

■ Distributional effects of monetary policy

In the aftermath of the financial and economic crisis, central banks worldwide reduced their policy rates to historical lows and took recourse to a range of unconventional policy measures, especially purchase programmes. Amongst other things, this has sparked a heated debate over whether and in what way monetary policy affects the distribution of income and wealth. Whereas the task of the Eurosystem's monetary policy is to maintain price stability and the political mandate for redistribution lies with fiscal policymakers, it is nevertheless important that monetary policymakers, too, analyse distributional effects in greater depth to gain a better understanding of the potential interaction between monetary policy and distribution to help them perform their monetary policy mandate in the best possible way. Much of the corresponding research on these issues is still in its infancy, and the findings depend to a large extent on the underlying models and assumptions. Caution is therefore warranted when interpreting the results. However, outlined below are a number of conclusions that can already be made as things stand today.

Contrary to earlier assumptions, monetary policy may, too, possibly exhibit distributional effects over the economic cycle, albeit comparatively weak ones. In conventional monetary policy mode, policy rate cuts may cause a slight reduction in distributional inequality; however, the reduction is marginal and relatively insignificant in terms of distributional developments over the past few decades.

The much-touted view that non-standard monetary policy measures demonstrably increased inequality cannot be corroborated. It is derived from analyses which are based on an inadmissible generalisation, neglect lagged distributional effects and fail to select the correct reference scenario.

Against the backdrop of existing studies and taking into account the three aspects mentioned above, it appears very doubtful, to put it mildly, that the expansionary non-standard monetary policy measures in recent years have caused inequality to increase overall. This particularly holds true for the distribution of income. Viewed in isolation, conventional interest rate policy and non-standard measures have probably, if anything, reduced income inequality. By contrast, the way in which these policies and measures have affected wealth distribution is less evident.

■ Introduction

Low interest rates and rising asset prices spark criticism of monetary policy

In times of exceptionally low interest rates, a growing chorus of voices have been lamenting the paltry interest earnings for savers as equity and real estate prices reportedly soar to record highs. These people suspect that income and wealth are being redistributed towards the already very wealthy households; in other words, that both income and wealth inequality are on the rise. While finding a socially acceptable or even desirable level of (in)equality is normally one of the main tasks of elected parliaments and governments, these developments are now pushing central banks into the spotlight as well. The historically low interest rates in the major economic areas and the abundance of non-standard monetary policy measures implemented worldwide since the onset of the financial crisis have sparked a mounting debate over whether central bank action systematically and persistently benefits certain parts of society.

Monetary policymakers interested in distribution due to its indirect impact on inflation and influence on transmission

The distribution of income and wealth is a fundamental political concern, ranking as it does as one of the building blocks of social cohesion and an issue that is constantly measured up against the general public's sense of justice. Monetary policymakers, by contrast, have a particular interest in distributional matters on two counts – first, in an indirect sense, because the distribution situation and developments have a bearing on the general monetary policy conditions through their effects on economic activity. Second, monetary policymakers also have a very clear direct interest in income and wealth distribution since, as a number of more recent research papers show, the impact of monetary policy measures hinges in part on the currency area's prevailing distribution situation, amongst other things.¹

■ Taking stock of the distribution situation

To answer the question of how income and wealth are distributed within society, it is first necessary to determine what exactly is to be examined. On the one hand, that means defining the underlying income and wealth concept. For income, it is particularly common, alongside gross (pre-tax) income or market income (before taxes and public transfers), to use (net) disposable income after government redistribution. With regard to wealth, the focus is typically on net wealth, where liabilities are subtracted from positive asset items.² The challenge here is to correctly record and value not just assets like real estate and business assets which often have no market price, but also accrued state pension assets. Income and wealth are calculated at the individual level or at the equivalised household level.³

Defining and measuring distribution

On the other hand, the individuals or groups of individuals for whom the distribution is to be investigated need to be identified. In addition to ordering individuals or households according to their income or wealth and analysing the resulting percentiles,⁴ it can also be revealing to analyse the distribution within and between

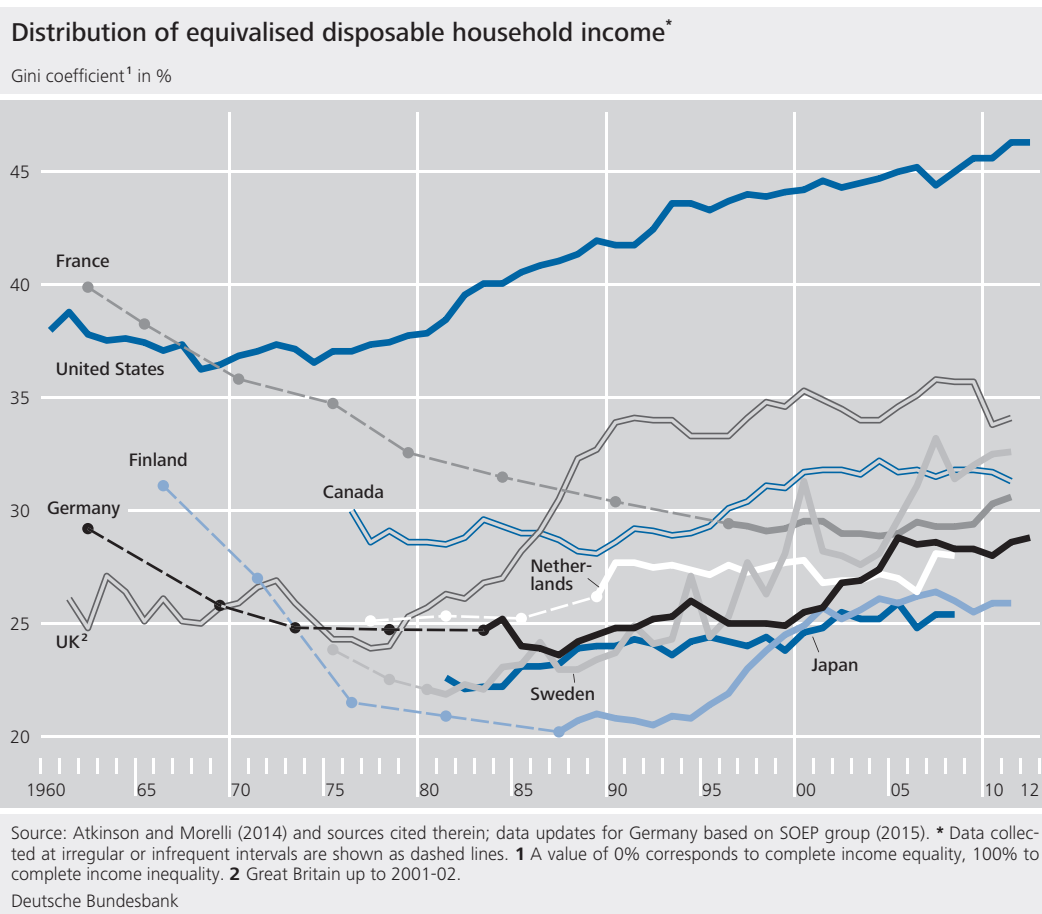
Distribution can be captured based on various household characteristics

¹ See G Kaplan, B Moll and GL Violante (2016), Monetary policy according to HANK, NBER Working Paper No 21897; A McKay and R Reis (2016), The role of automatic stabilizers in the US business cycle, *Econometrica* 84(1), pp 141-194; V Guerrieri and G Lorenzoni (2015), Credit crises, precautionary savings, and the liquidity trap, manuscript, January 2015; V Sterk and S Tenreyro (2016), The transmission of monetary policy through redistributions and durable purchases, manuscript, April 2016; as well as the papers referenced in greater detail below of Auclert (2016), Gornemann et al (2016), Luetticke (2015) and O'Farrell et al (2016).

² It is sometimes also worth analysing the distribution of certain income and wealth components such as entrepreneurial income or real estate assets.

³ To control for household size, the equivalisation approach assigns a value of 1 to the head of the household and lower values to each additional adult, especially to each child, because the needs of a household grow with each additional member but not in a proportionate way.

⁴ Percentiles are used to order individuals or households by income or wealth and then assign them to 100 equally sized groups for each of which the average income or wealth is computed. Similar measures for creating subsets include deciles (ten groups), quintiles (five groups) and quartiles (four groups).



population subgroups, eg young and old individuals, employed and unemployed individuals, creditors and debtors, tenants and homeowners, individuals with and without shareholdings.⁵

The heterogeneity in the dimensions stated above plays a key role for central banks in that economic agents react differently to monetary policy measures depending on their characteristics and financial situation. As distribution changes along each of the outlined dimensions may also entail changes in the monetary policy transmission process, it is not only distribution at a certain point in time but also its variations over time which are relevant.

The analysis below looks at the household level without any further sub-divisions. Owing to survey inconsistencies and data availability issues, comparing the distribution over time is only possible for a small number of countries and even there only to a limited extent.

Between roughly 1980 and 2005, inequality in disposable income – as measured by the Gini

⁵ See Deutsche Bundesbank, Ownership structure in the German equity market: general trends and changes in the financial crisis, Monthly Report, September 2014, pp 19-32. Generally speaking, it might also be worthwhile analysing the distribution of income and wealth across sectors and borders, but the main text of this article does not delve into this topic in greater detail.

Distribution of disposable income in Germany virtually unchanged over last ten years and less unequal than international average

coefficient⁶ – increased in the majority of surveyed countries; income inequality in Germany comes in just below midway in a comparison of all OECD, EU and EMU countries (see the chart on page 15).⁷ At the international level, distributional developments have been mixed since the financial crisis began in 2007. While income inequality measured in terms of the Gini coefficient has risen in the United States and France, it has remained almost unchanged in Germany and declined slightly in the UK.⁸

Net wealth distribution in Germany very unequal by international standards but virtually unchanged for ten years

Wealth inequality in Germany is high by international standards, with only the OECD countries the Netherlands, Austria and the United States as well as Sweden and Denmark showing similar or higher levels of wealth concentration.⁹ However, Germany's wealth distribution did not see any noteworthy changes between 2002 and 2012 – a finding that is backed up by Bundesbank data from the Panel on Household Finances (PHF) and the Household Finance and Consumption Survey (HFCS) (see the chart on page 17).¹⁰

Task of monetary policy and its channels of distributional effects

Distributional changes over the economic cycle

It is the Eurosystem's task to ensure price stability in the euro area by means of its monetary policy. Over the economic cycle, this normally means that, during booms (spells in which aggregate demand outstrips supply at normal utilisation levels, sending prices up), the central bank will increase the policy rate to put a damper on economic activity, while during downturns with low price pressures, it will cut the policy rate to stimulate economic activity. As they approached the effective lower bound in the aftermath of the severe financial and economic crisis of 2008-09, central banks increasingly turned to non-standard measures to provide monetary policy stimuli. It would seem reasonable to assume that monetary policy, being an important instrument of macroeco-

nomical stabilisation policy, also influences income and wealth distribution.¹¹

⁶ The Gini coefficient takes a value of 0 when all individuals exhibit identical income or wealth and a value of 1 when total income or wealth is held by a single individual or household. The coefficient says just as little about absolute wealth levels, equal opportunities or quality of life as it does about the extent of absolute poverty. An increase in the Gini coefficient cannot automatically be put down to tax or social policy measures with lower redistributive effects, since it can also be caused by demographic changes such as a higher birth rate, immigration of poorer individuals or a decline in life expectancy or in average household size. A low Gini coefficient of income can exist alongside a high Gini coefficient of wealth, as in the case of Sweden. Other distribution measures besides the Gini coefficient include the following. First, income and wealth ratios for different percentiles (99/1, 95/5, 90/10, 90/50, 75/25), which attach a higher weight to differences in income at the tails of distribution, whereas Gini coefficient differences close to the median are given the same weight as those far away; see A B Atkinson (1970), On the measurement of inequality, *Journal of Economic Theory* 2, pp 244-263; second, absolute measures such as the share of income or wealth in the hands of the poorest x% of society, which make it possible to gain a better understanding of the extent of (relative) poverty; see F G De Maio (2007), Income inequality measures, *Journal of Epidemiology and Community Health* 61(10), pp 849-852; third, the Theil index with its decomposability into subgroups.

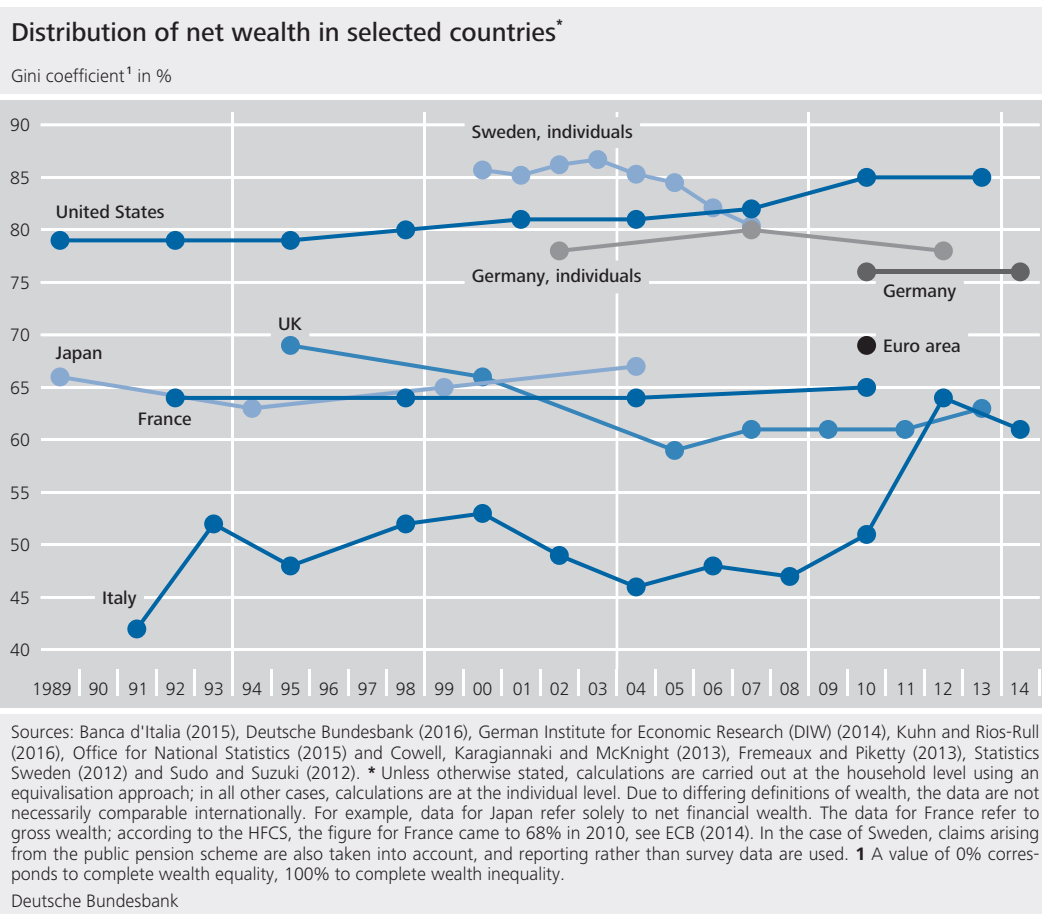
⁷ See OECD (2015), In it together. Why less inequality benefits all, in particular Figures 1.1 and 1.3. The German Council of Economic Experts holds a similar view, which is based on data from Germany's Socio-Economic Panel (SOEP); German Council of Economic Experts (2014); Annual Economic Report 2014/15, Charts 85, 88 and 89, pp 372-380.

⁸ See R O'Farrell, Ł Rawdanowicz and K Inaba (2016), Monetary policy and inequality, OECD Economics Department Working Paper No 1281, Box 1.

⁹ See OECD (2015), Household wealth inequality across OECD countries: new OECD evidence, OECD Statistics Brief, No 21, June 2015, Figure 2. The basis of measurement used here is the share in total wealth held by the richest 10% of the population. The countries Sweden and Denmark do not appear in this publication, but comparable publications on the same measure suggest that this is the case both for the top decile and the Gini coefficient; see Credit Suisse Global Wealth Databook (2015), p 16; Allianz Global Wealth Report (2015), p 52; and German Council of Economic Experts (2014), Annual Economic Report 2014/15, Chart 93.

¹⁰ See Deutsche Bundesbank, Household wealth and finances in Germany: results of the 2014 survey, Monthly Report, March 2016, pp 61-82; German Institute for Economic Research (DIW) (2014), Vermögensverteilung, DIW Wochenbericht 9/2014; German Council of Economic Experts (2014), Annual Economic Report 2014/15, Table 26 and Charts 90 and 93, pp 382-393; and O'Farrell et al (2016), Box 1. The high Gini coefficient readings for wealth, compared with those for the distribution of income, are attributable to the significant share of households or individuals without any positive wealth, amongst other things.

¹¹ However, changes would take place in income and wealth distribution over the course of the economic cycle even in the absence of monetary policy measures. And even in a hypothetical economy without money, those who take on entrepreneurial risk would tend to enjoy greater income and wealth during a boom, while those same people would suffer disproportionately heavy losses during a downturn.



Earlier assumption of distribution-neutral monetary policy over economic cycle increasingly questioned

While the finding that monetary policy measures also have a distributional dimension is not new, it was typical for that line of thinking to implicitly assume that monetary policy was distribution-neutral over the economic cycle, in that it favoured the one subgroup of society during the upswing and the other during the downturn.¹²

This theory is increasingly being called into question, however. It does not hold, for instance, when there are asymmetries in monetary policy behaviour, thus when monetary policy shows a stronger response to asset price declines, say, than to corresponding increases in the context of financial stability.¹³ A second reason behind the asymmetrical distributional effects of monetary policy might be its varying levels of effectiveness over the economic cycle. According to this view, unexpected policy rate changes tend, for the most part, to have a stronger impact on expenditure and prices during upswings than downturns.¹⁴ It is, therefore,

conceivable that asymmetries in one form or another might also result in monetary policy having distributional effects which do not fully offset one another over the economic cycle.

However, drawing conclusions on the distributional effects of monetary policy is fraught with

¹² See speech by R Rajan at the University of Frankfurt, 10 November 2015; and O'Farrell et al (2016), p 12. See also P Krusell and A Smith (1998), Income and wealth heterogeneity in the macroeconomy, *Journal of Political Economy* Vol 106(5), pp 867-896.

¹³ Between 1987 and 2000, the US Fed under Alan Greenspan's chairmanship repeatedly lowered policy rates in response to falling equity prices but for the most part did not raise rates when equity prices rose – a behaviour pattern many market players expected to continue in the future. See also SH Ravn (2012), Has the Fed reacted asymmetrically to stock prices?, *The B.E. Journal of Macroeconomics* 12(1), pp 1-36; SH Ravn (2014), Asymmetric monetary policy towards the stock market: a DSGE approach, *Journal of Macroeconomics*, Vol 39 (A), pp 24-41.

¹⁴ See S Tenreyro and G Thwaites (2016), Pushing on a string: US monetary policy is less powerful in recessions, *American Economic Journal: Macroeconomics*, forthcoming. See also O'Farrell et al (2016), op cit, pp 12-13; E Santoro, I Petrella, D Pfajfar and E Gaffeo (2014), Loss aversion and the asymmetric transmission of monetary policy, *Journal of Monetary Economics* 68, pp 19-36.

Historical evolution of income and wealth distribution in Germany

An analysis of the evolution of income and wealth distribution in Germany forms the empirical basis for the current debate on cross-country income and wealth distribution. The Gini coefficient is used as the measure of the unequal distribution of income and wealth. German reunification provides a natural caesura in the evolution of wealth and income inequality over time. The text below first outlines the evolution of income distribution and then that of wealth distribution.

According to OECD data, the old Federal Republic of Germany prior to reunification (West Germany) was one of the wealthiest and most egalitarian countries, as measured by income.¹ In the 1980s the Gini coefficient of West German net household income was below 25% and remained con-

stant between 1960 and 1990 (see the chart below).²

Immediately after German reunification, there was initially little sign of any change in the distribution of income. While income inequality tended to increase owing to the unification of the west German population with their poorer neighbours in eastern Germany (the former German Democratic Republic), incomes in eastern Germany were distributed more evenly, thus reducing the disparity somewhat.³ However, the former factor appears to have become more dominant over the years as the unequal distribution of gross income subsequently increased.

The adjacent chart illustrates that net income distribution after 1999 began to trace the path of the increasingly unequal distri-



1 See G Corneo, S Zmerli and R Pollak (2014), Germany: rising inequality and the transformation of Rhine capitalism, *Changing Inequalities and Societal Impacts in Rich Countries: Thirty Countries' Experiences*, chapter 12, p 271ff.

2 See OECD (2008), *Growing unequal?: Income distribution and poverty in OECD countries*. Equivalised market income comprises wage income (including employers' shares in social contributions), entrepreneurial income, property income excluding capital gains, excluding government pensions and social transfers. Aggregating all the individual market incomes in a household gives the household market income. These incomes can be personalised within the household. This is done by converting the household market income into a personalised income using the equivalence weightings of the modified OECD scale, which take account of the number and age of the household members. The resulting income is termed equivalised market income. Deducting tax from the household market income and adding transfers gives the net household income. For a precise definition of market income, see: S Bach, G Corneo and V Steiner (2007), *From bottom to top: the entire distribution of market income in Germany, 1992-2001*, SOEPpapers on Multidisciplinary Panel Data Research 51, DIW Berlin, October 2007, chapter 3.2 and Appendix 1.

3 For a discussion on this and additional references, see: T Brück and H Peters (2009), *20 years of German unification: evidence on income convergence and heterogeneity*, DIW Discussion Paper 925.

Development of Gini coefficients for wealth over time and according to various data sources

Item	Study	1973	1983	1988	1993	1998	2002	2008	2010	2012	2014
Germany	EVS	–	–	–	63.2	68.5	71.3	74.8	–	74.3	–
	SOEP	–	–	–	–	–	75.4	75.9	–	74.2	–
	PHF	–	–	–	–	–	–	–	75.8	–	76.1
western Germany	EVS	74.8	70.1	66.8	62.5	64.1	69.9	73.5	–	72.5	–
	SOEP ¹	–	–	–	–	–	76.1	78.4	–	76.8	–
	PHF	–	–	–	–	–	–	–	73.8	–	74.6
eastern Germany	EVS	–	–	–	69.4	67.6	71.9	75.3	–	77.2	–
	SOEP ¹	–	–	–	–	–	81.6	82.3	–	79.2	–
	PHF	–	–	–	–	–	–	–	76.6	–	78.4

Sources: Gini coefficients for 1973: H Mierheim and L Wicke (1978), *Die personelle Vermögensverteilung*, Tübingen, pp 58-59. Gini coefficients for 1983: H Schломann (1992), *Vermögensverteilung und private Altersvorsorge*, Frankfurt am Main/New York, pp 136-139. Gini coefficients for eastern and western Germany from 1988 to 1998: R Hauser and H Stein (2001), *Die Vermögensverteilung im vereinigten Deutschland*, Frankfurt am Main/New York, pp 112-124. Gini coefficients for the whole of Germany from 1993 to 1998: A Ammermüller, AM Weber and P Westerheide (2005), *Die Entwicklung und Verteilung des Vermögens privater Haushalte unter besonderer Berücksichtigung des Produktivvermögens*, Abschlussbericht zum Forschungsauftrag des Bundesministeriums für Gesundheit und Soziale Sicherung. Gini coefficients for Germany based on the SOEP: Federal Ministry of Labour and Social Affairs (March 2013), *Der Vierte Armuts- und Reichtumsbericht der Bundesregierung*. Gini coefficients for western and eastern Germany based on the SOEP: MM Grabka and C Westermeier (2014), *Anhaltend hohe Vermögensungleichheit in Deutschland*, DIW Wochenbericht No 9.2014, Berlin. Gini coefficients based on the PHF study: Deutsche Bundesbank, *Household wealth and finances in Germany: results of the 2014 survey*, Monthly Report, March 2016, pp 57-82. Gini coefficients for Germany after 2002 based on the EVS: Federal Ministry of Labour and Social Affairs (March 2013), *Der Vierte Armuts- und Reichtumsbericht der Bundesregierung*. Gini coefficients for western and eastern Germany after 2002 based on the EVS: special study for the Deutsche Bundesbank. In this case, the Gini coefficients for western and eastern Germany after 2002 were calculated by the Federal Statistical Office in the context of a special study for the Bundesbank. For western Germany, the calculation for 2013 excludes Berlin but the calculations for 2003 and 2008 include West Berlin. For eastern Germany, the calculations for 2003 and 2008 include East Berlin, while the calculation for 2013 includes the whole of Berlin. ¹ All Gini coefficients are shown at the household level except for the SOEP data for eastern and western Germany.

Deutsche Bundesbank

tribution of gross income, as the rise in the Gini coefficient for net income shows. The Gini coefficient for net household income increased noticeably between 2000 and 2006. It then fell slightly, though without fully reversing the rise that had taken place over the previous decade. In 2012, the Gini coefficient stood at 29%. According to OECD data, this was slightly below the OECD average (31.5%) and above the Gini coefficients of the Nordic OECD countries, but below the value for the United States.⁴

According to Corneo et al (2014), the increase in income disparity in Germany is linked to changes in the economic system, such as tax law, the labour market or the social security system.⁵ Biewen and Juhasz (2012) examine six possible determinants which together can explain some 80% of the rise between 1999-00 and 2005-06. About half of this increase is explained by

wage differentiation and around a quarter is the result of employment trends.⁶

Besides income distribution, wealth distribution also plays a significant role in analysing households' financial situation. However, the data on wealth distribution are limited. The table above gives an overview of the Gini coefficients available from various surveys covering differing periods. Hauser and Stein (2003)⁷, and Ammermül-

⁴ See OECD (2015), *In it Together: Why Less Inequality Benefits All*, Figure 1.1.

⁵ Corneo et al (2014), *op cit*. The authors further argue that other institutional changes such as the declining influence of the trade unions and rising income risk owing to a smaller supply of permanent jobs have caused an increase in inequality.

⁶ See M Biewen and A Juhasz (2012), *Understanding Rising Inequality in Germany, 1999/2000-2005/06*, *Review of Income and Wealth*, Vol 58, pp 622-647.

⁷ R Hauser and H Stein (2003), *Inequality of the distribution of personal wealth in Germany 1973-1998*, Working Paper Series No 298, The Levy Economics Institute.

ler, Weber and Westerheide (2005)⁸ investigate the development of inequality in wealth distribution since the 1970s based on the sample survey of income and expenditure (EVS);⁹ additional data based on the German Socio-Economic Panel (SOEP) were used for the period since 2000.¹⁰ For the most recent past, ie since 2010, the data from the "Panel on Household Finances" (PHF) survey are additionally available.¹¹ Although the individual studies take different approaches and use different methods when measuring wealth, they nevertheless produce comparable results.

The inequality of distribution of households' disposable net wealth in western Germany prior to reunification declined from 74.8% in 1973 to 70.1% in 1983 and 66.8% in 1988 (see the table on page 19).¹² Gini coefficients for eastern Germany are only available for the years since reunification.

Following reunification of the two German states, a growing inequality of wealth distribution in Germany was apparent until around 2008. The Gini coefficient for the whole of Germany rose from 63.2% in 1993 to 68.5% in 2003 and 74.8% in 2008.¹³ While this development was largely constant across western Germany, in eastern Germany there was initially a drop in the somewhat higher level of wealth inequality, from 69.4% in 1993 to 67.6% in 1998, before the increase that was also observed in western Germany set in and ran until 2008.

According to the various data sources, the evolution of wealth distribution since 2008 appears somewhat unclear, but largely flatlining. If the PHF study is taken as a basis, net household wealth for the period between 2010 and 2014 shows a consistently high Gini coefficient of around 76%.¹⁴

8 A Ammermüller, A Weber und P Westerheide (2005), Die Entwicklung und Verteilung des Vermögens privater Haushalte unter besonderer Berücksichtigung des Produktivvermögens, Abschlussbericht zum Forschungsauftrag des Bundesministeriums für Gesundheit und Soziale Sicherung.

9 A detailed description of the EVS can be found in Hauser and Stein (2003). The EVS has been carried out by the Federal Statistical Office every five years since 1962-63 based on a survey of between 45,000 and 60,000 households. Data on wealth have only been collected since 1973. In 1973 and 1983, data on participating interests held in private businesses were collected according to the taxation value and subsequently had to be adjusted to the market value. Financial assets include tradable shares. The surveys in 1993 and 1998 included estimates of the market prices of real estate and land. The exclusion of households with a monthly household income of €18,000 or more may have skewed the estimates downwards. As a regular, cross-sector survey, the EVS provides only limited comparability over time.

10 The German Socio-Economic Panel (SOEP) is a representative longitudinal study of individual persons in German households. In 2002, a questionnaire on wealth was introduced with questions on various wealth components. To improve comparability over time, the wealthiest households are disproportionately highly represented in the SOEP and are continuously asked about the various wealth components in all survey rounds. For details see JR Frick (2006), A General Introduction to the German Socio-Economic Panel Study (SOEP) – Design, Contents and Data Structure.

11 The "Panel on Household Finances" (PHF) is a survey by the Bundesbank on German households' wealth and finances. Details can be found in U von Kalckreuth, M Eisele, J Le Blanc, T Schmidt and J Zhu (2012), The PHF: a comprehensive panel survey on household finances and wealth in Germany, Deutsche Bundesbank Discussion Paper No 13/2012.

12 Studies on the evolution of wealth distribution prior to reunification based on the EVS can be found in Hauser and Stein (2003), Mierheim and Wicke (1978) and Schломann (1992), all op cit.

13 A Ammermüller, A Weber and P Westerheide (2005), op cit.

14 Deutsche Bundesbank, Household wealth and finances in Germany: results of the 2014 survey, Monthly Report, March 2016, pp 57-82.

Challenges in determining the distributional effects of monetary policy

uncertainty for a good number of reasons. First and foremost, it is extremely difficult to precisely determine the impact monetary policy measures have. This is because when monetary policymakers introduce measures they almost invariably do so in response to changes in general economic conditions. Thus, it is very difficult to distinguish between the impact of monetary policy measures and the economic changes that prompted their introduction when analysing the effects of such a rule-based monetary policy. So although the academic literature has made huge strides, it remains a challenge to clearly isolate the effects of monetary policy from those caused by other simultaneous or slightly earlier events.¹⁵

Second, when studying the impact of a monetary policy that responds to other influences, it is important to be aware of the counterfactual development, ie what would have happened in the absence of the monetary policy response. Not taking a monetary policy measure such as a policy rate move has a distributional effect as well. The alternative to the distributional effects of a given monetary policy measure is not the absence of distributional effects but different effects, either as a result of other changes in the economy or precisely because of the absence of the monetary policy measure and the potential disappointed expectations that this entails. Estimating this counterfactual development calls for a theoretical model, the results of which may, however, be driven by the assumptions about the model structure as well as by the data.

Third, there is the matter of measurement problems surrounding the income and wealth of high net worth individuals¹⁶ or changes to the prices of illiquid assets such as real estate, to name just two examples.

Fourth, the distributional effect of a monetary policy measure is not necessarily constant over time. For example, a policy rate cut can increase inequality in the short term, whereas the

positive real economic effects only act to reduce inequality over a longer period.¹⁷

These considerations already show that a clearly delineated investigation of the possible distributional effects of monetary policy comes up against a number of challenges. To make the task more difficult still, the distributional effects of monetary policy can materialise through a host of different channels.

The recent literature identifies five transmission channels.¹⁸ (i) Income composition: a change in the policy rate affects disposable income in a heterogeneous manner, depending on the primary type of income. Diminishing interest rates tend to reduce income from financial assets, whereas business income tends to rise. Labour earnings and transfers normally respond with a slight time lag, and do so particularly via unemployment developments. The overall effect on the distribution of income following an expansionary measure through the income composition channel cannot be quantified *ex ante*. This does not apply to the income of households participating actively and frequently in the financial market. They are better placed than other households to benefit from a policy rate cut: the early bird catches the worm, as it were (ii: financial segmentation). Income is also dependent on the composition of the asset portfolio: households with a large share of pos-

Transmission channels

¹⁵ The section later in this article dealing with microsimulation studies addresses this and other topics in greater detail.

¹⁶ See P Vermeulen (2016), Estimating the top tail of the wealth distribution, *American Economic Review: Papers & Proceedings* 106(5), pp 646-650.

¹⁷ See German Institute for Economic Research (DIW) (2016), EZB-Anleihekäufe können Vermögensverteilung beeinflussen, *DIW Wochenbericht* 7/2016, 17 February 2016.

¹⁸ O Coibion, Y Gorodnichenko, L Kueng and J Silvia (2016), Innocent bystanders? Monetary policy and inequality in the U.S. (manuscript), 17 February 2016. An older version of the paper appeared in 2012 as NBER Working Paper 18170. German Institute for Economic Research (DIW) (2016) adds another channel, the interest rate exposure channel based on Auclert (2016), to the five channels listed there; this new channel is absorbed by channels (i), (ii) and (iii) in the present structure. German Institute for Economic Research (DIW) (2016), op cit; Adrien Auclert (2016), *Monetary policy and the redistribution channel*, manuscript, Princeton University, January 2016.

Transmission channels for effects of monetary policy on distribution of income*

Transmission channel	Transmission mechanism
(i) Income composition	Business, financial and labour income as well as transfers all respond differently to policy rate changes ¹
(ii) Financial segmentation	Households participating actively and frequently in the financial market are better placed to benefit from the positive effects of policy rate changes
(iii) Portfolio	Households with a disproportionately large share of asset positions that are not protected against inflation, such as currency, suffer more from the inflationary effect of a policy rate cut
(iv) Savings redistribution	Unexpected cuts in policy rate (or increases in inflation) hurt savers and benefit borrowers, ie typically hurting the wealthier and benefiting the less wealthy ²
(v) Earnings heterogeneity	Labour earnings respond to unexpected policy rate changes to a differing extent depending on wage rigidities, the substitutability of work with capital and labour supply behaviour. Policy rate cuts tend to reduce unemployment in the short term (as the strongest form of wage income response), thus disproportionately benefiting poorer people who have a lower education level and are more at risk of unemployment

* Based on Coibion, Gorodnichenko, Kueng and Silvia (2016).

¹ The heterogeneity of households with regard to their primary source of income determines the distributional effect. In the Consumer Expenditure Survey, households are questioned about the following four sources of income: labour earnings, business, financial and other. Since the elasticity of each source of income to policy rate changes differs in size, this results in distributional effects. See Coibion et al (2016), p 2 ff, section 3.4 and Appendix Table 2. ² This channel is often referred to as the Fisher channel after I Fisher (1933), The debt-deflation theory of great depressions, *Econometrica* 1 (4), pp 337-357, for instance in Auclert (2016). An important examination of this channel is provided by M Doepke and M Schneider (2006), Inflation and the redistribution of nominal wealth, *Journal of Political Economy* 114 (6), pp 1069-1097.

Deutsche Bundesbank

itions that are not protected against inflation suffer more from the inflationary effect of a policy rate cut (iii: portfolio). Expansionary monetary policy tends to increase income inequality through channels (ii) and (iii). However, this is offset by counterbalancing effects from two other channels: unexpected policy rate cuts or rising prices hurt savers and benefit borrowers (iv: savings redistribution) and reduce unemployment at the same time, at least temporarily (v: earnings heterogeneity). This cursory overview alone makes it plain that the interrelationships between effects, even in the realm of conventional interest rate policy, are complex and do not clearly have the same out-

come.¹⁹ The question of how monetary policy affects the distribution of income is therefore an empirical one. To make matters more complicated, the studies which explicitly address this question often do not consider all the transmission channels outlined here, or the selected techniques do not allow effects to be unambiguously attributed to individual transmission channels.²⁰ Nevertheless, the transmission channels described here provide a useful, didactic structure (see the adjacent table), with the aid of which this article will first analyse the distributional effects of conventional monetary policy before illuminating the distributional effects of the non-standard monetary policy measures which have been increasingly observed over the past few years.

Distributional effects of conventional monetary policy

Recent empirical studies for the United States and for the United Kingdom show that surprise policy rate hikes seem to increase income inequality in the short term, whereas surprise policy rate cuts reduce income inequality in the short term.²¹ The income composition channel (channel (i)) is identified as the major driver for the USA: whereas wages are virtually invariant

Unexpected policy rate cuts reduce cyclical income inequality but do not impact significantly on distribution trend

¹⁹ In addition, the effects of expansionary and contractionary monetary policy through the various channels are not inevitably mirror images of each other, as in the case of channel (ii).

²⁰ These channels cannot be entirely applied to the distributional effects on wealth, partly because the examination of the latter has to include the adjustment in human capital formation, say.

²¹ Coibion et al (2016), op cit, based on US data from 1980 to 2008; and H Mumtaz and A Theophilopoulou (2015), Monetary policy and inequality in the UK, School of Economics and Finance at Queen Mary University of London Working Paper No 738, and ibid (2016), The impact of monetary policy on inequality in the UK. An empirical analysis, School of Economics and Finance at Queen Mary University of London Working Paper No 783. The authors use annual data from the United Kingdom from 1968 to 2008 and quarterly data from 1969 to 2012, respectively. All three papers focus on unexpected policy rate cuts and their inequality-reducing effect. Since the selected VAR approaches are linear, the symmetry produces mirror-image results for unexpected policy rate hikes. This approach inevitably fails to take into account the above-mentioned possible asymmetries between expansionary and contractionary monetary policy measures.

and entrepreneurial income rises, lower interest rates make financial income drop significantly while countercyclical transfers rise. The causal relationship between transfers and monetary policy is unclear, though. The rise in transfers, however, is a significant driver of diminishing income inequality, since transfers make up much of the income of low-income earners.²² Still, monetary policy only goes a little of the way towards explaining the development of income inequality in the models, and it has had no influence on the trend growth in US income inequality since the 1980s.²³ The distributional effect of monetary policy seems to be less pronounced when the central bank pursues an inflation target.²⁴ This could be seen as an indication that the more central banks are bound to rules, the less important unsystematic monetary policy measures become for distribution. Although the studies also find indications of effects along channels (ii) to (v), these would appear to be relatively negligible in quantitative terms.

Distributional effect chiefly through the income effect of unemployment

The main finding made by Coibion et al (2016) – that expansionary monetary policy reduces income inequality, while contractionary monetary policy increases it – can also be found in more recent structural models. In a New Keynesian model framework with labour market frictions, in which the relative labour earnings effect is modelled in detail depending on the employee’s qualification level, an expansionary monetary policy initially reduces unemployment; however, since it is precisely the bottom earners who are hit particularly hard by unemployment, an expansionary monetary policy acts to diminish inequality through the income composition and earnings heterogeneity channels.²⁵ Furthermore, an expansionary monetary policy reduces the inequality of the distribution of income and wealth in a model framework with illiquid asset positions, in which both the heterogeneity of household portfolios and liquidity constraints play an important role (see the box on pages 30 to 34).²⁶ In addition to channel (i), this model gives in-depth consideration to the portfolio channel (iii) and the savings redistribution channel (iv),

though both are deemed to be of secondary importance.

Third and lastly, inequality-reducing effects of expansionary monetary policy can also be revealed by conducting a detailed analysis of the heterogeneous effects of short-term changes in real interest rates. These real interest rate changes occur in conjunction with monetary policy measures and affect households to very different degrees, depending on their portfolio structure.²⁷ In this approach, all five channels

22 Insofar as the rise in transfers comes more in response to a downturn in economic activity than to an unexpected monetary policy measure, the inequality-reducing effect of expansionary monetary policy is probably overstated.

23 However, the results achieved by Coibion et al (2016) should be subjected to critical scrutiny insofar as they only relate to the unsystematic, surprising part of monetary policy, which is measured here using the narrative approach of Romer and Romer (2004); Ch D Romer and DH Romer (2004), A new measure of monetary shocks: derivation and implications, *American Economic Review* 94(4), pp 1055-1084. The time series for such shocks, dubbed “monetary policy shocks”, is derived from (i) a time series of intended policy rate changes (determined inter alia from FOMC minutes) and (ii) the Fed’s internal inflation and GDP projections. The errors remaining when regressing (i) on (ii) then make up the desired time series for monetary policy shocks. Using similar data to Coibion et al (2016), Davtyan (2016) comes to the opposite conclusion, namely that surprise policy rate cuts increase income inequality; K Davtyan (2016), Income inequality and monetary policy: an analysis on the long run relation, Universitat de Barcelona Research Institute of Applied Economics Working Paper 2016/04.

24 Mumtaz and Theophilopoulou (2015), op cit. The surprise monetary policy measures are identified here by means of sign restrictions.

25 N Gornemann, K Kuester and M Nakajima (2015), Doves for the rich, hawks for the poor? Distributional consequences of monetary policy, manuscript. The authors’ theoretical model also enables them to analyse the effects of changes in the monetary policy response function – ie the rule-based part of monetary policy – where they also find significant distributional effects.

26 C Bayer, R Luetticke, L Pham-Dao and V Tjaden (2015), Precautionary savings, illiquid assets, and the aggregate consequences of shocks to household income risk, CEPR Discussion Paper No 10849; R Luetticke (2015), Transmission of monetary policy with heterogeneity in household portfolios, mimeo, University of Bonn. Luetticke (2015) also finds that surprise policy rate cuts reduce both income inequality and wealth inequality, despite the losses in wealth caused by inflation.

27 A Auclert (2016), Monetary policy and the redistribution channel, op cit. The major innovation in his work is a detailed analysis of the interest rate exposure channel, which captures the effects of the short-term drop in the real interest rate after a policy rate cut. Auclert finds that these effects depend on the asset items of households including their human capital, less their debt, which in Auclert’s model also includes consumption plans in the sense of a liability. This article’s five-channel presentation incorporates Auclert’s interest rate exposure channel in channels (i) to (iii).

appear to be relevant for the redistributive effect of monetary policy, and *vice versa*, redistribution here seems to be a relevant channel for asymmetrical real economic effects of monetary policy: in this paper, interest rate hikes produce stronger redistributive effects than interest rate cuts.

Microsimulation studies for the euro area not explicitly related to monetary policy

Microsimulation studies provide no information on distributional effects of monetary policy, but they do very clearly illuminate certain distributional aspects

Alongside analyses of the impact of monetary policy measures on distribution, microsimulation studies, too, deliver useful information on the distributional effects of a surprise decline in price levels or an increase in asset prices. The strength of this microsimulation method lies in its ability to precisely replicate the actual distribution of the various wealth components in different households, sectors and countries of the euro area. However, such studies are not analyses that explore the distributional effects of a monetary policy measure, since the first stage of the transmission of a monetary policy measure to the general price level or to asset prices is not modelled.²⁸ Microsimulation studies are classical partial analyses which disregard certain parts of the overall impact, as well as feedback and second-round effects. Two of these studies which use Bundesbank data from the Panel on Household Finances (PHF) and the Household Finance and Consumption Survey (HFCS) are discussed below. They focus not on the distribution of income but on that of wealth.

Sudden drop in price level leads to redistribution among households, sectors and countries

The first study simulates a sudden and unexpected 10% drop in the price level and examines its impact on the wealth distribution.²⁹ A decline on that scale can normally be expected to occur in the aftermath of a strong expansion in aggregate supply or a significant decline in aggregate demand, but it could also materialise in conjunction with an unforeseen, highly contractionary monetary policy, as this, too, dampens the rate of price growth. This paper

mainly analyses the aforementioned portfolio and savings redistribution channels (iii) and (iv), and shows that a surprise drop in inflation of this magnitude increases net wealth inequality in the euro area as a whole, but reduces it in Germany, as well as in Austria and Malta. This is mainly down to leverage levels among young, middle-income households. In these three countries, young, middle-income households have very little debt, which is why the price decline does not raise their real debt levels by much, either. And the rise in wealth inequality is just as meagre, since the wealth of these typically less affluent young households does not diminish.

The second study, meanwhile, analyses the direct effect of a 10% increase in housing, bond and equity prices on the wealth distribution.³⁰ As explained below, this is the oft-postulated isolated effect of an expansionary monetary policy measure (conventional or unconventional) on asset prices. This paper looks particularly at the income composition channel (i), assuming unchanged labour earnings. PHF/HFCS data³¹ reveal that wealth inequality increases when equity prices rise, but that it declines

Equity price appreciation amplifies wealth inequality, housing price inflation reduces it

²⁸ It goes without saying that in the absence of a monetary policy measure as a starting point, it is also not possible to analyse distributional effects through channels that are not directly related to wealth, such as parts of the income composition channel (i) and the earnings heterogeneity channel (v).

²⁹ K Adam and J Zhu (2016), Price level changes and the redistribution of nominal wealth across the euro area, *Journal of the European Economic Association* 14(4) pp 871-906.

³⁰ K Adam and P Tzamourani (2016), Distributional consequences of asset price inflation in the euro area, *European Economic Review* 89, pp 172-192. Event studies on the ECB's announcement of the OMT programme likewise ascertain a roughly 10% increase in equity prices; however, this announcement naturally had a host of further direct and indirect effects, which will also have distributional consequences sooner or later. The study should not, therefore, be mistaken for an attempt to fully capture the distributional consequences of the OMT programme; see K Adam and P Tzamourani (2016), in particular pp 179-180.

³¹ The PHF (Panel on Household Finances) study is a representative household survey undertaken by the Deutsche Bundesbank; it forms part of the Eurosystem's Household Finance and Consumption Survey (HFCS).

Distributional consequences of asset price inflation in the euro area

The non-standard monetary policy measures deployed by a large number of central banks tend to have a highly inflationary effect on asset prices. This asset price inflation can be associated with substantial distributional effects, which is why it is attracting ever more attention from policymakers and the public at large.¹

A recently published paper (Adam and Tzamourani, 2016)² sets out to quantify the distributional effects of asset price inflation in the euro area. The data set used in the analysis is taken from the latest Eurosystem Household Finance and Consumption Survey (HFCS), which provides detailed, harmonised and representative information on euro-area households' balance sheet items for the 2010 reference year.³ Altogether, roughly 62,000 households from all the euro-area countries at that time (except for Ireland) were surveyed.

Distribution of capital gains across the population

The paper begins by exploring the distribution of capital gains relative to household net wealth in the euro area given a 10% increase in equity, bond and housing prices.

The table below shows that the capital gains associated with equity and bond price inflation are confined to a relatively small group of euro-area households. The median household does not benefit at all from these price appreciations, while the top 5% of households that benefit most from them experience net wealth gains of roughly 3% to 4%. These gains are rather large given the 10% increase in bond and equity prices considered here. Housing price appreciations, by contrast, benefit a substantially larger proportion of the population than do higher equity or bond prices; here, the median household experiences large net wealth gains of close to 8%. The paper

¹ See M Draghi (2015), The ECB's recent monetary policy measures: effectiveness and challenges, Camdessus lecture, IMF, Washington, DC, 14 May 2015; and A Haldane (2014), Unfair shares, Speech at the Bristol Festival of Ideas, Bristol, 21 May 2014.

² K Adam and P Tzamourani (2016), Distributional consequences of asset price inflation in the euro area, *European Economic Review* 89, pp 172-192.

³ Information on the methodology used and a summary of the results can be found in Household Finance and Consumption Network (HFCN) (2013), The Eurosystem Household Finance and Consumption Survey, Methodological Report, European Central Bank; HFCN (2013), The Eurosystem Household Finance and Consumption Survey – results from the first wave, European Central Bank. Data for the second wave are only available for a small group of countries. The results for Germany can be found in Deutsche Bundesbank, Household wealth and finances in Germany: results of the 2014 survey, Monthly Report, March 2016, pp 57ff.

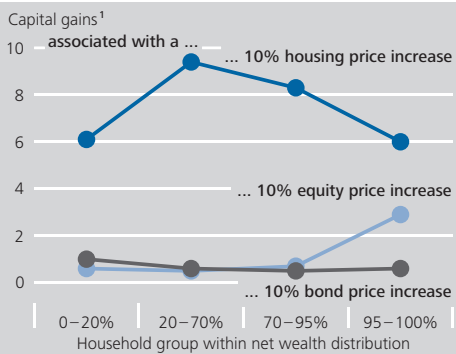
Capital gain distribution in the euro area associated with a 10% increase in equity, bond and housing prices

As a percentage of household net wealth

10% increase in	Household position in the capital gain distribution						
	5th percentile	10th percentile	25th percentile	Median	75th percentile	90th percentile	95th percentile
Bond prices	0.0	0.0	0.0	0.0	0.4	2.1	3.8
Equity prices	0.0	0.0	0.0	0.0	0.4	1.7	3.3
Housing prices	0.0	0.0	0.0	7.3	9.6	12.1	17.6

Source: Adam and Tzamourani (2016).
 Deutsche Bundesbank

Capital gains across the net wealth distribution in the euro area



Source: Adam and Tzamourani (2016). ¹ As a percentage of group net wealth.
 Deutsche Bundesbank

then moves on to investigate whether the capital gains and household net wealth are systematically related. It does so by once again analysing capital gains, but not, as before, by ordering all the households according to the size of their capital gains but by splitting them into four groups based on their net wealth.

Capital gains across the net wealth distribution

The distributional effects of the capital gains in the euro area differ quite substantially from one asset class to the next. The above chart shows the capital gains for the different household groups within the net wealth distribution (average group gains divided by average net wealth). “Poor households” are defined as those in the bottom 20% of the euro-area net wealth distribution, “middle class households” as the 50% of households immediately above the poor ones, while “upper middle class households” are the 25% of households above that. Lastly, “rich households” are the top 5% of households in the net wealth distribution.

Capital gains from bond price appreciation display no significant variation across these four household groups. Relatively few households benefit from higher bond prices, and their number is roughly the same across the net wealth distribution. The situation is noticeably different for capital gains from equity price increases, which are heavily concentrated among the richest 5% of households. The distribution of capital gains from housing price increases, meanwhile, has a hump shape, with gains being concentrated among middle class and upper middle class households in the euro-area net wealth distribution. Poor and rich households benefit to a lesser extent (relative to their net wealth) from housing price appreciations; fewer poor households own real estate, while for rich households, real estate accounts for a smaller share of their wealth.

As Adam and Tzamourani (2016) demonstrate, the individual countries of the euro area display substantial differences to one another. Thus, there are some countries where poor households, too, are more likely to be homeowners and are highly leveraged. For this reason, these households benefit to a greater extent (relative to their net wealth) from rising housing prices than other wealth groups. The opposite holds true for Austria, Germany, France and Italy, where poor households are less likely to be homeowners and therefore benefit least of all (relative to other groups in the net wealth distribution) from housing price increases. In Germany, where house ownership levels are particularly low, housing price increases do not affect the median household.

The resulting changes in net wealth inequality are reflected in the change in the Gini coefficient for net wealth distribution. Higher housing prices cause the Gini coeffi-

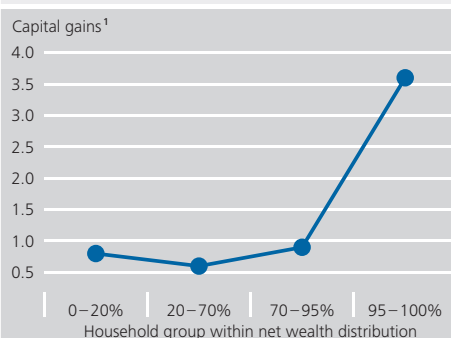
cient to decline substantially, particularly in countries in which poor households benefit to a disproportionately strong extent from such increases. Rising equity prices cause the Gini coefficient to increase significantly, while bond price appreciation leaves the net wealth distribution largely unchanged.

While the analysis of the HFCS data does not permit a causal analysis of the effects of monetary policy surprises, it is worth at least trying to gauge the direct distributional effects via asset prices. Following the paper of Peersman and Smets (2003),⁴ this is done by determining how an unexpected policy rate change affects equity, bond and housing prices and then analysing the direct consequences for the distribution of wealth. The outcome is that an unexpected monetary policy easing triggers a disproportionately large increase in the capital gains at the upper end of the net wealth distribution – the richest 5% of households experience capital gains that are five times higher, on average, than those of the other households. By the same token, these households experience capital losses that are five times heavier if monetary policy is unexpectedly tightened.

Distributional consequences of the ECB's OMT announcements

The ECB's programme of outright monetary transactions (OMTs) was announced over the summer of 2012, but these operations were subsequently never activated. The OMT announcement nevertheless had large and persistent effects on a range of financial market prices. Following Krishnamurty et al (2004),⁵ the programme's distributional consequences are derived from identified announcement effects on bond and equity prices, while the effects on housing prices were not included on account of data shortages.⁶ As far as the distributional

Capital gains from equities and bonds associated with OMT announcements*



Source: Adam and Tzamourani (2016). * ECB outright monetary transactions (OMTs). ¹ As a percentage of group net wealth.

Deutsche Bundesbank

consequences are concerned, the effects of the OMT announcements were found, in qualitative terms, to strongly resemble those of an unexpected easing of monetary policy. Here, too, the main beneficiaries are to be found at the top end of the net wealth distribution. Quantitatively speaking, the distributional implications of the OMT announcements largely matched those of a surprise loosening of the policy rate by 175 basis points. However, this microsimulation study does not observe all the transmission channels of an expansionary policy stance, which is why generalisations should be viewed with some caution.

⁴ See G Peersman and F Smets (2003), The monetary transmission mechanism in the euro area: more evidence from VAR analysis, in I Angeloni, A K Kashyap and B Mojon (eds), Monetary policy transmission in the euro area, chapter 2, pp 36-55.

⁵ A Krishnamurthy, S Nagel and A Vissing-Jorgensen (2014), ECB policies involving government bond purchases: impact and channels, Working Paper.

⁶ Analysis based on closing price changes in the Barclays Euro Aggregate Bond index and EuroStoxx 50 index on the day preceding the OMT announcement and the day following the announcement. Since housing prices cannot be observed at high frequency, the distributional effects stemming from housing price movements cannot be computed here.

when housing prices go up.³² However, the dispersion of the effects on wealth distribution is significant, notably in the case of housing price inflation. Whilst inequality clearly subsides in countries where home ownership rates are high (Spain, Finland), this effect is considerably weaker in countries with a high proportion of rentals, such as Austria, France and Germany (see the box on pages 25 to 27).

Distributional effects of non-standard monetary policy measures

Asset price inflation in wake of non-standard monetary policy measures just one aspect of their distributional effect

In the current situation, with nominal policy rates hovering close to 0% in Japan, the euro area and the United Kingdom, the scope for reducing policy rates as a means of implementing expansionary monetary policy is nearly exhausted. Central banks have switched to other methods instead, such as purchasing large volumes of long-dated bonds as a way of lowering the long-term nominal interest rate.³³ This, too, can give rise to complex distributional effects.³⁴ The general public holds the central banks' purchase programmes responsible for the considerable price increases seen in certain assets such as real estate and equities, which are associated with a redistribution towards wealthier individuals.

Expansionary non-standard monetary policy measures likely to reduce distributional inequality through other transmission channels over medium term, making overall impact uncertain

A view appears to have crystallised in the existing academic literature that non-standard monetary policy measures have increased wealth inequality in the short term by raising asset prices. The medium to long-term effect on wealth distribution, however, is not clear, since this is strongly dependent on the macroeconomic adjustment processes triggered in response to the monetary policy measures. These adjustment processes have not been given the attention they deserve in the vast majority of existing studies (see the table on page 29). The effect of non-standard monetary policy measures on the distribution of income is driven by the same arguments. While the non-standard measures tend to increase income inequality

through that part of the income composition channel (i) that relates to financial income, they foreseeably reduce them through the parts of the income composition channel (i) that do not relate to financial income and through the savings redistribution channel (iv) and the earnings heterogeneity channel (v), albeit with a certain time lag. In light of the insights summarised above on the distributional effects of conventional expansionary monetary policy, a decline in income inequality as a result of the non-standard monetary policy measures seems probable, insofar as non-standard measures do not have an entirely different impact on the distribution than conventional monetary policy, at least in essential respects. As changes in employment, in particular, have a huge bearing on distributional developments,³⁵ any efforts to gauge the distributional effects of non-standard monetary policy measures should not only consider the direct effects on asset prices, but also the lagged distributional effects caused by changes in the labour market.

Finally, it should be borne in mind that distributional developments are, for the most part, analysed in relation to the *status quo* prior to the implementation of the monetary policy measure in question; it would be more relevant, however, to compare them with the counterfactual situation – that is, a situation in which the central banks took no action.³⁶

³² Equity price increases benefit only a small number of rich households, whereas a rise in housing prices makes significantly more households wealthier in nominal terms – in particular the middle class. Bond price increases produce fairly equally distributed growth in wealth.

³³ On top of this, the Eurosystem has conducted a series of very long-term refinancing operations (LTROs, VLTROs, TLTROs), which have had a similar effect on long-term bond yields.

³⁴ Brunnermeier and Sannikov (2016) see this as a redistribution from taxpayers to banks, and specific asset purchases such as the Securities Markets Programme (SMP) quite possibly even as an international redistribution benefiting certain euro-area countries; cf *ibid* (2016), *The I theory of money*, NBER Working Paper No 22533, August 2016.

³⁵ See D Krueger, K Mitman and F Perri (2016), *On the distribution of the welfare losses of large recessions*, NBER Working Paper No 22458, July 2016.

³⁶ See the literature listed above, in particular Bayer et al (2015), Casiraghi et al (2016) and Bank of England (2012).

Distributional effects of non-standard monetary policy measures in time series and partial equilibrium approaches

Publication	Measure analysed	Approach	Distributional effect	Note
Saiki and Frost (2014)	Expansion of monetary base in Japan 2002-13	VAR	Increase in income inequality	No analysis of counterfactual situation and macroeconomic adjustment effects
Mumtaz and Theophilopoulou (2016)	Quantitative easing (QE) by Bank of England 2009-12	Partial equilibrium	Richest 5% of households benefited disproportionately	Approach disregards any effects which QE might have beyond bond prices
Bank of England (2012)				Aggregate effects of QE likely to benefit broad majority of population
Domanski et al (2016)	Asset price changes in France, Germany, Italy, Spain and UK			Increase in wealth inequality
Adam and Tzamourani (2016)	Asset price changes in the euro area	Semi-structural econometric model and satellite models	Negligible change in income and wealth distribution, as the countervailing distributional effects of asset price increases and higher employment compensate each other	Counterfactual situation simulated, but general equilibrium effects not captured in a fully consistent manner in a single model
German Institute for Economic Research (2016)				
Casiraghi et al (2016)	Effects of Eurosystem's non-standard monetary policy measures in Italy: SMP, OMT announcement, three-year tenders; PSPP			

Sources: A Saiki and J Frost (2014), Does unconventional monetary policy affect inequality? Evidence from Japan, *Applied Economics* 46(36), pp 4445-4454; H Mumtaz and A Theophilopoulou (2016), The impact of monetary policy on inequality in the UK. An empirical analysis, School of Economics and Finance at Queen Mary University of London, Working Paper No 783; Bank of England (2012), The distributional effects of asset purchases, *Quarterly Bulletin* 2012, Q3, pp 254-266; D Domanski, M Scatigna and A Zabai (2016), Wealth inequality and monetary policy, in *BIS Quarterly Review*, March 2016; K Adam and P Tzamourani (2016), Distributional consequences of asset price inflation in the euro area, *European Economic Review* 89, pp 172-192, especially section 4.5; German Institute for Economic Research (DIW) (2016), EZB-Anleihekäufe können Vermögensverteilung beeinflussen, *DIW Wochenbericht* 7/2016, 17 February 2016; M Casiraghi, E Gaiotti, L Rodano and A Secchi (2016), A "reverse Robin Hood"? The distributional implications of non-standard monetary policy for Italian households, *Banca d'Italia Temi di discussione* No 1077.

Deutsche Bundesbank

Taking into account the counterfactual situation and the status quo prior to implementation of non-standard monetary policy measures, these appear to be welfare-boosting in spite of their distributional effects

As mentioned above, an analysis of the distributional effects of not taking the monetary policy measure requires a structural theoretical model that suitably captures both non-standard monetary policy measures and a sufficient degree of household heterogeneity. Bayer et al (2015) take a first step in this direction.³⁷ The starting point of their analysis is a sudden shock to income risk, to which households respond with stronger demand for more liquid investment products. Excess demand for such investment products can lead to consumption and investment restraint and thus to welfare losses. This modelling approach captures an important aspect both of the acute financial crisis and of

the ensuing weakness of economic activity that has lasted to this day, and the significance of monetary policy also quickly becomes apparent. By providing an adequate measure of liquid assets, specifically central bank money, it can increase welfare but also contribute to asset price inflation. If the central bank acts accordingly with rule-based optimising behaviour, households with a high proportion of real assets and those with a low income (and the major advantage of high employment) benefit

³⁷ C Bayer, R Luetticke, L Pham-Dao and V Tjaden (2015), Precautionary savings, illiquid assets, and the aggregate consequences of shocks to household income risk, CEPR Discussion Paper No DP10849.

Distributional effect of monetary policy arising from valuation and general equilibrium effects

Many important questions regarding the distributional consequences of monetary policy can only be answered within the context of a micro-based general equilibrium model. For example, owing to the endogeneity of monetary policy measures, the winners and losers of systematic monetary policy can only be identified using a counterfactual analysis. A model of the kind described above additionally enables the user to break down the distributional effects of unexpected monetary policy measures into individual income and wealth effects. In particular, it yields information on welfare effects which go beyond those relating to the pure valuation effects of monetary policy on assets.

For this purpose, it is important to capture the interaction of monetary policy measures and the distribution of income and assets in a theoretically consistent manner: Bayer, Luetticke, Pham-Dao and Tjaden (2015),¹ and, building on their work, Luetticke (2015)² have developed a model framework that addresses these matters. Expanding on the New Keynesian model with its price-setting rigidities by incorporating household heterogeneity, it accounts for the distribution of wealth and liquidity of assets.

In this model framework, the (welfare) effects of monetary policy measures are very unevenly distributed. Monetary policy has a distorting effect on the relative prices of labour and illiquid and liquid assets and thus changes the level of total household assets (including human capital) in a number of very different ways. Hence, monetary policy influences aggregate demand not just by means of intertemporal substitution but also through its distributional effects.

A New Keynesian model incorporating heterogeneous households

Compared with a New Keynesian model incorporating a representative agent, as is customarily used for analysing monetary policy, Bayer et al (2015) and Luetticke (2015) deviate from the assumption of complete financial markets, ie the notion that the household sector can fully protect itself against income risks. Since households are borrowing-constrained, they accumulate precautionary savings in the form of nominal and real assets, albeit with differing degrees of liquidity: nominal assets are more liquid than real assets. In this context, poorer households hold a larger share of their total assets in low-yielding liquid nominal assets (eg in the form of savings and overnight deposits) while most wealthy households invest in more illiquid real assets that offer a higher return (eg real estate). According to the Survey of Consumer Finances (SCF), this pattern is also reflected in the empirical distribution of portfolios in the United States (see chart on page 31).

The private sector can create illiquid assets by investing in physical capital, with the effect that a change in demand for illiquid assets is directly reflected in a change in investment. By contrast, any change in demand for liquid assets or in the supply of such assets, for instance as a result of central bank policy, only has an indirect effect on investment in the economy inasmuch as

¹ C Bayer, R Luetticke, L Pham-Dao and V Tjaden (2015), Precautionary savings, illiquid assets, and the aggregate consequences of shocks to household income risk, CEPR Discussion Paper No DP10849.

² R Luetticke (2015), Transmission of monetary policy with heterogeneity in household portfolios, mimeo, University of Bonn.

it modifies the relative returns generated by illiquid and liquid assets.

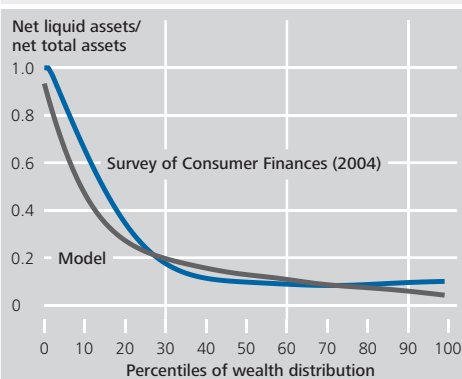
Thanks to the model framework used here, it is now possible to look beyond the distributional effects of the macroeconomic consequences induced by monetary policy (ie the business cycle effect) and to study the central bank's influence on changes in the prices of nominal and real assets (ie the portfolio effect/debt deflation).

Distributional effects of an unexpected change in the policy rate

Luetticke (2015) examines the distributional effects of an unexpected temporary increase in the nominal interest rate by one standard deviation, ie by 18 basis points. As with a model incorporating a representative agent, this approach initially generates a decline in aggregate consumer demand and demand for capital goods, causing GDP to fall by 0.54% on impact.³

That said, this policy affects the wealth and income of households very differently. The table below quantifies the losses and gains experienced by individual wealth deciles in

Liquid assets as a share of household portfolios



Source: Bayer et al (2015).
 Deutsche Bundesbank

the period during which an unexpected change in the policy rate occurs, relative to the average consumption level within the decile, and thus illustrates the magnitude of those changes for the respective wealth

³ The magnitude of the effect is outlined in the literature; see L Christiano, M Eichenbaum and C Evans (2000), Monetary policy shocks: What have we learned and to what end?, in: J Taylor and M Woodford (eds), Handbook of Macroeconomics 1, Elsevier Science, pp 65-148.

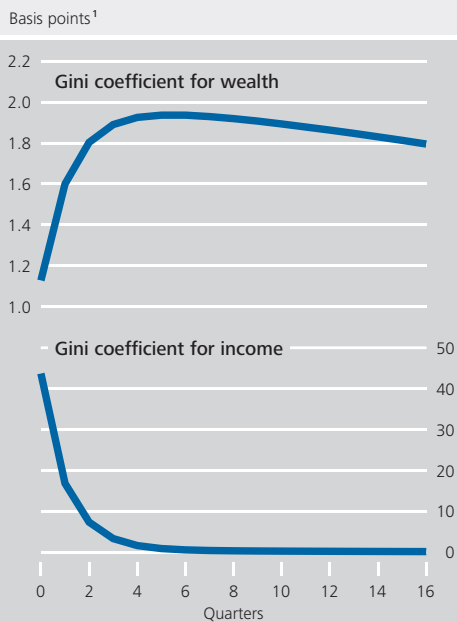
Gains and losses arising from an unexpected increase in the policy rate, by wealth decile*

in %

Wealth decile	Income gains/losses			Wealth gains/losses	
	Real interest rate on liquid nominal assets $\Delta \left(\frac{R_t^B}{\pi_t} \right)$	Return on illiquid real assets Δr_t	Labour income and corporate earnings $\Delta(W_t N_t + \Pi_t)$	Value of illiquid real assets Δq_t	
0- 10	-0.23	-0.00	-1.62	-0.00	
10- 20	-0.10	-0.01	-1.57	-0.04	
20- 30	-0.03	-0.03	-1.53	-0.13	
30- 40	0.02	-0.05	-1.51	-0.21	
40- 50	0.04	-0.08	-1.49	-0.31	
50- 60	0.06	-0.11	-1.45	-0.43	
60- 70	0.08	-0.14	-1.40	-0.56	
70- 80	0.10	-0.20	-1.28	-0.80	
80- 90	0.15	-0.52	0.01	-2.11	
90-100	0.29	-1.27	1.39	-5.18	

Source: Luetticke (2015). * Gains and losses in individual wealth deciles are expressed as a percentage of the average level of consumption within a given decile in the period during which an unexpected change in the policy rate occurs.

Impulse responses of the Gini coefficients for wealth and income*



Source: Lueticke (2015). * To a one-standard-deviation unexpected temporary rise in the nominal interest rate. ¹ An increase in the Gini coefficient for wealth by 100 basis points corresponds to an increase in that Gini coefficient from, for example, 0.81 to 0.82.
 Deutsche Bundesbank

groups.⁴ Higher nominal interest rates, coupled with falling inflation, lead to an even sharper increase in the real interest rate on nominal debt securities and therefore result in a redistribution from debtors to savers. The model assumes that, in accordance with the SCF data, slightly more than 20% of households start off as net debtors. Due to the mechanism known as debt deflation (Fisher, 1933), the share of these households rises alongside their level of debt.⁵ Private households' efforts to save incur a further decline in aggregate consumer demand, thereby highlighting the interaction between redistributive consequences and the macroeconomic effects of monetary policy.

A restrictive monetary policy additionally intensifies the degree of income inequality and therefore indirectly also wealth inequality because the mostly wealthier entrepreneurial households benefit from rising profit

margins while labour income falls on account of dwindling demand for labour. On the other hand, wealthier households – which tie most of their wealth up in illiquid real assets – have to contend with losses in value due to falling capital goods prices. However, since these losses are only partially realised owing to the long-term investment horizon, the overall degree of wealth inequality nonetheless increases.

The adjacent chart shows the changes in the Gini coefficients for wealth and income in basis points and over time. Monetary tightening only increases wealth inequality to a minimal degree while income inequality goes up perceptibly in the short term but more or less returns to the initial state after about a year.

These results are consistent with the empirical findings of von Coibion et al (2012) which demonstrate that a restrictive monetary policy heightens inequality.⁶ Unlike a vector autoregression (VAR) model, the model in question has the advantage of depicting, distinguishing between and quantifying the individual income and wealth effects, as shown in the table on page 31.

Distributional effects of systematic monetary policy

Owing to the endogeneity of monetary policy, it is no longer possible to conduct an empirical VAR analysis to analyse the distributional consequences of systematic monetary policy. If monetary policy systematically responds to changes in economic fun-

⁴ Consumption is often favoured as a benchmark variable in theoretical models as it represents a real variable with a significant and direct influence on welfare.
⁵ I Fisher (1933), The debt-deflation theory of great depressions. *Econometrica* 1(4), pp 337-357.
⁶ O Coibion, Y Gorodnichenko, L Kueng and J Silvia (2012), Innocent bystanders? Monetary policy and inequality in the US, NBER Working Papers No 18170.

Welfare gains/losses arising from stabilising monetary policy

as a percentage of consumption in a given year

Distribution	1st quintile ¹	2nd quintile	3rd quintile	4th quintile	5th quintile
Distribution of liquid assets	2.7	1.3	0.55	0.1	-0.45
Distribution of illiquid assets	0.35	0.45	0.7	0.95	1.35
Distribution of labour income	2.05	1.5	0.85	0.2	-0.35

Source: Bayer et al (2015). ¹ A household in the bottom quintile for the distribution of liquid assets with an average labour income and illiquid assets would be willing to forego 2.7% of its annual level of consumption in order to prompt stabilising central bank intervention measures.

Deutsche Bundesbank

damentals, it is no longer possible to empirically identify the contribution of monetary policy to the overall economy and to inequality as compared to simultaneous changes in other factors. In view of the above, it is therefore essential to consult a theoretical model.

With this in mind, Bayer et al (2015) commence by pointing out that a higher level of income risk leads to a decline in both consumer and investment demand as households are inclined to increase their precautionary savings by primarily building up reserves in liquid securities while liquidity-constrained households tend to liquidate real assets. This behaviour causes inflation to fall, investment activity to contract and illiquid capital goods to depreciate.

In particular, Bayer et al investigate the distributional effects of stabilising monetary policy in response to a slump in aggregate demand. During the "Great Recession", the US economy's slow pace of recovery was mainly attributed to a persistently low level of demand. While tighter credit standards and the need for deleveraging are often cited as explanatory factors,⁷ Bayer et al (2015) show that heightened uncertainty concerning future income developments can also play a key role in weakening demand.

The model allows the user to make a counterfactual analysis and, notably, to draw a comparison between stabilising and non-stabilising monetary policy in the event of changes in demand. The central bank is in a position to stabilise the economy as a whole by enlarging the monetary base in response to any increase in demand for liquid assets, thus countering any deflationary pressure.

Such stabilising monetary policy on the part of the central bank has a positive effect on overall economic welfare. The household sector would, on average, be willing to forego around 0.8% of its annual level of consumption in order to prompt stabilising central bank intervention measures. However, the above table makes clear that this average figure masks highly heterogeneous changes in welfare.

Whenever the central bank stabilises the economy, this leads to an increase in the prices of illiquid assets (eg real estate) relative to labour income and compared with a scenario in which no intervention occurs. Exceedingly high-income households (top quintile of the distribution of income) which have accumulated only small quantities of illiquid assets lose out under a policy geared to stabilisation. If the central bank were to

⁷ GB Eggertsson and P Krugman (2012), Debt, deleveraging, and the liquidity trap: a Fisher-Minsky-Koo approach, *The Quarterly Review of Economics* 127(3), pp 1469-1513.

allow a recession to occur, these households would be affected by falling labour income, yet this negative effect would be more than offset by the more favourable purchase price of real assets. According to the model, households with highly liquid assets are likewise placed at a disadvantage as they bear the burden of funding the monetary expansion. Conversely, stabilising monetary policy particularly benefits wealthy households whose assets are mostly real, as well as poor and low-income households that are wholly dependent on their labour income and for whom stabilised wages and demand for labour are of critical importance. Eventually, stabilised incomes, especially those of liquidity-constrained households with a high propensity to consume, will impact positively on consumer demand and thus on the effectiveness of systematic monetary policy.

to a particularly large extent from the monetary policy action in the model, while households with a high income but low holdings of real assets tend to be worse off (see the box on pages 30 to 34).

■ Conclusion

Given the mandate of monetary policy to safeguard price stability and the division of tasks with policy areas in national ownership, distributional effects are not, nor can they be, a primary or secondary goal of monetary policy. That said, the distributional *status quo* does have a bearing on the effects produced by monetary policy measures. For central banks, then, a profound understanding of these effects, and thus research on the interplay between monetary policy and distribution, will remain important topics going forward.

Distributional effects provide useful insights for monetary policy but not a monetary policy objective

Many questions surrounding the impact of monetary policy measures on the distribution of income and wealth and more still on the consequences of a certain income and wealth distribution for the transmission of monetary policy still have not been extensively explored. The fact that the first two waves of the Bundesbank's wealth survey (Panel on Household Finances, PHF) showed no strong signs of significant redistribution between 2010-11 and 2014 could be taken as an indication that the non-standard monetary policy measures carried out by the Eurosystem up to 2014 did not have any major redistributive effects.³⁸ However, further research on this topic – notably assessments of distributional microdata in con-

Research on monetary policy and distribution still in its infancy

³⁸ However, a number of factors qualify this statement. These include the time lag before redistributive effects become visible in wealth distribution, the fact that strong redistributive effects might have been offset by equally strong countervailing redistributive effects caused by other factors, and finally the fact that the counterfactual development without monetary policy measures is unknown.

junction with theoretical models – would appear to be necessary to gain a rough idea of the counterfactual situation that is so crucial for evaluation yet often disregarded and more difficult to communicate in the public debate.

Current level of knowledge

Drawing on the existing research, it would appear reasonable to draw the following conclusions from the current perspective.

First, contrary to earlier assumptions, monetary policy may, too, possibly exhibit distributional effects over the economic cycle, albeit comparatively weak ones.

Second, in conventional monetary policy mode, policy rate cuts may cause a slight reduction in distribution inequality; however, the reduction is marginal and relatively insignificant in terms of distributional developments over the past few decades.

Third, there are three reasons why the much-touted view that non-standard monetary policy measures had demonstrably increased inequality cannot be corroborated. That view was derived from analyses which are based on an inadmissible *pars pro toto* assumption, neglect lagged distributional effects and fail to select the correct underlying reference scenario.

Regarding the first reason, most available studies confine themselves to analysing asset price developments and their effects on the distribution of wealth and income. Once asset price increases become associated, to a greater or lesser degree, with monetary policy measures, it is then argued that monetary policy has increased inequality. This is incorrect insofar as that is just one aspect of the effect of monetary policy measures. Besides affecting asset prices, monetary policy measures in general and the non-standard measures applied over the past few years in particular have also had a bearing on economic activity, employment, macroeconomic uncertainty and confidence among market players. A major driver of income inequality, in particular, is the labour market and the risk

of unemployment for low-skilled, poorer households.³⁹ Severe recessions lead to significant welfare losses, in particular through their effects on the labour market.⁴⁰ Monetary policy measures which reduce the risk of unemployment therefore have a great deal of potential to reduce distributional inequality.

As for the second reason, it is also true of monetary policy distributional effects that they cannot materialise everywhere simultaneously. Equity prices, for example, move almost immediately in response to monetary policy measures, whereas price changes for illiquid assets are only measurable with a considerable delay, at best, and the same holds true for real economic effects through consumption, investment and employment. It therefore follows that the distributional effects of non-standard monetary policy measures can also change as time progresses since the measure in question was taken and that measures which initially appear to be redistributing upwards can turn out to have the opposite effect later on.

The third and final reason is that the *status quo* before the measure is taken often serves as the reference point when assessing monetary policy measures. This does not make sense, however, insofar as the measure was often introduced precisely because this *status quo* was about to change due to unforeseen circumstances. The right reference point for analysing the distributional effect of a monetary policy measure, then, is not the distribution before the measure is implemented, but the distribution that would have materialised if the measure had not been introduced. However, determining this counterfactual situation calls for a whole series of assumptions which can best be made using a consistent theoretical model.

³⁹ See Coibion et al (2016) and Gornemann et al (2016), both *op cit.*; see also LP Feld and Ch M Schmidt (2016), *Jenseits der schrillen Töne. Elemente für eine rationale Diskussion über die Ungleichheit von Einkommen und Vermögen in Deutschland, Perspektiven der Wirtschaftspolitik* 17(2), pp 188-205.

⁴⁰ See Krueger et al (2016), *op cit.*

Judging by what the existing literature says about these three points, it appears very doubtful, to put it mildly, that the expansionary non-standard monetary policy measures in recent years have caused inequality to increase overall. Whereas the non-standard measures,

viewed in isolation, are likely to have reduced inequality in terms of the distribution of income, their aggregate effect on the distribution of wealth still remains unclear in view of the three reasons described above.