BANK OF ENGLAND

Speech

Let’s talk about negative rates

Speech given by

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Good afternoon and thanks for having me. It is a pleasure to give this speech, virtually, at UWE Bristol.

Over the past year, the MPC used a range of policy tools to contribute to supporting the economy and bringing inflation back to target. We also discussed various other tools that might be needed at some point in future. We always keep our toolkit under review, and given the events of 2020, I am sure it is not surprising that those discussions continued over the year. The MPC set out its collective view on one of those tools, negative interest rates, in a box in its August 2020 Monetary Policy Report.

Following that, the Bank of England began structured engagement with firms on operational considerations regarding the *feasibility* of negative interest rates. That work is still in progress, and the Bank will report back when it is complete; I do not have anything new to add on this today.

Once the Bank is satisfied that negative rates are *feasible*, then the MPC would face a separate decision over whether they are the *optimal* tool to use to meet the inflation target given circumstances at the time. As with decisions on any other monetary policy tool, each MPC member would have the option to vote on this at each meeting. We are individually accountable for our votes, and are required to explain their rationale to the public and to parliament. Today I therefore wish to set out my own current thinking on how negative interest rates might work in the UK. While this view will inform my future votes, my decisions on the amount of policy stimulus needed (and the right tool to deliver it) will depend on the outlook at the time of voting. I will make three main points:

- First, the 'financial-market channels' of monetary policy transmission have worked effectively under negative rates in other countries, with some of the evidence pointing to more powerful effects. Through standard cost of capital and exchange-rate mechanisms, as well as higher asset prices, these effects should lead to higher consumption and investment, and boost net exports and inflation. Quantitatively, these channels are an important part of monetary policy transmission.

- Second, the evidence from experiences of negative rates in other countries suggests that 'bank-lending channels' of monetary policy transmission have also been effective at boosting lending and activity, though there is some variation in the size of the estimated effects. There is no clear evidence that negative rates have reduced bank profits overall, and a number of studies find positive impacts, once you take into account the boost to the economy.

- Third, as with any policy tool, there are differences in the structure of the economy, both across countries and over time, which can potentially affect how the tool works. But there is little evidence to suggest that many aspects of policy would operate differently from usual. It is possible that the current structure of the UK banking system could lead to a less positive impact on bank profitability.

But at worst, in my view, this could only make bank-lending channels slightly less powerful than otherwise, while I expect the financial-market channels to work normally.

I will start by explaining what negative rates are and how they might work (Section 1), before touching on the global economic forces that have led several other central banks to implement them (Section 2). I will then summarise my views on the international evidence on negative interest rates (Section 3, going into more detail in Section 3.1). Next, I will discuss some differences across countries and over time that can affect how policies work (Section 4). Finally, I will update on how I see the current economic outlook (Section 5).

1 What are negative interest rates?

Over 2020, there was no shortage of media coverage discussing the possibility of the MPC adopting a negative interest rate policy. But the concept of a negative interest rate probably sounds strange to many people in the UK. Even among professional economists, many of us were taught that the economy and monetary policy would operate very differently when interest rates were below zero. Before discussing the effectiveness of such a policy, I would therefore like to talk about what we mean by negative rates; how, in general terms, they would work; and whether they actually are so different to what we have seen before.[1]

When we talk about potentially using negative interest rates, we are referring to Bank Rate, the policy rate set by the MPC. Bank Rate is the interest rate paid on central bank reserves, which are deposits held at the Bank of England by banks and building societies.[2] At present, with a slightly positive Bank Rate of 0.1%, these institutions receive one pound per year in interest for each thousand pounds they have deposited.[3] Under a negative Bank Rate, they would instead pay an interest charge on their reserves. At a negative rate of 0.1% applied on all reserves, for example, a £1000 deposit would be reduced to £999 after one year.[4]

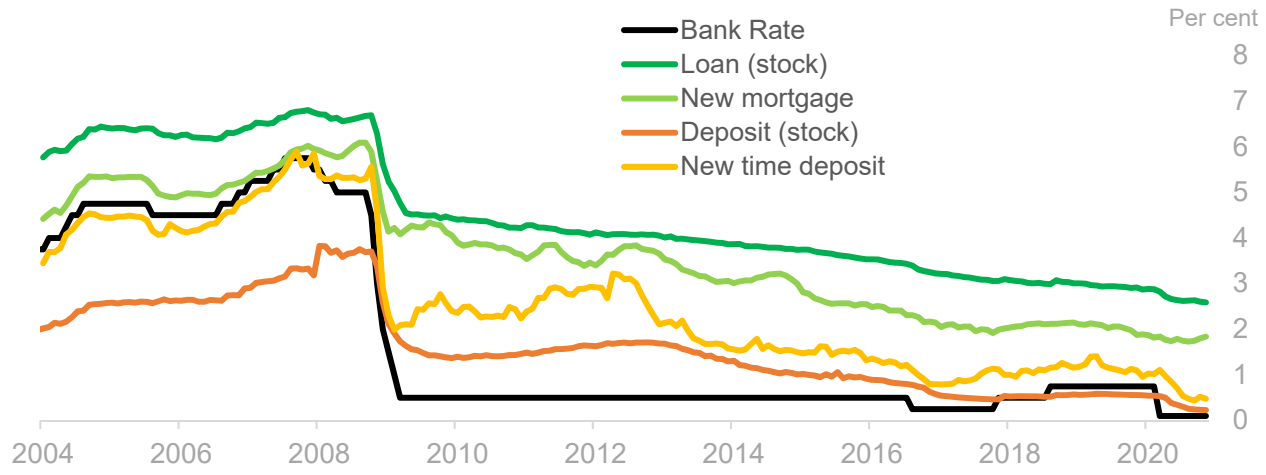
Just as at positive levels of Bank Rate, the interest payments made between the Bank and commercial banks have little *direct* impact on the economy. Instead, Bank Rate matters because it influences the entire set of rates charged on loans and paid on deposits of households and businesses; and because it affects the exchange rate and a range of asset prices set by financial markets.

Importantly, Bank Rate is only one of many influences on these asset prices and rates. A negative Bank Rate does not therefore imply that rates facing households and businesses will necessarily turn negative. With Bank Rate currently close to zero, the average rate charged on loans to UK households is 2.6% while the average rate paid on household deposits is 0.2% (**Chart 1**). Many other factors are incorporated into

[1] See Bean (2013) for a clear previous explanation of negative interest rates and how they might work in the UK.
[2] One can think of the Bank of England as the bank of (commercial) banks and building societies.
[3] With total reserve balances of around £770 billion, the Bank pays out a total sum of around £770 million per year at current Bank Rate.
[4] The payment would also depend on how any negative rate scheme was implemented, which has differed across countries. If negative rates were implemented, the design of the scheme would be part of that decision. See Saunders (2020) for a discussion of these issues.

these rates, including: the risk to the bank of borrowers defaulting; the value of any collateral; the cost of banks' other funding sources; how Bank Rate is likely to evolve; and banks' market share and profit objectives.[5] These other influences are far more important for the level of many loan rates – for example, the average advertised rate on a £5,000 personal loan, which offers no collateral and has a relatively high risk of default, is currently 8.2%.

Chart 1: Bank Rate and effective interest rates on household loans and deposits



Source: Bank of England and Bank calculations
Notes: Stock loan rates include both secured and unsecured lending.

These other influences also vary over time. Loan and deposit rates fell between 2013 and 2016 when Bank Rate did not change (**Chart 1**).[6] And new mortgage rates also fell over 2019, shortly after Bank Rate had been increased. But *holding other influences constant*, changes in Bank Rate do tend to feed through to changes in rates facing households and businesses. Because other influences are never held constant in reality, this 'pass through' is often easier to see following large changes in Bank Rate. The clearest recent example was the sharp fall in loan and deposit rates in 2008-09, following a 4.5 percentage point cut in Bank Rate.

As with the 2008-09 reductions in positive territory, a cut to negative policy rates would aim to transmit to the economy through two main sets of channels: via the banking sector and via financial markets. Through banks, a negative rate would aim to lower rates facing households and businesses – most importantly loan rates – which would in turn boost consumption and investment spending, income and inflation. A modestly negative policy rate would not translate into negative borrowing rates for households and businesses, but would intend to lower them compared to a scenario with a positive policy rate. Lower loan rates increase

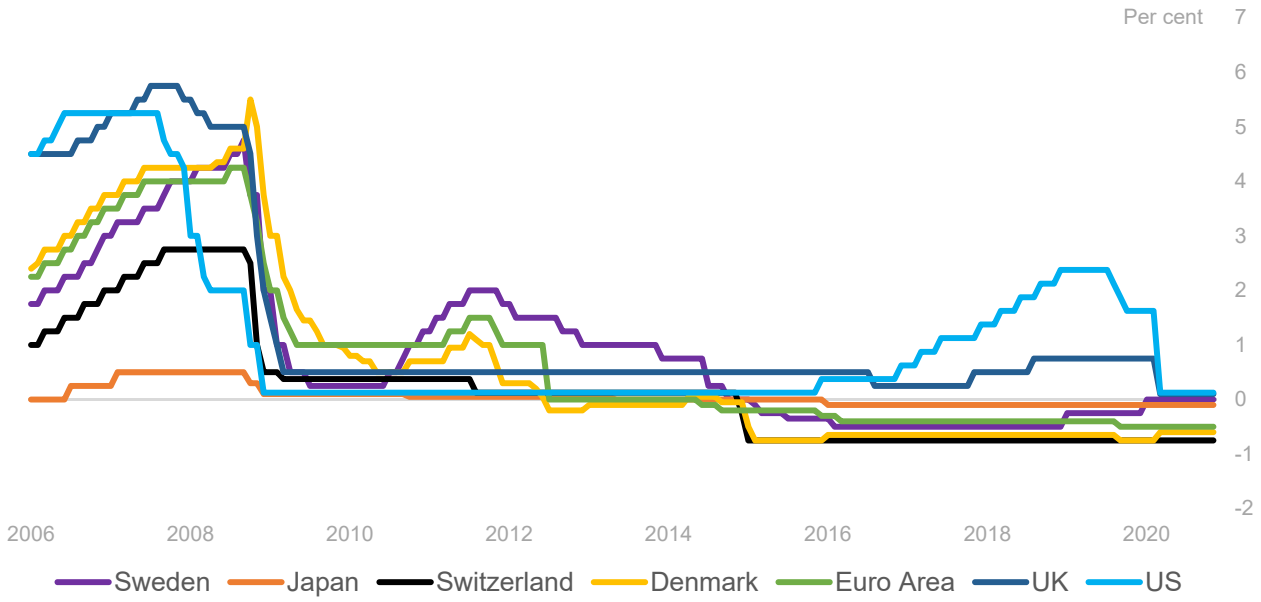
[5] See Button et al (2010) and Cadamagnani et al (2015).
[6] An important factor here was a fall in banks' wholesale funding costs from elevated levels during the Euro Area sovereign debt crisis.

borrowers' spending power and encourage them to bring forward consumption and investment, and looser borrowing conditions support property prices, in turn stimulating spending via wealth and collateral channels.

These bank-lending channels would add to transmission from financial-market channels of policy, just as at positive policy rates. Lower market interest rates reduce yields on corporate bonds, depreciate the exchange-rate and boost equity prices. In turn, a lower corporate cost of capital encourages investment; a weaker exchange rate boosts net trade and inflation; and higher asset prices increase wealth and spending. When spending is weak and inflation is undershooting our target, the MPC typically lowers policy rates to boost jobs and growth, and ultimately return inflation to target, consistent with our remit.

Despite the similarities, until recently, there was a widely-held view that interest rates could not turn negative. Generations of economists were taught in our textbooks that once policy rates fell to zero, interest-rate policy could no longer affect the economy.[7] We have been conditioned to view zero as a hard constraint – the zero lower bound – on policy rates.[8] Perhaps as a result, even though many central banks cut rates close to zero following the 2008-09 financial crisis, it was several years until any took them below zero (**Chart 2**).

Chart 2: Advanced economy policy rates



Source: BIS, ECB and Bank calculations
Notes. Sweden: repo rate. Japan: target for uncollateralised overnight rate until December 2015; rate on Complementary Deposit Facility thereafter. Switzerland: average of SNB target range until June 2019, SNB policy rate thereafter. Denmark: certificate of deposit rate. Euro Area: rate on main refinancing operations until May 2012, deposit facility rate thereafter. UK: Bank Rate.US: average of range for Fed funds rate.

[8] See Mankiw's, *Principles of Macroeconomics* for an example of a discussion in a well-known textbook, or Woodford (2003), for a more advanced text.

The textbook view was that interest rates could not turn negative owing to the existence of cash. Cash pays zero interest at all times, and banks are free to exchange their interest-bearing reserves for it.[9]

Consequently, if Bank Rate was negative, banks could avoid having to pay interest by swapping all of their reserves for banknotes. Similarly, if bank deposits charged a negative rate – or charged a fee greater than any interest paid out – consumers could close their accounts and keep banknotes under the metaphorical mattress. In the scenario portrayed in textbooks, even a very slightly negative interest rate would lead everyone to demand all of their deposits to be converted into cash.

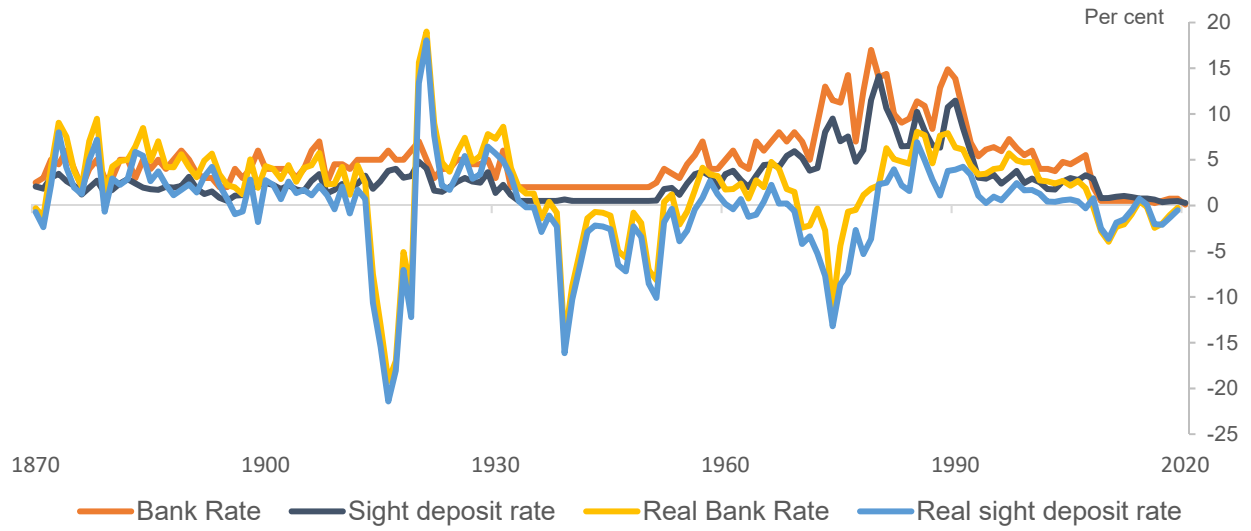
What changed was the realisation that the costs of holding cash are significant, especially for large depositors or banks.[10] While holding a few banknotes is little burden, holding large quantities involves costs related to security, storage and convenience. And while in the past cash was usually thought of as a more convenient means of payment than deposits, for many the reverse is now true.

These realisations, along with real-world examples abroad, have made clear that negative policy rates are possible. Banks and large depositors are willing to incur interest payments on their holdings to avoid the costs of storing and using cash, at least in the short-term, though uncertainty remains about exactly how far negative rates could go before large-scale cash hoarding took place.[11]

Although there are now several examples abroad, we have never before used a negative policy rate in the UK. To many people who remember well the high interest rates of the 1970s and 1980s, when the policy rate reached a high of 17%, the low interest rates we have recently experienced may seem like a dramatic change. But looking further back, low or even negative interest rates do not actually mark such a huge departure. And, I will argue, some of the seemingly high rates in the past were a nominal illusion.

[9] Over the years, many authors have also noted that in principle, different policies or technologies could overcome the zero lower bound. See Buiter (2009), Kimball (2015) and Rognlie (2016) for discussions. Suggestions date back to Silvio Gesell's 1916 idea to tax paper currency, which would be equivalent to having a negative interest rate on cash, and so would lower the rate at which people would wish to substitute out of interest-bearing deposits. All these solutions amount to either removing or reducing the effective lower bound. This is a separate proposition from the experiences we have seen so far in other countries, which have taken the cash constraint as given. More recently, Rogoff (2014) and Haldane (2015) have discussed the possibility that at some point in future, it is conceivable that a widely-used government issued digital currency could remove the lower bound by facilitating deeply negative rates on deposits.
[10] Textbooks typically assumed that the lower bound was zero under the current monetary system, although some authors allowed that it may be slightly negative, given storage costs for cash, but these were often assumed to be small enough that they could be neglected, as in Hicks (1937). McCallum (2000), for example, speculates that interest rates could only be negative by "a few basis points".
[11] The answer would likely depend on how long interest rates were significantly negative. Longer periods would incentivise banks to invest more in storage facilities. More generally, as discussed earlier, the effective lower bound can be affected by policy decisions.

Chart 3: Long-run Bank Rate, sight deposit rate and (ex-post) real interest rates



Sources: Thomas and Dimsdale (2017), Bank of England, ONS, Capie and Webber (1985) and Bank calculations.
Notes: Bank Rate is year-end rate, sight deposit rate is calendar-year average of monthly rates. To obtain real rates year-on-year realised CPI inflation in the subsequent year is subtracted from the relevant nominal interest rate.

Over a longer span of history, there were many previous periods when Bank Rate was set at a low positive level (**Chart 3**). The high nominal interest rates before inflation targeting was adopted were the exceptions rather than the rule.[12] The dark blue line shows sight deposit rates actually paid to households were typically lower still. Moreover, real deposit rates – that is, interest rates adjusted for price inflation, which is the most economically meaningful measure – have been negative many times before (light blue line). But many of us are prone to money illusion – considering the nominal value of payments, rather than the real value of goods and services they can purchase.[13] As a result, we may regard negative (real) deposit rates as more unusual than they actually are.

2 Recent trends in global interest rates

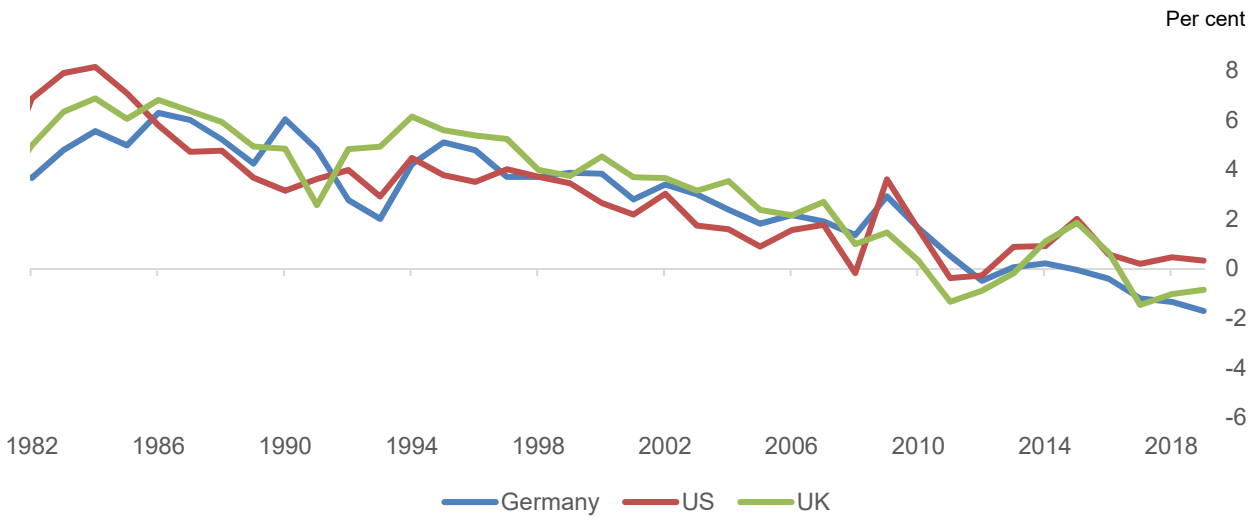
An important question is what has caused the trend over the last 40 years towards low and negative interest rates in many advanced economies?

Long-term real interest rates are determined by the balance between global savings and investment.[14] They have fallen over the past 40 years (**Chart 4**) because a range of slow-moving factors made desired investment fall relative to desired saving.[15] These include a fall in productivity growth; greater risk; and

[12] Vlieghe (2017) makes the same point for real interest rates.
[13] For example, see Shafir et al (1997) and Darriet et al (2019).
[14] The interest rate which balances the amount of global savings and investment over time is known as the trend equilibrium real interest rate. A box in the August 2018 Inflation Report discussed the factors which have influenced this in recent years.
[15] Rachel and Summers (2019) suggest that it has fallen over 300 basis points in a generation.

demographics – with people living longer and having fewer children, populations are ageing and need to save more for retirement.[16]

Chart 4: Ten-year (ex post) real government bond yields



Source: FRED, OECD, BIS.
Notes: Realised CPI inflation in a given year (from BIS) is subtracted from the nominal bond yield in that year (from OECD via FRED).

Ultimately, although central banks can set short-run interest rates, monetary policy has little influence over these structural factors. The MPC, like most other monetary policy committees, is guided by its remit to meet the inflation target. And so it must take into account these longer-run trends in savings and investment when setting short-run interest rates, along with cyclical influences like changes in government spending, uncertainty and financial conditions. If desired investment falls persistently, for example, persistently lower policy rates are necessary to offset disinflationary pressure, all else equal.

With short-term interest rates felt to be at their lower bounds, since 2009 many central banks have turned to alternative, 'unconventional policies' to reduce longer-term interest rates, or prevent them from rising. These include quantitative easing and forward guidance about future interest rates. However, when long rates are already very low as they are now, and markets are functioning smoothly, my view is that it is difficult to reduce long rates any further, so there is little further stimulus to be gained from these tools.[17] Of course, other MPC members may take different views on these tools and how their effectiveness varies over time. I believe that quantitative easing is important in the event of market dysfunction, for example, but also that its power mainly lies in helping offset the disruption, rather than providing net additional stimulus to the economy.

[16] See Vlieghe (2016) for an elaboration of these points.
[17] The key constraint is that long rates depend partly on market expectations of future policy interest rates. Hence, if markets think that policy rates have a lower bound, then long rates are also likely to be bounded. Introducing negative policy rates would relax this constraint.

Many of the structural factors that have reduced interest rates are likely to persist. For example, demographic trends will not reverse for some time.[18] And though I have been optimistic about future productivity growth, there has been little to suggest that it will recover to rates above 2%, seen in the thirty years to 2007.[19] Finally, though the global rollout of a Covid vaccine should gradually lower risks to individuals and businesses, *perceptions* of tail risks – perhaps over future pandemics – are likely to remain heightened.[20] Moreover, growing risks associated with climate change might add downward pressure to risk-free interest rates.[21] I therefore think it is crucial that the MPC has in its toolkit other policies that are able to effectively boost spending and inflation when needed.

3 Are negative rates effective? International experience

The debate on negative rates should hinge on whether and under what conditions they are an effective policy tool. To answer these questions, we must turn to the experience of advanced economies which have actually implemented negative interest rate policy (NIRP): Denmark (from 2012), the Euro Area (from 2014), Switzerland (from 2014), Sweden (from 2015-2019) and Japan (from 2016).[22] My reading of the literature is that:

- Financial-market channels appear to be unimpeded under negative rates, and some may even be stronger than usual.

- While pass-through to household deposit rates can be constrained near zero, pass-through appears to be less constrained for corporate deposit rates, which may stimulate spending by firms.

- There is strong evidence of transmission into looser bank lending conditions, even if this is somewhat constrained relative to 'normal'.

- There is no clear evidence that negative rates have reduced bank profits overall, and a number of studies find positive impacts, once you take into account the boost to the economy.

- Taking these points together, the evidence suggests that negative rates can provide significant stimulus.

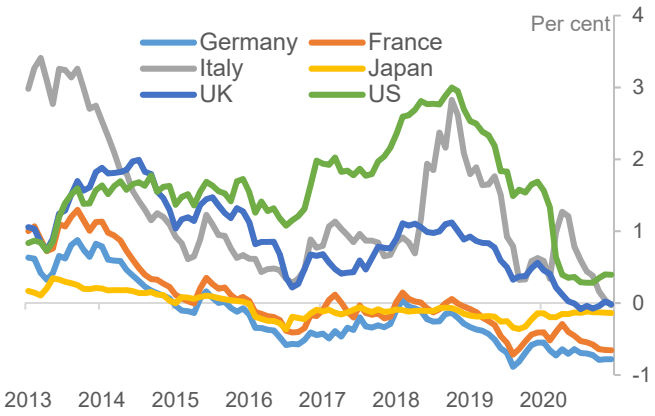
[18] Indeed, Schmelzing (2020) argues that over several centuries one can observe a gradual 'suprasecular' decline in global real interest rates of around 1-2 basis points per annum. In a contrasting view, Goodhart and Pradhan (2020) argue that a 'great demographic reversal' in the coming years will lead to upward pressure on inflation, nominal and real interest rates, for example as the share of the population of working age falls back.
[19] See Tenreyro (2018) for a previous discussion of my views on productivity growth.
[20] See Vlieghe (2017) for a discussion of the effect of risk on real interest rates.
[21] Climate change risks might also encourage new investments in green technology, which could limit the impact on the risk-free rate.
[22] In most cases these dates correspond to the announcement of the first cut below zero for the interest rate on deposits/excess reserves held at the central bank – the rate around which interbank lending rates have tended to coalesce in the post-GFC environment of substantial central bank liquidity provision. For Sweden the dates correspond to the repo rate.

I will now set out the evidence supporting these conclusions. (The casual reader may wish to skip the remainder of this section.)

3.1 Evidence from the literature

I will first examine the financial-market channels of monetary policy. In countries with negative rates, a wide range of market interest rates have turned negative, from short-term interbank lending rates to yields on government bonds (**Chart 5**) and even some corporate bonds.[23] Of course, other factors are at play here, including the structural forces described earlier. But empirical studies which attempt to strip out other factors have found that cuts in policy rates into negative territory, if anything, may have a greater effect on longer-term yields than normal.[24] And other studies reached a similar conclusion for the impact on exchange rates and equities.[25]

Chart 5: Five-year nominal government bond yields



Sources: Bloomberg Finance L.P and Bank calculations.
Notes: Zero-coupon spot rates derived from government bond prices.

This is perhaps unsurprising: there is no obvious reason why these channels would be impaired; the main questions about negative rates have related to banking sector channels. But financial-market channels are important and should not be overlooked. For example, estimates from the Bank's suite of models suggest that financial market channels - operating via the exchange rate, firms' cost of capital and households' financial wealth – account for a third to two thirds of the total medium-term impact on output from Bank Rate changes, and a half to three quarters of the impact on inflation.[26]

Turning to the banking sector, I'll first examine pass-through of policy rates to deposit rates. When deposit rates are well above 0% at the time when negative rates are implemented, pass-through of policy rate cuts can be material.[27] But several studies document that, rather than shifting smoothly into

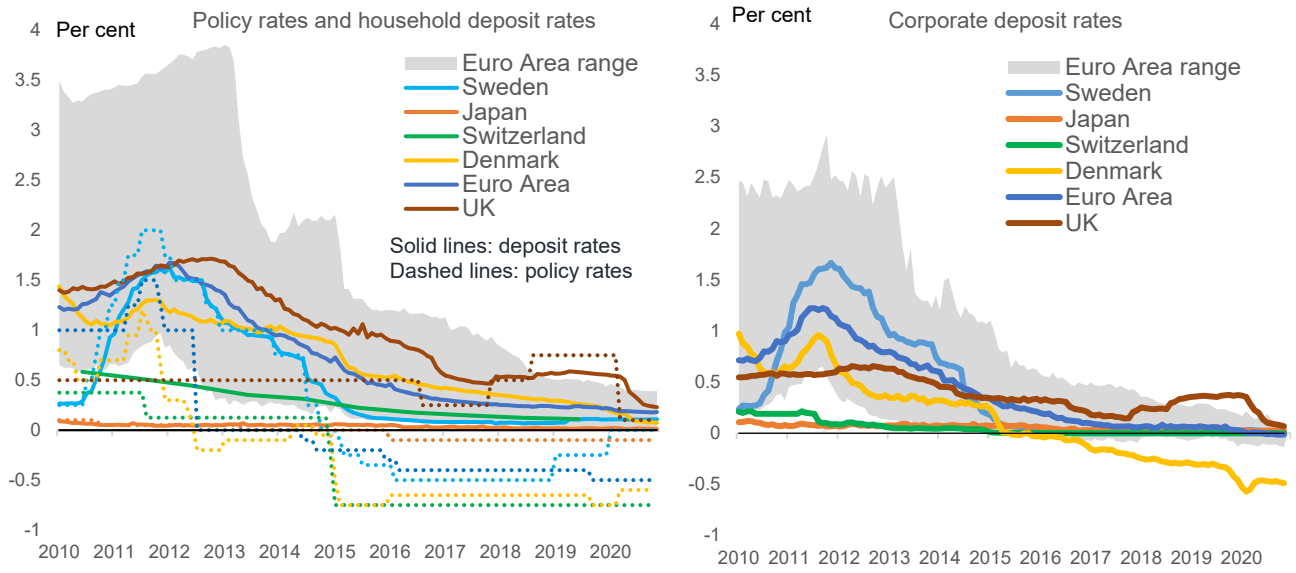
[23] For example, see Arteta et al (2016).
[24] See Bräuning and Wu (2017) and Rostagno et al (2019). Grisse et al (2017) find evidence that transmission of rate cuts to international long rates is stronger the closer the proximity to the perceived lower bound, perhaps due to signalling to traders that the floor on policy rates is lower than they previously thought.
[25] Bräuning and Wu (2017), results of Gräb and Mehl (2015) cited in Eisenschmidt and Smets (2019).
[26] The range here reflects differences in how persistent the change in Bank Rate is perceived to be: the more persistent the expected change, the greater the role of the forward-looking financial market channels.
[27] A box in the August 2016 *Inflation Report* documents a positive relationship between the starting level of deposit rates for new business and the pass-through of reference rates in a number of European economies over 2013-16. Eggertsson et al (2019) finds a similar result for the average rate on Swedish deposits, while Hong and Kandrac (2018) note that Japanese retail deposit rates were very low prior to the introduction of NIRP, resulting in less scope for pass-through. Klein (2020) finds no evidence of a slowdown of pass-through to deposit rates in the Euro Area over the 2014-18 period overall, but notes that pass-through appears to stall after 2017 as deposit rates approached zero. Bittner et al (2020) finds that deposit rate pass-through under NIRP was stronger in Euro Area countries with higher starting levels of deposit rates.

negative territory, the distribution of deposit rates instead 'piles up' close to zero, such that pass-through of policy rate cuts is reduced.[28] The extent of the constraint varies across depositors. As **Chart 6** shows, average household deposit rates appear to have been bounded below by zero. And within the distribution, the share of household deposits receiving negative rates is very small, albeit increasing.[29]

In contrast, corporate deposit rates in Denmark and some Euro Area countries have fallen below zero (**Chart 6**), with negative rates more likely to be imposed on larger corporates.[30] Banks' decision to 'go negative' also seems to depend on the size and expected persistence of negative policy rates. There was little pass-through to Euro Area corporate deposits at first, but pass-through increased when policy rates went deeper into negative territory.[31]

And the modestly negative rates seen on some deposits have not caused demand for cash to spike, suggesting that the old textbook model has been superseded.[32]

Chart 6: Policy rates and indicative measures of household and corporate deposit rates



Source: Bank of England, ECB, Danmarks Nationalbank, Riksbank, Bank of Japan, Swiss National Bank and Bank calculations
Notes: Policy rates defined in notes for Chart 2. Deposit rate definitions: Euro Area, Denmark, Sweden and UK are weighted-average interest rate on outstanding stock of MFI deposits. Switzerland: for households, average interest rate on domestic customer deposits, for corporates simple average of median interest rate for private clients on a) payment accounts without withdrawal restrictions and b) high value (>100,000 CHF) 1 year term deposit. Japan: simple average of a) average posted interest rate on ordinary deposits and b) effective rate on low value (<3m Yen) time deposits for households, effective rate on high value (>10m Yen) time deposits for corporates.

[28] For example Demiralp et al (2019), Eisenschmidt and Smets (2019) and Tan (2019) for the Euro Area.
[29] In their November 2020 *Financial Stability Review*, the ECB noted that that the share of household overnight deposits with a negative interest rate had reached 7% by September 2020. And Krogrstrup et al (2020) note that in late 2019 Danish banks began applying negative rates to household deposits above a certain size.
[30] See Turk (2016).
[31] See Altavilla et al (2019).
[32] See Malinovskaya and Wessel (2016) and Rognlie (2016), for example.

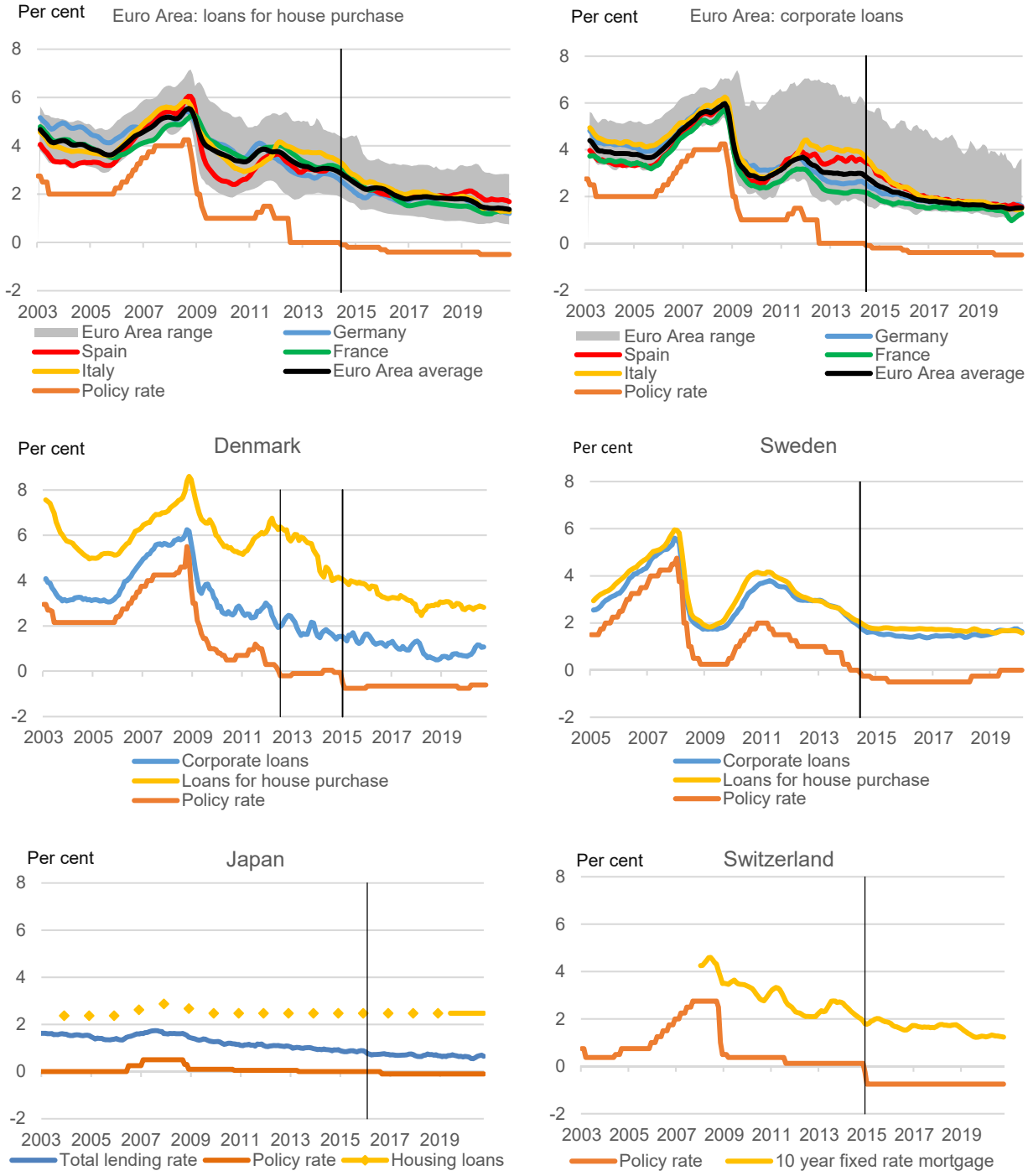
Incomplete pass-through to deposit rates has limited *direct* consequence for households' saving and spending decisions. A fall in deposit rates normally has a modest effect on spending, since while it encourages the depositor to bring forward spending rather than save, it also reduces her income, which pushes in the other direction.[33] Some new studies suggest that for firms, negative rates on corporate deposits have even led firms to increase investment and employment.[34] Interestingly, they find that *charging* firms for depositing money prompts a stronger response than changing the (positive) level of interest those deposits return. This suggests one aspect of the banking channel of negative rates which could be more powerful than usual.

A theoretical paper by Brunnermeier and Koby (2018) has hypothesised that reduced pass-through to deposit rates could squeeze banks' profits and cause a contraction in credit supply.[35] Bank profits could fall if the return on their assets – for example central bank reserves[36] – fell by more than the interest paid on their liabilities, which include deposits. In turn, this could affect banks' willingness or ability to extend credit.
In my opinion an outright *contraction* in credit supply in response to negative rates is a remote possibility. Since bank funding costs overall should fall – given the presence of significant amounts of non-deposit funding, for example – this should create space for banks to reduce loan rates somewhat (and hence boost credit supply) while preserving their margins. Competitive pressures may lead banks to cut loan rates by more than this, which in turn could reduce bank profits, but this would be consistent with stronger credit supply and more stimulus being provided. I would find it highly unlikely that we would see any combination where banks would simultaneously reduce their loan rates substantially – such that their profits fell materially – while also reducing the supply of credit. **More importantly, there is actually strong evidence that negative rates lead to looser bank lending conditions, even if some studies find that the transmission is somewhat constrained relative to 'normal'.**

In aggregate, loan rates for households and corporates in different countries have generally fallen since the introduction of negative interest rates (**Chart 7**).[37] While there were many factors affecting loan rates over this period, the aggregate data suggests that negative rates succeeded in loosening bank lending conditions. To examine this more precisely, I turn to the literature.

[33] These opposing income and substitution effects are present in the standard heterogeneous agent model of Kaplan et al (2014) for example.
[34] See Altavilla et al (2019) on the Euro Area, and Abildgren and Kuchler (2020) on Denmark.
[35] When policy rates go below a certain level, lower profits reduce banks' capital, which in turn constrains bank lending. This mechanism features in the model of Eggertsson et al (2019) also.
[36] Though central bank reserves tend to comprise a relatively small share of banks' total assets – e.g. see Chart 8 below - and several countries have restricted the proportion of reserves that are subject to negative rates.
[37] One counterexample is Switzerland, where certain mortgage rates rose after the introduction of negative rates. We shouldn't overweight this, though, since a tightening in macroprudential policy may have contributed to the rise, and lending rates fell back later.

Chart 7: Policy rates and bank lending rates in negative interest rate countries



Sources: ECB, Danmarks Nationalbank, Riksbank, Bank of Japan and Swiss National Bank
Notes: Stalks show the beginning of the NIRP period in each region. In Denmark there are two periods, separated by a brief period of low but positive policy rates in 2014. Policy rates defined in notes to Chart 2. Lending rates are centred three month moving averages. Euro Area, Denmark and Sweden: Interest rates on all new MFI business to non-financial corporations and loans to households for house purchase (total household lending for Sweden). Using only the three-month maturity lending rate, as suggested by Erikson and Vestin (2019), gives similar results. Japan: average contract interest rate on discounts and loans (short-term and long-term) and interest rate on housing loans from City banks. Switzerland: 10-year fixed mortgage rate.

Several euro area studies have found that negative rates lowered loan rates and stimulated credit growth.[38] There is debate over the extent: for example, some found normal levels of pass-through[39] while others find some pass-through but less than normal. [40] All results demonstrate that there is stimulus through the banking sector.[41] For Sweden, studies agree that the Riksbank's initial cuts into negative territory were passed through to mortgage rates, but disagree on the extent of pass-through of subsequent rate cuts.[42]

One identification challenge is that negative rates were implemented to combat disinflationary shocks, and it is difficult to control for the impact of these shocks in empirical studies.[43] That might suggest putting more weight on certain countries' experience. For example, negative rates were implemented in Denmark to stem upward pressure on the exchange rate, in keeping with the DNB's fixed exchange rate target. Since the shock was largely external to Denmark[44] the Danish experience is more of a 'natural experiment' that can better support causal claims. In Denmark, pass-through has been positive, providing stimulus to the economy, although slower than 'normal'.[45]

Another approach, carried out in a recent paper by Ulate (2021), uses a global sample of data, which allows the author to use countries with low but positive policy rates as a control group. It finds significant pass-through for loan rates even as deposit rate pass-through was constrained.[46]

The most popular method has been to compare outcomes for banks that are more 'exposed' to negative rates relative to others. For example, several studies have used a bank's reliance on deposits as a proxy for exposure. By comparing across banks, authors have a better chance of making causal claims about the impact of negative rates on bank behaviour, although the aggregate implications can be harder to interpret.

As the green entries in **Table 1** show, many studies have concluded that more exposed banks had *stronger* credit supply responses than others, both in terms of a greater *quantity* of lending, and by lending to *riskier* borrowers. The latter finding suggests that the stimulus provided may be similar to the 'risk-taking channel' of monetary policy also proposed at positive rates.[47] In my view, these results are striking, and strongly refute the concerns around banking sector transmission. Other studies (shown in grey) find little difference across

[38] In this context, credit growth is being used as a summary statistic. If negative rates were found to have less of an impact on aggregate credit growth than 'usual' that might suggest that some combination of lower loan rate pass-through, less loosening of non-price terms, or less of a response of borrower demand to easier borrowing conditions, though some studies do attempt to control for the latter.
[39] Eisenschmidt and Smets (2019) and Horvath et al (2018). Klein (2020) found a larger impact on loan rates relative to normal, while Bräuning and Wu (2017) found a larger impact on loan rates and credit growth at longer maturities.
[40] Altavilla et al (2019) found loan rate pass-through to be significant though constrained, though their focus is on deposit rates.
[41] And the banks themselves agree. As reported in Boucinha and Burlon (2020), a net balance of respondents to the ECB's Bank Lending Survey also report that in absolute terms NIRP resulted in higher credit growth and, particularly, lower loan rates.
[42] See Eggertsson and Summers (2019) and Erikson and Vestin (2019). The debate centres around whether to attribute falls in effective mortgage rates between 2016H2-2018 to lagged pass-through of the cuts in the repo rate in 2015H2-2016H1.
[43] This would bias studies *against* finding a boost from bank-lending channels.
[44] For example, you might think that disinflationary shocks in the Euro Area would have little effect on Danish loan rates.
[45] See Adolfsen and Spange (2020). One complication is that the structure of the Danish banking system is different to the UK – differences across countries are discussed in the next section.
[46] In a recent blogpost, Beauregard and Spiegel (2020) use a similar approach and find that credit growth was significantly stronger in NIRP countries after one year, but weaker after two to three years
[47] Borio and Zhu (2012).

banks, which provides little reason to believe transmission is constrained. The picture is not completely uniform. A small number of studies (shown in red) find that more exposed banks are likely to have had a weaker credit supply response than others, at least along certain margins. Although even if more exposed banks do cut loan rates by slightly less, for example, it does not follow that aggregate pass-through is zero.

Finally, some studies examine the impact on bank profits. As mentioned earlier, bank profits do not need to rise in order for negative rates to provide stimulus. Indeed, a reduction in banks' net interest income – the difference between the interest banks earn on their assets and pay out on their liabilities - is likely to signify strong pass-through to loan rates, which should boost spending. However, a sharp deterioration in bank profits could conceivably affect financial stability, or cause credit supply to tighten later on.

There is little clear evidence that negative rates have reduced bank profits overall,[48] [49] and a number of studies find positive impacts,[50] **once you take into account the boost to the economy provided by the stimulus**.[51] Banks' profits come from a range of sources, each of which may be affected differently by negative rates. On the one hand, several studies find that one such component - banks' net interest income - tends to fall when policy rates go negative.[52] That said, some find that even that hit is partially mitigated by lower non-deposit funding costs and stronger credit volumes, while increases in risk-taking may also have helped. Most importantly, the fall in banks' net interest income tends to be offset elsewhere, for example by reduced loan losses, which is in turn consistent with looser monetary policy boosting the economy and raising borrowers' incomes.[53] When taken together, the evidence here suggests that banks overall are not harmed by negative rates, while the economy benefits.

The way negative rates were implemented may also have helped banks to maintain profitability. For example, in many cases some portion of banks' reserves was exempted from negative rates, also known as "tiering" (though this did not happen in the Euro Area until 2019), while the ECB's TLTRO (similar to the Bank's Term Funding Scheme) helped lower bank funding costs.[54]

[48] Due to a formatting error, this paragraph and the subsequent one were missing from the originally published draft of this speech. They were added on 8 February 2021.
[49] See Strasky & Hwang (2019) for the Euro Area, Hong & Kandrac (2018) for Japan and Lopez et al (2020) for a global sample. In a recent blog, Beauregard and Spiegel (2020) find little impact on profits initially, but a negative impact on profits after a few years, using a global sample of banks – however, these results do not control for local economic conditions.
[50] See Rostagno et al (2019) for the Euro Area, and Basten & Mariathasan (2018) for Switzerland.
[51] A number of other studies have investigated the impact of low interest rates, but not specifically negative rates. For example, while Borio et al (2017) find that low interest rates reduce bank profits, Claessens et al (2018) find no significant effect on profitability overall, although the effects appear to become more negative over time. Altavilla, Boucinha and Peydró (2018) find that lower rates are broadly neutral for total bank profits after controlling for expected future economic conditions, while a prolonged period of low rates does have a direct negative effect on profits but this is counterbalanced by improved macroeconomic conditions.
[52] In addition to the papers looking at overall profitability, Klein (2020) focuses specifically on net interest margins and finds a negative effect from NIRP. The picture on net interest income is not uniform, however, with Basten & Mariathasan (2018) and Tan (2019) finding positive and insignificant effects, respectively, for banks more exposed to negative rates.
[53] Another channel emphasised in the theoretical literature is capital gains on security holdings resulting from lower policy rates – though this will only flow through to banks' accounting profits if securities are marked to market which tends to be the case only for a minority (Altavilla, Boucinha and Peydró 2018).
[54] See Saunders (2020) for more discussion of these options.

Interestingly, a number of studies[55] – though not all[56] – find that bank equities tend to fall after policy rate cuts below zero are announced. That seems at odds with the more sanguine results on bank profitability. One interpretation is that financial markets initially focussed on net interest income, but did not initially account for the indirect boost to profits from negative rates arising from improvements in other sources of income. Weakness in bank equity prices after the initial implementation of negative rates could also reflect an adjustment to a weaker economic outlook, if central banks were perceived to have better information about the state of the economy, and negative rates were seen to signal a particularly large deterioration.[57]

[55] For example, Ampudia and van den Heuvel (2019) and Bats et al (2020) find that Euro Area bank equity prices have tended to fall in response to surprise reductions in short rates under NIRP, which wasn't the case when interest rates were higher. Hong and Kandrac (2018) show that bank equity prices fell materially upon the announcement of NIRP in Japan, which they argue was largely unexpected. And Eggertsson et al (2019) find that Swedish bank equities tended to underperform relative to the broader stock market on the days of negative rate announcements.
[56] Altavilla et al (2018) find that falls in short rates and flattening of the yield curve led to higher bank equity prices on the days when unconventional policy measures were announced, including but not limited to NIRP.
[57] See, for example, Romer and Romer (2000) or Nakamura and Steinsson (2018) for evidence of the presence of central-bank information effects.

Table 1: Micro data evidence on bank-lending channels: Response of more exposed relative to less exposed banks

	Paper	Identification strategy	Response of more exposed banks relative to less exposed		
			Loan price	Loan volume	Loan risk
Euro Area	Arce et al 2018	Self-reported NII impact		Similar corporate lending	Similar corporate loan standards, lower risk tolerance and risk-weighted assets
	Altavilla, Boucinha, Holton & Ongena 2018	Self-reported NII impact		More corporate lending	
	Amzallag et al 2019 (Italy)	Overnight deposits	Higher fixed mortgage rates (¼ of total) but similar floating rates		
	Bittner et al 2020 (Germany & Portugal)	Deposits		Mixed results for corporate lending	Mixed results, but more credit to new risky firms in Germany
	Bottero et al 2019 (Italy)	Interbank loans & securities	Lower corporate loan rates	More corporate lending	Bigger rise in lending for risky firms
	Bubeck et al 2020	Deposits		Increase securities holdings; mixed evidence on syndicated loan volumes	Buy riskier securities; increase syndicated lending for riskier borrowers
	Demiralp et al 2019	Deposits and reserves		More household and corporate lending for high deposit banks; similar private securities holdings	
	Grandi & Guille 2020 (France)	Deposits		More lending, especially to corporates; increase debt securities holdings	
	Heider et al 2019	Deposits		Less syndicated lending	Increase in average borrower risk
	Klein 2020	Impact of lower NIM		Usual hit to lending vanishes under NIRP	
	Tan 2019	Deposits	Lower mortgage spreads (limited evidence)	More lending (though effect dissipates), driven by mortgages, similar corporate lending	
Sweden	Eggertsson et al 2019	Deposits	Less mortgage rate pass-through	Less household lending	
Denmark	Adolfsen & Spange 2020	Deposits	Similar pass-through to households & corporates (but slower than normal)	Stronger or similar lending to households & corporates (depending on specification)	
Switzerland	Basten & Mariathasan 2018	Reserves	Higher mortgage rates	Increase in share of loan assets (both uncollateralised loans and mortgages)	Higher risk-weighted asset share
	Schelling & Towbin 2020	Deposits and reserves	Lower corporate loan spreads, lower or similar mortgage spreads	More corporate lending	More risk in corporate lending (across various dimensions)
Japan	Hong & Kandrac 2018	Equity price response to NIRP announcement		More lending	Higher loan portfolio yield, interpreted as higher risk borrowers, and longer loan maturities

4 What other factors might influence how negative rates work?

While we now have a considerable body of evidence on negative rates from other countries, this is nevertheless drawn from a relatively small number of experiences compared to changes at positive policy rates. Hence, as it does for all policies, the MPC has discussed various factors that might affect the transmission of negative rates, were they to be implemented here. The MPC set out its collective view on some of these factors in the August 2020 Monetary Policy Report. In this section I will set out my own perspective.

There are many reasons why monetary policy transmission (or policy multipliers) can vary across countries and over time. These differences apply to varying extents to all policies. For example, last year Governor Bailey discussed why the effects of quantitative easing were likely to depend on the circumstances under which it was used.[58] And I have previously highlighted that in the UK interest rates affect inflation more quickly than in the past.[59] So it would not be surprising if some features of the UK economy, at a given point in time, might influence exactly how negative rates operate here.

Potentially relevant features include the composition of bank balance sheets; differences in openness across economies; the size and composition of household debt, and the quantitative relevance of market-based finance in the economy. Importantly, many of these features are not fixed – they can vary over time, including in response to policy changes.

Most of these differences also affect policy transmission at positive rates. For example, the UK is a relatively small and open economy, so one would expect the exchange-rate effects of monetary policy to be stronger than in larger, less open economies such as Japan, but weaker than in Switzerland, for example. Compared to the euro area, the UK CPI basket is more import intensive, which would lead to a greater direct impact of exchange-rate changes on inflation, all else equal.[60] And UK corporates use a relatively large share of bond market financing, suggesting that the cost-of-capital channel may be more powerful in the UK.[61]

Another difference is that UK households have more debt, and a larger *share* of floating-rate and shorter-term fixed-rate mortgages, compared with much of Europe[62] (**Chart 8**). On the one hand, this would suggest a stronger 'cash flow' channel of monetary policy in the UK, with more borrowers benefitting

[58] See Bailey (2020) and Bailey et al (2020), who echoed Vlieghe (2018).
[59] See Tenreyro (2019), Cloyne and Hürtgen (2016) and Cesa-Bianchi et al (2020).
[60] Differences in economies' size may also be important, if exporters in a smaller economy are likely to have less market power over prices on the global market, such that more of the adjustment from a move in the exchange rate will come via volumes rather than prices. See Broadbent (2017) for a broader discussion of the adjustment of UK exporters to the exchange rate.
[61] As of 2019, debt securities comprised 8% of total corporate (PNFC) liabilities in the UK, compared to 4% for corporates (NFC) in the Euro Area, for example.
[62] In 2019, the UK household debt to GDP ratio was 84%, compared to 58% in the Euro Area. And as of 2020 Q3, floating rate and fixed-rate mortgages of five years of less together comprised 98% of the outstanding stock and 98% of the flow of new business in the UK, compared to 24% of the flow in the Euro Area (stocks data not published).

relatively quickly when interest rates are cut.[63] On the other hand, the sizeable share of *outstanding* mortgages on floating rates could mean some of the costs to banks' net interest income are more front-loaded than the benefits.

Other cross-country differences may be relevant only at negative or near-zero interest rates.[64] The largest UK banks currently fund more of their household and small business lending with household deposits than do banks in some other countries, including the euro area (**Chart 8**). The level of deposit rates at the time of cutting to negative rates has also differed across countries, and within countries compared to later cuts.[65] If other funding costs were to fall in line with Bank Rate, but as in Europe, banks did not cut household deposit rates below zero, then this could lead to differences in transmission. All else equal, a larger share of household deposit funding would require that to maintain unchanged net interest income, banks would also have to cut lending rates by slightly less.[66] With an increase in aggregate (and loan) demand and lower impairments from a stronger macroeconomic outlook, this could still imply a boost to bank profitability, relative to the counterfactual of no policy change. If banks chose to pass-through less of the cut, this would suggest a little less stimulus via the banking sector.

The effects of such cross-country differences in transmission are difficult to estimate precisely, both because they depend on prevailing balance sheets at the time, and crucially, on how the banking system adapts in response. As an example of how balance sheets can change, UK banks have markedly increased their share of retail funding since the 2008 financial crisis.[67] More recently, they have also substituted away from more expensive time deposits into sight deposits such as current accounts. If the introduction of negative rates changed the relative costs of different sources of funding, banks may be able to adjust their funding mix or maturity over time in a way that maximised profitability, subject to ring-fencing and other prudential requirements on banks to maintain stable funding bases.

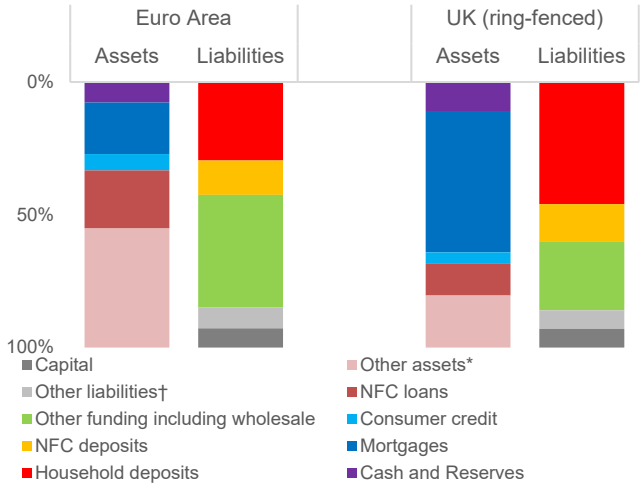
Banks have also used other strategies in the past and in other countries to maintain profitability, which they could potentially turn to again, although perhaps only if negative rates had to be used more often in future. For example, some UK banks have charged fees on some of their deposit accounts for several years – **Chart 9** shows the interest-rate equivalent of these fees has varied over time. In Denmark, which has experienced negative rates for several years, some banks have chosen to set a modest negative rate on larger deposits. Given the skewed distribution of household deposit holdings in the UK, even charging

[63] For example, see Calza et al (2013).
[64] Ramsden (2020) also highlights some of these differences.
[65] The current level of sight deposit rates in the UK is lower than it was in the euro area when negative rates were first implemented there, although more similar for the most recent cut. It is higher than it was for later cuts, and it is higher than in some other countries when negative rates were introduced.
[66] As pointed out in the August 2020 *Monetary Policy* Report, smaller banks and building societies are generally most exposed to this risk in the UK. See Saunders (2020) for more discussion on how banks might choose to react.
[67] The introduction of ring-fencing for the largest UK banks has also increased the share of deposits used to fund household and small business lending. Chavaz and Elliot (2020) estimate that this has reduced the cost of credit for households, which in turn increased risk taking by some smaller banks.

negative rates on only a small proportion of accounts with large deposits above a certain value could enable banks to significantly reduce their funding costs.

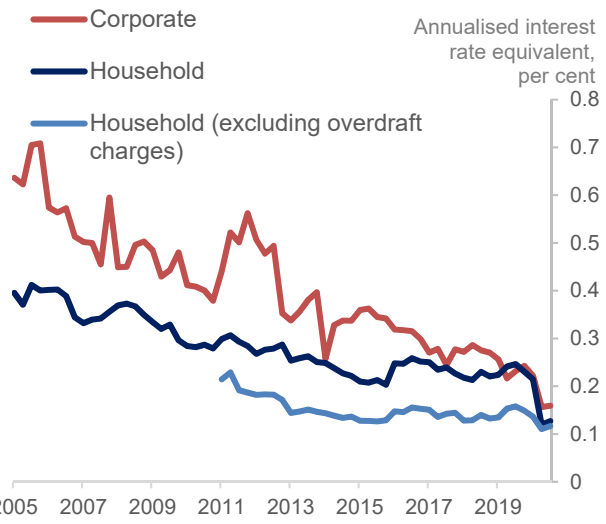
In all, there are many ways banks might respond to further cuts in policy rates other than limiting pass-through to lending rates. And even if they opted not to fully pass on cuts to lending rates at first, this would only offset part of the stimulus from lending channels, and would leave the rest of the transmission mechanism unaffected.

Chart 8: Euro Area and UK bank balance sheets



Sources: Bank of England, ECB and Bank calculations
* Includes interbank loans, other financial loans, external loans, equities, derivatives, debt securities.
† Other liabilities include provisions and tax liabilities.
Sources: Regulatory returns, ECB consolidated banking data.
Notes: 2019 Q4 balance sheets. UK data for ring-fenced banks only.

Chart 9: UK current account fees



Sources: Bank of England and Bank calculations
Notes: Interest rate equivalents calculated by dividing banks' current account fee income by total deposits from that sector (M4 measure) and annualising. Data for corporates (private non-financial corporations) includes overdraft charges.

More generally, the effects of any monetary policy are likely to depend on the cyclical conditions at the time the policy is introduced. My own research has found that US monetary policy is less powerful during recessions, when it is needed most, than during upswings.[68] But with few experiences to go on, there is little evidence about the presence or otherwise of these effects for negative policy rates.

One factor is that banks' balance-sheet positions also vary over the cycle, which could potentially interact with negative interest rates. Banks are likely to be in a somewhat weaker position over the next few years due to the Covid-induced downturn. At the same time, the UK banking sector went into the Covid crisis having increased capital ratios markedly over the past decade, in large part in response to actions taken by the Bank's FPC and PRC.

To think through the potential effects, one can compare the effects of negative rates on banks with different initial financial positions. Some studies have found that in Europe, banks with weaker financial positions were

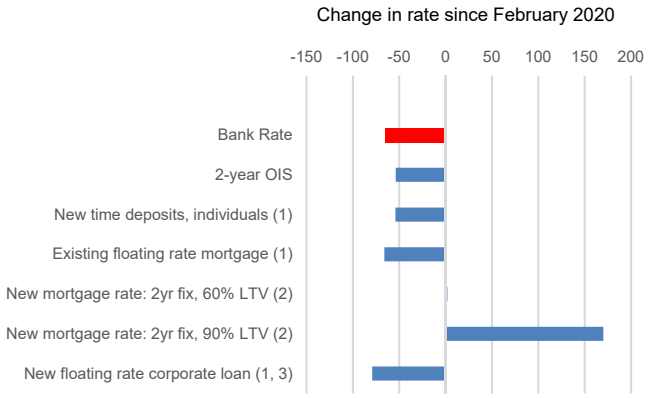
[68] Tenreyro and Thwaites (2016).

more likely to restrict pass-through to deposit rates[69] or tighten some non-interest terms,[70] in response to negative rates. But others obtained opposing[71] or inconclusive[72] results.

We may also be able to learn from recent experience of interest rate policy in the UK. Although there are no past examples of negative policy rates, the MPC voted in March 2020 to cut Bank Rate from 0.75% to 0.1%. Since there is no clear discontinuity at zero in the demand for cash, and since deposit rates facing households are typically lower than the policy rate itself, then any differences in transmission at negative rates should also be somewhat evident at low, positive policy rates.

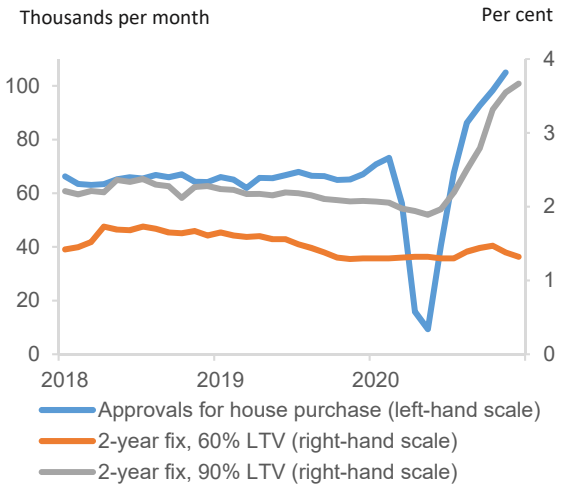
My reading is that the cut in Bank Rate has so far worked as expected. The financial-market channels of policy appear to be operating normally. And there has been significant pass-through to a range of commercial bank interest rates (**Chart 10**). These include rates on *existing* variable-rate mortgages, on new corporate loans, and on deposits.[73] The rates on *new* fixed-rate mortgages at low (60%) loan-to-value (LTV) rates have ended the year broadly flat, though these are less directly linked to Bank Rate, and had already fallen around 30 basis points over 2019. Very strong demand for new mortgages, coupled with difficulties processing high volumes of business, have also pushed up on these rates this year.[74] (**Chart 11** shows the sharp increase in house-purchase approvals, boosted by the temporary stamp-duty holiday and pent-up demand following lockdown, which have triggered a thick-market effect.[75]) Consistent with that, low LTV mortgage rates rose slightly after the first lockdown ended, before falling back recently.

Chart 10: Changes in risk-free reference rates and bank interest rates



Sources: Bank of England and Bank calculations
(1) Effective interest rates, from Bankstats table G1.4
(2) Quoted interest rates, from Bankstats table G1.3
(3) Private non-financial corporations

Chart 11: Mortgage rates and approvals



Sources: Bank of England and Bank calculations

[69] See Altavilla et al (2019).
[70] See Arce et al (2018).
[71] For example, see Basten and Mariathasan 2018, Grandi and Guille (2020) and Tan 2019.
[72] Bottero et al (2020). Bittner (2020) found that banks with lower equity ratios expanded credit by more in Portugal – where the starting level of deposit rates was well above zero – but had no significant effect in Germany.
[73] Rates on sight deposits such as current accounts, which were already close to zero, have fallen by somewhat less than Bank Rate.
[74] See the November 2020 *Monetary Policy Report* for more details.
[75] See Ngai and Tenreyro (2014).

Monetary policy has also been anticipating and acting against a Covid-related tightening in credit conditions for high LTV borrowers (i.e. with smaller housing deposits). These products provide lenders with less collateral, putting them at greater risk of losses. With uncertainty over the outlook for house prices, and a risk of more mortgage defaults as unemployment rises, lenders' perceptions of likely losses on these loans have increased, leading them to increase rates sharply or withdraw products entirely (**Chart 11**). But absent looser policy, and the associated boost to incomes and employment, credit conditions would likely have tightened even more for these borrowers.

My overall assessment is that, while we can never have complete certainty, negative interest rates should with high likelihood boost UK growth and inflation. Cutting Bank Rate to its record low of 0.1% has helped loosen lending conditions relative to the counterfactual (of no policy change), and I believe further cuts would continue to provide stimulus. It is possible that bank-lending channels impart slightly less stimulus relative to experiences in other countries, at least initially, but I would consider it as very unlikely that we do not see any boost to lending. There are also several ways in which banks would be able to adapt to mitigate any hit to net interest income, while overall profitability would be supported by the boost to demand and the associated falls in provisions, relative to the counterfactual of no policy stimulus. There is little reason to suspect that the financial-market channels of monetary policy, which our models suggest are quantitatively important, would operate differently to normal.

5 Economic outlook

As in 2020, the economic outlook for the UK in 2021 will depend overwhelmingly on the path of the Covid-19 pandemic, both at home and abroad. Since the last MPC forecast (published in early November), we have had positive news on vaccines, which has been tempered by the intensification of the current wave of Covid. Altogether, this will imply a worse near-term outlook than anticipated in November, before the economy starts a now less uncertain recovery later in 2021. Both the speed and the extent of the recovery will hinge crucially on how households, businesses and economic policy respond to the continued effects of the virus.

The latest manifestation of the virus's economic effects is the renewed national lockdown brought in last week in England, with similar measures also in place in Wales, Scotland and Northern Ireland. The precise path of output over 2020 Q4 and 2021 Q1 will be determined by the timing and extent of these lockdown measures. We will see headline-grabbing negative growth numbers, followed by large positive ones when the economy is able to reopen. Crucial for jobs, incomes and inflation will be the *level* of output we recover to later in the year, rather than the changes in the interim.

After current restrictions are relaxed, the speed and the extent of the output recovery will depend on how vaccine rollout and other public health policies affect the pandemic, and on how the behaviour of households and companies responds to those developments. As high-risk groups are vaccinated and mortality falls,

there is likely to be a reduction in voluntary and mandated social distancing, which will help consumption recover some way towards its pre-Covid level. But there are factors that will act to slow and limit any recovery, which policy must take into account.

First and foremost, until vaccination is widespread across the population at home and abroad, there is likely to be a limit to how far activity can recover in some sectors. Spending in high social-contact sectors is likely to continue to increase virus prevalence, particularly given the more transmissible new strain. Moreover, even if the UK continues to vaccinate more quickly than most countries, slower rollout in any of our trading partners will weigh on activity here, especially in sectors such as tourism.

Further ahead, even as fear of the virus subsides, the differing effects it has had across different parts of the economy will constrain spending. Some households have built up a large stock of enforced savings during lockdowns, when they couldn't spend on services such as hospitality. While this will create some pent-up demand, it is likely to be released only gradually – consuming many of these services requires time – limiting the speed of any rebound. And many other households, often low-income to start with, have suffered falls in income through unemployment or lower working hours, which will translate into lower spending. Many more households, as well as businesses, may choose to maintain a higher buffer of savings in future or pay down debt, while job and revenue uncertainty persists.

Adding to the uncertainty, structural changes to the way we consume and work may be partly here to stay. Consumers have learnt that many goods and services can be purchased as easily online. Workers and firms have learnt that commutes and rental costs can be efficiently reduced with more remote working. With fewer days of office work, transport and complementary consumption will fall and, with them, employment in those activities will also fall. The speed of labour reallocation, and the extent of business failures, will play crucial roles in determining how much these effects spill over into other sectors, higher unemployment and weaker aggregate demand.

So far, fiscal policy, especially the government's Job Retention Scheme, has helped to prevent a much larger increase in unemployment. The successful development of vaccines should also have given many badly affected firms confidence in their viability, since where demand substitution and business closures are temporary, demand should at some point be able to return. But the labour market has nonetheless loosened significantly.[76] In addition, the resurgence in the virus and related downturns are likely to mean significantly more job losses still to come. For some sectors, despite fiscal support schemes, the cumulative revenue loss is likely to lead to business failures.

[76] The official unemployment rate had risen to 4.9% in October, ahead of the second national lockdown, and measurement difficulties mean these data were likely to be understating its true rate. Separate HRMC data were consistent with unemployment already being above 6%.

While fiscal policy is the main actor in this crisis, monetary policy also has a role to play in supporting the economy, consistent with our mandate. In the near-term, it can stimulate demand in sectors still able to operate during the lockdown; support cash flow and help keep borrowing costs low for businesses and households. These effects should help limit insolvencies and job losses, reducing scarring to the economy's potential output in future.

The policy measures that limit scarring are also essential to bring inflation back to target. At present we have a very large degree of spare capacity, so there is no short term trade-off between our objectives. As the vaccine is rolled out, we will see some pick-up in demand, which should use up some capacity and reduce the disinflationary pressures from the pandemic. But even as we recover ground, we should not forget that disinflationary pressures predated Covid – core inflation has now been below 2% for 27 consecutive months, and for 80% of the past seven years.

Importantly, in my view, the speed with which we eliminate spare capacity, and the scale of the rise in unemployment, will depend on policy. All else equal, looser monetary policy can help the economy recover faster, bringing inflation back to target, while also preventing some of the job losses and business failures that could otherwise reduce potential output in future. The MPC has given guidance that policy will not be tightened before there is clear evidence that significant progress is being made in eliminating spare capacity and achieving the inflation target sustainably. It is possible that more stimulus be needed to do so at an appropriate pace. If that is the case, having negative rates in our toolbox will, in my view, be important.

References

Abildgren, K., and A. Kuchler (2020), "Do firms behave differently when nominal interest rates are below zero?", *Danmarks Nationalbank Working Paper No. 164.*

Altavilla, C., M. Boucinha and J. L. Peydró (2018), "Monetary policy and bank profitability in a low interest rate environment". *Economic Policy*, *33*(96), 531-586.

Altavilla, C., M. Boucinha, S. Holton and S. Ongena (2018), "Credit supply and demand in unconventional times", *ECB Working Paper No. 2202*.

Altavilla, C., L. Burlon, M. Giannetti and S. Holton (2019), "Is there a zero lower bound? The effects of negative policy rates on banks and firms", *ECB Working Paper No. 2289*.

Ampudia, M., and S. J. Van den Heuvel (2018), "Monetary policy and bank equity values in a time of low interest rates", *Finance and Economics Discussion Series 2019-064*, Board of Governors of the Federal Reserve System.

Amzallag, A., A. Calza, D. Georgarakos, and J. Sousa (2019), "Monetary policy transmission to mortgages in a negative interest rate environment, *ECB Working Paper No. 2243*.

Arce, O., M. García-Posada, S. Mayordomo and S. Ongena (2018), "Adapting lending policies when negative interest rates hit banks' profits", *Working Papers, No. 1832,* Banco de España.

Arteta, C., M. A. Kose and T. Taskin (2016), "Negative interest rate policies: Sources and implications", *Policy Research Working Paper 7791*, The World Bank.

Bailey, A. (2020), "The central bank balance sheet as a policy tool: past, present and future", speech given at Jackson Hole Economic Policy Symposium, available at https://www.bankofengland.co.uk/speech/2020/andrew-bailey-federal-reserve-bank-of-kansas-citys-economic-policy-symposium-2020.

Bailey, A., J. Bridges, R. Harrison and A. Makodi (2020), "The central bank balance sheet as a policy tool: past, present and future", Paper prepared for the Jackson Hole Economic Policy Symposium, available at https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/the-central-bank-balance-sheet-as-a-policy-tool-past-present-and-future.pdf.

Basten, C., and M. Mariathasan (2018), "How banks respond to negative interest rates: Evidence from the Swiss exemption threshold", *CESifo Working Paper Series 6901*.

Bats, J., M. Giuliodori and A. Houben (2020), *"Monetary policy effects in times of negative interest rates: What do bank stock prices tell us?", DNB Working Paper 694*.

Bean, C. (2013), letter to Andrew Tyrie on negative interest rates, available at https://www.bankofengland.co.uk/letter/2013/charles-bean-negative-interest-rates-may-2013.

Beauregard R. and M. M. Spiegel (2020), "Commercial Banks under Persistent Negative Rates", *FRBSF Economic Letter*.

Bittner, C., D. Bonfim, F. Heider, G. Saidi, G. Schepens and C. Soares (2020), "Why so negative? The effect of monetary policy on bank credit supply across the euro area", *unpublished working paper*.

Borio, C., L. Gambacorta, and B. Hofmann (2017), "The influence of monetary policy on bank profitability", *International Finance*, *20*(1), 48-63.

Borio, C. and H. Zhu (2012), "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?" *Journal of Financial Stability* 8(4): 236-251..

Bottero, M., M. C. Minoiu, J. L. Peydró, A. Polo, M. A. F. Presbitero, and E. Sette (2019), "Negative monetary policy rates and portfolio rebalancing: Evidence from credit register data", *IMF Working Paper No. 19/44*.

Boucinha, M., and L. Burlon (2020), "Negative rates and the transmission of monetary policy", *ECB Economic Bulletin Articles*, *3/2020*.

Bräuning, F., and B. Wu (2017), "ECB monetary policy transmission during normal and negative interest rate periods", *available at SSRN 2940553*.

Broadbent, B. (2017), "Brexit and the pound", speech given at Imperial College, available at https://www.bankofengland.co.uk/speech/2017/brexit-and-the-pound.

Brunnermeier, M. K., and Y. Koby (2018), "The reversal interest rate", *NBER Working Paper No. 25406.*

Bubeck, J., A. Maddaloni, and J. L. Peydró (2020), "Negative monetary policy rates and systemic banks' risk-taking: evidence from the euro area securities register", *Working Papers 1128,* Barcelona Graduate School of Economics.

Buiter, W. H. (2009). "Negative nominal interest rates: Three ways to overcome the zero lower bound," The *North American Journal of Economics and Finance*, vol. 20(3), pages 213-238.

Button, R., S. Pezzini and N. Rossiter (2010), "Understanding the price of new lending to households", *Bank of England Quarterly Bulletin*, 2010 Q3, available at https://www.bankofengland.co.uk/quarterly-bulletin/2010/q3/understanding-the-price-of-new-lending-to-households

Cadamagnani, F., R. Harimohan, and K. Tangri (2015), "A bank within a bank: how a commercial bank's treasury function affects the interest rates set for loans and deposits", *Bank of England Quarterly Bulletin*, 2015 Q2, available at https://www.bankofengland.co.uk/quarterly-bulletin/2015/q2/a-bank-within-a-bank-how-a-commercial-banks-treasury-function-affects-the-interest-rates-set-for.

Calza, A., T. Monacelli and L. Stracca (2013), "Housing finance and monetary policy", *Journal of the European Economic Association*, *11* (Supplement 1), 101-122.

Cesa-Bianchi, A., G. Thwaites and A. Vicondoa (2020), "Monetary policy transmission in the United Kingdom: A high frequency identification approach", *European Economic Review*, *123*, 103375.

Claessens, S., N. Coleman, and M. Donnelly (2018), "Low-For-Long" interest rates and banks' interest margins and profitability: Cross-country evidence", *Journal of Financial Intermediation*, *35*, 1-16.

Cloyne, J., and P. Hürtgen (2016), "The macroeconomic effects of monetary policy: a new measure for the United Kingdom", *American Economic Journal: Macroeconomics*, *8*(4), 75-102.

Chavaz, M., and D. Elliot (2020), "Separating retail and investment banking: evidence from the UK", *Bank of England Staff Working Paper No. 892.*

Darriet, E., M. Guille, J. C. Vergnaud and M. Shimizu (2020), "Money illusion, financial literacy and numeracy: Experimental evidence", *Journal of Economic Psychology*, *76*, 102211.

Demiralp, S., J. Eisenschmidt and T. Vlassopoulos (2019), "Negative interest rates, excess liquidity and retail deposits: Banks' reaction to unconventional monetary policy in the euro area", *ECB Working Paper No. 2283*.

ECB (2020), *Financial Stability Review*, November 2020.

Eggertsson, G. B., and L. H. Summers (2019), "Negative interest rate policy and the bank lending channel", VoxEU.

Eggertsson, G. B., R. E. Juelsrud, L. H. Summers and E. G. Wold (2019), "Negative nominal interest rates and the bank lending channel", *NBER Working Paper. No. 25416.*

Eisenshmidt, J., and F. Smets (2019), "Negative interest rates: Lessons from the euro area", *Series on Central Banking Analysis and Economic Policies no. 26*.

Erikson, H., and D. Vestin (2019), "Pass-through at mildly negative policy rates: The Swedish case," *Sveriges Riksbank Staff Memo*, 1-32.

Gambacorta, L. (2009), "Monetary policy and the risk-taking channel", *BIS Quarterly Review December 2009*.

Goodhart, C. and M. Pradhan (2020), "The Great Demographic Reversal: Ageing Societies, Waning Inequality and an Inflation Revival", Springer Nature.

Grandi, P., and M. Guille (2020), "The Upside Down: French Banks, Deposits and Negative Policy Rates", *mimeo*.

Grisse, C., S. Krogstrup and S. Schumacher (2017), "Lower bound beliefs and long-term interest rates", *IMF Working Paper No. 17/62*.

Haldane, A. (2015), "How Low Can You Go?", speech given at the Portadown Chamber of Commerce, Northern Ireland, available at https://www.bankofengland.co.uk/speech/2015/how-low-can-you-can-go

Heider, F., F. Saidi and G. Schepens (2019), "Life below zero: Bank lending under negative policy rates", *The Review of Financial Studies*, *32*(10), 3728-3761.

Hicks, J. R. (1937), "Mr. Keynes and the 'Classics'; A Suggested Interpretation." *Econometrica*, vol. 5, no. 2, 1937, pp. 147–159.

Hong, M. G. H. and J. Kandrac (2018), "Pushed past the limit? How Japanese banks reacted to negative interest rates", *IMF Working Paper No. 18/131.*

Horvath, R., J. Kotlebova and M. Siranova (2018), "Interest rate pass-through in the euro area: Financial fragmentation, balance sheet policies and negative rates", *Journal of Financial Stability*, *36*, 12-21.

Kaplan, G., B. Moll and G. L. Violante (2018), "Monetary policy according to HANK", *American Economic Review*, *108*(3), 697-743.

Kimball, M. (2015), "Negative Interest Rate Policy as Conventional Monetary Policy", *National Institute Economic Review*, 234(1):R5-R14.

Klein, M. (2020), "Implications of negative interest rates for the net interest margin and lending of euro area banks", *Deutsche Bundesbank Discussion Paper No. 10/2020*.

Krogstrup, S., A. Kuchler and M. Spange (2020), "Negative interest rates: The Danish experience", VoxEU.

Lopez, J. A., A. K. Rose and M. M. Spiegel (2020), "Why have negative nominal interest rates had such a small effect on bank performance? Cross country evidence", *European Economic Review*, *124*, 103402.

Malinovskaya, A. and D. Wessel (2016), “Did negative rates in Europe trigger massive cash hoarding?”, *The Brookings Institution blog*.

McCallum, B. T. (2000), “Theoretical Analysis Regarding a Zero Lower Bound on Nominal Interest Rates”, *Journal of Money, Credit and Banking*, vol. 32, no. 4, 2000, pp. 870–904.

Nakamura, E., and J. Steinsson (2018), “High-Frequency Identification of Monetary Non-Neutrality: The Information Effect”, *The Quarterly Journal of Economics*, Volume 133, Issue 3, August 2018, Pages 1283–1330.

Ngai, L. and S. Tenreyro (2014), “Hot and Cold Seasons in the Housing Market”, American Economic Review, vol. 12, December 2014, pp. 3991-4026.

Rachel, L., and L. Summers (2019), “On Secular Stagnation in the Industrialized World”, *NBER Working Paper No. w26198*.

Ramsden, D. (2020), “The monetary policy toolbox in the UK”, speech given at the society of professional economists online conference, available at https://www.bankofengland.co.uk/speech/2020/dave-ramsden-society-of-professional-economists-online-conference-2020.

Romer, C. D., and D. H. Romer (2000), "Federal Reserve Information and the Behavior of Interest Rates." *American Economic Review*, 90 (3): 429-457.

Rognlie, M. (2016), “What lower bound? Monetary policy with negative interest rates”, u*npublished manuscript*.

Rostagno, M., C. Altavilla, G. Carboni, W. Lemke, R. Motto, A. S. Guilhem and J. Yiangou (2019), “A Tale of Two Decades: The ECB's Monetary Policy at 20”, *ECB Working Paper No. 2346*.

Saunders, M. (2020), “Some monetary policy options – if more support is needed”, speech given at online webinar, available at https://www.bankofengland.co.uk/speech/2020/michael-saunders-some-monetary-policy-options-if-more-support-is-needed.

Schelling, T., and P. Towbin (2018), “Negative interest rates, deposit funding and bank lending”, *SNB Working Paper No. 5/2020*.

Schmelzing, P. (2020), “Eight centuries of global real interest rates, R-G, and the ‘suprasecular decline’, 1311-2018”, *Bank of England Staff Working Paper, No. 845*, available at https://www.bankofengland.co.uk/working-paper/2020/eight-centuries-of-global-real-interest-rates-r-g-and-the-suprasecular-decline-1311-2018.

Shafir, E., P. Diamond, and A. Tversky (1997), “Money illusion”, *The Quarterly Journal of Economics*, *112*(2), 341-374.

Stráský, J., and H. Hwang (2019), “Negative interest rates in the euro area: does it hurt banks?”, *OECD Economics Department Working Papers, No. 1574*.

Tan, G. (2019), “Beyond the zero lower bound: negative policy rates and bank lending”, *DNB Working Paper No. 649*.

Tenreyro, S (2019), “The elusive supply potential: monetary policy in times of uncertainty”, speech given in Glasgow, Scotland, available at https://www.bankofengland.co.uk/speech/2019/silvana-tenreyro-speech-during-regional-visit-to-glasgow.

Tenreyro, S. and G. Thwaites (2016), “Pushing on a string: US monetary policy is less powerful in recessions”, *American Economic Journal: Macroeconomics*, *8*(4), 43-74.

Thomas, R. and N. Dimsdale (2017), "A Millennium of UK Data". *Bank of England OBRA dataset*, available at http://www.bankofengland.co.uk/research/Pages/onebank/threecenturies.aspx.

Turk, R. (2016), “Negative interest rates: How big a challenge for large Danish and Swedish banks?”, *IMF Working Paper No. 16/198*.

Ulate, M. (2021), “"Going Negative at the Zero Lower Bound: The Effects of Negative Nominal Interest Rates." *American Economic Review*, 111 (1): 1-40.

Vlieghe, G. (2016), “Debt, Demographics and the Distribution of Income: New challenges for monetary policy”, speech given at the London School of Economics, available at https://www.bankofengland.co.uk/speech/2016/debt-demographics-and-the-distribution-of-income-new-challenges-for-monetary-policy

Vlieghe, G. (2017), “Real interest rates and risk”, speech given at the Society of Business Economists’ Annual conference, London, available at https://www.bankofengland.co.uk/speech/2017/real-interest-rates-and-risk

Vlieghe, G. (2018), “The yield curve and QE”, speech given at Imperial College Business School, London, available at https://www.bankofengland.co.uk/speech/2018/gertjan-vlieghe-imperial-college-business-school-london

Woodford, M. (2003)¸ *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press.