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Negative Interest Rate Policies: Taking Stock of the Experience So Far*

Negative interest rates as a policy tool are a recent innovation. The first time a main central bank policy rate entered negative territory was in Denmark in 2012. Since then, the European Central Bank (ECB) and central banks in Japan, Sweden, and Switzerland have also used a negative interest rate policy or NIRP (see Table 1). They did so when the room for easing policy by cutting rates in positive territory had been exhausted, and often in concert with other “unconventional” monetary policy measures.

The global neutral real rate of interest—the level of real rates at which demand equals potential output, therefore eliminating inflationary or deflationary pressures—has been in decline for decades in response to slow-moving structural forces and is currently close to zero in many advanced economies (e.g., see Del Negro et al. 2019). With inflation targets of about 2 percent, a low real rate has resulted in very low nominal rates as well. In a recession, and when policy rates are already low, central banks have turned to NIRP as a means to deliver needed monetary stimulus, usually alongside other unconventional policy measures.

However, this move was met by deep skepticism (and even hostility) by the public and many economists (The Economist 2015). The potential adverse effects of NIRP on bank profitability, financial intermediation, and financial stability were of particular concern. One key fear was that banks may find it hard

ABSTRACT

For almost 10 years, several central banks in advanced economies have cut and maintained their key policy rates below zero. Central banks in Denmark, the euro area, Japan, Sweden, and Switzerland had turned to such policies in response to persistently below-target inflation rates and a very low neutral real interest rate. However, negative rate policies remain controversial, and their potential side effects are subject to much debate. This paper surveys the body of research that has grown out of the experience with the policy to date, and takes stock of the evidence. Overall, the experience with negative rates has broadly been positive. Lending and deposit rates fell following the adoption of NIRP. Bank lending volumes rose, and bank profits for the most part did not significantly deteriorate.

to cut retail deposit rates below zero (Hannoun 2015). The reason is that deposit holders may substitute physical cash for bank deposits once interest rates go below an “effective lower bound” (ELB). This is a particular risk in the case for retail deposits, since insurance and storage costs of small cash holdings are not very large.

While banks’ net interest margins (NIM) may suffer if banks cannot pass on negative rates to their

* This paper draws on Brandao-Marques et al. (2021).



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customers, negative rates may support banks' net worth by boosting asset values and improving loan quality. If NIRP has the intended effect of easing economic conditions, bank provisioning declines along with borrowers' improved balance sheets. For tradeable assets, a similar revaluation may occur, and is reflected in mark-to-market gains. The equity value of the bank is potentially improved through both of these channels. But this benefit is transitory—capital gains are a one-off, and new loans will be priced to reflect better conditions.

When the negative net income effect outweighs the positive net worth effect, cuts in rates may hurt lending. NIRP may then depress bank profits and, with it, banks' ability to raise capital at reasonable cost and to extend credit to the broader economy. The interest rate below which these adverse effects could

seriously impair or even reverse the pass-through of policy rates to lending and deposit rates is the “reversal rate” (Brunnermeier and Koby 2018). However, the reversal rate may lie above, at, or below the effective lower bound and is in fact a different economic concept. It depends on the composition of financial intermediaries' balance sheets and income (Darracq Pariès et al. 2020). Therefore, before discussing the evidence on NIRP's effect on overall bank profitability, we will discuss what we currently know about bank deposit-taking and lending, both in terms of quantities and prices.

DEPOSIT RATES

Banks seem to have responded to NIRP by increasing fees on retail deposits, while passing on negative rates partly to firms. For retail customers, banks overcame the ZLB (zero lower bound) on deposit rates by charging higher fees and commissions on retail depositors (Arce et al. 2018; Bottero et al. 2019 for the euro area; Basten and Mariathan 2019 for Switzerland). In contrast, for corporate customers, negative rates were transmitted to rates on deposits (Altavilla et al. 2019; Deutsche Bundesbank 2020). Moreover, the responsiveness of bank deposit rates to successive policy rate cuts after the introduction

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Table 1
Timeline of NIRP

Country	Instrument	Date	Level
Denmark	Certificates of deposit	6 July 2012	-0.20 percent
		25 January 2013	-0.10 percent
		25 April 2013	0.05 percent
		5 September 2014	-0.05 percent
		20 January 2015	-0.20 percent
		23 January 2015	-0.35 percent
		30 January 2015	-0.50 percent
		6 February 2015	-0.75 percent
		8 January 2016	-0.65 percent
		13 September 2019	-0.75 percent
20 March 2020	-0.60 percent		
Euro area	Deposit rate	11 June 2014	-0.10 percent
		10 September 2014	-0.20 percent
		9 December 2015	-0.30 percent
		16 March 2016	-0.40 percent
		18 September 2019	-0.50 percent
Japan	Deposit rate	16 February 2016	-0.10 percent
Switzerland	Sight deposits	15 January 2015	-0.75 percent
Sweden	Repo rate	18 February 2015	-0.10 percent
		25 March 2015	-0.25 percent
		8 July 2015	-0.35 percent
		17 February 2016	-0.50 percent
		9 January 2019	-0.25 percent
		8 January 2020	0 percent

Source: Compilation of authors.

of NIRP does not seem to have changed significantly (Figure 1).

DEPOSIT VOLUMES

The evidence on the effects of NIRP on the quantity of deposits is less clear. This is because, except for some experimental evidence (Baars et al. 2020; Bracha 2020; Corneille et al. 2020; Efendic et al. 2019), empirical studies of the response of household savings and portfolio choices to NIRP are largely absent. Therefore, we can only empirically test the effects of NIRP on bank liabilities by observing bank behavior, which is usually obscured by several confounding factors. For example, the evolution of deposits may reflect the adoption of unconventional monetary policy measures, such as quantitative easing.¹ Still, the available descriptive evidence on aggregate cash ratios suggests that neither households nor non-financial firms have significantly rebalanced their portfolios away from bank deposits (Brandao-Marques et al. 2021).

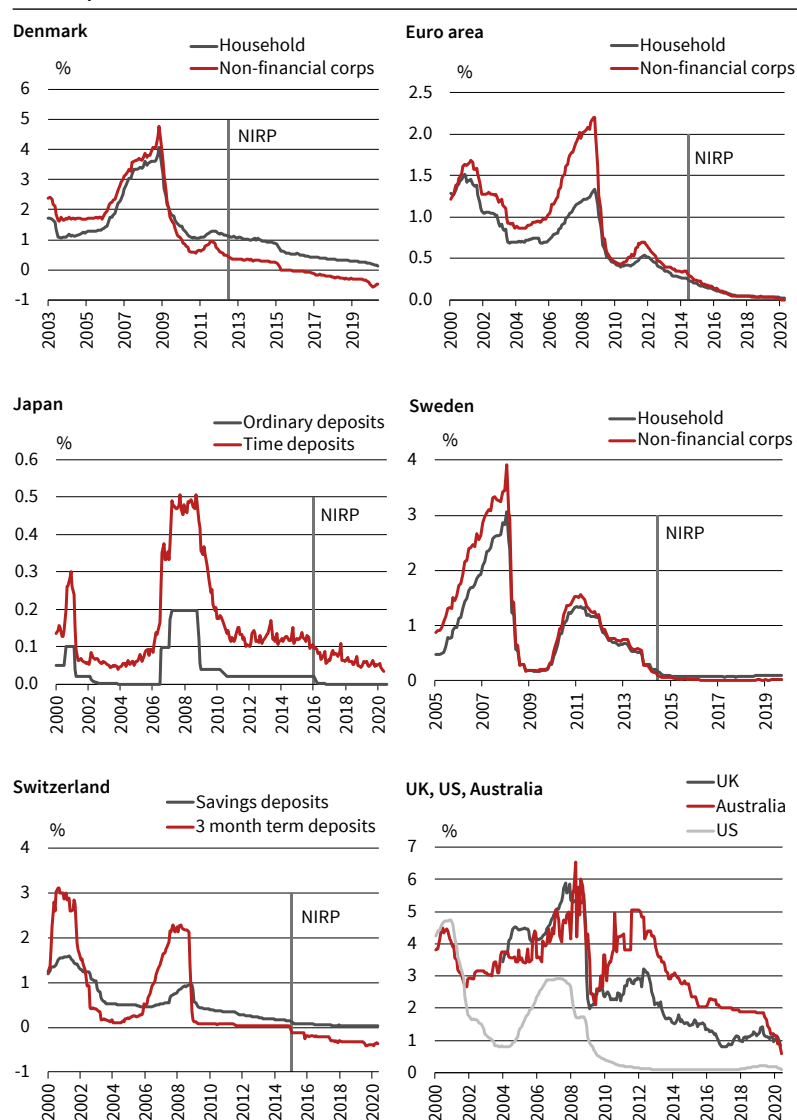
LENDING RATES

NIRP seems to have lowered interest rates on new mortgages and corporate loans, but there is substantial heterogeneity across banks. Bottero et al. (2019) report that Italian banks lowered loan rates and increased lending in response to NIRP—particularly those banks holding larger shares of liquid assets. Similar results have been obtained for Switzerland by Basten and Mariathasan (2018). In Denmark, lending rates fell after NIRP was introduced but there is no evidence that banks theoretically more exposed to NIRP (i.e., with a higher reliance on deposit funding) responded differently than other banks (Adolfson and Spange 2020). In contrast, Italian banks with a relatively high reliance on retail deposits tended to increase rates on loans to the nonfinancial private sector (Amzallag et al. 2019), while Japanese banks that were more exposed to NIRP did not lower lending rates as much as other banks (Hong and Kandrac 2018). According to the findings by Baeriswyl et al. (2021), Swiss banks tried to compensate for stickiness of deposit rates by raising lending rates when short-term market rates entered negative territory.

LOAN VOLUMES AND RISK-TAKING

Other mechanisms may lead banks to lend more or make riskier loans in response to shrinking profitability and low policy rates. On the one hand, when banks have significant market power (the key ingredient for a “deposits channel of monetary policy”), they may respond to lower intermediation margins caused by a policy rate cut by lending more (Drechsler et al. 2017

Figure 1
Bank Deposit Rates before and after NIRP



Source: Danmarks Nationalbank; European Central Bank; Bank of Japan; Sveriges Riksbank; Swiss National Bank; Haver Analytics.

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and 2021). On the other hand, banks may increase risk-taking and lend to riskier borrowers if NIRP reduces banks' net worth (Dell'Ariccia et al. 2014).

According to some studies, banks with more liquid assets and greater access to wholesale funding are able to increase lending more after NIRP. Studies that use different cross-sectional characteristics to measure the exposure to NIRP find a stronger increase in lending by banks with a larger share of liquid assets (Bottero et al. 2019) and more excess reserves with the central bank (Basten and Mariathasan 2019). Moreover, banks with a lower share of deposit funding increase their supply of credit more (Heider et al. 2019; Lopez et al. 2020) or as much as (Bottero et al. 2019) other banks.² In addition, Inoue et al. (2019) and Eggertsson et al. (2019) have found that in Japan and

¹ When the central bank purchases assets directly from households or firms, this mechanically increases bank deposits held by these sectors.

² The only study that ranks banks in terms of retail deposits and excess liquidity simultaneously also finds a positive impact of NIRP on lending (Demiralp et al. 2019).

Table 2

Estimated Effects of NIRP on Bank Profitability

Paper	Coverage	Effect on measures of bank profitability
Altavilla, Boucinha and Peydro (2018)	Euro area	Increase in bank equity prices in response to unexpected cuts in negative territory identified using high-frequency event studies
Ampudia and van den Heuvel (2019)	Euro area	Decrease in bank equity prices in response to unexpected cuts in negative territory identified using high-frequency event studies
Bats, Giuliadori and Houben (2020)	Euro area	Decrease in bank equity prices in response to unexpected cuts in negative territory identified using high-frequency event studies
Coleman and Stebunovs (2019)	Europe	Decrease in net interest income when rates are negative (dummy variable)
Hong and Kandrac (2018)	Japan	No change in net interest income, earnings per share, and net total income; decrease in bank equity prices identified using high-frequency event studies
Klein (2020)	Euro area	Decrease in net interest income when rates are negative (dummy variable)
Lopez, Rose and Spiegel (2019)	European Union, Japan, Switzerland	No change in net income, decrease in net interest income, increase in noninterest income for banks with a higher share of retail deposits when rates are negative
Molyneux, Reghezza and Xie (2019)	33 OECD countries	Decrease in net interest income and ROA when rates are negative (dummy variable)
Stráský and Hwang (2019)	Euro area	Decrease in net interest income, no change in ROA when rates are negative (dummy variable)
Urbschat (2019)	Germany	Decrease in net interest income, no change in net income from commissions, increase in net income from the valuation of assets, and provisions for banks with a higher share of deposits

Source: Compilation of authors.

Sweden, respectively, a larger share of retail deposits is associated with lower lending.³ The finding that banks that rely more on wholesale funding increase lending more than those that depend more on deposits is in line with the bank lending channel.

Some other studies, however, find that banks that rely more on deposits increase their lending as much, and often more so, than their peers with deposit funding shares. For example, Tan (2019), and Schelling and Towbin (2020) have found that banks increase lending, but the effect is stronger for banks with high deposit ratios and for those that rely more on retail deposits. One explanation for this finding is that banks try to compensate for the decline in interest income by increasing lending volumes (Klein 2020), which would be consistent with Drechsler et al. (2017) on deposits channel of monetary policy.

Banks seem to have taken on more ex-ante risk following the adoption of NIRP (Brown 2015). This result holds in particular for loans (Basten and Mariathan 2019; Bottero et al. 2019; Heider et al. 2019), with some evidence pointing to banks terming out

loans (IMF 2020), but also for securities (Bubeck et al. 2020). Furthermore, smaller banks that are more reliant on deposits for funding seem to become riskier (Nucera et al. 2017, Heider et al. 2019; Schelling and Towbin 2020), as do those banks with lower capital ratios (Inoue et al. 2019) or with stocks that have experienced larger drops in prices following the adoption of NIRP (Hong and Kandrac 2018). These findings are consistent with Dell'Ariccia et al. (2014) on risk-taking channel of monetary policy. In contrast, Arce et al. (2020) found the opposite for euro banks in general and Spanish banks in particular: banks with net interest income more adversely affected by NIRP reduce risk-taking in lending to shore up their capital.

However, the overall observed increase in ex-ante risk-taking did not translate into higher nonperforming loans (ex-post risk). This is consistent with additional lending to financially constrained firms which lack access to credit but are otherwise profitable (Bottero et al. 2019), but it can also be consistent with NIRP improving the ex-post creditworthiness of borrowers, or simply with nonperforming loans being a lagged indicator of credit quality.

OVERALL PROFITABILITY

Several studies have used bank heterogeneity to identify the effects of NIRP on banks' net interest income and profitability (Table 2). On average, the evidence suggests that bank profits have not significantly deteriorated, thanks to an increase in lending, the introduction of fees on deposit accounts, and the realization of capital gains. For banks in the EU, Japan, and Switzerland, NIRP only had a small overall effect on

³ Eggertsson et al. (2019) describe a theoretical model of the transmission of monetary policy through the banking system. In their model, banks may respond to negative policy rates by raising the spread between their lending and borrowing rates. The wider spread tends to depress output and inflation, rather than stimulating them as intended. However, this result rests on assumptions that (a) there is one type of liability (deposits) subject to the effective lower bound, (b) the marginal benefit to holding reserves in terms of reduced intermediation costs can be driven to zero, (c) the marginal cost of issuing loans rises as bank profits fall, and (d) the central bank attempts to set a policy rate below the effective lower bound. The consequence is that when the central bank sets rates below -0.01 percent (the assumed effective lower bound), it causes bank profits to be lower, and so leads to a contraction in loan supply. See also Ulate (2021) for a similar exercise that reaches very different conclusions.

profitability because losses in interest income were offset by gains in non-interest income, such as fees, capital gains, and insurance income (Lopez et al. 2020), or because of lower loan-loss provisions (see Urbschat 2019 for evidence on German banks).

In relative terms, the income of large, less specialized banks and those that rely relatively less on deposits performs better under NIRP (Molyneux et al. 2019). Larger banks were also likely to have made use of hedging strategies to protect margins (IMF 2020). Other studies find that overall bank profitability in the euro area has been largely unaffected by the introduction of NIRP once the total effects of this policy on asset quality are taken into account (Hong and Kandrac 2018, Altavilla et al. 2019; Stráský and Hwang 2019).

However, the evidence that the average effect of NIRP on bank profits has been small is not conclusive as it may be capturing only short-term effects, which may be reversed over time. In fact, for positive interest rates, evidence shows that rate cuts initially increase bank net interest margins and profits, but after some time the effect is reversed, consistent with loan pricing frictions (Alessandri and Nelson 2015; English et al. 2018). In fact, the expectation of large adverse medium- to long-run effects on bank profitability, potentially offsetting any temporary increase in profits, could explain why bank stock prices fell after NIRP (Ampudia and van den Heuvel 2018; Heider et al. 2019; Balloch and Koby 2020; Bats et al. 2020).

CONCLUSIONS

In sum, although economists and policymakers have identified a number of potential drawbacks of NIRP, none of them have emerged with such an intensity as to justify removing this instrument from the central bank toolbox. This is because the transmission mechanism of monetary policy does not appear to change significantly when official rates become negative. Moreover, overall, bank profitability has not significantly suffered so far, making the reversal rate remain a theoretical concept which has not been empirically validated and, most likely, not yet breached (Arce et al. 2020).

However, there are still many aspects of NIRP that we do not understand yet. First, the evidence on the effects on macroeconomic variables is quite scarce, even though central banks moved rates into negative territory in order to sustain economy growth and inflation. Second, the role of bank competition in shaping outcomes remains obscure. Absent competition from other intermediaries or capital markets, the transmission of negative policy rates to bank lending rates will be weaker, as banks would try and preserve their intermediation margin (IMF 2017). To the best of our knowledge, only one study has tested this hypothesis (Molyneux et al. 2020), despite the availability of relevant data. Third, the mechanisms behind Altavilla et al. (2019) corporate channel are mostly

unknown. According to this channel, cash-rich firms with relationships with banks that charge negative rates on deposits are more likely to use their liquidity to increase investment. However, the specific mechanisms at work remain to be investigated. Finally, the literature so far has largely overlooked the impact of negative interest rates on financial intermediaries other than banks. Given the growing importance of these institutions, the absence of empirical evidence on NIRP on their behavior is surprising.

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