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Quantitative Easing – What Are the Side Effects on Income and Wealth Distribution

In-Depth Analysis

Kerstin Bernoth, Philipp J. König, Benjamin Beckers and Caterina Forti Grazzini

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Quantitative Easing - What Are the Side Effects on Income and Wealth Distribution

In-Depth Analysis

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Berlin, June 2015

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Executive Summary

- The European Central Bank (ECB) only announced a large-scale asset purchase (LSAP) program in January 2015, with actual purchases only starting in March. Therefore it is too early to assess the distributional impact that this program may have had.

- Some doubts can be casted on the claim that the ECB's program will have sizeable and long-lasting effects on bond yields and real economic activity based on research investigating the effects of similar purchase programs in the US, the UK and Japan. However, appreciation of asset values observed since the introduction of the program is quite substantial.

- Usually, central banks show an attitude of `benign neglect' with respect to issues concerning the distribution of the economy's aggregate income and wealth. This is justified insofar as the overall impact of monetary policy on income and wealth distributions in normal times is rather ambiguous.

- However, in exceptional times, when central banks employ large-scale outright purchases programs to overcome the zero-lower-bound restriction on their policy rates, the relative potency of the respective channels by which income and wealth distributions are affected is altered.

- Whenever the main effect of asset purchases occurs initially and primarily in financial markets and induces a pronounced appreciation of financial asset values, adverse distributional effects may result since primarily wealthier households benefit from it.

Adverse distributional effects are likely mitigated once the asset purchases unfold their intended impact on real economic activity and inflation.

- Since the ECB's extended asset purchase program started at a time when long-term interest rates were already low and liquidity in the financial system was abundant, major effects are likely to be observed only in financial markets where they lead to an increase in asset prices and therefore valuation gains for the holders of these assets.

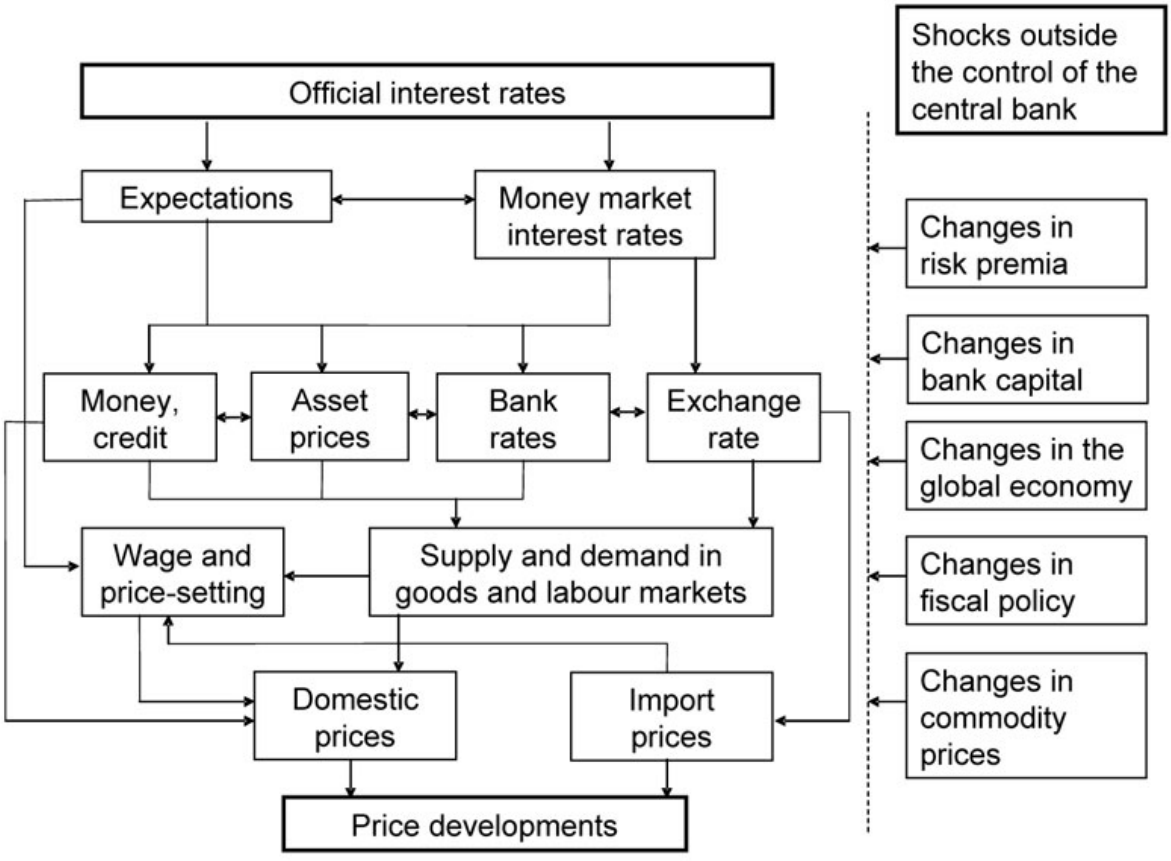
- This implies that the ECB's asset purchase program will most likely, at least in the short-run, exacerbate income and wealth inequalities in the euro area.

- Overall, the distributional consequences of the ECB's asset purchase programs are therefore ambiguous. Once the program helps to stabilize and improve real economic activity, it will first and foremost help those at the lower tail of the wealth and income distribution; but as the impact of purchases is, at the moment, primarily felt in financial markets, they are likely to aggravate inequality.

1 Inequality and the Monetary Transmission Process

The European Central Bank's (ECB) ultimate targets are the macroeconomic variables that it wants to control in order to maintain macroeconomic and financial stability. For the past twenty or so years, a consensus has emerged that an environment of low and stable inflation is important for sound macro-financial conditions and for fostering economic development (Goodfriend, 2007). In this vein the ECB targets, for example, an inflation rate of below, but close to, 2 percent over the medium term. However, central banks are usually not able to directly steer their ultimate target variables, i.e. they do not exert direct control over the aggregate price level or the general levels of unemployment and aggregate production. Therefore they employ operational targets, for example the overnight interest rate on the interbank market, that can be more directly controlled through the central bank's monetary policy instruments. Changes in the operational target then, albeit with a lag, affect the ultimate targets. The process, by which initial monetary policy actions eventually give rise to changes in the ultimate target, is the monetary transmission mechanism. Figure 1 provides a stylized overview of the ECB's transmission process.

Figure 1: Stylized Representation of the ECB's Monetary Transmission Process



Source: European Central Bank

In normal times, the transmission process starts with changes in the central bank's policy rate, which lead to immediate changes in the operational target and further induce agents in the economy to adjust their expectations about the central bank's policy stance and the future course of monetary policy[1].

Via financial markets and the banking sector, these adjustments are further transmitted to interest rates of different maturities (1-month, 1-year, 10-year etc.) for different types of assets (covered bonds, bank bonds, government bonds, stocks, commercial paper etc.) and loans (mortgages, consumption loans, credit lines to firms etc.), thereby also affecting asset prices (including exchange rates) and inducing changes in the consumption, saving and investment decisions of households and firms. These, in turn, give rise to changes in aggregate demand. Thereby prices, employment and output change and eventually the desired level of the ultimate target(s) is achieved; for example, the inflation rate of close to 2 percent as in the case of the European Central Bank.

1.1 How Monetary Policy Changes Income and Wealth Distributions

Although the distributions of income and wealth in the economy are usually not of first-order importance for monetary policymakers and the central bank – neither stated as official ultimate targets nor central to monetary policy announcements and press conferences – this does not imply that monetary policy actions cannot have distributional consequences. In particular, at each instant in the monetary transmission process, the economy's income and wealth distributions may be altered. However, even though such distributional consequences are typically viewed by central banks as unintentional, they can also alternatively be viewed as an essential part of the transmission process (Tobin, 1982). With respect to the way in which monetary policy changes income and wealth distributions, the literature distinguishes between the following channels[2.]

a. **Interest rate exposure channel:** Interest rate changes by the central bank affect asset and liability positions of economic agents. Auclert (2015) defines the difference between maturing assets and liabilities at a certain point in time as net saving requirements. A decrease in the interest rate benefits those agents who have negative net saving requirements, while it hurts those with positive net saving requirements. For example, agents who have primarily invested into long-term assets are likely to benefit from interest rate decreases compared to those who hold short-term bonds. Hence, interest rate reductions re-distribute wealth from those with positive to those with negative net saving requirements, and conversely for interest rate increases. To the extent that households saving for retirement are strongly invested into long-term bond holdings, they tend to gain from falling interest rates.

[1] The ECB employs three policy rates, the rate on the main refinancing operations and the interest rates on its two standing facilities (deposit facility and marginal lending facility). The main refinancing rate is usually considered to be the ECB's main policy rate. In normal times it is set exactly equal to the midpoint of the corridor provided by the standing facility rates.

[2] The literature on monetary policy and inequality is not abundant and no consensus terminology is established. Therefore, we use the terminology of Coibion *et al.* (2012) for the description of the different channels.

b. **Financial segmentation channel:** Policy-induced changes in the money supply may primarily benefit those groups of agents who directly interact with the central bank or who participate in financial markets more frequently. This idea goes back to pre-classical economist Richard Cantillon (b. 1680, d. 1730) and was more recently explored by Ledoit (2011) in a financial network model, as well as by Williamson (2008) in a model of asset and goods market segmentation. In Williamson's model, market segmentation induces distortions such that monetary expansions imply inefficient allocations and redistributions of wealth between different groups of agents. Since wealthier households are more likely to be more strongly connected to financial markets, expansionary monetary policy may exacerbate wealth and income inequalities.

c. **Earnings heterogeneity channel:** Monetary policy actions may affect earnings of high-income households in a different way than it does for low-income households. In particular, given that labour earnings are the main source of income for most households, monetary policy may lead to changes in the income distribution, if it does not affect the employment situation of all income groups homogenously (Carpenter et al., 2004). For example, because low-income households have a higher unemployment probability than high-income households, expansionary monetary policy shocks may benefit primarily the poorer households unevenly. The earnings heterogeneity channel therefore implies that expansionary monetary policy tends to reduce income and wealth inequalities.

d. **Income composition channel:** Relatedly, the effects of monetary policy on income may be different for those agents who receive a large part of their income from wage earnings compared to those who receive a large fraction of their income from (financial) asset holdings. Expansionary monetary policy may exert upward pressure on the prices of financial assets and thereby benefit the latter group of agents more, thereby exacerbating the income inequality. While channels a) – d) describe ways how income and wealth distributions may be altered during the transmission process of monetary policy impulses via changes in credit and bank rates, exchange rates and asset prices, the following channels, e) and f), describe how variations in the rate of inflation, which presently constitutes the most important ultimate objective of most central banks, impact income and wealth inequality.

e. **Portfolio channel:** An increase in inflation depresses the real value of cash balances. Thus, agents that hold a large part of their wealth in cash balances or in certain assets whose real values are sensitive to variations in inflation experience a larger drop in their wealth when inflation increases, than agents that hold less of their wealth in inflation-sensitive assets. Erosa and Ventura (2002) point out that this may lead to an increase in wealth inequality as low-income households tend to hold more of their wealth in cash balances than high income households. However, Batthacharya et al. (2005) point out that this effect could also lead to a reduction in wealth inequality. Absent a regular wage income, the older generations tend to hold more of their wealth in cash balances in order to finance their consumption stream than the younger generations. Under the additional assumption that older generations hold a large share of the economy's overall

wealth, this could lead to a reduction in wealth inequality between older and younger generations. Hence, the overall effect may be ambiguous.

f. **Savings redistribution channel:** Related to the portfolio channel is the savings redistribution channel; but rather than pertaining to the effects of inflation on wealth held in cash balances in general, the savings redistribution channel points to the redistributive effects of unanticipated inflation. An unexpected increase inflation, e.g. due to a large regime shift in monetary policy, leads to a redistribution from savers, who see the real value of their assets decrease, to borrowers, who see the real value of their liabilities decrease. Whenever savers are wealthier than borrowers, the savings redistribution channel implies that unexpected inflation reduces inequality.

Considering these different channels, it should be clear that the effects of monetary policy actions on wealth and income distributions are quite ambiguous in normal times. This ambiguity is likely to be responsible for the `benign neglect' of central banks vis-à-vis distributional concerns. After all, the best a central bank can do in normal times is to support stable macro-financial conditions and prevent overly large deviations of realized values from the targeted values of its ultimate objectives.

1.2 Transmission Process of Large-Scale Asset Purchases

The monetary transmission process changes during exceptional times, for example in case of deep and severe financial crises, for two principle reasons.

First, in the face of malfunctioning financial (especially interbank) markets, the central bank must provide a more-than-normal amount of central bank liquidity in order to keep the banking sector afloat. This provision of `excess liquidity' implies downward pressure on short-term interest rates in the remaining functioning segments of the interbank market. This, in turn, may hamper a smooth achievement of the central bank's ultimate targets.

Second, as a consequence of deflationary pressures due to depressed economic conditions and banking sector problems, conventional monetary policy may reach its limits. In particular, since the policy rate cannot be lowered below zero, once the central bank reaches this so-called `zero-lower-bound', its conventional interest rate policy cannot be used to induce additional reductions in longer-term rates that would be needed to provide further stimulus to the economy.

In both cases, the central bank has to rely on unconventional monetary policy measures. Broadly speaking, the following unconventional policy measures can be distinguished: (i) Exceptional provision of liquidity beyond the normal benchmark amounts via credit / repo operations (possibly for an extended maturity); (ii) widening the range of central bank eligible collateral in such operations; (iii) additional strategic communication policy to steer expectations about the future course of monetary policy (so-called forward guidance); and (iv) large-scale outright purchases of particular assets. For the purpose of this analysis, we focus on outright asset purchases (iv). However, firstly, it should be kept in mind that measures (i)-(iii) have been used extensively by the ECB during the most recent turmoil and, secondly,

they can also be associated with distributional consequences, albeit on a smaller scale than large-scale outright purchases.

The central bank may use large-scale outright purchases (iv) mainly for providing liquidity to the banking sector, relieving it from certain risky assets and pushing down risk-premia, as well as for achieving its ultimate objective by circumventing the initial stages of the normal transmission process. The latter is particularly important if the stimulus from lowering the policy rate down to the zero lower bound is not enough to relieve the economy from deflationary pressures. In this case, outright purchases are considered a means to push down long-term yields directly rather than via movements in the short-term yields like in normal times, to exert upward pressure on asset prices and thereby eventually affect real economic conditions and to bring inflation back to target. The most important channels through which long-term interest rates and asset prices are considered to be affected via outright purchases are:[3]

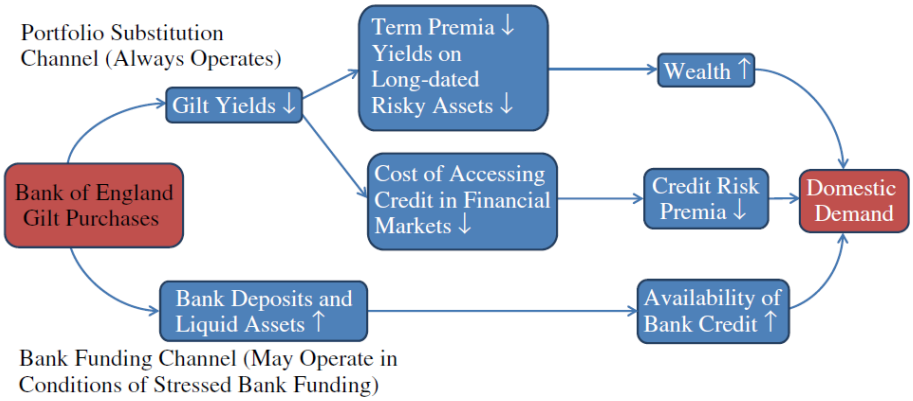
aa) Portfolio Balance Channel: Large-scale asset purchases (LSAPs) by the central bank reduce the supply of the purchased asset and, at the same time, increase the amount of central bank money in circulation. As a consequence, prices in the relevant securities segment increase, implying that interest rates for the respective assets decrease. This induces investors to rebalance their portfolios in search for more profitable alternative investments. Thus, the demand for securities that are close substitutes of the purchased securities will rise, leading to further reductions in interest rates and so on. The resulting broad-based decline in interest rates stimulates private consumption and investment activities. This increase in aggregate demand eventually increases the overall price level. The effectiveness of the portfolio balance channel depends crucially on the particular type of security that is purchased outright by the central bank. The acquired assets should not constitute close substitutes to central bank money, since the initial portfolio re-balancing would otherwise not be set in motion. This is more likely to occur, for example, in an environment where interest rates are already very low. Hence, in such a case, outright asset purchases cannot be expected to have quantitatively large effects via the portfolio balance channel.

bb) Bank Funding Channel: The banking sector's credit supply function depends on a large number of different variables. Among other things, it is crucially determined by the availability of central bank liquidity for carrying out payments, settling transactions and refinancing loans. As outright asset purchases by the central bank replace illiquid long-term assets with highly liquid central bank money, the banks' refinancing possibilities and their ability to provide loans to customers are strengthened. The effectiveness of the bank funding channel is greatest during times of acute market stress when banks are facing a shortfall of liquidity availability; whenever banks exhibit a rather long debt maturity

[3] For overviews, see Bernoth, K., König, P., Raab, C. and Fratzscher, M. (2015), König, P., Bernoth, K. and Raab, C. (2015), Bernoth, K., König, P. and Raab, C. (2015).

structure (otherwise they would likely hoard the liquidity, rather than refinancing new loans to build up liquidity buffers against a sudden dry-out of short-term funds). Figure 2, taken from Joyce et al. (2012), shows how portfolio balancing and bank funding channel interact.

Figure 2: Joint Operation of Portfolio Balance and Bank Funding Channel



Source: Joyce et al. (2012)

cc) Signal and Announcement Channel: The announcement and explicit justification of a LSAP program helps market participants to better understand the central bank's assessment of the monetary and economic situation. It also indicates the monetary authority's willingness to pursue an expansionary monetary policy over a longer period of time. Accordingly, market participants will revise their short-term interest rate expectations downward. The resulting decrease in long-term interest rates stimulates aggregate spending, and simultaneously causes the currency to depreciate. Moreover, inflation expectations will rise, because the central bank signals that it is tackling the deflationary trend with all means possible.[4]

In view of the intentional effects of LSAPs by the central bank on inflation, interest rates, asset prices and the real economy, **Table 1** summarizes the theoretical effects on wealth / income inequality caused by outright asset purchases.

First, if LSAP by the central bank lead to a broad-based reduction in long-term interest rates and increases asset prices, wealth and income distributions are altered via the interest rate exposure channel a), and the financial segmentation channel b). However, the overall effect is ambiguous.

Second, the transmission of unconventional monetary policy, in particular outright asset purchases, may induce distributional effects above and beyond monetary policy measures in normal times since central bank actions directly affect specific parts of financial markets,

[4] See Blinder et al. (2008) for an overview of central bank communication policies.

especially via the portfolio balancing channel aa), implying that the income composition channel d) and the financial segmentation channel b) become more potent. In this respect, whenever financial asset holdings are concentrated among the wealthier, high-income households, outright asset purchases, by potentially raising the value of financial assets, may imply a more-than-proportional gain for these households and may induce more unequal wealth and income distributions.

Thirdly, if unconventional monetary policy is successful in combating disinflationary or even deflationary pressures, thus increasing inflation, this may affect the income and wealth distribution via the portfolio channel e) and the savings redistribution channel f). However, both channels work in opposite direction such that the overall effect is not clear-cut: Inflation harms those agents holding a larger part of their wealth in currency and cash-balances. These are usually agents concentrated among the less well-off at the lower tail of the income and wealth distribution. In this sense, inflation increases wealth inequality by reducing disproportionally nominal wealth and income of the poorer, low-income households and less for the wealthier, high-income households. But, through the savings-redistribution channel and the associated debt-deflation effect, inflation lowers the real value of debt, thereby redistributing from creditors/savers to debtors/borrowers. Whenever borrowers are chiefly concentrated in the lower tail of the wealth distribution, higher inflation induces a redistribution from wealthier to poorer households.

Lastly, given that the central bank is able to stabilize the economy, and particularly employment, it helps to prevent, or at least to mitigate, adverse distributional effects that would otherwise occur via the earnings heterogeneity channel c).

Table 1: The Theoretical Effects of Asset Outright Purchases on Wealth and Income Inequality

	(Intended) Effects of Asset Outright Purchases on			
	Interest Rates ↓	Asset Prices ↑	Inflation ↑	Unemployment ↓
Channel affecting inequality	**Effect on Wealth and Income Inequality**			
a) Interest Rate Exposure	(+)/(−)			
b) Financial Segmentation	(+)	(+)		
c) Earnings Heterogeneity				(−)
d) Income Composition		(+)		
e) Portfolio			(+)/(−)	
f) Savings Redistribution			(−)	

Note: The entries in the table show the effects on wealth / income inequality brought about by outright asset purchases via changes in interest rates, asset prices, inflation and unemployment. (+) means that inequality increases, while (-) means that inequality is reduced.

2 Distributional Implications of Large-Scale Asset Purchases in the Euro Area

In January 2015, the ECB extended its previous asset purchase programs – the covered bond purchase program 3 and the ABS purchase program – with a purchase program for government bonds as well as bonds of euro area institutions and agencies. Overall, the extended asset purchase program comprises monthly purchases worth 60 billion euros and is scheduled to last until at least September 2016.

To assess the likely consequences of the ECB's extended asset purchase program on the income and wealth distributions in the euro area, we proceed in two steps. First, we discuss in how much the ECB's asset purchases may potentially affect inflation, interest rates, asset prices and economic activity. Since the latest asset purchase program is in effect only since March 2015, we review evidence for similar programs conducted by the Bank of Japan (BoJ), the U.S. Federal Reserve (FED), and the Bank of England (BoE). The asset purchase programs of all three central banks have generally been directed towards long-term, fixed-income assets such as government bonds, or mortgage-backed securities. Second, we consult the relevant literature plus the Household Finance and Consumption Survey (HFCS), which provides detailed household-level balance sheet information for about 62,000 households in the euro area with reference year 2010, to assess the likely impact of the changes in inflation, interest rate, asset prices and real economic activity on the wealth and income distributions in the euro area.

2.1 Redistribution Induced by Changes in Long-Term Interest Rates

QE and Long-Term Interest Rates

A large body of literature addresses the direct effect of central bank outright purchases on long-term interest rates. One strand of the literature uses event studies to investigate the impact on announcement dates, while a second strand attempts to capture the persistence of interest rate declines in response to outright purchase programs using structural vector autoregressive (SVAR) models.

Most studies find sizeable declines of long-term government bond yields on announcement days. For the U.S., Gagnon *et al.* (2011) and Meaning and Zhu (2011) report a cumulative decrease in 10-year U.S. government bond yields over all ten announcement days ranging from 80 to 91 basis points (bps). For the UK and Japan, the interest rate effects are somewhat smaller: 10-year government bond yields for the U.K. decreased by only around 50 bps (Meaning and Zhu, 2011; Glick and Leduc, 2011), whereas 10-year Japanese government bond yields declined by about 25 bps (Glick and Leduc, 2011; Lam, 2011). Gabriel and Lutz (2014) estimate that mortgage yields decreased to a similar extent as 10-year government bond yields and exhibit a comparable persistence pattern.

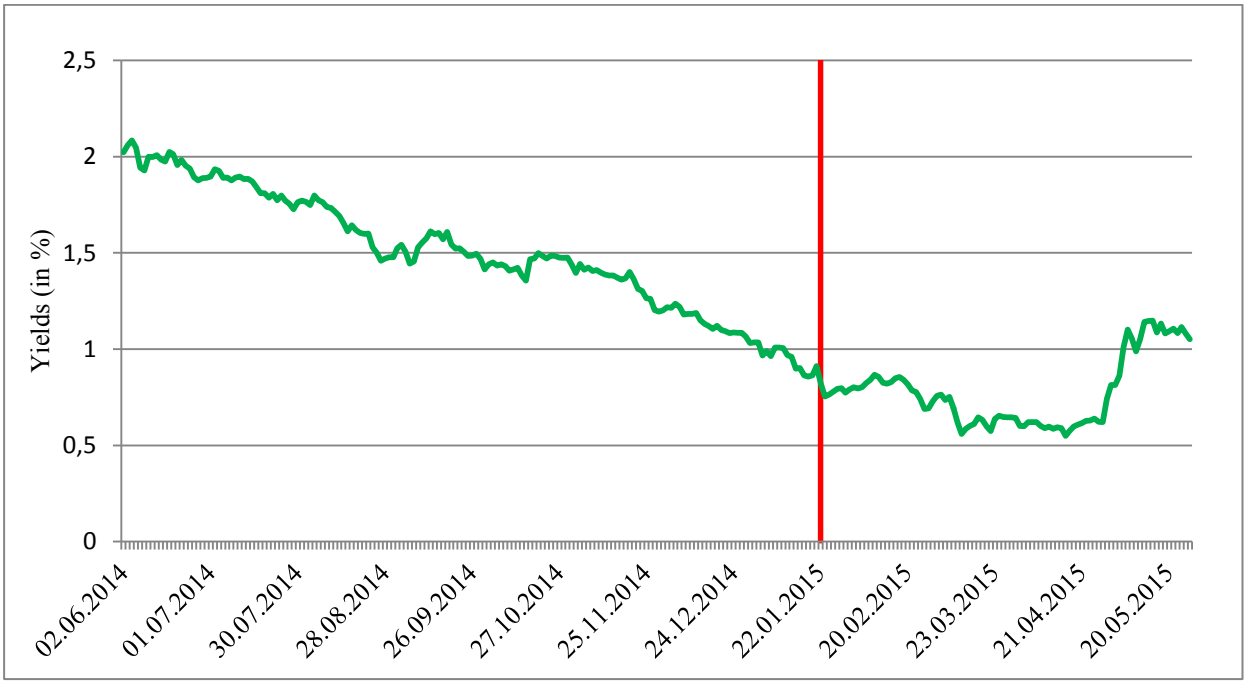
However, most studies also find that the announcement of the first outright purchase program was associated with the largest effect on long-term yields (Krishnamurthy and Vissing-Jorgensen, 2011). Martin and Milas (2012) attribute this finding to two reasons: First, yields

were already at a relatively low level when subsequent programs were implemented in the USA and UK; thus they could not decline much further. Second, the commitment effect to hold interests low for a prolonged period has only been substantial news for the first round of QE.

To investigate the persistence of interest rates effects, Wright (2012) and Rogers *et al.* (2014) study the effect of asset purchase shocks via SVARs. For the U.S. bond market, their estimates indicate that interest rate changes were highly persistent, lasting for more than one year. For the U.K., however, the effects died off much more quickly.

As **Figure 3** indicates, the recent outright purchases by the ECB have likely supported the negative trend in bond and credit yields; something underway since 2012. Following the announcement, the average Eurozone 10-year government bond yields dropped by around 7 bps, and continued to decrease until the beginning of May. Since bond yields were already rather low before the announcement of outright purchases, an interest rate reduction in the magnitude of the U.S. experiences was unlikely.

Figure 3: **10-Year Government Bond Yield (euro area weighted average), announcement date of ECB's LSAP (22.1.2015) shown in red.**



Source: Thomson Reuters, Datastream

Long-Term Interest Rates and Inequality

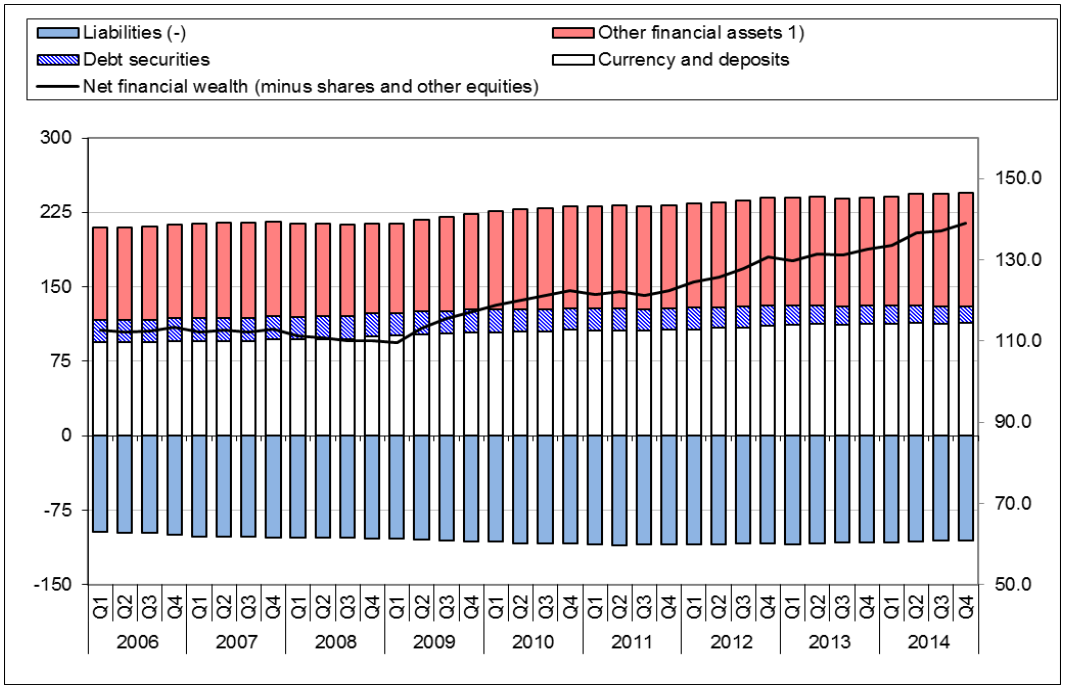
Lower long-term interest rates induce first-round distributional effects from savers to borrowers via the interest rate exposure channel. As one can see in **Figure 4**, households in the

euro area are, on aggregate, net interest rate receivers. Overall, holdings in interest bearing assets such as deposits, debt securities and other financial assets exceed households' liabilities. On aggregate, European households' net wealth decreases with a decrease in interest rates holding all else equal.

However, interest bearing asset holdings and liabilities are not evenly distributed among households. For some households their liabilities exceed their interest bearing asset holdings and they will therefore benefit from falling interest rates; for other households it is the other way around. The Eurosystem Household Finance and Consumption Survey (HFCS) shows that indebtedness, both in nominal terms and relative to total assets, is negatively related to household income and the age of the households' reference person. Approximating interest rate exposure by subtracting deposit, bond and private pension insurance holdings from total debt, we can tentatively conclude that the young and low-income households will profit from interest rate reductions, while the older and medium- to high-income households are likely to experience income losses as a consequence of further interest rate reductions.

However, this rough proxy for interest rate exposure sets an upper bound. Given that mortgages constitute an important part of household balance sheets in the euro area, making up 63 percent of the total debt, and taking into account that around 55 percent of these active mortgage contracts are fixed-rate mortgages (Ehrmann and Ziegelmeyer, 2014), the effect of further interest rate reductions on indebted households will be limited.

Figure 4: Households' Interest Bearing Assets and Liabilities in the Euro Area



Source: European Central Bank and authors' calculations.

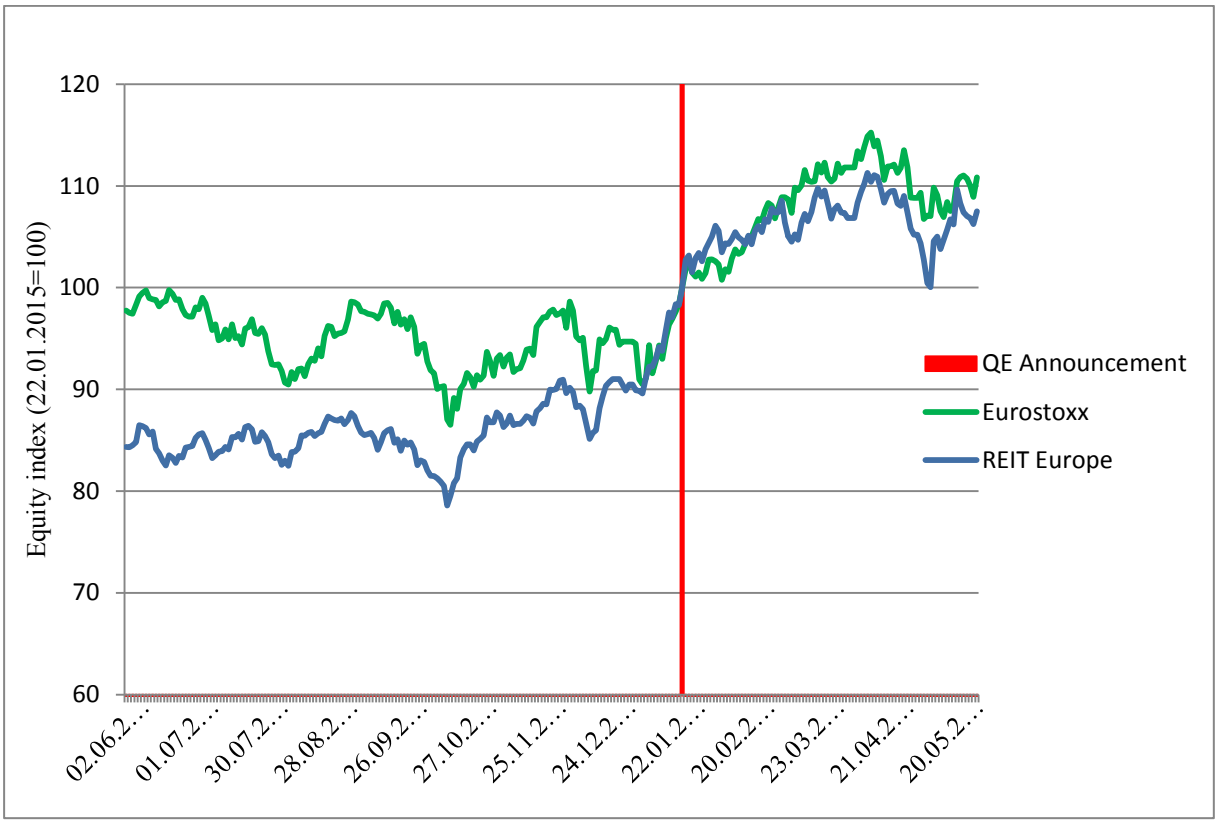
Taken together, this implies that even if the ECB can induce further reductions in long-term interest rates, such reductions may have only limited distributional effects. However, if such distributional effects take place, they are likely to lead to losses of older and medium- to high-income households and benefit younger and low-income households.

2.2 Redistribution Induced by Changes in Asset Prices

QE and Asset Prices

The effect of LSAPs on asset prices has, so far, not been studied to a large extent. Rogers et al. (2014) find different responses of equity prices following expansionary unconventional monetary policy shocks across countries: While U.S. stock prices increased by 0.86 percent in response to the monetary policy announcement by the FED, announcements by the BoE and the Bank of Japan seem to have had no measureable effect on stock prices in the U.K. and Japan, respectively. These results are confirmed by Fratzscher et al. (2013) for the U.S., by Rosa (2012) for the U.K. and Arai (2013) for Japan. Gabriel and Lutz (2014) estimate that stock prices increase by around 12 percent in response to an unconventional monetary policy surprise which reduces the 10-year Treasury yield by 25 bps. This jump is highly persistent. Comparing these findings to those of Bernanke and Kuttner (2005), the authors conclude that unconventional monetary policy surprises have a much stronger (by a multiple of four) effect on asset prices compared to conventional monetary policy surprises that lower the short-term rate by the same magnitude. The authors further estimate the response of returns on real estate investment trusts to LSAPs surprises, finding even stronger increases by about 20 percent compared to general stock indices. Thus, overall, there seems to be evidence that outright asset purchases by the central bank have strong and lasting effects on the prices of assets such as equity and housing. Similarly, substantial increases in European stock market prices (10.8% for the Eurostoxx index) have been realized since the ECB announcement of the large-scale asset purchase program on January 22, 2015 (see **Figure 5**). Data for house prices is not yet available, but data on real estate investment trusts (REITs) allows a preliminary assessment. Since the QE announcement the REIT Europe has increased as well, but with roughly 7.5 percent slightly less than the average market. Figure 5, however, reveals that asset purchases have likely been anticipated, as both series started to strongly increase already around January 5, 2015.

Figure 5: **Leading Equity Price Index and REIT for the Eurozone**

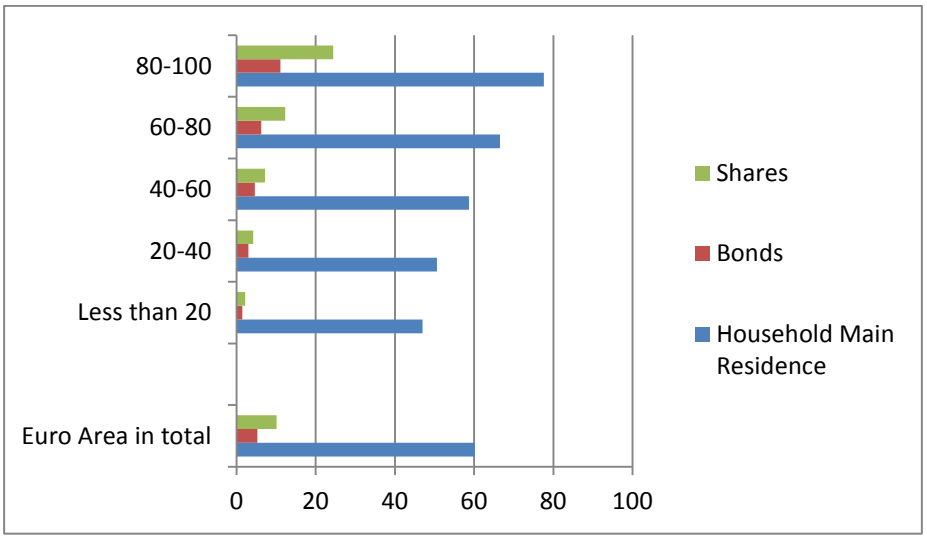


Source: Thomson Reuters and Euronext

Asset Prices and Inequality

Figure 6 shows the share of euro area households that hold part of their wealth in bonds, equity and housing. With a participation rate of 60 percent, investment in household main residence is the most popular of the three asset categories. In contrast, only around five and ten percent of euro area residents invest in bond and in equities, respectively. Participation in all three asset classes increases with household income. Participation in shares is highly concentrated among top income earners. Bond holdings are of lesser importance for all income quintiles. These distributions indicate that primarily equity and house price increases will increase income and wealth inequality and to lesser extent changes in bond prices.

Figure 6: **Asset Participation by Income Quintile (in percent)**



Source: The Household Finance and Consumption Survey.

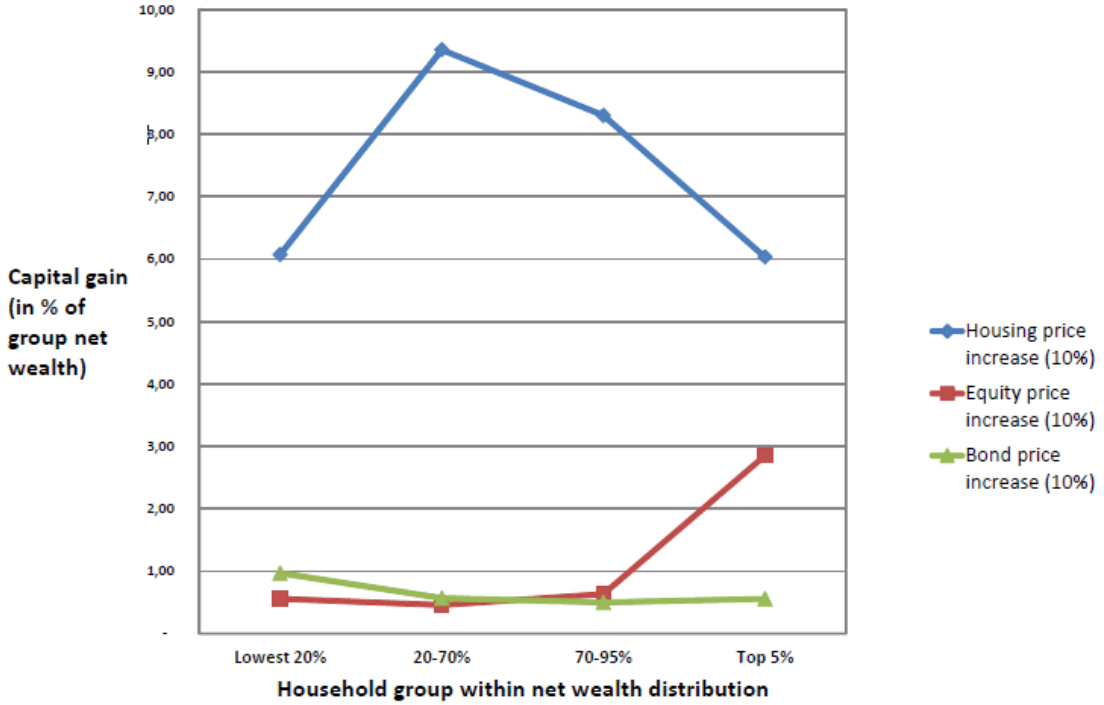
This result is partly confirmed in a recent study by Adam and Tzamourani (2015). Using the HFCS data, they study the distributional consequences of a 10 percent increase in house, bond and equity prices, respectively. They find that bond price increases do not seem to have a significant distributional effect on household wealth. Furthermore, capital gains due to bond price increases are rather small, which is in line with the low participation rate in this asset category; a ten percent increase in bond prices raises net wealth by less than one percent on average. Adam and Tzamourani (2015) confirm that capital gains from equity holdings are highly concentrated within the top 5 percent and that stock price increases of ten percent induce an increase in net wealth in this household group by roughly three percent (**Figure 7**). These results turn out to be very homogenous across all individual euro area member states.

Adam and Tzamourani (2015) further confirm that capital gains arising from a ten percent house price increase are much larger, ranging between six and ten percent of net household wealth. Interestingly, middle class and upper middle class of Euro Area households benefit the most, while relatively poor and rich households benefit (relative to their net wealth) less from housing price increases. This is due to fewer poor households owning houses and because richer households hold a smaller proportion of their wealth in housing compared to the middle and upper middle class.

Thus, the observed increases in equity prices in most European countries that were observed in response to the ECB's outright purchases are likely to have increased net wealth inequality. Since the participation in all three asset categories also tends to rise with the age of the household's representative persons, one may tentatively conclude that equity price increase not only redistributed wealth from low- to high-income households, but also from the young to the old. The recent bond price increases had probably only a negligible impact on net

wealth increases. The effect of house price increases on overall income and wealth distributions is unambiguous, though.

Figure 7**: Capital Gains across Euro Area Net Wealth Groups**



Source: Adam and Tzamourani (2015), p. 6.

2.3 Redistribution Induced by Changes in Inflation and Economic Activity

QE and Inflation and Real Economic Activity

During long-lasting financial and economic crises, price developments are often very weak and inflation deviates downwards from the central bank's inflation target. The ultimate objective of the ECB's asset purchase program is to spur economic activity and to bring both inflation and inflation expectations back to the target level of close to two percent. The impact of asset outright purchases programs on inflation and real economic activity are difficult to assess due to the limited amount of data available since the beginning of these programs. A possibility to circumvent this issue is to rely on counterfactual simulations. For example, Baumeister and Benati (2010) find that given the above described impact of outright purchase programs on long-term yields, the FED and BoE measures have likely averted significant downward risks to inflation and output. In particular, they observe that for the U.S. and the UK, large-scale asset purchases by the central banks have kept the economy away from deflation and softened output contraction a considerable extent. In specific, the authors' best estimate suggests that U.S. GDP growth was held at -6 percent in 2009Q1 instead of -10 percent without the LSAPs and inflation was about 1 percent higher than under the no-

response scenario. The estimated gains for the U.K. are even larger with output shrinking by only about 8 percent instead of 13 percent and a short deflationary period with -1 percent price increases instead of -4 percent. It is important to keep in mind, however, that their results are based on the assumption that the respective central banks have been able to successfully lower long-term yields by around 60 bps in the U.S. and 50 bps in the U.K. Similarly, Chung et al. (2012) find in their simulation study that the first asset purchase program by the Fed lowered the unemployment rate by 1.5 percentage points and helped to avoid severe deflation.

Studies attempting to identify unconventional monetary shocks in the data in order to study the initial and long-run effects on both inflation and output, find less pronounced effects. For Japan, Schenkelberg and Watzka (2013) find that output and inflation respond positively to expansionary unconventional monetary policy; however, the output level is raised only with a lag of about 20 months. This casts some doubt on the findings of Baumeister and Benati (2010) who claim that unconventional monetary policy exerts an immediate effect on output and inflation.

All in all, there is some tentative evidence that shows that inflation and economic activity may respond positively to LSAPs. However, the size of these effects is difficult to assess and it depends crucially on the magnitude of the reaction of long-term interest rates. While one may conclude that previous QE measures have likely helped avoid a larger recession and further job losses, it is uncertain whether the ECB's purchase program will bring about a reduction of long-term interest rates sufficiently strong to bring inflation back to target in the near future.

Inflation and Real Economic Activity on Inequality

Adam and Zhu (forthcoming) estimate the redistribution effects from unexpected price level movements in the euro area following the approach of Doepke and Schneider (2006). They compute the net nominal positions (NNP) of the household, the firm and the government sector using data from the HFCS and the Euro Area Accounts (EAA). The NNP measures the net inflation exposure of a sector arising from ownership of nominal claims and liabilities. They show that households' inflation exposure varies systematically across euro area countries. Households in traditionally high-inflation countries, such as Greece, Portugal, Slovakia, Slovenia and Spain, hold lower nominal exposure compared to households of traditionally low-inflation countries, such as Austria, Belgium, Germany, Finland or France. This implies that households' wealth in the latter group of countries is usually more affected by unexpected price increases.

Moreover, Adam and Zhu (2015) find that relatively young middle class households, which turn out to be net borrowers, are net winners of unexpected inflation, while older and richer households tend to loose. As a result, wealth inequality in the euro area decreases with unexpected inflation. However, they also find considerable heterogeneity across the individ-

ual EMU countries. In some countries, i.e. Germany, Austria and Malta, inequality increases due to the presence of relatively few young borrowing households.

Ampudia et al. (2014) combine household-level data from the HFCS with country-level aggregate time series and analyse the impact of unemployment on income. They find that an increase in the unemployment rate results in a significant drop in mean and median household income. However, their simulation method preserves some information on the heterogeneity across household characteristics. Low-income households are much more likely to become unemployed in adverse economic situations and also experience larger drops in income than higher income households.

As such, the likely stabilization effect of the asset-purchase program of the ECB might help to improve primarily the employment and income situation of low income households, which will induce a decline in income and wealth inequality.

2.4 Overall Impact

The overall impact of large-scale asset purchases by the central bank on wealth and income inequality is ambiguous given the various transmission channels discussed above. So far, only a few studies investigate the overall effect of asset purchase programs on inequality. An in-depth study by Coibion et al. (2012) evaluates the effects of conventional monetary policy shocks and concludes that, contrary to popular concerns, it is rather a contractionary monetary policy shock that leads to an increase in inequality. However, it is questionable whether these findings can be directly translated to outright purchase programs. In particular, as asset valuation effects are likely to be much more important for an outright purchase program than for conventional monetary policy measures, it is very possible that also the distributional effects of both policy tools differ largely. This perception is confirmed by the study of Saiki and Frost (2014). The authors focus solely on the period of unconventional monetary policy and quantitative easing in Japan since the second quarter of 2002. In this period they find that outright purchases widened income inequality.

3 Conclusion

The announcement of the ECB's extended large-scale asset purchase program was widely applauded by financial market participants and economic policy circles across Europe. Outright purchase programs have become an important policy tool to circumvent the initial stages of the monetary transmission process when further monetary stimulus is needed and policy rates have already hit the zero lower bound. The programs have a common goal in reducing long-run interest rates and boosting asset prices to spur economic growth. Although intended, the recent boom in asset prices has raised concerns about undesirable distributional side effects that may increase income and wealth inequality.

Assessing the effects of purchase programs in the US, the UK and Japan with respect to their intended effects, the literature finds that the very first programs at the beginning of the global financial crisis were the most effective at bringing down long-term interest rates. This is likely due to the fact that interest rates at the time were quite high. Against this background it is rather unclear whether the ECB's purchases will produce sizeable effects on long-term interest rates. Therefore it is also unclear whether the program will produce a sizeable and long-lasting effect on real economic activity. The development of inflation rates in the euro area has shown some slight improvement since the beginning of the program, but it is unclear to which extent these developments can be directly attributed to the ECB's asset purchases or whether they are a consequence of a general improvement in euro area-specific economic conditions and global macroeconomic factors, such as recent oil price developments.

However, given recent developments in equity markets across euro area countries, it seems that the purchases have already led to a strong increase in asset prices, thereby helping asset prices remain rather elevated.

With respect to the distributional side effects, even a sizeable reduction in bond yields is, in itself, unlikely to have strong distributional effects in the euro area. This is due to households holding only a small part of their wealth in the form of bonds. In case the ECB's purchases help strengthen real economic conditions, they probably reduce inequality as they help the less wealthy, low-income households that tend to be more-than-proportionally affected by income losses and unemployment during a recession. Finally, the pronounced increase in asset prices that has been observed since the introduction of the asset purchase program, however, has likely exacerbated any prevailing income and wealth inequality in the euro area. This is due to the fact that especially high-income households hold a large part of their wealth in financial assets.

Overall, this implies that the distributional consequences of the ECB's asset purchase programs are ambiguous. Once the program helps to stabilize and improve real economic activity, it will first and foremost help those at the lower tail of the wealth and income distribution; but as the impact of purchases is, at the moment, primarily felt in financial markets, the purchases are likely to aggravate inequality. The benign neglect shown by central bankers for the distribution of income and wealth is therefore appropriate once asset purchases indeed

bring inflation back to target, thus boosting aggregate demand and income. In this case, one may tolerate any counteracting effects on wealth and income inequality brought about by elevated asset prices. However, once the purchases fail to have substantive impact on the real economy and on the inflation rate, central bankers have to start rethink their attitude towards potential distributional side effects of their policies.

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