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NIRP, Bank Profitability and Risk- Taking: Much Ado About 50 Basis Points



Policy Department for Economic, Scientific, and Quality of Life Policies
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Abstract

A widespread concern about negative policy rates is that they might depress bank profits and encourage risk-taking. We find that the impact of negative rates per se is limited. Other policy measures (TLTROs, tiered deposits) have largely neutralised the impact of NIRP on bank profits. Asset purchases might have been more important by compressing the yield curve. Any small positive impact of negative rates on lending and aggregate demand may have been swamped by the negative impact of low rates on productivity.

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LIST OF ABBREVIATIONS

APP	Asset purchase programme
BoJ	Bank of Japan
ECB	European Central Bank
EP	European Parliament
EU	European Union
LCR	Liquidity coverage ratio
NFCs	Non-financial corporations
NIRP	Negative interest rate policy
NPLs	Non-performing loans
PEPP	Pandemic emergency purchase programme
PSPP	Public sector purchase programme
QE	Quantitative easing
RoA	Return on assets
SSM	Single Supervisory Mechanism
TLTRO	Targeted longer-term refinancing operations
ZIRP	Zero interest rate policy

EXECUTIVE SUMMARY

- **The presumption that negative interest rate policies (NIRP) depress profitability of banks and lead to more risk-taking is widespread, but difficult to document.** The available evidence does not suggest a large effect either way.
- **Much of the literature does not distinguish between low and negative rates.** This contribution focuses mainly on negative policy rates, not “low for long”.
- **Negative rates are supposed to constitute a special case** of low rates because banks have not been able or willing to institute negative deposit rates for retail deposits, thus leading to a loss of revenues.
- **This potential impact of negative rates on bank profitability could be substantial, but it has been offset by two other policy measures:** targeted longer-term refinancing operations (TLTROs) and tiered deposits.
- **Banks have re-financed almost half of their lending to non-financial corporations (NFCs)** through very cheap long-term lending from the ECB (longer-term refinancing operations [TLTRO]). The interest savings alone from the TLTRO compensated the loss of income from not charging negative rates on household deposits.
- **Under the two-tier deposit scheme introduced in 2019, the negative rate applies only to about three quarters of excess reserves, providing further relief to banks.**
- **The popular model of a “reversal rate” (Brunnermeier and Koby, 2018) does not assume that negative rates are special.** On the contrary, the reversal rate, i.e. the level below which further rate cuts become contractionary, could well be positive in this model.
- **Bank profitability has not shown a clear trend in the euro area since NIRP was introduced in 2014.** Profitability as measured by standard indicators has in general remained low, but increased slightly since NIRP started. Whether this was because of NIRP or in spite of it is impossible to prove, given that different indicators point in different directions. Moreover, there is great heterogeneity across different national banking markets.
- **A number of indicators suggest a slight reduction in banks’ risk since 2014,** and again there are large differences between different countries.
- **A more important negative side effect of “low for long” might arise through an entirely different channel, namely through the impact on competition since low rates give an advantage to incumbent firms,** making it easier for them to either buy up competitors or price them out of the market. A prolonged period of low/negative rates could thus have a negative impact on growth.

1. INTRODUCTION

Following the 2008-2009 global financial crisis, central banks in several developed economies employed unprecedented monetary policies including quantitative easing (QE), forward guidance, and lowering their policy rates to zero (ZIRP). In the summer of 2014, the ECB went further and adopted a negative interest rates policy (NIRP) to provide additional monetary stimulus to the economy, and thus to get inflation up to a level consistent with its price-stability mandate (“below but close to 2%”). However, this policy, like other unconventional measures, has remained controversial. The debate has mostly centred on the possible side effects of NIRP and the transmission of monetary policy.

The longer-term consequences of keeping rates negative have been studied for some time, first under the heading: “low for long” (with negative rate regarded as being simply a special kind of low interest rate). A 2016 European Systemic Risk Board (ESRB) report (ESRB, 2016), on the danger of “low for long”, was mainly concerned with the life insurance sector, which has considerable contracts outstanding with guaranteed rates of return above the current rates (on riskless securities). This concern has abated as the actual returns on the portfolios of life insurance companies have remained high enough to cover the older guaranteed returns given the performance of stock markets. Very recently the ESRB has returned to this argument finding more reasons to be concerned about the negative impact of an environment of ‘lower for longer’ for the wider financial system (ESRB, 2021).

One interpretation of “low of long” means that as short-term rates (determined basically by ECB policy rates) remain low for a long time, the long-term rates fall towards the level of the short-term ones. This was the case for a few years after negative rates were first introduced in 2014. By 2018-2019 long-term riskless rates as proxied by the ten-year Bund had converged to the policy rates of the ECB. However, recent developments in financial markets have illustrated once more that central banks have only a limited influence over long-term rates. Over the last months, riskless long rates have increased substantially although the ECB has not changed its stance.

In economic theory, there should be little difference between very low but positive and negative interest rates. However, in practice it seems that negative rates constitute a special case because *de facto* banks are reluctant to charge for deposits. This seems to be the case much more for household deposits than for deposits by commercial entities. Schnabel (2020) shows that only a very small fraction of household deposits are remunerated at negative rates. In this sense, negative rates are special. This report will thus concentrate on the impact of negative rates, not on the effect of low interest rates in general.

We set the scene in Section 2 by describing the timeline of negative rates, emphasising the fact that most NIRP steps were accompanied by other policy actions, some of which offset the impact of NIRP on profits and some of which may have had a negative impact on profits of banks.

Section 3 examines the model proposed by Brunnermeier and Koby (2018), which emphasises that the reversal rate could also be positive. In Section 4, we discuss whether key features of the model correspond to reality. Section 5 concentrates on different measures of profitability since the start of NIRP, and Section 6 provides a summary of the literature on NIRP and risk-taking.

The discussion about the potential limits to the effectiveness of negative policy rates to stimulate bank lending, and thus to influence aggregate demand, neglects another strand of the literature which has investigated the impact of low interest rates on productivity and supply. Several contributions to this literature have found that lower interest rates can have a negative effect on

productivity growth. We briefly summarise this strand of the literature in Section 7. Section 8 concludes the paper.

2. NEGATIVE RATES IN THE EURO AREA

A closer look at the history of negative rates in the euro area reveals that they were introduced and changed in a very gradual manner. Moreover, many of the steps concerning negative rates were accompanied by other measures, making it difficult to disentangle the impact of negative rates from that of these other measures.

The ECB first set its deposit rate at a negative value in June 2014 (-0.1%). It decreased this later the same year to -0.2 %, with further cuts of 0.1 points in 2015, 2016, and 2019. Each step was thus only ten basis points whereas the “normal” change in policy rates was 25 basis points as long as the deposit rate was positive.

The introduction of negative rates in 2014 was accompanied by the first TLTROs, which provide term financing at special low rates. Later pushes of the deposit rate further into negative territory were accompanied by the asset purchase programmes, which are designed to lower long term rates, and the final lowering of the deposit rate was accompanied by the introduction of a two-tier system, under which part of excess reserves are exempted from the negative deposit rate. Figure 1 illustrates this.

Box 1: The two-tier system

The two-tier system exempts an amount equal to six times the required reserves of a bank from the negative rate. As of May 2021, the result of this system was that about EUR 880 billion of excess reserves were exempted from paying the deposit rate of 0.5%, resulting in savings for banks of around EUR 4.4 billion annually. About EUR 2,400 billion of excess reserves, plus the total amount under the deposit facility, were still subject to the negative rate, implying that the exempted amount represented about a quarter of the total (880 out of 3,280 billion)¹.

This implies that the “effective deposit rate” (effective in terms of the profits and loss account of banks) is now close to 37.5 basis points, lower than the official rate of 50 basis points.

The total in negative rates owed by commercial banks to the Eurosystem under the tiered system amounts now to about EUR 16 billion per annum (0.5% of 3,280 billion).

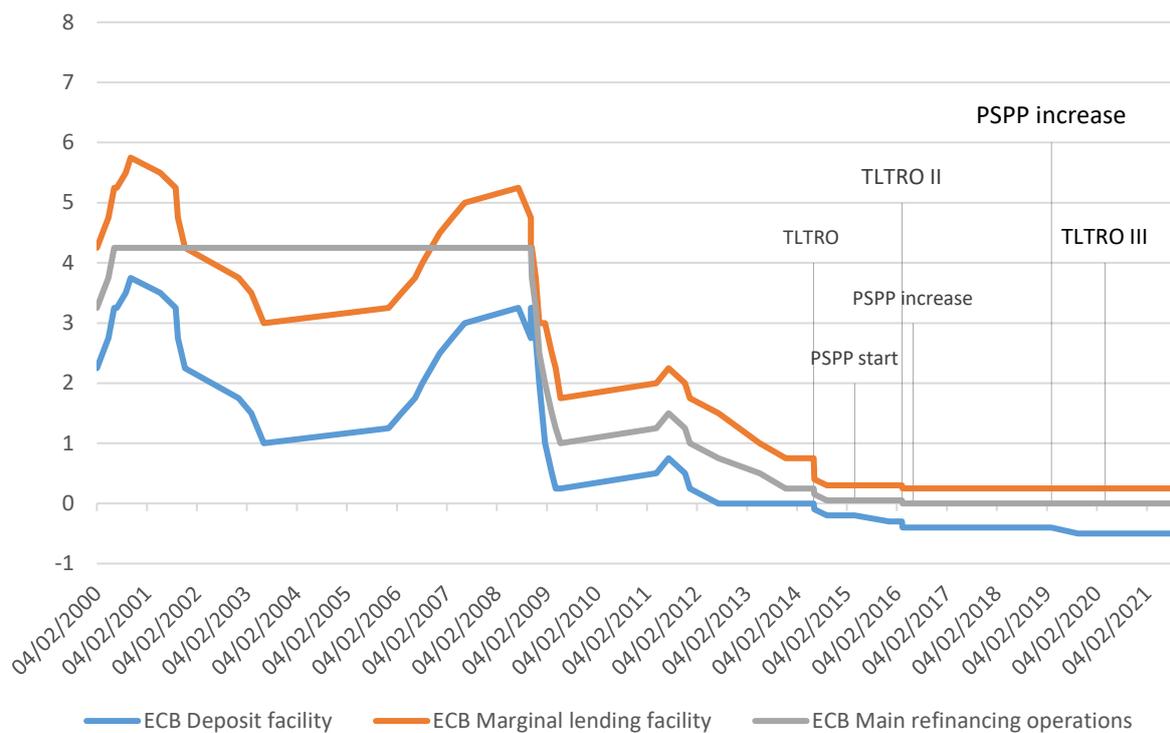
A two-tier system has also been applied in other countries with negative rates.

For example, the Swiss National Bank, whose deposit rate is at -0.75%, even more negative than that of the ECB, has exempted an even larger share of excess reserves (up to 20 times the required reserve ratio) from this rate, so that in reality only a small proportion of excess reserves are charged the negative rate. In Japan, the negative rate is still only -0.1%, a negligible magnitude, but even still, a large part of reserves is exempted. This shows that central banks in general have been concerned about limiting the impact of negative rates on bank profits.

The two-tier system of the ECB could also be described as an increase in the required reserve ratio by a factor of six. Such an increase in the required reserve ratio would have been considered extremely contractionary before the advent of negative rates. But with negative rates an increase in required reserves has the opposite effect.

¹ ECB website: “Two-tier system for remunerating excess reserve holdings”. <https://www.ecb.europa.eu/mopo/two-tier/html/index.en.html>.

Figure 1: Key ECB policy interest rates, TLTRO, PSPP



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

All these concomitant changes make it difficult to isolate the impact of negative rates in terms of monetary policy transmission and key mechanisms such as the pass-through of funding costs to loan rates.

A further difficulty for empirical studies regarding the impact of negative policy rates on credit growth is that the deposit rate is the price for one very short-term financial instrument, namely excess reserves at the ECB, which can be withdrawn on a daily basis. This is why one would expect the rate on sight deposits at commercial banks to be closely related to the deposit rate of the ECB.

However, this represents only one aspect. Bank loans to non-financial corporations (NFCs) are usually for 3-5 years. Banks will thus price their loan rates with respect to the riskless rate of this tenor. Other policy measures, such as bond buying programmes and forward guidance were especially designed to influence (lower) longer-term rates, including this intermediate part of the yield curve. When the ECB uses several instruments at the same time as it introduces negative rates (or lowers them further) it becomes impossible to disentangle the impact of the negative rate from that of bond buying or forward guidance.

The broader point is that banks are engaged in maturity transformation, they "borrow short and lend long". The profitability of banks thus increases typically with the slope of the yield curve, bank profits are higher when medium to long term rates are above the short-term rate. What matters for bank profitability is thus not the level of the short-term rates, but the difference between long and short rates. When the ECB started the public sector purchase programme (PSPP) (its largest asset purchase programme), the intention was to compress the yield curve. Any negative impact on bank

profitability one observes after 2014 could thus have been the consequence of a compression of the yield curve, rather than the inability of banks to set negative deposit rates.²

Figure 1 also shows that the magnitude of negative rates is small (0.5% in total over several years) compared to the changes in the deposit rate in the first decade of the euro. Clearly, paying particular attention to 0.5% negative rates makes sense only if negative rates are somewhat special, i.e. if lowering the deposit rate from 1% to 0.5% is qualitatively different from lowering it from 0 to -0.5%. Negative rates are supposed to be special because banks might not be able to set negative rates on the deposits they need to finance lending. Schnabel (2020) shows that this has partially been the case. Banks seem to have been able to pass negative rates on their deposits from NFCs, but not on household deposits. This observation allows one to calculate an order of magnitude of the potential impact of NIRP on bank profits.

Household (sight) deposits amount today to about EUR 4 trillion. The inability of banks to transmit fully negative ECB rates to these customers could mean a potential loss of roughly 0.5% of this sum, or about EUR 20 billion *per annum*. It has been shown above that the “effective” negative rate is closer to -0.4% if one takes into account the tiered deposit scheme in force from 2019. The effective loss for banks might thus be closer to EUR 16 billion. The loss from not charging negative rates on household deposits is thus equal to the direct cost banks have to pay on all their excess reserves.³

Moreover, the ECB is offering banks substantial amounts of long-term financing at, or even below, the ECB’s deposit rate. As of May 2021, this long-term financing amounted to over EUR 2 trillion, equivalent to nearly half of all the lending by banks to NFCs⁴. Banks will be charged a rate of potentially 50 basis points below the deposit rate if they meet certain thresholds on loan growth. This means that banks can obtain funding at -1%, much less than even the zero rate they maintain for most household deposits. A 1% gain on EUR 2 trillion represents a subsidy of EUR 20 billion annually. The TLTROs can thus offset on their own the cost of negative ECB deposit rates for banks.⁵

In principle, one needs to distinguish between the stimulating impact of negative rates by lowering the market rates for very short-term assets and the impact on profits. The tiered deposit scheme is designed to maintain the incentive of low interest rates while cushioning the impact on profits. By contrast, the TLTROs were explicitly designed to provide incentives for more lending, with the impact on profits just being a side effect.

Schnabel (2020) argues that NIRP has had a positive impact on loan growth in the euro area by enhancing the monetary policy transmission. She argues that a survey of existing studies arrives at the conclusion that the growth of loans extended to NFCs has been higher, since the start of the NIRP in mid-2014, than it would have been in a counterfactual scenario of non-negative policy rates (see Figure 2 below).⁶

However, the difference between the actual growth of loans and the median of the counterfactual estimates is minute, only 0.3% per annum. Over several years, a 0.3% difference can accumulate, but

² One should also note that about 60% of all bank loans to NFCs are at variable rates. This implies that the debtor takes the risk of interest rate changes. This is a fact which is not taken into account in the “reversal interest rate” model presented below.

³ It is also well known that interest rates do not constitute the main cost of deposits for banks. Set-up costs, including “know your customer” obligations and IT costs constitute a large share of the overall cost of collecting deposits. Over time, banks can thus adjust their fees for household deposits to offset the impact of negative interest rates. Non-interest income has indeed increased over the last year, suggesting that at least part of the cost of deposits has been transferred to consumers.

⁴ ECB website: “Consolidated financial statement of the Eurosystem”. 14 May 2021. <https://www.ecb.europa.eu/press/pr/wfs/2021/html/ecb.fst210518.en.html>

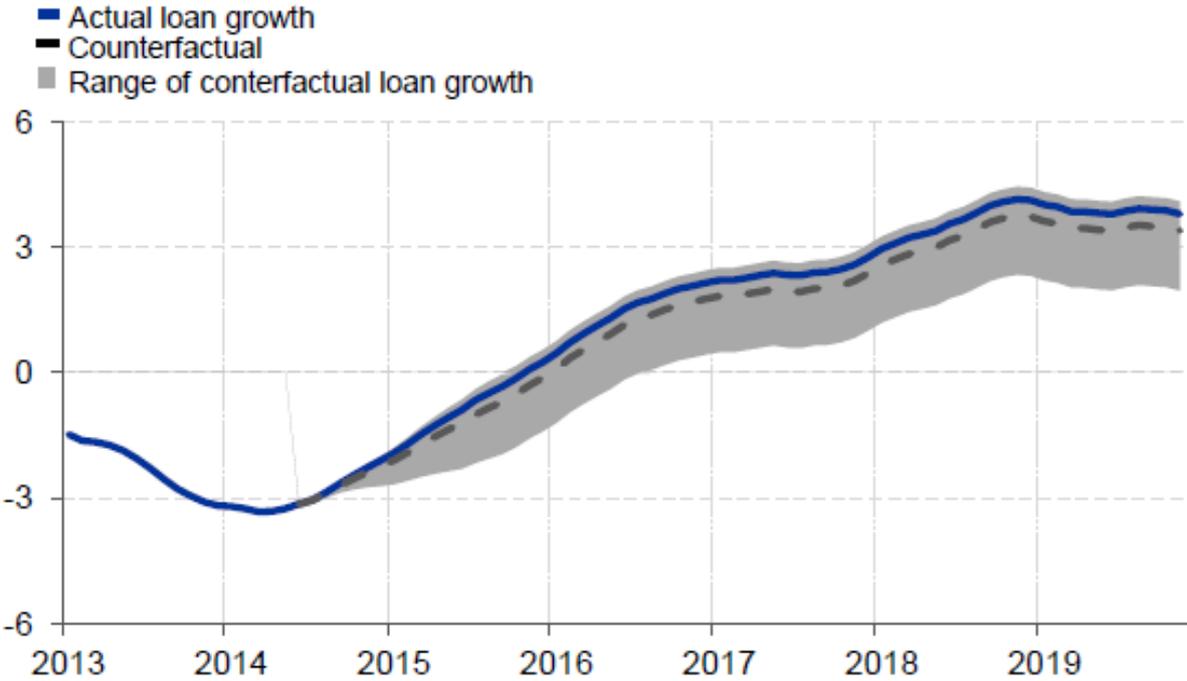
⁵ Somewhat surprisingly, ESRB, 2021, does not mention the TLTRO as a factor offsetting the impact of negative rates on bank profitability.

⁶ A very recent study by Rostagno et al. (2021), based on counterfactual analysis, show that in the absence of NIRP, forwards guidance and QE, euro area would have experienced a lower GDP growth and inflation by 1.1 pp and 0.75 pp, respectively, and a higher unemployment rate by 1.1 pp in 2019. However, they do not discuss the possible impact on banks profitability.

even over seven years one would arrive only at a gain of about 2%. Given a total volume of lending to NFCs of less than EUR 5 trillion, this would translate into additional lending of EUR 100 billion, less than 1% of the euro area economy (distributed over seven years).

Moreover, it is not clear what the counterfactuals assume about the TLTROs, which could be considered as a part of NIRP, and might have had a substantial impact on lending.

Figure 2: Estimated impact of NIRP on bank loans to firms (percentage p.a.)



Source: ECB Economic Bulletin, Issue 03/2020, Altavilla et al. (2018), Bubeck et al. (2019), Bottero et al. (2019).

Note: The blue line is the actual annual NFC loan growth (six-month moving average). Based on a range of empirical studies, the grey area represents the dispersion in loan growth among banks according to their exposure to NIRP-specific effects. The dashed line represents the median across all studies.

3. MODEL OF THE REVERSAL RATE

The reversal interest rate is defined as the rate at which accommodative policy becomes contractionary. This concept is proposed and theoretically examined by Brunnermeier and Koby (2018). They start with a partial equilibrium model, which means that they look only at the activities of a single bank and do not examine the impact higher or lower bank lending overall might have on the entire economy. Central to their model are two financial frictions. One limits lending to a certain multiple of the net worth of the bank (not its capital, this distinction is important). The other one forces banks to hold a certain amount of liquid assets, again as a proportion of net worth.

The first element is supposed to reflect the fact that banking regulation forces banks to hold a certain amount of capital proportional to the amount of lending the bank does (or more general the amount of risky assets on the balance sheet of the bank).

The second element corresponds to the liquidity coverage ratio (LCR) under which banks have to hold a certain part of their balance sheet in highly liquid high-quality assets to be able to make good any sudden loss of deposits.

An often overlooked aspect of the model is that it does not assume that negative rates are special. Negative deposit rates can arise at commercial banks in this model, but this does not have to be the case. In this model, banks will always set a rate on their deposits that is below the policy rate set by the central bank. This implies that a policy rate of zero would correspond to a negative deposit rate at commercial banks.

It is possible that the reversal rate could be positive, and the rate commercial banks offer on their deposits could then be either positive or negative, depending on the mark-down banks adopt towards their depositors.

Other, conventional, elements of the model are the assumptions that firms will demand more loans if the bank lowers the interest rate and that depositors will increase their deposits if the bank offers a higher rate. However, there is no special effect as the deposit rate offered by the bank goes negative.

Box 2: The reversal rate in a nutshell

The starting point is the capital constraint specified as:

$$\varphi^L L \leq N \quad (1)$$

where $\varphi^L \geq 0$ is risk weight, and L and N denote the bank's loans and bank's net worth respectively. The demand for bank's loan $L(i^L)$ is decreasing in the nominal policy interest rate i . i^L is the nominal rate on loans offered by the bank and increasing in i .

Banks also face a liquidity constraint:

$$S \geq \varphi^D D \quad (2)$$

where $\varphi^D > 0$ is weight, and D and S indicate bank's deposit and fixed-income assets with a return equivalent to i . Deposit $D(i^D)$ and the deposit rate i^D both are increasing in i .

Banks maximise their net worth:

$$N = (1 + i^L)L + (1 + i)S - (1 + i^D)D \quad (3)$$

subject to the constraints, as well as its balance sheet $L + S = D + E$, which can be used to simplify equation (3) as:

$$N = E + i^L(L) * L + iS - i^D(D) * D \quad (4)$$

in which one can substitute for L and S from the two financial friction constraints (1) and (2).

$$0 = E + i^L(N/\varphi^L) * \frac{N}{\varphi^L} + i\varphi^D D - i^D(D) * D - N \quad (5)$$

This defines an implicit function, $F(N, D) = 0$, with deposits remaining the single choice variable. The derivative of F with respect to D is equal to:

$$\frac{\partial F}{\partial D} = i\varphi^D - \frac{\partial i^D(D)}{\partial D} D - i^D(D) = i\varphi^D - i^D(D) \left(\frac{\partial i^D(D)}{\partial D} \frac{D}{i^D(D)} + 1 \right) = 0 \quad (6)$$

With linear demand function for deposits: $i^D = K + kD$, this simplifies to:

$$\frac{\partial F}{\partial D} = i\varphi^D - (kD + K + kD) = i\varphi^D - (K + 2kD) = 0 \quad (6)'$$

With linear demand for deposits the optimal amount deposits is given by:

$$D = \frac{i\varphi^D - K}{2k} \quad (6)'$$

Deposits and loans are related by the balance sheet balance identity and the liquidity constraint on holding safe assets: $L = (1 - \varphi^D)D + E$.

It follows that, with linear demand for deposits, loans will always be a positive function of the safe interest rate and a reduction in interest rates will lower the supply of loans.

The result would be different if the demand for deposits were given by a constant elasticity function.

This implies that the optimal amount of deposits is given by:

$$\frac{i\varphi^D}{\left(\frac{\partial i^D(D)}{\partial D} \frac{D}{i^D(D)} - 1 \right)} = i^D(D)$$

The optimal amount of deposits would then depend on the size of the elasticity, changing sign depending on whether that elasticity is greater or smaller than 1.

Brunnermeier and Koby emphasise an additional effect by assuming that the value of equity, $E(i)$, is a function of the riskless rate (set by the central banks) because it is subject to revaluation following changes in policy rates. It is assumed that the initial equity consists of an interest-insensitive \bar{e} component and interest-sensitive $e(i)$ component where $\partial e(i)/\partial i < 0$, reflecting a maturity mismatch. This is the second key element of the model.

Solving the optimisation problem without substituting out for the constrained values for D and L leads to the following lending and deposit rates:

$$i^{L*} = i + \frac{1}{\varepsilon_{L*}} + \underbrace{\frac{\varphi^L}{1 + \varphi^L} \lambda^{L*}}_{\text{capital constraint}} \quad (4)$$

capital constraint

$$i^{D*} = i - \frac{1}{\varepsilon_{D*}} + \underbrace{\frac{\varphi^D}{1 + \varphi^D} \lambda^{D*}}_{\text{liquidity constraint}} \quad (5)$$

liquidity constraint

where $\varepsilon^{L*} = \frac{\partial \log L(i^L)}{\partial i^L}$ and $\varepsilon^{D*} = \frac{\partial \log D(i^D)}{\partial i^D}$ are, respectively, elasticity of loan demand and deposit supply with respect to the corresponding rates.

Cut to policy rate i initially increases the bank's loans $\frac{dL}{di} < 0$, by lowering the loan interest rate i^L insofar as the capital constraint does not bind, however it depresses the return on new investments in fixed-income assets and, thus net interest income NII and profits leading to lower bank's net worth:

$$NII = i^L L + i S - i^D D \quad (6)$$

There exists an interest rate i^{RR} , the largest rate, below which the capital constraint binds. For all the interest rates below this threshold $< i^{RR}$, $dL/di > 0$. At the point the policy rate hits the reversal interest rate $i = i^{RR}$, $dL/di = 0$, therefore banks divert loan investment into fixed-income asset investment. Further interest rate cut amplifies the adverse impact on banks' profit which decreases the loans through the constraint.

In this model, a lower policy rate leads always to lower profits for banks. This raises the question what happens if low rates persist for long and the rate of return on investment in banking falls below the cost of capital. In this case, one would expect that banks close down or merge and downsize (Repullo, 2020).

4. THE MODEL AND REALITY

In this section, we compare briefly the main elements of the model with a number of key elements of the structure of the euro area banking system, in order to check whether the mechanisms described by the model operate in reality.

The key element of the model is the assumption that the capital constraint for the bank depends on its current period net interest income, which in turn depends on the interest rate set by the monetary authorities. In reality, however, banking regulation is based on the accounting, or regulatory, value of the capital of a bank, which is not adjusted when the interest rate changes. This implies that the regulatory capital constraint is not affected by current profits and the interest rate.

This is an important point because in the traditional banking model, in which loans are limited to a multiple of capital (in reality the regulatory capital, i.e. the capital as defined in great detail in banking regulations) there can be no reversal rate. When banks face limits on how much lending is allowed given their capital structure, they will simply go up to that limit. Lower central bank policy rates can, under certain circumstances, lead to lower bank profits. But, whatever the level of profits, whether high or low, banks still have an incentive to increase lending up to the limit imposed by regulators. This remains true as long as lending rates exceed deposit rates, which is largely the case as documented below. Repullo(2020) also emphasises this basic point.

High profits can lead over time to more capital, but this build-up of capital is too gradual to be compatible with the assumption of the model that the capital ratio is defined in terms of net worth. Repullo also makes this point and argues that the accumulation of profits contributes over time to higher equity (only if profits are not distributed as dividends), but that this process takes time. The profitability of banks is very low in Europe. This implies that the accumulation of profit can contribute only little to the accumulation of capital, which in turn means that it is the level of current capital which represents the main constraint.

The main limit to bank lending in the Brunnermeier-Koby model is the variable “net income” which is also called “net worth”, should rather be called “lending margin” (on loans to NFCs). As will be shown below, this lending margin oscillates around 1.5%. However, banks now hold close to 10% of capital against such loans. It would thus take a long time for changes in the interest margin to lead to a significant change in capital.

In the longer run, the level of capital available to the banking system should depend on its profitability. Investors will provide banks with additional capital only if the rate of return in banking is at least equal to the rate of return available in other sectors (on a risk-adjusted basis) and capital would be taken out of banks as long as expected profit rates elsewhere are higher. In the long run, one would thus expect that bank lending would indeed depend on the profitability of banks. This raises the question of whether a reversal rate might still exist, as deeply negative rates could lower the profitability of banks so much that capital flees the sector, reducing its ability to provide loans. Repullo investigates this issue and finds that there can be no reversal rate even if the supply of capital reacts to bank profitability.

Another aspect of this model which does not take into account reality is that the maturity of loans and deposits is implicitly the same. This is difficult to accept given that the core of the business of banks is to use short-term deposits to fund longer-term loans and mortgages.

Another feature of this model for which it is difficult to find an equivalent in reality is the assumption that the value of equity of banks is a function of the riskless interest rate. The book value of equity is usually just the difference between assets and liabilities. One could of course argue that the market

value of equity of banks in general is a function of the riskless rate. But this does not mean that the book value of equity should be just the difference between the value of all assets (loans and the riskless asset) minus deposits.

There are other, perhaps minor, aspects of the model that also do not seem to be in line with reality. For example, the funding cost for banks can also be influenced by other monetary policy instruments, like the TLTRO. As documented above, banks have re-financed almost half of their lending to NFCs via very cheap long-term lending from the ECB (TLTROs). Moreover, under the two-tier deposit scheme introduced in 2019, the negative rate applies only to about three quarters of excess reserves.

Moreover, one needs to take into account that, since it is not possible to charge negative rates on household deposits, lost income can be offset by higher fees. Murai and Schnabl (2021) document that the share of fee income in total profits has increased from 5% to 20% since 1999 for Japanese banks which have been operating in a very low interest rate environment for a long time.

One also needs to keep in mind that lending to NFCs constitutes only a small part (13%) of the total assets of banks. Overall bank profitability is determined by many other factors.

5. A LOOK AT THE DATA

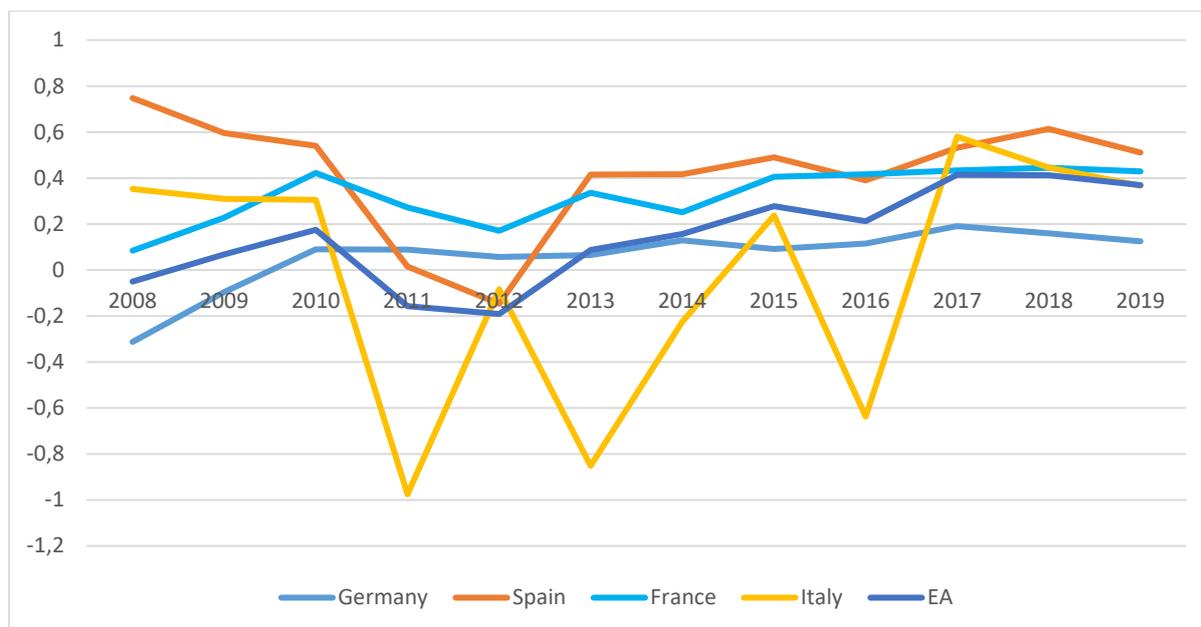
Even if there is no reversal rate, there still remains the concern that negative rates might have depressed bank profits because household deposit rates have not become negative, at least not on a wide scale. We thus provide some indicators of profitability.

In the following charts we show in general the data for the four largest euro area economies, because in most instances the euro area average is not representative of anything. Individual countries are not clustered around this average. The large countries (which dominate any average) are either below or above that average.

The numbers for profits used in these statistics are of course the accounting profits reported by banks. The managers of banks have an incentive to smooth profits. After a financial crisis, losses on non-performing loans (NPLs) are often recognised only with a delay, in order to give the banks time to replenish their capital. This is what happened in those countries most under financial stress in 2011-2012. For this reason alone, one would expect a number of years with low or even negative profits after 2012. NIRP was introduced in 2014 when this process of recognising losses on NPLs was still going on, making it difficult to identify the impact of negative rates.

Another reason why trends in reported profits might be misleading is that from time to time major institutions experience a crisis which is often the result of having hidden problem loans until they are discovered and all acknowledged at once. This leads to sudden large losses which might come after a period of apparent profitability.

Figure 3: Return on assets (percentage)



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

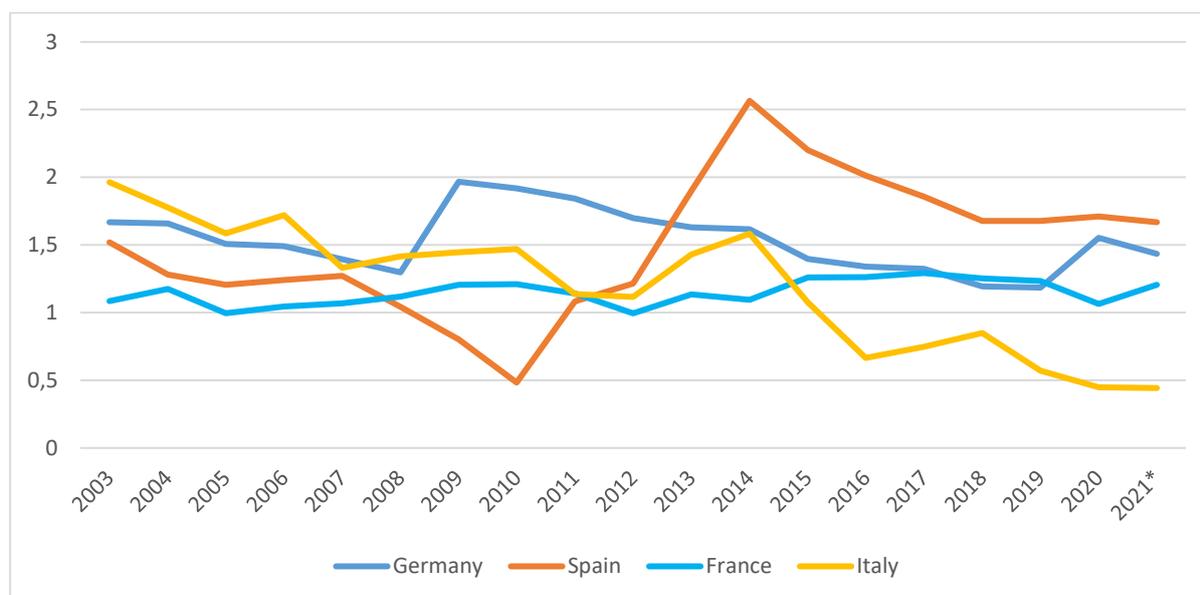
Note: "EA" is euro area.

Figure 3 illustrates these problems. The return on assets (RoA) is extremely variable (and mostly negative) in Italy up to 2016. The RoA is less volatile elsewhere, but there are large differences across countries. The return on assets lowest in Germany for some years now, only about a third of the return of French banks. The average for the euro area, which is in the middle of these extremes, has

considerably increased since 2014. This suggests that either NIRP did not have any impact on profitability (for the reasons outlined above: TLTROs and tiered deposits) or there were other factors, which more than offset the inability to charge negative rates on household deposits.

However, another piece of evidence would seem to confirm the presumption that negative policy rates depress the interest margin of banks because the cost of deposits cannot fall below zero. The lending margin on loans to NFCs is shown in Figure 4. It is apparent again that there are very large differences across member countries, but these differences do not correlate well with the data on overall profitability presented above. Banks in Italy have the lowest margin, most of the time since 2012, 50% lower than those in Spain. But the difference in profitability is much smaller. This could be due to higher loss rates in Spain or higher non-interest income in Italy (which will be documented below). What is even more surprising is that the lending margin has been almost exactly the same in France and Germany, but that the RoA are very different as shown above. The lending margin, which in the model presented above plays a crucial role is thus in reality not a good indicator of profitability.

Figure 4: Lending margins on loans to NFCs (percentage point)



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

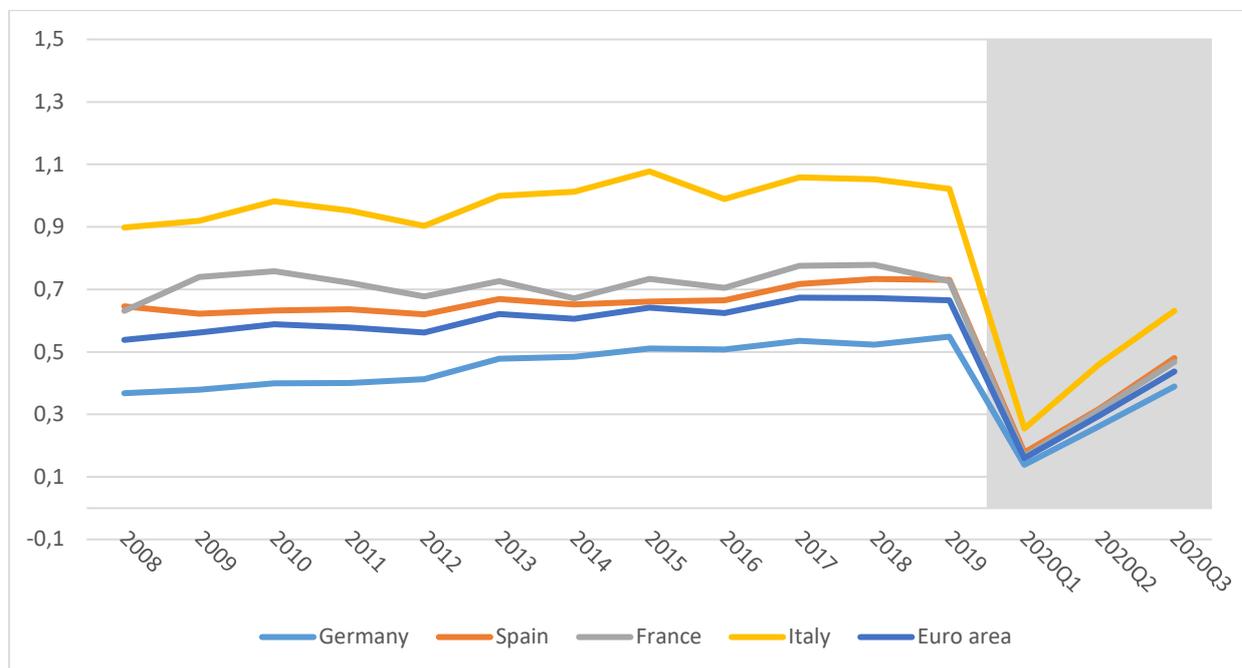
Note: First three months average.

Here again one can observe the long shadow of the financial crisis for Spain and Italy. The lending margin shot up during the crisis, but this was due to the fact that banks had to ask for higher rates to cover expected losses. Once the economy recovered, the lending margins declined because fewer firms went bankrupt, reducing the loss rate on lending. The lending margin has been less variable in countries where banks were not subject to financial stress in 2011-2012, like France and Germany. ESRB (2021), which looks only at the euro area average emphasizes the fact that one can observe a (small) fall in the margin, after the introduction of negative rates. Our interpretation is different as the euro area average is influenced by the delayed impact of the financial stress in countries like Italy or Spain.⁷

⁷ Lending margins refer to the difference between interest rates on new business loans and a weighted average interest rate on new deposits, while interest margin is measured as the difference between interest income and interest cost in terms of average assets.

Another important element contributing to profitability is the income from fees and commissions. Figure 5 below again shows very large differences, which explain the discrepancies between the data on RoA and lending margins. Banks in Italy earn much more from fees than those in Germany. But this source of income seems rather stable, showing on average a slight increase since 2014, which could be partially explained by the substitution of negative rates on deposits by fees.

Figure 5: Ratio of net fee and commission income to total assets (percentage)



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

The yield curve compression through asset purchases might have had a stronger impact on bank profitability than negative (policy) rates. It is no coincidence that the second and third waves of the TLR, which provide lending at subsidised rates, were introduced when the three-year rates (on riskless government bonds) reached new lows in 2016 and 2019.

6. RISK-TAKING CHANNEL

Another key concern about NIRP is that negative interest rates can pose risks to financial stability. Banks with profitability might increase their risk. The financial crisis of 2008-2009 showed that excessive risk-taking by banks can be very costly to the economy. It is thus understandable that more risk-taking by banks is seen *a priori* as undesirable. However, the term “risk” can have many different meanings, especially for banks. For example, the risk for banks increases if they hold less equity to absorb unexpected losses. A thin cushion of equity is generally held to have been one of the key causes of the global financial crisis. After this crisis, supervisors all over the world forced banks to hold more equity. This type of risk is thus in principle controlled. But when banks extend more credit to new borrowers they take another type of risk, one that might be desirable. One of the aims of low interest rates is to encourage this type of risk-taking, on condition that the risk be recognised and adequately provisioned for.

Schnabel (2020) thus argues that inducing risk-taking should be regarded as a feature, not a bug, of negative rate policies. The purpose of NIRP is to encourage higher bank lending to stimulate the economy. More lending necessarily means more risk-taking by banks.

The ECB, in different functions, is responsible for both types of risk. By setting low, and now negative, policy rates, it encourages risk-taking. At the same time, its supervisory arm, the Single Supervisory Mechanism (SSM), is responsible for banking supervision, whose main aim is to “de-risk” banks. This creates the danger that one arm of the ECB (monetary policy) encourages banks to take risks by lending to new borrowers, while another arm prevents banks from doing so in the pursuit of financial stability.

Even before central banks introduced negative rates there were warnings that banks were likely to “search for yields” in response to decreased profitability at the cost of expanding loans with lower credit quality (Rajan, 2005; Borio and Zhu, 2008). This phenomenon has been the subject of a number of empirical studies⁸. Most of these studies deal with the issue of the consequence of low interest rates in general (as opposed to negative rates). Many of them find evidence of increasing banks risks in response to low rates (Altunbas et al., 2010; Gaggli and Valderrama, 2010; Maddaloni and Peydró, 2011; Buch et al. 2014; Genay and Podjasek, 2014; Jimenez et al., 2014; Aramonte et al., 2019; Ioannidou et al., 2015; Andries et al., 2016; Dell’Ariccia et al., 2017). Fewer studies look more specifically at negative rates (Nucera et al., 2017; Hong and Kandrak, 2018; Basten and Mariathan, 2018; Heider et al., 2019).

The effect of interest rates on banks profitability and risk-taking can be very different depending on a bank’s business model, balance sheet, degree of capitalisation and banking system, and regulatory environment. This is emphasized in Buch et al. 2014; Dell’Ariccia et al., 2017; Nucera et al., 2017; BIS, 2018; Boungou, 2019. Table 1 provides a structured overview of the existing empirical literature on risk-taking, including the measures used to assess the bank’s risk. Further below we look at some of these measures for the EU’s big four economies (alongside the euro area as a whole).

⁸ Angeloni et al. (2015) and Balloch and Koby (2019) investigate theoretically the impact of low interest rates on bank risk-taking and bank profitability.

Box 3: Literature on risk taking and low or negative rates

The table below summarises the main results from this vast literature. Most of these contributions investigate the impact of low rates in general, only very few consider the specific case of negative (policy) rates. Basten and Mariathasan (2018) focus on domestically owned retail Swiss banks⁹. They find that banks with higher exposed reserves to the negative deposit facility rate by one standard deviation increased the balance sheet shares of uncollateralized loans by 0.60 percentage points (pp), the share of mortgages by 0.69pp, and the share of financial assets by 0.26pp. Also based on their results, higher exposed reserves (by one standard deviation) lead to an increase in the ratio of risk-weighted assets by 1.51pp, which is attributable to riskier loans.

Heider et al. (2019) show that the introduction of negative policy rates by the ECB leads to more risk-taking and less lending by euro area banks, which are more reliant on deposit funding. According to their result, 9.45pp increase in banks' deposit ratio after July 2012 is associated with 16% increase in their ROA volatility. Also, 14.76pp increase in a bank's deposit ratio leads to a reduction in lending by 13%.

Hong and John Kandrak (2018) document that bank stock prices dropped when in January 2016 the Bank of Japan (BoJ) imposed a negative interest rate of -0.1% on banks' current accounts held at the BoJ. As a result, 1pp decline in a bank's stock price was followed by about a 4% increase in the standard deviation of its daily returns, 0.58% decrease in the bank's capital-to-asset ratio, and between a 10% and 15% increase in probability of default within the next five years after the announcement.

Table 1: Measures of risk in the literature

	Measures of bank's risk	Borrowers	Sample of banks	Findings
Altunbas et al. (2010)	<ul style="list-style-type: none"> Expected default frequency (EDF) ROA volatility 	NFCs, HH	EU, US	<ul style="list-style-type: none"> Low levels of real policy rate (measured as money-market rate minus inflation) over an extended period contribute to an increase in bank risk.
Andries et al. (2016)	<ul style="list-style-type: none"> Z-score (1) Loan loss provisions NPLs 	NFCs, HH	Euro area	<ul style="list-style-type: none"> Negative relation between short-term and long-term interest rates and bank risk-taking, with greater impact during 2008-2011 crisis.
Aramonte et al. (2019)	<ul style="list-style-type: none"> Probability of default of loan portfolios 	NFCs	US	<ul style="list-style-type: none"> Decrease in longer-term interest rates increases the risks for nonbanks.
Buch et al. (2014)	<ul style="list-style-type: none"> Loan risk assessed by the banks 	NFCs	US	<ul style="list-style-type: none"> Expansionary monetary policy (low effective Federal Funds rate) increases small domestic banks exposure to risk. "Too low for too long"

⁹ A cut from zero to -75 basis points was introduced in January 2015 and applied only to the fraction of each bank's central bank reserves that exceeded twenty times its minimum reserve requirement.

	Measures of bank's risk	Borrowers	Sample of banks	Findings
				interest rates affect foreign banks risk exposure.
Basten and Mariathasan (2018)	<ul style="list-style-type: none"> Share and growth of risk-weighted assets Banks' credit risk, market risk, interest rate risk and operational risk 	NFCs, HH	Switzerland	<ul style="list-style-type: none"> Negative policy rates increase credit and interest rate risk for banks. More exposed banks maintain non-negative deposit rates and larger deposit ratios.
Dell'Ariccia et al. (2017)	<ul style="list-style-type: none"> Risk rating of new loans Change in commercial and industrial (C&I) loans Ratio of holdings of risky securities to total assets 	NFCs	US	<ul style="list-style-type: none"> Increases in short-term interest rates is negatively associated with ex ante bank risk-taking. This relationship is less pronounced for banks with relatively low capital or during periods of financial distress.
Gaggl et al. (2010)	<ul style="list-style-type: none"> Probability of borrowers' default 	NFCs	Austria	<ul style="list-style-type: none"> Period of low refinancing rates is associated with higher expected default rates within Austrian banks' business-loan portfolios.
Heider et al. (2019)	<ul style="list-style-type: none"> Borrowing firm's ROA, stock-return volatility, leverage, and interest rate associated with the loan 	NFCs	Euro area	<ul style="list-style-type: none"> More risk-taking and less lending by euro-area banks with higher reliance on deposit funding following negative policy rates.
Nucera et al. (2017)	<ul style="list-style-type: none"> SRisk(2) 	NFCs, HH	Euro area	<ul style="list-style-type: none"> Large banks with sufficiently diversified income streams are perceived to be less (systemically) risky. Smaller banks that rely predominantly on deposit funding, are perceived as more risky.
Maddaloni and Peydró (2011)	<ul style="list-style-type: none"> High securitisation activity, weak supervision for bank capital 	NFCs, HH	Euro area, US	<ul style="list-style-type: none"> Low short-term interest rates soften lending standards especially for mortgages. The effect is increased over prolonged period of low rates.
Jiménez et al. (2014)	<ul style="list-style-type: none"> Borrowers' credit history 	NFCs	Spain	<ul style="list-style-type: none"> Lower overnight interest rate increases the risk for low capitalised banks.
Ioannidou et al. (2015)	<ul style="list-style-type: none"> Borrowers' credit history 	NFCs	Bolivia	<ul style="list-style-type: none"> Lower policy rate encourages banks to extend riskier loans.
Hong and Kandarac	<ul style="list-style-type: none"> Share of risk-weighted assets 	NFCs	Japan	<ul style="list-style-type: none"> More exposed banks to negative rates increase

	Measures of bank's risk	Borrowers	Sample of banks	Findings
(2018)	<ul style="list-style-type: none"> ● Volatility of returns ● Banks' distance to default ● Kamakura Default Probability (KDP) ● Z-scores ● Capital-to-asset ratio 			their credit and take on more risk.

Source: Authors' own elaboration

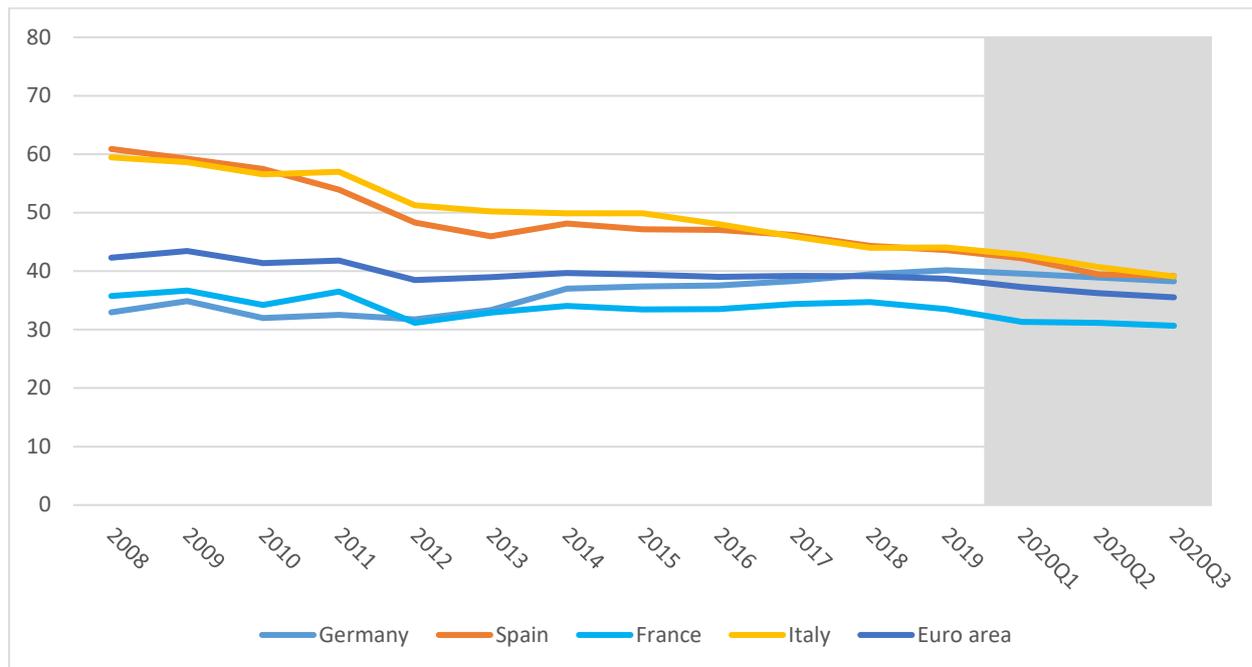
Note: (1) Z-score is computed as the ratio of the return on assets plus the capital-asset ratio, to the standard deviation of assets returns. (2) SRisk is the estimated capital shortfall of a bank, conditional on a 40% drop in a world equity index over a six months-ahead horizon.

The empirical studies surveyed here have generally found that banks increase risk-taking in response to lower rates. But here again the impact of negative rates in the euro area since 2014 is difficult to pinpoint in the aggregate data, especially lending to NFCs.

A key indicator of risk-taking for regulators is the ratio of risk-weighted assets to total assets, where risk-weighted assets means that each asset is given a risk weight which could range from zero (sovereign bonds, for example) to 100% or more (some loans to NFCs, for example).

Figure 6 shows that this indicator has been rather stable and on a declining trend since 2008, where again the change is most noticeable in countries under financial stress (Spain and Italy), with little change for France and Germany. This trend has most probably been due to the pressure of supervisors who wanted to de-risk banks after the financial crisis. It is difficult to detect any change after the start of NIRP in 2014. After that date, one observes a small increase in Germany, but the decline continues in Spain and Italy. The small increase in risk-weighted assets in Germany is compatible with the hypothesis that the negative deposit rate of the ECB had its strongest impact in Germany where rates were already close to zero. But the increase is too small to have had any significant impact.

Figure 6: Ratio of risk-weighted assets to total assets (percentage)



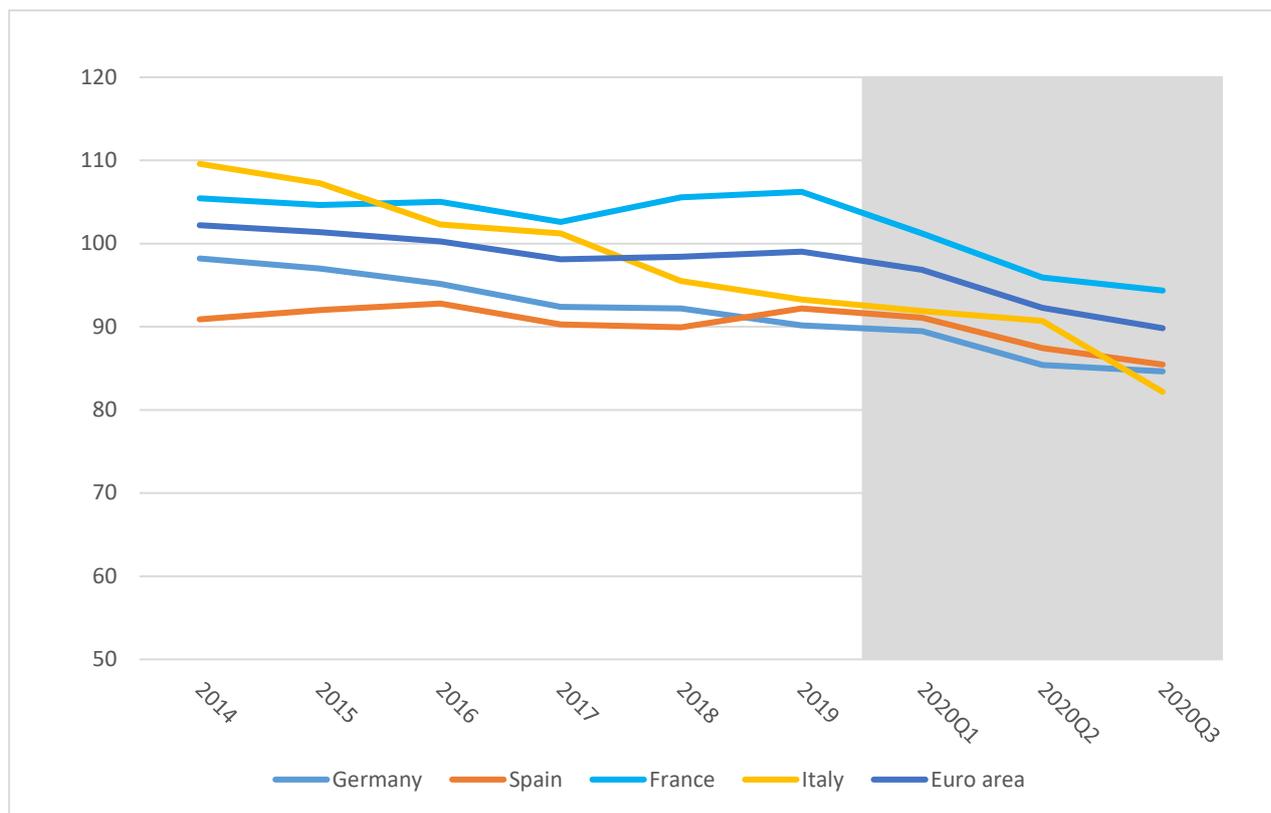
Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

Another more basic indicator, which is directly related to the models of banking mentioned above is the ratio of loans to deposits. Figure 6 below shows that this ratio has declined continuously (except for France, one year) since 2014, i.e. the start of NIRP.¹⁰

This decline in the aggregate deposit ratio is probably due also to a macroeconomic factor, namely the increase of the savings rate in the euro area. As savings tend to take the form of bank deposits in Europe, any increase in the overall savings rate is likely to lead to higher bank deposits. If investment does not increase at the same time, the ratio of loans to deposits must fall in the aggregate.

¹⁰ This indicator is available only since 2014 in the ECB's Statistical Data Warehouse. It is thus impossible to compare the post-NIRP values to the preceding period.

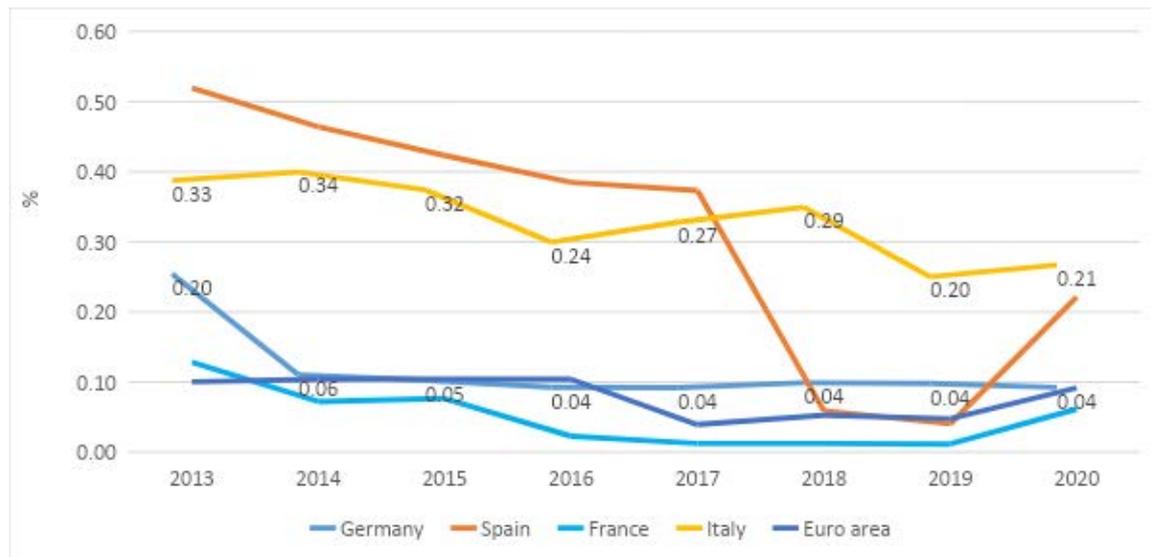
Figure 7: Loan-to-deposit ratio (percentage)



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

The literature often uses another measure of risk, namely the volatility of the return of banks. Some studies have used the standard deviation of the return on assets over the preceding five years. But this measure is itself rather volatile due to the large jumps in profits illustrated above. Figure 8 shows the very large difference across Member States and the large jumps in this measure for countries like Spain where one year of large losses led to large jumps in the volatility measure based on five years of data. The euro area average has fallen slightly since 2014 (from 0.6% to 0.4%), indicating that NIRP did not lead to an increase in risk-taking large enough to overcome the overall reduction in risk due to resumption of steady growth after the financial crisis.

Figure 8: Volatility of return on assets (over five years, percentage)



Source: Authors' own elaboration based on data from ECB Statistical Data Warehouse.

These traditional indicators of risk-taking by banks thus show a decline, rather than an increase in risk taking by banks. But one might also use other, indirect, measures of risk.

For example, one would expect that lending to higher risk customers would be associated with higher interest rates and loan losses. However, this has not been the case. NPL ratios have fallen, rather than increased since the start of NIRP. Interest rates charged to NFCs have also fallen over time, indicating that banks actually perceive a falling risk of default of their customers.

The fall in NPL ratios might be due to the gradual recovery of the economy from the deep recession in 2011-2012, but the fall in interest rates, relative to the refinancing costs of banks (the lending margin shown above in Figure 4) is not compatible with the hypothesis that banks have taken on more risk (unless one assumes that banks are knowingly taken on more risk without being compensated for it).

One measure of whether banks are taking more risks is the interest rate on loans to NFCs. The rates on risky loans (or rather the difference between the cost of capital and these rates) needs to increase if the banks incur more risk. (Banks can incur more risk by investing in risky securities, but this is not how the usual banking model works.) The cost of borrowing (which includes more than just the interest rate) of NFCs has fallen over the last years (absolute and relative to ECB policy rates). The same applies to a more narrow concept, namely the interest rates on loans to NFCs. Banks were thus not compensated for higher risk in lending to NFCs.

A general problem with linking indicators of risk after 2014 to negative rates is that there is another confounding factor. 2014 was also the year that the ECB took over the responsibility of supervising the bulk of the euro area's banking system. It is generally agreed that the ECB enforced the existing banking regulations more strictly than the national supervisors had done before. Moreover, the regulations themselves were tightened, adding for example, a minimum of highly liquid assets which banks have to hold. These developments forced banks to de-risk their balance sheets, potentially more than offsetting any impact on risk-taking negative rates might have had.

7. LOW RATES AND LOW PRODUCTIVITY

The generally accepted view of monetary policy is that it cannot affect the “natural” or equilibrium rate of interest, which is determined by longer run trends in the savings investment balance. The task of monetary policy is merely to maintain price stability. The central bank can push actual inflation towards the price stability target by (temporarily) setting its policy rates below the natural rate when inflation is too low (and *vice versa*: when inflation is too high, the central bank should increase its policy rate above the natural rate) (ESRB, 2021; Gros, 2019).

One could thus argue that monetary policy should not be held responsible for the negative impact of lower interest rates on productivity, which operates in the medium- to long-term, and policy rates should in principle be fluctuating around the natural rate, sometimes above and sometimes below. However, the ECB has now held its policy rates in negative territory for a number of years, and this may have contributed to the observed fall in productivity growth.

This literature has found several reasons why low interest rates might lower productivity growth.

One channel is via market structure. Incumbent firms are always tempted to deter new competitors by charging a low price today in order to secure or maintain a monopoly position for later (Liu et al., 2019).

Aghion et al. (2019) argue that the relationship between financial conditions and growth is (inverted) U-form: a financial crisis kills investment and growth. Super accommodative financial conditions are also bad for growth.

Empirical evidence is provided by Cette et al. (2016) who argue that a decline in real interest rates can trigger unfavourable resource reallocations that reduce total factor productivity. They argue that this has been the case particularly for the Southern members of the euro area since 1995, and can explain the fact that in these countries total factor productivity even fell (a phenomenon which has been dubbed the “great unlearning”, Hassan and Ottaviano, 2013)

ECB’s TLTROs illustrate the potential impact of low rates on productivity. Under the TLTRO III, banks can refinance additional loans to NFCs or households at rates up to 50 basis points below the ECB deposit rate (which is minus 50 basis points). This means that banks will have an incentive to refinance even loss-making investments.

8. CONCLUSION

Two basic points often get mixed up in the debate about the potential side effects of negative rates.¹¹

First of all, one needs to distinguish between low rates and negative ones. Negative rates are supposed to constitute a special case because banks face a psychological hurdle in setting negative deposit rates for their customers (when they are households).

Second, the ECB can freely set only its own policy rates, the key one being the rate on excess reserves held by banks. But longer term rates are set in the market.

The policy rate of the ECB determines one important, very short-term interest rate for banks, and has in the past been a key determinant for the rate banks pay on sight deposits. Lower ECB deposit rates thus usually also lead to lower funding costs for banks. But this pass-through is less strong with negative rates, potentially impairing bank profitability. However, the profitability of banks is also affected by many other interest rates. Long-term interest rates are also very important for banks because lending to NFCs is usually at 3-5 years and mortgages are even more long-term (up to 20-30 years). This implies that the profitability of banks depends much more on the difference between long and short rates (the so-called yield curve) than on the level of the ECB's short term deposit rate, and whether it is negative or not.

The ECB cannot set these long-term rates, but it has tried to influence them through its asset purchase programmes (APP, PEPP). Arguably, these actions have had a stronger effect on the profitability of banks than the negative deposit rates. Negative long-term might be more damaging to the profitability of banks than the negative rate on excess deposits.

Moreover, the ECB has taken two steps to mitigate the perceived risk to bank profitability (from its negative rate on excess reserves). In 2019, it exempted about one quarter of all excess reserves from the negative rate. As early as 2014, about the time when negative rates were first introduced, the ECB also offered banks special medium-term (three-year) refinancing at favourable rates, which were improved later in 2016 and 2019. Under the TLTRO, the interest cost for the bank could be as low as 50 basis points below the deposit rate. These exceptional rates are linked to the growth of lending and thus not unconditional, but the volume of these operations is so large that the interest rate subsidy provided by the ECB outweighs the cost which derives from the inability of banks to charge households negative rates on sight deposits.

In this way, the ECB has already compensated for the negative effects of NIRP. A NIRP that consists of negative deposit rates plus TLTRO, plus a tiered deposit system, would not be expected to have a negative effect on profitability and risk-taking.

All in all, the importance of negative rates seems vastly overrated.

¹¹ A third distinction which we have not addressed in this contribution is that between nominal and real interest rates. The latter should be key for the customers of banks. In a short run perspective, prices can be taken as given, implying that any change in nominal interest rates also corresponds to a change in real interest rates.

REFERENCES

- Aghion, P., Bergeaud, A., Cette, G., Lecat, R. and Maghin, H. (2019). “Financial constraints and productivity growth: An inverted-U relationship”. VoxEU, 13 September 2019. <https://voxeu.org/article/financial-constraints-and-productivity-growth>
- Altavilla, C., Boucinha, M., Holton, S. and Ongena, S. (2018). “Credit supply and demand in unconventional times”, ECB Working Paper Series No 2202. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2202.en.pdf>
- Altunbas, Y., Gambacorta, L. and Marqués Ibañez, D. (2010). “Does monetary policy affect bank risk taking?”, ECB Working Paper Series No 1166. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1166.pdf>
- Angeloni, I., Faia, E. and LoDuca, M. (2015). “Monetary policy and risk taking”, *Journal of Economic Dynamics & Control* 52, 285–307.
- Aramonte, S., Lee, S. J. and Stebunovs, V. (2019). “Risk Taking and Low Longer-Term Interest Rates: Evidence from the U.S. Syndicated Loan Market”, *Journal of Banking and Finance*, forthcoming. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3347222
- Arce, Ó., García-Posada, M., Mayordomo, S. and Ongena, S. (2018). “Adapting lending policies when negative interest rates hit banks’ profits”, Working Papers, No 1832, Banco de España. <https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadadas/DocumentosTrabajo/18/Files/dt1832e.pdf>
- Balloch, C. and Koby, Y. (2019). “Low Rates and Bank Loan Supply: Theory and Evidence from Japan”, Working paper, London School of Economics.
- Basten, C. and Mariathasan, M. (2018). “How Banks Respond to Negative Interest Rates: Evidence from the Swiss Exemption Threshold”, CESifo Working Paper No. 6901.
- Borio, C. and Zhu, H. (2008). “Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism?”, BIS Working Paper No. 268. <https://www.bis.org/publ/work268.pdf>
- Bottero, M., Minoiu, C., Peydró, J.-L., Polo, A., Presbitero, A. and Sette, E. (2019). “Negative Monetary Policy Rates and Portfolio Rebalancing: Evidence from Credit Register Data”, IMF Working Papers, No 19/44, February. <https://www.imf.org/en/Publications/WP/Issues/2019/02/28/Negative-Monetary-Policy-Rates-and-Portfolio-Rebalancing-Evidence-from-Credit-Register-Data-46638>
- Brunnermeier, M.K. and Koby, Y. (2018), “The reversal interest rate”, National Bureau of Economic Research Working Paper Series. <https://www.nber.org/papers/w25406>
- Bubeck, J., Maddaloni, A. and Peydró, J.-L. (2019). “Negative Monetary Policy Rates and Systemic Banks’ Risk-Taking: Evidence from the Euro Area Securities Register”, Working Papers, No 1128, Barcelona Graduate School of Economics, November. <https://www.barcelonagse.eu/research/working-papers/negative-monetary-policy-rates-and-systemic-banks-risk-taking-evidence-euro>
- Buch, C. M., Eickmeier, S. and Prieto, E. (2014). “In search for yield? Survey-based evidence on bank risk taking”, *Journal of Economic Dynamics & Control* 43, 12-20.
- Cette, G., Fernald, J. and Benoît, M. (2016). “The pre-Great Recession slowdown in productivity”, *European Economic Review* 88(C): 3–20.

-
- Dell’Ariccia, G., Laeven, L. and Suarez, G. A. (2017). “Bank Leverage and Monetary Policy’s Risk-Taking Channel: Evidence from the United States”, *Journal of Finance* 72 (2):613–654.
 - ESRB. (2016). “Macroprudential policy issues arising from low interest rates and structural changes in the EU financial system”, November. https://www.esrb.europa.eu/pub/pdf/reports/161128_low_interest_rate_report.en.pdf
 - ESRB. (2021). “Lower for longer – macroprudential policy issues arising from the low interest rate environment”, June.
https://www.esrb.europa.eu/pub/pdf/reports/esrb.reports210601_low_interest_rate~199fb84437.en.pdf
 - Gaggli, P. and Valderrama, M. T. (2010). “Does a Low Interest Rate Environment Affect Risk Taking in Austria?”, *Monetary Policy and the Economy* of the Oesterreichische Nationalbank, 4, 32–48. [467].
 - Gros, D. (2019). “Global Trends in Inflation: Are Central Banks Barking up the Wrong Tree?”, Study for the Committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg.
<https://www.europarl.europa.eu/cmsdata/207621/11.%20CEPS%20FINAL-original.pdf>
 - Hassan, F. and Ottaviano, G. (2013), “Productivity in Italy: The great unlearning”. Vox EU.
<https://voxeu.org/article/productivity-italy-great-unlearning#:~:text=The%20long%2Dlasting%20stagnation%20in,misallocation%20on%20the%20productivity%20slowdown.>
 - Heider, F., Saidi, F. and Schepens, G. (2019). “Life below Zero: Bank Lending under Negative Policy Rates”, *Review of Financial Studies* 32 (10):3728–3761.
 - Heider, F., Saidi, F. and Schepens, G. (2021). “Banks and Negative Interest Rates”, ECB Working paper series.
<https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2549~bc0dc3b89f.en.pdf?b011ec33f20a6a5fb53b587ddee22bff>
 - Hong, G. H. and Kandrac, J. (2018). “Pushed Past the Limit? How Japanese Banks Reacted to Negative Interest Rates”, IMF Working Paper No. 18/131.
<https://www.imf.org/en/Publications/WP/Issues/2018/06/13/Pushed-Past-the-Limit-How-Japanese-Banks-Reacted-to-Negative-Interest-Rates-45927>
 - Ioannidou, V., Ongena, S. and Peydró, J.-L. (2015). “Monetary Policy, Risk-Taking, and Pricing: Evidence from a Quasi-Natural Experiment”, *Review of Finance*, 19, 95–144.
 - Jiménez, G., Ongena, S., Peydró J.-L. and Saurina, J. (2014). “Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit risk-taking?”, *Econometrica* 82 (2):463–505.
 - Liu, E., Mian, A. and Sufi, A. (2019). “Low Interest Rates, Market Power, and Productivity Growth”. NBER Working Paper 25505. <https://www.nber.org/papers/w25505>
 - Maddaloni, A. and Peydró, J.-L. (2011). “Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards”, *Review of Financial Studies* 24 (6):2121–2165.

- Murai, T. and Schnabl, G. (2021). "The Japanese Banks in the Lasting Low-, Zero- and Negative-Interest Rate Environment", *Credit and Capital Markets*, vol. 54.
- Nucera, F., Lucas, A., Schaumburg, J. and Schwaab, B. (2017). "Do Negative Interest Rates Make Banks Less Safe?", *Economics Letters* 159:112–115.
- Rajan, R. G. (2005). "Has financial development made the world riskier?" Paper presented at The Greenspan Era: Lessons for the Future, A Symposium Sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, August 25–27.
- Repullo, R. (2020). "The reversal interest rate: A critical review", *Vox EU*, 4 November. <https://voxeu.org/article/reversal-interest-rate-critical-review>.
- Rostagno, M, Altavilla, C., Carboni, G., Lemke, W., Motto, R, and Guilhem, A. S. (2021). "Combining negative rates, forward guidance and asset purchases: identification and impacts of the ECB's unconventional policies", ECB Working Paper Series No 2564. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2564~e02f3aad4c.en.pdf>
- Růžičková, K. and Teplý, P. (2015). "Determinants of banking fee income in the EU banking industry: Does market concentration matter?", *IES Working Paper* No. 4/2015.
- Schnabel, I. (2020). "Going negative: the ECB's experience", 35th Congress of the European Economic Association, 26 August. <https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200826~77ce66626c.en.html>
- Stráský, J. and Hwang, H. (2019). "Negative interest rates in the euro area: does it hurt banks?", OECD Economics Department Working Papers 1574, OECD Publishing. <https://ideas.repec.org/p/oec/ecoaaa/1574-en.html>

A widespread concern about negative policy rates is that they might depress bank profits and encourage risk-taking. We find that the impact of negative rates per se is limited. Other policy measures (TLTROs, tiered deposits) have largely neutralised the impact of NIRP on bank profits. Asset purchases might have been more important by compressing the yield curve. Any small positive impact of negative rates on lending and aggregate demand may have been swamped by the negative impact of low rates on productivity.

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