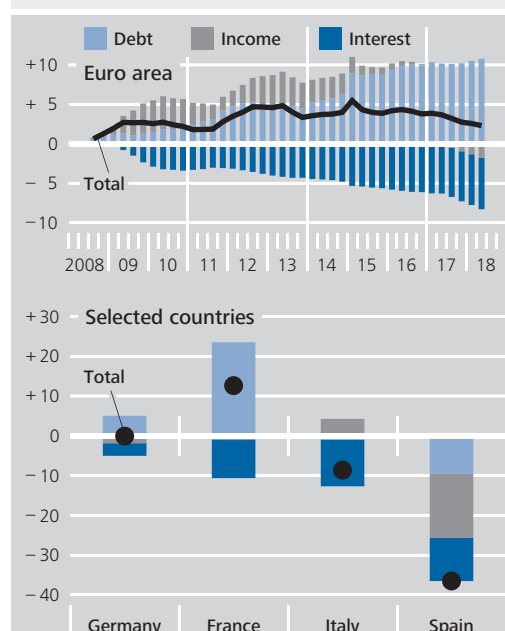Cumulative changes in percentage points, Q3 2008 to Q2 2018

Sources: ECB and Bundesbank calculations. * Including non-profit institutions serving households. The debt service ratio represents the sum of interest and redemption payments as a percentage of disposable income.
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Contributions to changes in the debt service ratio of non-financial corporations*

Cumulative changes in percentage points, Q3 2008 to Q2 2018

Sources: ECB and Bundesbank calculations. * The debt service ratio represents the sum of interest and redemption payments as a percentage of disposable income.
Deutsche Bundesbank

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18 To capture all inflows available for making interest and redemption payments, the interest and dividend payments are added back into the gross disposable income in the calculations we use for our analysis. In addition, interest expenditure is taken into account before the allocation of FISIM here because these assumed charges are just as relevant to debt service as "pure" interest payments. The implicit average interest rate is then calculated in the same way as for net interest income. For a commonly used method of calculating the debt service ratio, see K. Dynan, K. Johnson and K. Pence, Recent Changes to a Measure of U.S. Household Debt Service, Federal Reserve Bulletin, October 2003, pp. 417-426. With regard to the definition of the individual variables, the calculations in our analysis follow the methodology of the Bank for International Settlements (BIS). See also M. Drehmann, A. Illes, M. Juselius and M. Santos, How much income is used for debt payments? A new database for debt service ratios, BIS Quarterly Review, September 2015, pp. 89-103.
19 As a general rule, the average maturity of debt also influences developments in the debt service ratio. Since their exact value is not known, in line with the BIS's approach, we assume the average debt maturity to be 18 years for households and 13 years for non-financial corporations. Because this variable is constant, it does not influence the change in the debt service ratio in its own right in this analysis.
20 For information about the importance and development of debt service ratios in the euro area, see also Deutsche Bundesbank (2017), Recent developments in the indebtedness of the private non-financial sector in selected euro-area countries, op. cit.

*… and
non-financial
corporations*

tion in outstanding debt. By contrast, the large amount of new debt in France contributed to a moderate rise in the debt service ratios of households.

At the country level, the debt service ratios for non-financial corporations also showed mixed developments (see the lower chart on p. 25). In the euro area as a whole, the ratio has risen slightly since mid-2008, mainly due to the build-up of debt in France, which significantly increased the ratio there, although, as in the other countries, the falling interest burden per se helped to push it down. By contrast, in Italy, and especially in Spain, the debt service ratio fell. In Italy, this mainly stemmed from the decline in the interest rate level. In Spain, a strong increase in disposable income as well as a reduction in debt also contributed to a further drop in the ratio. In Germany, however, it largely moved sideways.

Overall, the low interest rate level over the last few years has therefore helped to significantly improve the debt service ratios of both sectors and the net interest income of non-financial corporations. With regard to a return to normal interest rates, the question is therefore whether and to what extent these balance sheet indicators could deteriorate again in an environment in which interest rates start to rise.

ratio, the interest rate level and common macroeconomic control variables. In a second step, three different paths for the future development of interest rates are factored into the model. The outcomes this delivers in terms of developments in net interest income and debt service ratios then equate to the possible future developments in the balance sheet indicators, conditioned on the interest rate path assumed in each case.

To ensure consistency, the VAR model employed here is based on the specification used above for the local projections and comprises the variables that are generally used in macro models for monetary policy analysis: quarterly growth rates for real GDP, the GDP deflator and real house prices. Interest rate developments are measured based on a short-term shadow rate which reflects both the level of long-term interest rates and the slope of the yield curve.[21] This basic model is then extended to include either net interest income or debt service ratios and estimated individually for each of the four major Member States as well as for the euro area as a whole.[22]

*… based on an
extended
monetary policy
VAR model …*

Based on these estimates, possible developments in net interest income and debt service ratios are then simulated over the period from

*… and three
interest rate
scenarios*

The impact of an interest rate normalisation on balance sheet indicators of the private non-financial sector

*Simulations on
the effects of an
interest rate
normalisation
on net interest
income and
debt service
ratios …*

In order to answer this question, scenario analyses are used to simulate the potential effects of an interest rate normalisation on net interest income and debt service ratios of the private non-financial sector in the euro area as a whole and in the four large Member States. The analyses are based on two steps. First, a vector autoregressive (VAR) model is used to estimate the correlations between the balance sheet indicators net interest income and debt service

21 The shadow rate comes from the Geiger and Schupp model (2018). For more information, see F. Geiger and F. Schupp (2018), With a little help from my friends, Deutsche Bundesbank Discussion Paper No 27/2018.
22 Account is taken of net interest income or debt service ratios of both sectors – households and non-financial corporations – simultaneously in order to capture potential interdependencies between these variables. This yields a total of ten models: five models for the basic model extended to include net interest income of both sectors and five models for the basic model extended to include debt service ratios of both sectors. In addition, all models incorporate a crisis dummy, a time trend and an interaction term between the crisis dummy and the time trend. The binary crisis dummy takes a value of zero for the period from the fourth quarter of 1999 to the second quarter of 2008 and a value of one for the period from the third quarter of 2008 to the second quarter of 2018. In combination with a linear time trend, this permits a check for a possible structural break as a result of the financial crisis. Based on information criteria, the optimum number of lags is determined to be two and is applied across all models. The estimation period stretches from the fourth quarter of 1999 to the second quarter of 2018.

the third quarter of 2018 to the fourth quarter of 2020. At this point, it should be noted that the simulations do not estimate the impact of an exogenous monetary policy shock – i.e. a monetary policy measure that is unexpected by market participants. Historical correlation patterns are, in fact, used to analyse potential developments in net interest income and debt service ratios under three different interest rate normalisation scenarios. The design of the simulations also ensures that possible changes to net interest income and debt service ratios are not driven by divergent macroeconomic developments. To this end, the macroeconomic projections with regard to GDP and the GDP deflator produced by Eurosystem staff are applied to all scenarios across the simulation period.[23] As regards developments in the (shadow) interest rate, the following three scenarios are considered:[24]

– "Baseline scenario": the interest rate path is in line with market participants' expectations.

– "No tightening": interest rates remain unchanged at the same level as in the fourth quarter of 2018.

– "Rapid tightening": every quarter, interest rates rise 15 basis points faster than in the baseline scenario.

Interest rate scenarios cover different routes to economic recovery

In the baseline scenario, interest rates normalise in line with market participants' expectations as at the end of the fourth quarter of 2018 as derived from a term structure model.[25] In the "no tightening" scenario, the implicit assumption is that the real economy will continue to recover, but that this will require a higher degree of monetary policy support than market participants are currently pricing in. By contrast, the "rapid tightening" scenario assumes that developments in the economy as a whole mean that interest rates will have to be tightened significantly more rapidly than market participants currently expect. The chart above shows the cumulative change in net interest in-

Simulation of net interest income of the private non-financial sector*

Cumulative change in percentage points, Q3 2018 to Q4 2020
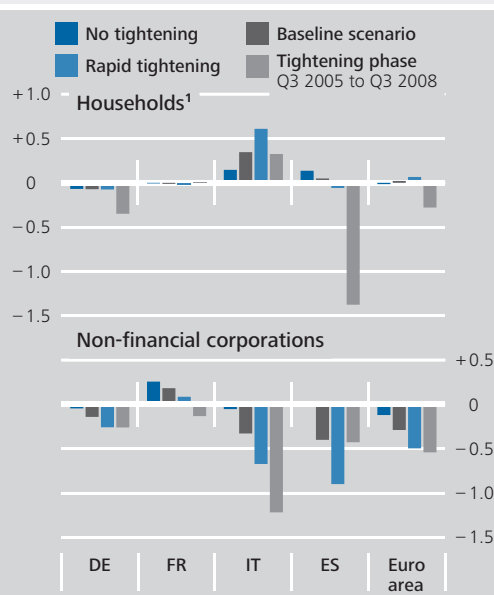
Sources: BIS, ECB and Bundesbank calculations. * Net interest income equals the difference between interest earnings and interest payments. For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of gross domestic product. **1** Including non-profit institutions serving households.

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come throughout the simulation period. To make a comparison easier, the change during the last interest rate tightening cycle (third quarter of 2005 to third quarter of 2008) is depicted alongside the simulated development in the three scenarios.
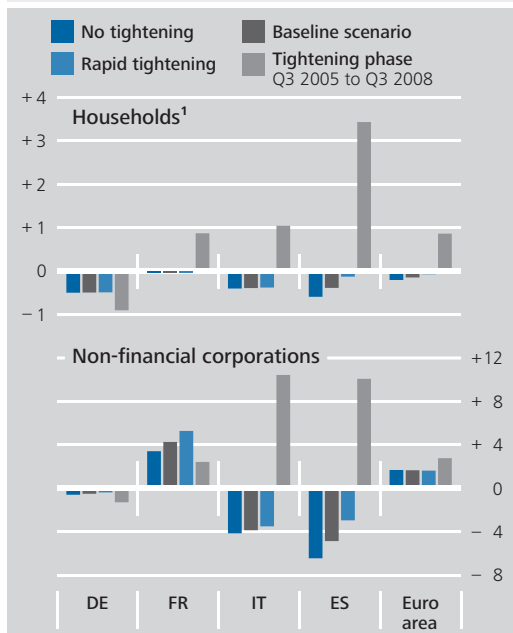
23 See ECB, A guide to the Eurosystem/ECB staff macroeconomic projection exercises, July 2016. The way in which the simulation is structured is therefore based on the assumption that even in the two alternative scenarios, the economic recovery will continue and rates will converge towards the inflation target. An alternative approach would be not to specify the pathways for real GDP and inflation. In this case, the "rapid tightening" scenario outlined below would lead to an overly hasty normalisation of monetary policy with a negative impact on the economic recovery. In the "no tightening" scenario, however, the monetary policy normalisation would be initiated too late. The negative and positive feedback effects on the real economy would thus result in a somewhat larger divergence of the simulated developments across the scenarios. However, the qualitative results are consistent with the outcomes discussed below.
24 As data are already available for the shadow rate for the third and fourth quarters of 2018, the actual data are used here.
25 For more information, see F. Geiger and F. Schupp (2018), op. cit.

Simulation of debt service ratio of the private non-financial sector*

Cumulative change in percentage points, Q3 2018 to Q4 2020

Households[1]

Non-financial corporations

DE FR IT ES Euro area

Legend:
- No tightening
- Rapid tightening
- Baseline scenario
- Tightening phase Q3 2005 to Q3 2008

Sources: BIS, ECB and Bundesbank calculations. * The debt service ratio represents the sum of interest and redemption payments as a percentage of disposable income. **1** Including non-profit institutions serving households.

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interest rates are tightened rapidly. At the country level, non-financial corporations in Italy and Spain would see a sharp fall in net interest income. Conversely, this sector had, in both countries, also benefited most from falling interest rates during the low interest rate period. The high proportion of floating rate liabilities means that here, too, there is a clear variation across the scenarios. In Germany, net interest income decreases slightly regardless of the scenario under consideration, while the results for France suggest a small increase in all cases.
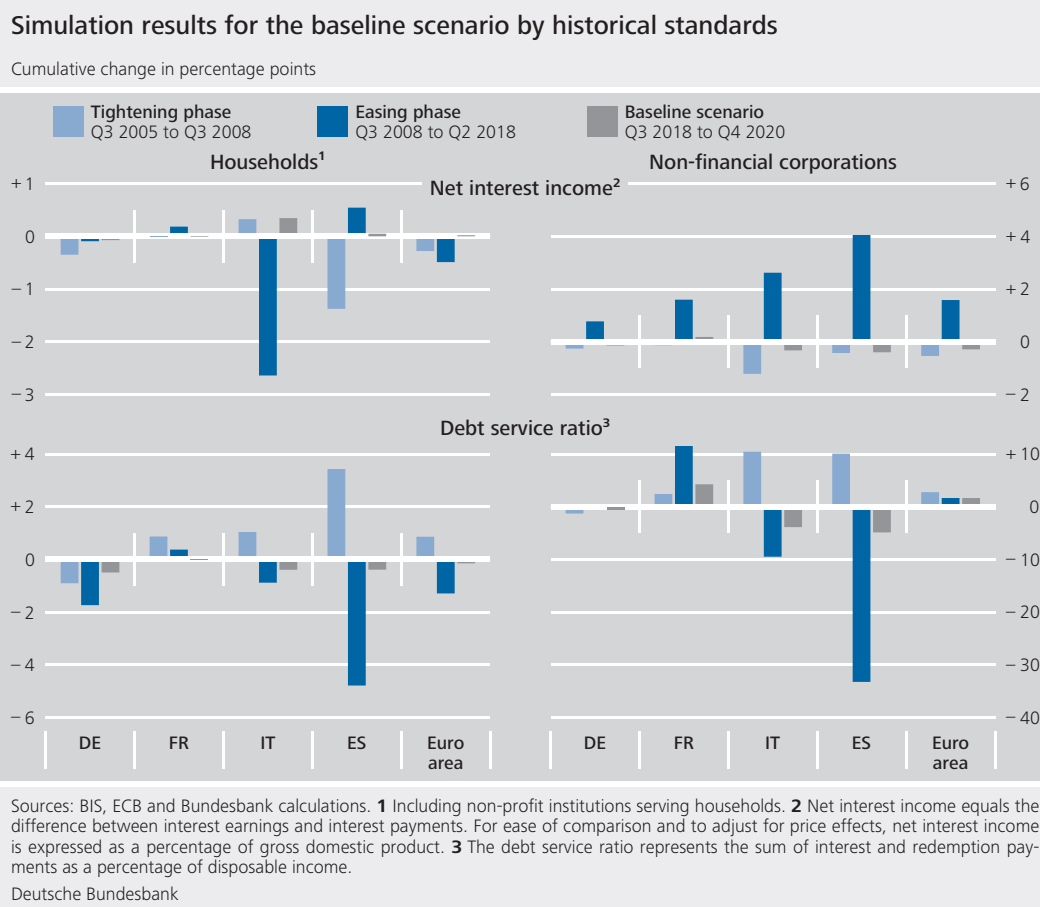
The adjacent chart shows the results of the simulation for the debt service ratios. For households, the baseline scenario for the euro area as a whole indicates a small decrease in the debt service ratio. Developments in the two alternative scenarios differ only slightly. At the country level, debt service ratios also sink in all scenarios. Because households in Spain have a high proportion of floating rate liabilities, there are clear variations across the scenarios. In Germany and Italy, the large percentage of liabilities with long interest rate fixation periods means that the decline is comparable in quantitative terms in all scenarios. In France, virtually no change is expected, regardless of the scenario.

Households' debt service ratio slightly lower in euro area

The fact that developments are relatively moderate in all countries can be explained by the circumstance that, during the last tightening cycle, households (with the exception of those in Germany) raised debt levels in response to rising house prices and a favourable income situation (in some cases, significantly).[26] This led to rising redemption payments and a corresponding increase in debt service ratios. At present, however, it can be assumed that the deleveraging process that has taken place over the last few years will continue in the tighten-

Differences vis-à-vis last tightening cycle are explained by different debt dynamics

Net interest income of households should hardly change, …

For households, net interest income at the euro area level, as well as in Germany, France and Spain, is virtually unchanged in all scenarios. Because households in Spain have a high proportion of floating rate liabilities, the variation across the individual scenarios is somewhat higher. Italian households could benefit significantly from an interest rate normalisation. Given that households in Italy have a relatively large stock of debt securities that are remunerated at market rates, there is a clear increase in net interest income, which also varies markedly across the scenarios. During the low interest rate period, Italian households suffered the largest losses.

… while that of non-financial corporations should decline perceptibly

Non-financial corporations in the euro area, by contrast, would see a drop in net interest income under the baseline scenario, though it should be significantly less pronounced than during the most recent tightening cycle. Under the "no tightening" scenario, the drop is considerably smaller, while it is markedly larger if

26 For a detailed analysis of the debt situation in the euro area, see Deutsche Bundesbank (2017), Recent developments in the indebtedness of the private non-financial sector in selected euro-area countries, op cit.

Simulation results for the baseline scenario by historical standards

Cumulative change in percentage points

Sources: BIS, ECB and Bundesbank calculations. **1** Including non-profit institutions serving households. **2** Net interest income equals the difference between interest earnings and interest payments. For ease of comparison and to adjust for price effects, net interest income is expressed as a percentage of gross domestic product. **3** The debt service ratio represents the sum of interest and redemption payments as a percentage of disposable income.

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ing phase, or at least that debt levels will not rise significantly.[27]

Moderate increase among non-financial corporations in euro area

For non-financial corporations in the euro area as a whole, there is a moderate increase across all scenarios, which falls perceptibly short of the increase seen during the last tightening phase. At the country level, there is a marked rise especially among non-financial corporations in France. Among this group, the debt service ratio swells significantly in all scenarios, and rises more sharply than in the period from the third quarter of 2005 to the third quarter of 2008 even if constant interest rates are assumed. This is because there has been a clear increase in the level of indebtedness in recent years, and this trend was implicitly extrapolated in the simulations. If the rate at which new debt is acquired were to decelerate significantly once an interest rate normalisation was introduced, the changes could be expected to be perceptibly smaller. The simulations yield a small drop for non-financial corporations in

Germany that is fairly similar across all scenarios given the high percentage of fixed rate liabilities.

In Spain and Italy, simulations indicate a decrease in debt service ratios. The noticeable differences between the various interest rate scenarios in Spain are due to the high proportion of floating rate liabilities. There are also noticeable, albeit slightly smaller, differences between the three scenarios among non-financial corporations in Italy, which are also frequently financed with floating rate loans. The striking differences as compared with what happened during the previous tightening cycle can be explained by the circumstance that, back then, with the economy strong, non-financial corporations, too, took on considerable amounts of debt. This led to rising redemption payments and a corresponding in-

Debt service ratios lower in Italy and Spain given altered debt dynamics

27 In the simulations, this is taken into account by extrapolating the existing deleveraging trend.

crease in debt service ratios. In the current situation, by contrast, the deleveraging process of recent years is likely to continue during the tightening cycle.[28]

Evaluation of results and concluding remarks

Interest rate normalisation is likely to have a limited impact on balance sheet indicators of private non-financial sector …

This article has focused on the question of how net interest income and debt service ratios of the private non-financial sector might develop as interest rates normalise. Overall, the results suggest that balance sheet indicators should deteriorate only slightly, with non-financial corporations tending to appear more vulnerable than households at the sectoral level. For example, the changes as calculated based on the simulations are generally low compared with the adjustments during the low interest rate period and the changes during the last interest rate tightening cycle (see the chart on p. 29).

… as debt levels have been reduced and interest rates should rise only slowly

This can be attributed primarily to two factors. First, indebtedness in some sectors and countries has come down significantly in recent years and should not pick up again significantly over the next few years, unlike during the last tightening cycle. Second, the interest rate level is likely to be altered only gradually, something that was different in the previous period of rising interest rates as well as with the easing during the low interest rate period. With changes likely to be small, the deterioration in the balance sheet indicators is unlikely to be accompanied by a significant weakening of the real economy.

Heterogeneities and impact on other sectors could exacerbate impact on the real economy

The aggregate results for households and non-financial corporations obtained here must be qualified in two ways. First, there could be significant differences between individual households and corporations within the two sectors. If an interest rate normalisation hits households and companies with a high level of debt and illiquid assets particularly hard, the potential negative effects on the real economy are likely to be stronger. Second, the analysis carried out here ignores the impact of an interest rate normalisation on an economy's other sectors – general government and financial institutions. If these were hurt by an increase in interest rates, this could also have negative financial and real economic implications.[29]

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28 Again, this is technically implemented through a trend extrapolation.
29 For an in-depth analysis of general government's interest expenditure, see Deutsche Bundesbank, The development of government interest expenditure in Germany and other euro-area countries, Monthly Report, July 2017, pp. 33-67.