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Fighting Inflation More Effectively without Transferring Central Banks' Profits to Banks

Abstract

The major central banks now operate in a regime of abundance of bank reserves. As a result, they can only raise the money market rate by increasing the rate of remuneration of bank reserves. This, in turn, leads to large transfers of the central banks' profits (and more) to commercial banks that will become unsustainable and makes the transmission of monetary policies less effective. We propose a two-tier system of reserve requirements that would only remunerate the reserves in excess of the minimum required. This would drastically reduce the giveaways to banks, allow the central banks to maintain their current operating procedures and make monetary policies more effective in fighting inflation.

JEL-Codes: E520, E580.

Keywords: monetary policy, bank reserves, minimum reserve requirements.

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1. Introduction

The major central banks pay interest on commercial banks' holdings of bank reserves (held at the central bank). In order to fight inflation these central banks have started to hike interest rates since late 2021. This has led these central banks to make large interest payments to commercial banks. Taking the example of the Eurosystem: bank reserves held by credit institutions at the national central banks and the ECB amounted to €3.6 trillion in August 2023[1]. In September 2023 the remuneration rate on these bank reserves held by commercial banks was raised to 4%. This means that the Eurosystem is paying out €146 billion in interest to credit institutions as of September 2023, on a yearly basis.

Other central banks, in particular the Federal Reserve and the Bank of England followi the same procedure of raising the interest rate by increasing the rate of remuneration on bank reserves. In Table 1, we compare the interest transfers for these three central banks. We find that these transfers to commercial banks have become substantial. The last column of the table shows these interest payments as a percent of GDP. One observes that in relative terms the transfers made by the Bank of England are the highest followed by the ECB and the US Fed.

Table 1

Bank reserves and interest payments to banks (Aug 2023), billions				
	Bank reserves	*Interest rate*	*Interest payments*	*percent GDP*
ECB	*€ 3.650*	*4,00%*	*€ 146*	*1.10%*
Fed	*$3.136*	*5,15%*	*$162*	*0.64%*
BoE	*£909*	*4,25%*	*£39*	*1.75%*

Sources: Bank of England, Board of Governors Federal Reserve and European Central Bank
See list of references for more detail on the sources.

To give an idea on the size of these transfers in Europe consider the following. With a yearly transfer of €146 billion by the Eurosystem towards the banks in the Euro area we are approaching the yearly total spending of the EU which amounts to €168 billion[2]. A remarkable situation which is even more remarkable when considering that the transfers by a European

[1] https://www.ecb.europa.eu/press/pr/wfs/2023/html/ecb.fst230613.en.html

[2] Some economists have argued that during the period of 2015-2022, banks paid to the Eurosystem when the deposit rate was negative. We calculated that the total payment by banks over this whole period was €61 billion (see Appendix 1). This compares with €146 billion that is being paid out today on an annual basis.

institution towards the banks are decided without any political discussion and are granted without attaching any condition. This contrasts with the EU spending which is the result of an elaborate political decision-making process and is usually accompanied by tight conditions.

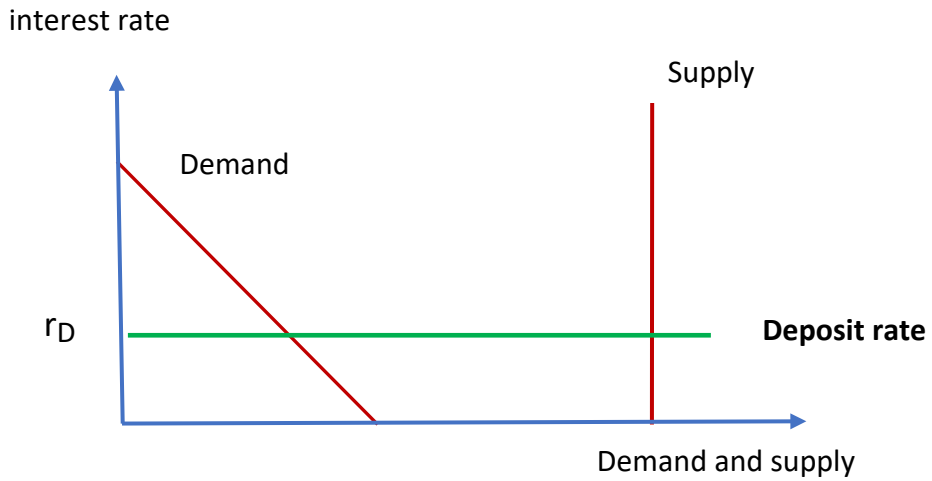
In this paper we wish to study a number of issues that arise from these large transfers. In Section 2, we review the theoretical idea on the need to remunerate bank reserve and its potential problems in the context of the eurozone. In Section 3, we study the implications of the large losses central banks are incurring as a result of these transfers. In Section 4, we evaluate the transmission of monetary policies in the current regime. In Section 5, we look at the alternative operating procedures of central banks in their fight against inflation that do not imply massive transfers of central banks' profits to banks. We will propose a two-tier system of minimum reserve requirements as an alternative operating procedure. In Section 6, we argue that there is a need to rethink the role of minimum reserve to ensure financial stability. We conclude in Section 7.

Although the interest transfers by central banks occur in most advanced countries, and create similar problems in all these countries, we will focus on the Eurozone in this paper. This will allow us to study some of the special problems that arise from these transfers in a monetary union.

2. Is remuneration of bank reserves necessary for monetary policy?

Is the remuneration of bank reserves necessary to conduct monetary policy? The standard answer of many economists and central bankers is positive. Here is the argument (see De Grauwe and Ji(2023b). Today, there is an oversupply of bank reserves thanks to the large-scale QE operations of the past. There is, in other words, no scarcity of liquidity, on the contrary, there is an abundance. This creates a problem for the central banks when they want to raise the interest rate. We show this in Figure 1. This represents the demand for reserves (by banks) and the supply (by the central bank). The demand is negatively related to the money market interest rate (interbank rate). The supply is determined by the central bank. The latter increases (reduces) the supply by buying (selling) government bonds. Figure 1 presents the regime of reserve abundance: the central bank has bought large amounts of government bonds in the past and thereby created an excess supply of reserves. As a result, without remuneration of bank reserves, the interest rate is stuck at 0% and the central bank cannot raise the interest rate.

Figure 1: Demand and supply of reserves in reserve abundance regime



Note: This is a stylised representation of the market for bank reserves. It does not show the marginal lending rate which acts as a ceiling and is raised together with the deposit rate.

To raise the interest rate in this reserve abundance regime the central bank can remunerate bank reserves, which are essentially deposits at the central bank held by commercial banks. In doing so, the demand curve becomes horizontal at the level of the deposit rate, i.e. the deposit rate, r_D, acts as a floor for the interbank interest rate. The reason is that banks will not be lending in the interbank market at an interest rate below the (risk-free) deposit rate. Given the abundance of bank reserves, this is the only way to raise the money market interest rate.

An increase in the interest rate on bank reserves (deposit rate) is then transmitted into an increase in the money market interest rate and to the whole structure of interest rates (Ihrig and Wolla(2020), Baker and Rafter(2022)). Today such an increase in the interest rate is necessary to fight inflation. Therefore, in the present regime of reserve abundance, the only way to raise the interest rate is to remunerate banks' reserves and increase this remuneration rate.

Many economists and central bankers today take it for granted that bank reserves are remunerated so as to conduct anti-inflation policy. Yet this remuneration is a recent phenomenon. Prior to the start of the Eurozone in 1999, most European central banks did not remunerate banks' reserve balances. During the 1970s and 1980s, for example, the Bundesbank used very high unremunerated minimum reserve requirements to siphon off large inflows of money into the country (Schobert and Yu (2014)). The ECB started the practice

of remunerating bank reserves in 1999. The Federal Reserve introduced the remuneration of banks' reserve balances only in 2008. Thus prior to 2000, the general practice was *not* to remunerate banks' reserve balances. This made good sense: commercial banks themselves do not remunerate demand deposits held by their customers. These demand deposits have the same function as bank reserves at the central bank: they provide liquidity for the non-bank sector. These are not remunerated. It is not easy to justify why bankers should be paid when they hold liquidity while everybody else should accept not to be remunerated.

The remuneration of bank reserves creates several problems that we discuss in this section. First, when the central bank makes interest payments to commercial banks it transfers part of its profits to the banking sector. Central banks make profit (seigniorage) because they have obtained a monopoly from the state to create money. The practice of paying interest to commercial banks thus amounts to transferring this monopoly profit to private institutions. This monopoly profit should in fact be returned to the government that has granted the monopoly rights. It should not be appropriated by the private sector, which has done nothing to earn this profit. The present situation of paying out interest on banks' reserve balances amounts to a subsidy to banks paid out by the central banks at the expense of taxpayers.

Second, the paying of interest on banks' reserve accounts has another unfortunate consequence. It transforms long-term government debt into short-term debt. Most of the government bonds held by the central banks have been issued at very low interest rates, often even zero or negative. This implies that governments are immune for some time from the interest rate rises. By paying an interest rate of 4% (Eurozone) to 5.15% (US) on bank reserves and thus reducing government revenues by the same amount, the central banks transform this long-term debt into highly liquid debt forcing an immediate increase in interest payments on the consolidated debt of the government and the central bank. In Section 3, we will provide details of the losses of central banks arguing that these losses may create political problems for the Eurozone.

Third, the problematic nature of remunerating bank reserves also appears from the following. Banks are "borrowing short and lending long". In other words, banks have long assets (with fixed interest rates) and short liabilities. As a result, an interest rate increase tends to reduce banks' profits because the interest cost of their liabilities increases fast, while the interest revenues are slow to pick up. Banks are supposed to cover this interest rate risk. But this is

costly, and as a result, they are often reluctant to buy such an insurance. By remunerating bank reserves, the central banks are actually providing free interest hedging to banks. The latter obtain immediate compensation from the central banks when interest rates rise. It is difficult to see the economic rationale of a system where public authorities provide free insurance of the banks' interest rate risks at the expense of taxpayers.

Such a free provision of interest hedging to banks is likely to intensify moral hazard risks. First, the remuneration of reserves reduces the incentives banks have to hedge their interest rate risk. The ECB as the single supervisor in the Eurozone requires that banks manage their interest rate risk appropriately (see references below). However, when at the same time the ECB remunerates commercial banks' reserves, it undermines its own micro- and macro-prudential supervision objectives. In addition, because the remuneration of reserves will lead to a lower degree of interest rate risk hedging by banks, the central bank will find it increasingly difficult to stop remunerating reserves, as it might fear that the interest rate risk of some banks could materialise triggering banking crises. Second, as will be shown in section 4, the remuneration of bank reserves strengthens the equity position of reserve-rich banks, , thereby giving them incentives to increase the loan supply and weakening the transmission of monetary policy.

3. The losses of central banks

As a result of large transfers to commercial banks many central banks are now loss-making. In this section, we provide estimates of these losses. We first show the size of the potential annual interest payments of the central banks of the Eurosystem in Table 2. We observe large differences among these central banks, varying from 0.43% to 9.15% of GDP.

The large central banks' transfers to banks as shown in Tables 1 and 2 have important implications for the profit and losses of central banks. These transfers are so high that not only do they wipe out central banks' profits, but they also push many of them into loss-making territory. This is well-illustrated by a recent study by researchers at the International Monetary Fund that analyzes the profit and loss accounts of five major Eurozone central banks (Belhocine, et al. (2023)). We use the data on profits and losses obtained in this study. We provide the assumptions made by the IMF team in computing these numbers in the note

of Figure 2. One assumption stands out here: the IMF team assumes that the deposit rate will peak at 3.5%. In September 2023 it reached 4%, which implies that the losses estimated by the IMF are probably underestimated.

Table 2. Remuneration of bank reserves in the Eurosystem (Aug 2023)

Country	Remuneration (million Euro)	% of GDP
Luxembourg	7095	9.15
Cyprus	920	3.31
Finland	5285	1.97
Belgium	10326	1.88
Netherlands	13918	1.45
Malta	241	1.40
France	35925	1.36
Germany	49107	1.27
Austria	4108	0.92
Croatia	593	0.87
Estonia	302	0.84
Slovenia	426	0.75
Spain	9170	0.68
Ireland	3277	0.65
Portugal	1434	0.59
Greece	1201	0.58
Latvia	215	0.55
Lithuania	360	0.53
Slovakia	484	0.44
Italy	8347	0.43

Source: European Central Bank

We show the results in Figure 2. This presents the profits and losses of the four largest central banks and of the Eurosystem as a whole (expressed as a percent of respective GDPs). Note that these profits and losses do not include the valuation losses of the government bonds held by the central banks. If marked to market, these bonds show a loss. However, these losses are exactly equal to the gain of the Treasury which has issued bonds at very low interest rates in the past, and now enjoys a gain arising from the fact that it will pay very low interest rates while market interest rates have increased significantly until these bonds mature. If we consolidate the balance sheets of the central bank and the treasury these gains and losses disappear. Therefore, these valuation losses should not be counted as the losses of the central bank. If we did this, we would count these losses twice: once because of the transfers of interest to the banks and a second time as valuation losses.

We also present the cumulative profits and losses starting in 2022. Two observations can be made. First, the Bundesbank makes the largest losses. It is estimated that it will take until 2027 for the Banks to make profits again. The Banque de France is the second in the row of central banks with losses. Profit-making is estimated to start again in 2025. Surprisingly, the Banca d'Italia is the only one among the larger central banks not to make losses (although its profits decline during 2022-23). The Bank of Spain makes some small losses during 2023-24. The cause of this divergence is the following. The Bundesbank, and to a lesser degree the Banque de France, hold a portfolio of low-yielding long-term government bonds. As a result, interest revenues are very low, and given the long duration of these bonds, it will take time before they start earning interest. This is not the case for the Banca d'Italia and to a lesser degree the Bank of Spain which hold relatively high-yielding government bonds. It follows that the Bundesbank and the Banque de France have transformed low-yielding long-term government bonds into short-term liabilities (bank reserves) on which they pay high interest rates. This transformation is much weaker in the case of the Banca d'Italia and the Bank of Spain.

All this has another surprising implication. The profit and loss profile of the central banks mimics the profit and loss profile of commercial banks during periods of interest increases. As the latter "borrow short and lend long", banks tend to make losses during periods of interest rate increases as the interest rate on short-term deposits increases fast while the interest rates on long assets only increase gradually. Paradoxically, this time banks are escaping the burdensome loss profile as they are making large profits during the current spell of interest rate increases. This appears to be possible because central banks have taken over this burden from the commercial banks. It is also worth mentioning that during the 1970s and 1980s when central banks raised the interest rates to fight inflation they did not make losses (Humann, et al. (2023)). Actually, they increased their profits. One of the main reasons was that they did not remunerate bank reserves.

Figure 2: Profit and losses Eurozone central banks

Source: Belhocine, et al. (2023), IMF, and own calculations. The assumptions made by the IMF team to estimate the profit and losses of the Eurozone central banks are: (1) The deposit rate will peak to 3.5% in 2024 and then decline to 2.3%; (2) The yields on QE-portfolios held by central banks will increase until 2024-25 and then gradually decline to 2%; (3) The APP-programme of the ECB will be brought down gradually by not reinvesting the bonds coming to maturity; (4) The PEPP will be maintained at the same level as today by reinvestments.

In Figure 2, we also show the cumulative profits and losses profile. These are important because large cumulative losses can lead to a point where the equity of the central banks

turns negative. This is likely to occur in the case of the Bundesbank and possibly the Banque de France. Should one worry about the negative equity of central banks? Not really. Central banks, in contrast to commercial banks, do not need to have positive equity to conduct credible monetary policies. In addition, a more relevant concept of the net worth of central banks is the net present value of future seigniorage gains and losses (see Buiter, (2008)). The cumulative profit and loss profiles shown in Figure 2 indicate that the losses are likely to be temporary. As a result, the net present value of future gains and losses is most likely to be positive.

While technically, negative equity does not pose problems for a central bank, the political economy of this issue is very different (see Wellink and Marsh (2023)). The negative equity of the central banks expresses the fact that these are transferring large amounts of money to private agents and in doing so make large losses. These will have to be borne by governments and taxpayers. Negative equity reveals this underlying problem. When this appears in the open, citizens will ask the question of why it was necessary to enrich the bankers to fight inflation. They will also insist on knowing why the central banks did not look for other operating procedures that were equally effective to combat inflation and that avoided making transfers to banks at the expense of taxpayers.

The ECB has announced that it will gradually reduce its holdings of government bonds by not reinvesting in new bonds when old bonds come to maturity. This will lead to a gradual decline in the amount of government bonds on its balance sheet. It will take many years, however, to reach the point where the excess supply of reserves has been eliminated[3].

Thus, it appears that Eurozone will remain in a reserve abundance regime for many years to come[4]. This implies that the operating procedure of the ECB (and the other central banks of advanced countries) will continue to be based on manipulating the rate of remuneration of banks reserves as their central policy tool, which in turn also implies that these central banks

[3] The Federal Reserve is also reducing its holdings of government securities. It has made it clear, however, that it wants to remain in the reserve abundance regime by keeping a sufficient amount of government securities on its balance sheets. The Bank of England has announced a gradual depletion of its holdings of UK government bonds. To maintain the abundant reserve regime the Bank of England offers reserves through short-term repo operations at the same rate of remuneration of bank deposits at the central bank. This will keep the supply of bank reserves sufficiently high so that the regime of reserve abundance can be maintained while allowing the Bank of England to unwind its stock of government bonds (see Schnabel (2023)).

[4] And also, in the US and the UK, see previous footnote.

intend to continue to make large transfers of their profits to commercial banks for many years, if not decades to come.

4. The transmission of monetary policies in the current regime

An important issue is how the existence of remunerated bank reserves affects the transmission of monetary policies. Does this remuneration make the transmission of monetary policies effective? In today's context of central banks' anti-inflationary policies this question can be reformulated as follows: Does the remuneration of bank reserves enhance or reduce the effectiveness of the interest rate hikes to fight inflation?

To answer this question, we first turn to the theory. There is a large economic literature on the equity channel of bank lending which is relevant here. This can be described as follows. When the bank's capital (equity) declines banks will have an incentive to reduce lending. There are essentially two reasons for this. One is a balance sheet effect. A lower equity means that the bank may not satisfy the capital requirements imposed by regulators. The bank will then have to reduce the supply of loans. The second reason is that with lower equity, the cost of funding bank loans will tend to increase, thereby leading to fewer incentives for banks to lend. Thus, a decline in the value of banks' equity leads to less bank lending. Conversely, an increase in the value of equity stimulates banks to lend more (see Shin (2015), Gambacorta and Shin (2016), Vanden Heuvel (2002), Diamond and Rajan (2000)). This theory has been subjected to many empirical tests confirming its importance (see Boucinha, et al. (2017), Girotti and Horny (2020)).

This equity effect is also important for the transmission of monetary policies. When the central bank raises the interest rate this will have a direct negative effect on bank loans that have become more expensive. It will also have an indirect effect through the equity channel: the higher interest rate tends to reduce the value of the banks' equity (because it lowers the collateral value of the banks' loans). In addition, a rate hike typically leads to a recession which tends to increase the size of non-performing loans. This also has a negative effect on the value of equity of banks. This equity effect in turn will induce the banks to lower the supply of loans. Thus, the equity channel tends to amplify the direct effect of the increased interest rate on bank loans.

This equity channel of bank lending is important to understand how the remuneration of reserves may affect bank lending. By increasing profit margins of banks, the use of remunerated minimum reserve requirements tends to increase the net worth (equity) of banks. With a higher equity ratio, banks will be more willing to supply loans to households and firms. Thus, when today the central banks raise the interest rate and as a result increase the remuneration of reserves, they give incentives to banks to extend more loans (ceteris paribus). Put differently, the expected negative effect of a rate hike on loans is (partly) offset by the positive equity effect on bank loans when bank reserves are remunerated. The transmission mechanism is made less effective, i.e., increases in the policy rate have a lower effect on the loan supply and ultimately on inflation.

We test this hypothesis by estimating the following econometric equation (1) with fixed effects, using monthly country-level data of the 20 Eurozone countries:

$$y_{it} = \alpha + Reserve_{it-1} + r_t + \Delta Rm_{it-1} + Con_{it} + \alpha_i + \varepsilon_{it} \qquad (1)$$

where y_{it} is the percentage change in the aggregate credit institutions' loans to households or non-financial corporations in country *i* in month *t* (where *t* goes from September 2022 until August 2023), $Reserve_{it-1}$ is the aggregate level of reserves in country i in previous month as a percent of GDP of country i, r_t is the policy rate in month t, ΔRm_{it} is the change in the remuneration of bank reserves in month t as a percent of GDP of country i, Con_{it} represents the control variables and α_i is the countries' fixed effects. ε_{it} is the error term.

We focus on the variables $Reserve_{it-1}$ and ΔRm_{it}. The former measures the level of reserves in country i (as a percent of GDP) in the previous month. Note that we use the previous month observation as the stock of bank reserves is typically recorded at the end of the month. We expect that the higher this level (and given that it is remunerated) the stronger are the funding possibilities for banks wishing to extend loans. We interpret the second variable, ΔRm_{it}, to measure the equity effect, i.e. it measures how changes in the policy rate changes the net worth of the banks in country *i* in month *t* relative to month t-1. An increase in the policy rate raises the cashflow from the central bank to the banks and in doing so increases the net worth of the banks, ceteris paribus. We expect a positive sign of this variable, i.e., as the cashflow to banks increases as a result of an increase in the policy rate, banks have an incentive to increase the supply of loans. In doing so, the transmission of an increase in the policy rate is made less effective in reducing inflation by lowering growth of aggregate loans.

We expect the policy rate r_t to have a negative effect on the supply of loans. Finally, we use as control variables the crude oil price (in logs) and consumer and business confidence indices.

The results based on the fixed effect model (equation (1)) regarding loans to households and to non-financial corporations are shown in Tables 3a and 3b, respectively. The first columns of Tables 3a and 3b show the results for the full sample of 20 Eurozone countries. We find that all the independent variables have the correct sign and are significant. The policy rate and the oil prices have the expected negative effects on the growth of loans to households and non-financial corporations. The level of reserves has a positive and significant effect on the growth of bank loans. An increase in the remuneration of bank reserves leads to a positive and significant effect on bank loans both to households and non-financial corporations. Thus, when bank reserves are high in a country, bank loans in that country will increase faster and when the remuneration increases (due to a higher policy rate) banks tend to increase their lending. All this weakens the transmission of monetary policies in the fight against inflation.

We have done several robustness checks. We have split the sample into different parts. Top-50% refers to the subsample containing the observations of countries during the months with levels of reserves belonging to the top 50% of the distribution; Bottom 50% contains the bottom 50% of the distribution. In addition, we have done regressions excluding two outlying countries, i.e. Cyprus and Luxembourg which have extremely high levels of bank reserves (probably due to the fact that they are important tax havens) which could affect our results. We show the results in the columns (2) to (5).

We find that the equity effect measured by "change in remuneration" remains significant in all cases, except in the case of the bottom-50% for the bank loans to non-financial corporations. Thus, it appears that the equity effect is important for countries with high levels of bank reserves. In Table A1 of Appendix 2, we show the list of countries that belong to this group. They are mostly countries from the Northern Eurozone. This is less the case in the subsample of countries with relatively low levels of reserves (at least for the loans to non-financial corporations). This is in a way not surprising. In countries with low levels of reserves, the equity effect on loans is weak as bank reserves (and their remuneration changes) have a weak impact on the net worth of the banks. In the subsample of countries with high levels of reserves, the link between these reserves and the banks' net worth is strong.

Table 3a. The transmission of monetary policies: Loans to households (growth rate, in yearly percent changes), twenty Eurozone countries, 2022M9-2023M8

	(1) All sample	(2) Top 50%	(3) Top 50% exclude	(4) Top 50% exclude	(5) Bottom 50%
Lag reserve	6.11***	7.45***	2.92	1.79	-0.82
	[1.51]	[0.81]	[2.32]	[1.97]	[4.66]
Policy rate	-1.05***	-0.98***	-1.10***	-1.30***	-1.90***
	[0.21]	[0.22]	[0.22]	[0.39]	[0.12]
Ln (oil price)	-2.44***	-3.04***	-3.19***	-3.67***	-3.02**
	[0.84]	[0.76]	[0.68]	[0.44]	[1.06]
Change in remuneration	1.08***	1.00***	1.38***	1.44***	2.76**
	[0.24]	[0.22]	[0.24]	[0.31]	[0.88]
Consumer confidence				0.04	0.29**
				[0.32]	[0.11]
Constant term	Yes	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	216	106	84	72	97
R^2	0.658	0.778	0.749	0.828	0.866

Clustered at the country level, the results display robust standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01. Note: we use adjusted loans to households which measures the lending to the real economy (households). "Exclude" means that Cyprus and Luxembourg are excluded from the sample

Table 3b. The transmission of monetary policies: Loans to non-financial corporations (growth rate, in yearly percent changes), twenty Eurozone countries, 2022M9-2023M8

	(1) All sample	(2) Top 50%	(3) Top 50% exclude	(4) Top 50% exclude	(5) Bottom 50%
Lag reserve	7.05***	12.42***	16.29***	13.92***	-7.23
	[2.43]	[1.58]	[4.28]	[3.57]	[20.24]
Policy rate	-3.00***	-1.46**	-1.64**	-1.42***	-3.75***
	[0.54]	[0.54]	[0.59]	[0.18]	[0.65]
Ln (oil price)	-8.11***	-1.59	-3.57*	1.13	-10.26**
	[2.03]	[2.13]	[1.80]	[1.71]	[3.42]
Change in remuneration	2.13***	1.98***	2.71***	1.16**	7.84
	[0.24]	[0.09]	[0.37]	[0.51]	[4.66]
Business confidence				1.32***	0.35
				[0.41]	[0.59]
Constant term	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	216	106	84	72	97
R^2	0.627	0.711	0.583	0.882	0.746

Clustered at the country level, the results display robust standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01. Note: we use adjusted loans to non-financial corporations which measures lending to the real economy (non-financial corporations). "Exclude" means that Cyprus and Luxembourg are excluded from the sample

Our results make clear how the current regime of remuneration of bank reserves may reduce the effectiveness of the transmission of monetary policies. From Tables 3a and 3b we observe that an increase in the policy rate of one percentage point is associated with a decline in loans to households of 0.98-1.9% and to non-financial corporations of 1.42-3.75%. However, this association is counteracted by the fact that the same increase in the policy rate increases transfers to banks leading these to partially offset the negative association of the policy rate hike on bank loans.

We want to know how strong this compensation is. To find out we add the coefficient of the "change in remuneration variable" to the coefficient of the "policy rate" variable. In doing so we have to consider that the change in remuneration variable ΔRm is defined as $\Delta Rm = \Delta(r * Reserves)$, where *r* is the policy rate and *Reserves* is the level of bank reserves. Since we are interested in how the increases in the policy rate affects the remuneration, we single

out $Reserves * \Delta r$ from ΔRm. This means that the equity effect measured by the change in remuneration variable depends on the size of the reserves.

We concentrate on the top-50% observations in the sample (high-reserve sample) and compute the equity effects for different levels of remuneration in the sample. We then add these to the policy rate coefficient and obtain the total effects of an interest rate hike of 1 percentage point on the loan supplies. We show the results in Figures 3 and 4. Figure 3 shows the total effects on the supply of loans to households for different levels of reserves. We can compare these with the direct interest rate effect measured by the policy rate coefficient and represented by the vertical red line (-0.98%). We find that the total effects of a rate hike remain negative for most observations but that they are significantly reduced (in absolute value) compared to the effect coming from the estimated coefficient of the policy rate. The results obtained for the supply of loans to non-financial corporations (Figure 4) lead to the same conclusions.

Figure 3: Total effects of a one percent rate hike on the % change loans to households (Top 50% sample excluding Luxembourg and Cyprus)

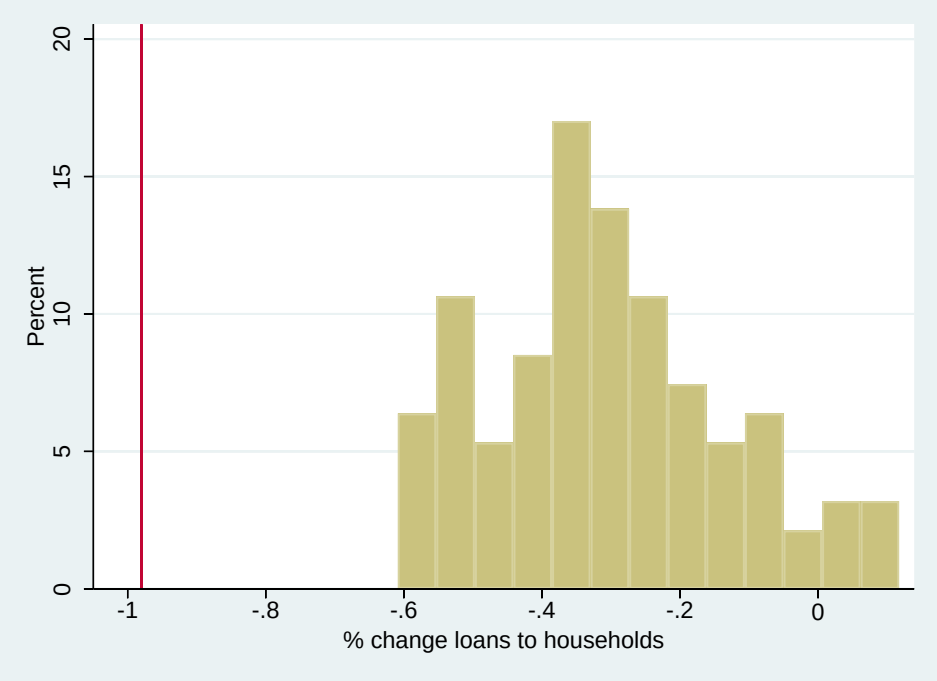
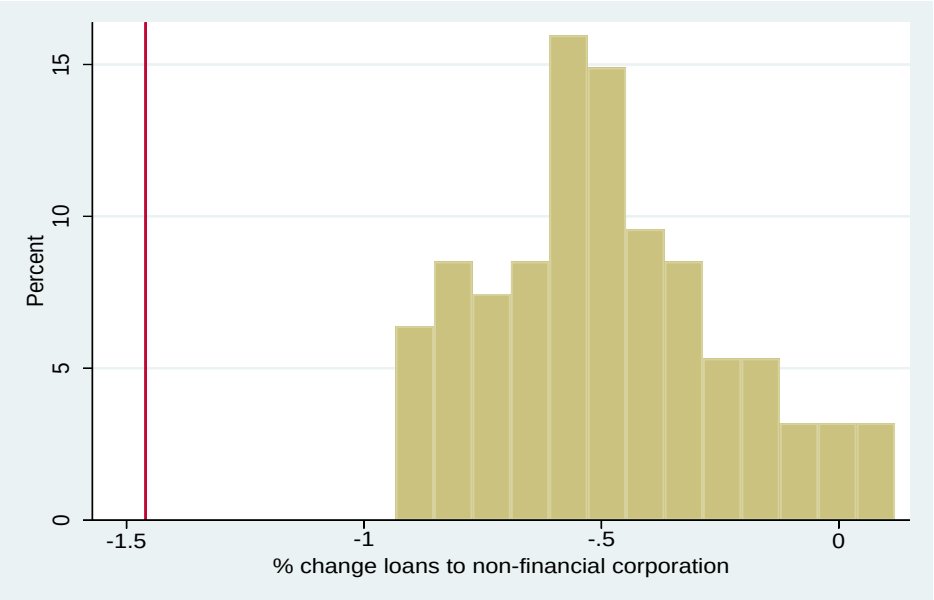


Figure 4: Total effect of a one percent rate hike on % change loans to non-financial corporations (Top 50% sample excluding Luxembourg and Cyprus)



The results obtained here are in line with the recent findings of Fricke et al. (2023). These authors use very detailed bank-level data for the Eurozone. They conclude from their empirical analysis of these micro-data that "banks with larger excess reserves display a relative increase in their credit supply to non-financial companies following the rate hike", thereby confirming that the remuneration of bank reserves tends to weaken the transmission mechanism of monetary policies aimed at reducing inflation.

5. Alternative policies that avoid making large interest payments to banks

In this section, we discuss the different alternatives the central banks can conduct monetary policies without having to transfer large parts of their profits to banks (see De Grauwe and Ji(2023a and 2023b).

The first alternative is to sell government bonds (in today's parlor: Quantitative Tightening, QT). This has two effects. First, the sales of government bonds reduce the amount of bank reserves, and therefore the amount of liquidity in the system. By selling enough government bonds the supply of reserves, the interbank interest rate is then determined by the intersection point of demand and supply of reserves. This recreates the situation that existed prior to QE. This was a regime of reserve scarcity. The central bank would set a target

interbank interest rate and would guide the market rate towards this target by manipulating the supply of reserves. This operating procedure would then determine the interbank rate without the need for the central bank to remunerate bank reserves (see Ihrig and Wolla(2020) for more detail).

The problem with this approach today is that the central banks would have to sell large amounts of government bonds. For example, in June 2023 the ECB was holding €4.9 trillion of bonds (mostly government bonds)[5]. This has led to reserve balances of the banking system of €4.3 trillion, 99% of which are reserves in excess of minimum reserve requirements (of 1%). To bring back the supply curve in the range given by the downward sloping part of the demand curve, the ECB would have to sell almost all the government bonds it holds. An operation that would create havoc in government bond markets.

A similar problem arises in the US and the UK. In March 2023 the US Federal Reserve was holding government securities and government backed securities amounting to $7.9 trillion[6] which, as in the Eurozone, has created a huge oversupply of bank reserves. The Bank of England is in a similar position. These central banks have made it clear that they wish to maintain the reserve abundance regime and that they do not wish to return to the previous reserve scarcity regime. This, as we argued earlier, implies that central banks intend to continue to make massive transfers of their profits to commercial banks. Surely there should be a better way to conduct monetary policy. This alternative consists in using minimum reserve requirements. We discuss two scenarios. A system of minimum reserve requirements that absorbs the excess reserves and a two-tier system of minimum reserve requirements.

5.1 Minimum reserve requirements that absorb the excess reserves

Central banks could decide to raise minimum reserve requirements while paying no interest on bank reserves. Most central banks have minimum reserve requirements in their toolkit. In fact, in the past this was a policy tool actively used by central banks. Its use, however, has fallen out of fashion. The ECB, for example, has chosen not to use this instrument and has kept it constant most of the time. Today it stands at 1%. The Federal Reserve has abolished

[5] See ECB, Consolidated Financial Statement of the Eurosystem, https://www.ecb.europa.eu/press/pr/wfs/2023/html/ecb.fst230613.en.html

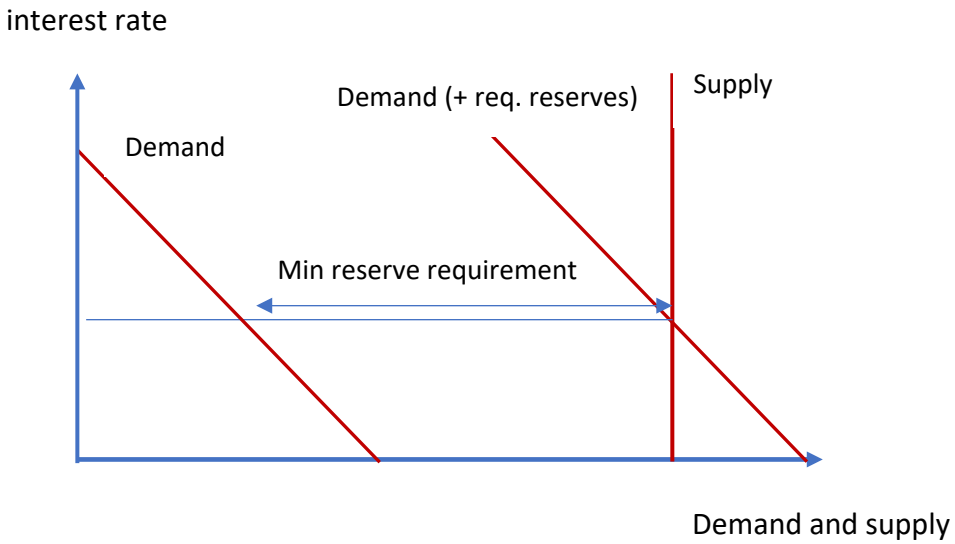
[6] Federal Reserve System, https://www.federalreserve.gov/releases/h41/20230323/

minimum reserve requirements altogether. Nothing prevents these central banks form using it again. Thus, they could decide to raise minimum reserve requirements so that the excess reserves banks hold today become required reserves on which no interest is paid. What would be the effect on the interest rates?

We show these effects in Figure 5. As a result of the increase in minimum reserve requirements, the demand for reserves shifts horizontally to the right. We are back in the reserve scarcity regime: the interest rate is determined by the intersection of the new demand curve with the unchanged supply curve. Banks are not remunerated on their bank reserves and the central bank can manipulate the supply of reserves to guide the money market rate by relatively small open market operations. For example, if it wishes to raise the money market rate it can reduce the supply of reserves by relatively small sales of government bonds thereby shifting the supply of reserves to the left. These interest changes can be achieved with relatively small changes in the supply of bank reserves because the supply curve intersects the demand curve in the negatively sloped segment.

An often-formulated objection to the use of minimum reserve requirements is that these amount to an implicit tax on the banking sector. Thus, it is said, the central bank is mixing monetary and fiscal policies. A central bank does not have a mandate to engage in fiscal policies. This is a strange objection. First, minimum reserve requirements do not lead to tax revenues for the government. Surely, it is not a tax. Second, the monetary authorities often use bank regulations that affect the profitability of banks. Minimum equity ratios come to mind. These regulations, including minimum reserve requirements, do not lead to tax revenues and therefore have no budgetary implications. In contrast, the present system where central banks transfer large amounts of their profits to banks and not to their respective governments has important budgetary implications as they reduce government revenues. If anything, it is the present operating procedure of central banks that mix monetary and fiscal policies. And surely, central banks do not have a mandate to transfer their profits to private agents rather than to the national budget.

Figure 5. Demand and supply of reserves with reserve requirement: no remuneration



5.2 A practical proposal: A two-tier system of reserve requirements

We are aware that transforming the whole of the existing stock of bank reserves into unremunerated minimum reserves would be quite intrusive and would be resisted by the banks who would see an easy source of profit disappear at once. It is also likely to be resisted by central banks because it implies a return to operating procedures that existed in a reserve scarcity regime prior to the financial crisis. The major central banks now embrace their new operating procedure (arising from the abundant reserve regime) which consists in raising the rate of remuneration on bank reserves as an instrument to increase the market interest rate in their fight against inflation. This has also led to a surprising but widespread conviction among central bankers and economists that this is the only reasonable operating procedure.

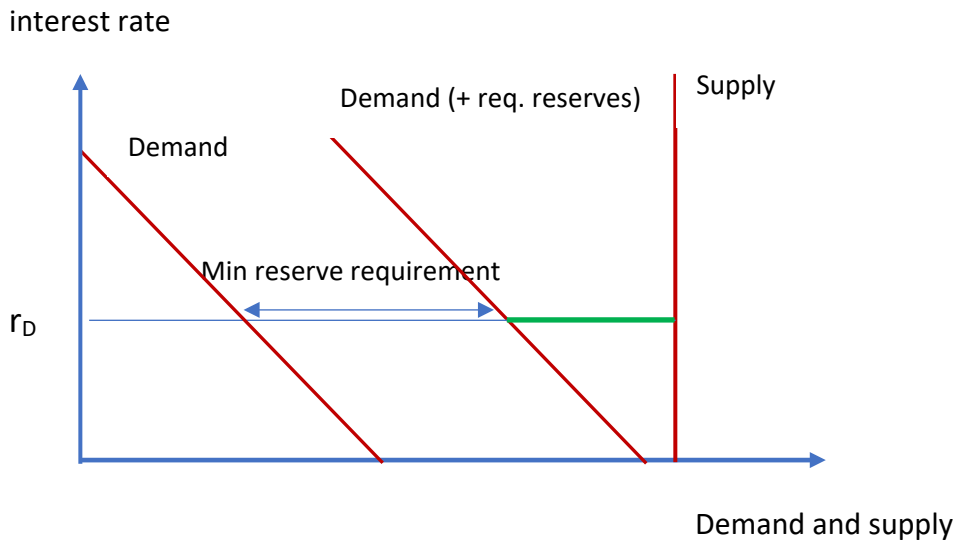
Can one design a system that will avoid having to make massive transfers to banks while maintaining the current operating procedure used by the central banks, and in doing so (hopefully) gaining their backing? We believe it is possible to design such a system. It is a two-tier system.

The two-tier system consists in imposing non-interest-bearing minimum reserve requirements on *part* of the bank reserves. The bank reserves exceeding the minimum requirement (excess reserves) would then be remunerated as they are today (for similar proposals for a two-tier system, see Whelan (2021), Buetzer(2022), van Lerven and

Caddick(2022), and Tucker(2022)); see also Angeloni (2023) for a proposal not to remunerate bank reserves).

The imposition of minimum reserve requirements leads to a horizontal displacement of the demand curve to the right (see Figure 6). The minimum reserve requirement would apply only to part of the total bank reserves. As a result of this partial displacement of the demand curve, we remain in the abundant reserve regime. The central bank then remunerates the excess reserves with the rate r_D (the horizontal green line). As before, this rate of remuneration acts as a floor for the market rate, and the central bank can raise the market rate by increasing the interest rate on (excess) bank reserves.

Figure 6. Demand and supply of reserves: two-tier system



A combination of sustained sales of government bonds and minimum reserve requirements would probably be the best policy option. Thus, the central bank would raise minimum reserve requirements as in Figure 6. It would then gradually start reducing its bond holdings allowing the supply curve to shift to the left. This also would make it possible for the minimum reserve requirements to be relaxed gradually. In such a strategy, both the supply and the demand curves in Figure 6 would then shift to the left, maintaining a regime of reserve abundance and allowing the central bank to use its monetary policy tools while reducing the subsidies to banks.

The advantage of this two-tier system is that the operating procedure so cherished by central bankers can be kept unchanged. The central bank continues to use the interest rate on bank reserves as its monetary policy instrument. The banks continue to have the same incentive to hold recess reserves, as these continue to be remunerated as today. However, the transfer of central banks' profits to commercial banks can be reduced significantly. We show this in Table 6, where we assume that the central banks would block 50% of the existing bank reserves in the form of non-remunerated minimum reserves. The remuneration would then be on the excess reserves using the same interest rates as shown in Table 1. We observe that in our proposed system there would be a significant reduction of interest transfers to bank. In our two-tier system, the banks would continue to profit: they would continue to receive relatively large transfers (call them subsidies) on what is essentially a risk-free asset. This would be much less than today, however, and surely less "exorbitant". It appears to us that if the central bank cares about the general interest, in particular the interest of the taxpayer, a two-tier system that allows the central bank to maintain its operating procedure intact but that reduces the massive subsidies to banks should be agreeable.

Table 6

Interest transfers in 2023 (billions)		
	present system	two-tier system
ECB	€ 146	€ 73
Fed	€ 162	€ 81
BoE	€ 39	€ 19

Sources: Own calculations based on data from Bank of England, Board of Governors Federal Reserve and European Central Bank

It should be noted that some central banks, in particular the ECB, used a two-tier system in the recent past when it charged a negative interest rate of -0.5% on bank reserves. We discuss this system in Appendix 1 and compare the interest banks paid during the period when negative deposit rates applied to the present situation. There is window of opportunities today as the ECB decided in July 2023 to stop remunerating required reserves (1 percent). This implies that the ECB could now increase required reserves and reduce its losses, without having to change its operating procedures. We made some calculations illustrating the range of choices the ECB has. In Table 7 we show the total reserves as of July 2023 (column 1). We then apply different minimum reserve requirements (column 2). Column 3 then shows the

size of the minimum required reserves on which no remuneration is paid. This leads to column 4 showing the reduction of transfers to banks resulting from these different minimum reserve requirements. Finally, the last column presents the level of excess reserves that are remunerated. Today with a minimum (unremunerated) reserve requirement of 1% the transfers of the Eurozone's central banks to the banks have been reduced by €6 billion. Clearly, the ECB could gradually increase minimum reserve requirements and it would achieve two things. The profit transfers to banks could be reduced and the ECB could maintain its operating procedure consisting of changing the deposit rate.

Table 7

Table: Total reserves (Aug 23), minimum reserves and transfers (billion euros)				
total reserves	percent min res	min reserves	reduction transfer	excess reserves
€ 3.818	1%	€ 168	€ 7	€ 3.650
€ 3.818	5%	€ 840	€ 34	€ 2.978
€ 3.818	10%	€ 1.680	€ 67	€ 2.138
€ 3.818	15%	€ 2.520	€ 101	€ 1.298

Note: total reserves = deposit facility + current accounts (min reserves)

The existence of non-remunerated minimum reserve requirements reduces the profitability of credit transformation by banks. As a result, a reverse equity effect is set in motion (see empirical evidence in Section 5). By reducing the profit margins of banks, the use of unremunerated minimum reserve requirements tends to reduce the net worth (equity) of banks. With a lower net worth banks will be less willing to take risks by extending loans. As a result, loan supply declines and the loan rate must increase. Thus, the use of minimum reserve requirements together with the interest rate instrument makes the fight against inflation more effective. Or put differently, the central bank would not have to increase the policy rate as much as it does today to have the same effect on bank credit.

We conclude it is perfectly possible for central banks today to raise the interest rates to reduce inflation without having to transfer large parts of their monopoly profits to commercial banks. These profits belong to society as a whole and should be transferred to governments.

6 Rethinking the role of minimum reserves

As argued earlier, minimum reserve requirements were a standard tool of monetary policy in the past in many industrialized countries. This monetary policy tool is still being used in many emerging countries. Its use as an active tool of monetary policy has been discontinued, however, in most industrialized countries.

6.1 A tradeoff between liquidity and profitability

One would have expected that after the banking crisis of 2008 monetary authorities would have taken recourse to minimum reserve requirements as an instrument to stabilize the banking system. They did not. Instead under Basle III they introduced a new instrument of liquidity control. Banks of a certain size were subjected to a "Liquidity Coverage Ratio" (LCR) (see BIS(2013)). The Basle III agreement defines the assets that qualify as liquid assets to be included in the LCR and calls them "High Quality Liquid Assets" (HQLA). The problem is that there are just too many HQLAs eligible for liquidity purposes. Not only do bank reserves at the central bank qualify[7], but also government bonds and even certain types of corporate bonds. In Appendix 3, we show a table with the different types of assets and the percentages of their permitted use. It strikes the reader that many of these assets, even with much imagination, do not qualify as liquidity because their prices in times of crises become extremely uncertain.

It is difficult to understand how regulators designed such a system of liquidity management. The common sense dictated that they would reactivate the only sound instrument of liquidity control, i.e., reserve requirements at the central bank. They did not do so. This seems to be an example of capturing the regulators by banks that want to have their cake and eat it, i.e., they want to have liquidity and make profits. In fact, there is a tradeoff between liquidity and profitability. Assets that are very liquid are not profitable; assets that generate profits are not very liquid.

[7] There is some discussion about whether required reserves qualify for inclusion in the LCR. The BIS qualifies central bank reserves (including required reserves) as belonging to the level 1 assets in the stock of HQLA's "to the extent that the central bank policies allow them to be drawn down in times of stress", BIS (2013). The experience of the post-financial crisis shows that central banks typically allow these reserves to be drawn down. Required reserves should be included in the LCR calculations.

By remunerating bank reserves the central banks have made it possible for banks to have their cake and eat it: banks can hold highly liquid assets and make a lot of profit. Central banks have eliminated the tradeoff between liquidity and profitability for the banks. In the Eurozone (October 2023), banks can earn more on their bank reserves (4%) than on 10-year German government bonds (2.75%). An extraordinary act of generosity towards bankers, at the expense of taxpayers.

6.2 Tradeoff between efficiency and stability

The decline in the use of minimum reserve requirements by central bankers was very much the result of a paradigm shift from the 1980s on; a shift that stressed the use of market forces and that frowned upon policy-induced distortions. Minimum reserve requirements were seen as introducing important inefficiencies in the financial markets that had negative effects on the optimal allocation of capital. It was often seen as a form of financial repression that led to wasteful investment with a negative effect on economic growth (see McKinnon(1972) for an early and influential analysis of this view). The corollary of this view was that in truly free markets (provided the monetary authorities maintained price stability) the risk of financial crises would be minimal.

How large the cost of the inefficiencies, induced by minimum reserve requirements, is an empirical matter[8]. The jury is still out on this[9]. But clearly, there is a tradeoff between efficiency and stability of financial markets. The existence of such a tradeoff has now been firmly established both theoretically and empirically. On the one hand, there is a large literature documenting how financial liberalization spurs efficiency and growth (see Levine (1997), Beck and Levine(2004), Bekaert et al. (2005) for both theory and empirical validation). On the other hand, there is an equally large literature showing that financial liberalizations tend to lead to excessive risk-taking activities in financial markets increasing the risk of crises (Stiglitz (2000)). As a result, most banking crises in the postwar period have occurred after financial liberalizations (see Demirgüç-Kunt and Detragiache (1999), Kroszner et al. (2007) and

[8] We also have to evaluate whether the cost of these distortions of minimum reserve requirements is offset by gains. These gains are that the authorities can eliminate another distortion which is the subsidy that is granted to the banks today.

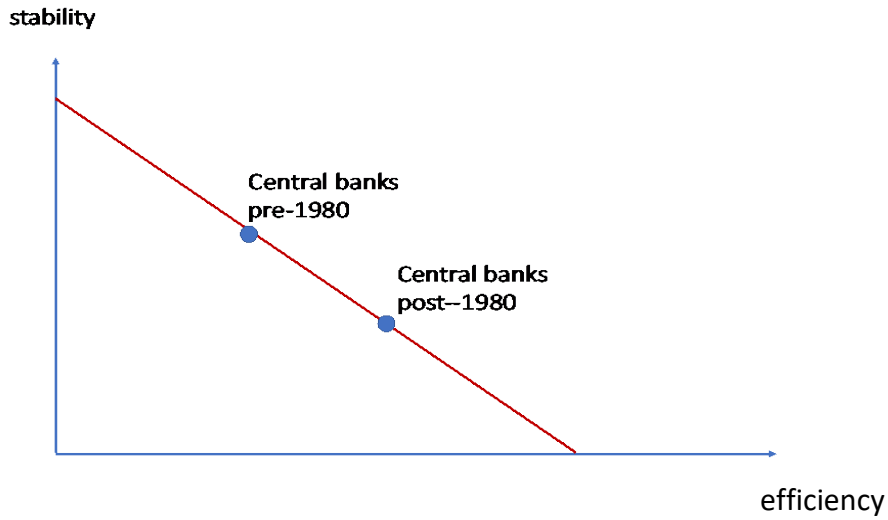
[9] See, for example, Cuaresma, von Schweinitz and Wendt (2019) who find medium levels of reserve requirements may be optimal for medium- to long-run growth.

Arregui et al. (2013)). The fact that financial liberalization leads to more efficiency and more instability leads to the conclusion that financial liberalization leads to a tradeoff between efficiency and stability.

By abandoning the use of minimum reserve requirements, central banks also abandoned the use of an instrument of monetary policy whose primary aim is stabilization of the banking sector and, more generally, the business cycle. Thus, one can also conclude that in the choice between efficiency and stability, central banks chose for efficiency at the detriment of stability.

We show this graphically in Figure 7. On the horizontal axis we set out the stability of the economy and on the horizontal axis the efficiency. Prior to the 1980s central banks tended to favour the use of an instrument aimed at having more stability in the banking sector and the business cycle at the expense of efficiency. Since the 1980s, central banks chose for more efficiency at the detriment of stability.

Figure 7: Trade-off stability and efficiency



In an important paper, Kashyap and Stein (2012) show that the use of minimum reserve requirements together with the interest rate makes it possible for the central bank to pursue the two objectives of price stability and financial stability. The interest rate can be geared towards achieving the goal of price stability, while the minimum reserve requirement can be used to achieve financial stability. When banks engage in maturity transformation (borrowing short and lending long) they take risks on their own balance sheets. There is also an externality involved in that bankruptcies of one bank can lead to bank runs and systemic risks. Individual

banks typically do not take these externalities into account. By using reserve requirements, the central bank can force the banks to internalize these externalities.

This also leads to the view that there may not really be a tradeoff between efficiency and stability. If we enlarge the concept of efficiency to include risk externalities, dealing with these externalities and thereby reducing instability, can also be interpreted as policies that increase the efficiency of the financial system.

7 Conclusion

The government bond buying programmes in the framework of QE have led to a fundamental change in the operating procedure of the major central banks which now operate in a regime of abundance of bank reserves. This requires to raise the money market interest rate by increasing the rate of remuneration of bank reserves. This, in turn, leads to a large transfer of the central banks' profits (and more) to commercial banks. We have argued that this is unsustainable, not only because of the sheer size of these transfers, but also because central banks' profits belong to governments that have granted the monopoly power to create money base, and the accompanying profits, to central banks. We have also argued that there is no serious economic argument to justify why banks should receive an interest rate that now varies between 4% (Eurozone) and 5.25% (US) on liquid deposits that carry no risk.

We showed empirically that the present system of remunerated bank reserves strengthens banks' equity position and thereby giving them incentives to increase the supply of bank loans. This has the effect of reducing the effectiveness of the transmission of monetary policies which today is focused on reducing inflation.

We argued that the remuneration of bank reserves is not inevitable and that there is an alternative to the current central banks' operating procedure. This alternative reduces the profit transfers to private agents and makes monetary policies more effective in fighting inflation. We proposed to use a system of two-tier minimum reserve requirements. This consists of freezing part of the existing bank reserves in non-interest-bearing deposits while remunerating the reserves in excess of these minimum requirements. This achieves two things. It allows for a drastic reduction in the transfer of central banks' profits to private agents, and it makes it possible for the central banks to maintain their current operating procedure.

We have argued that there are arguments of fairness to reject the present operating procedure that transfers the profits of central banks (and more) to the commercial banks. There is also an argument based on the effectiveness of monetary policies. We argued that the present operating procedures reduce the effectiveness of monetary policy in combatting inflation and that the use of minimum (unremunerated) reserves enhances this effectiveness.

Appendix 1. How much interest did banks pay to the Eurosystem when the deposit rate was negative?

During the period 2015-22 the deposit rate was negative (see Figure A1). The result was that the banks paid interest to the Eurosystem during that period. The question that arises here is how much interest on their deposit accounts the banks paid out to the Eurosystem during that period. The question is relevant because today banks often object to the imposition of unremunerated minimum reserves, arguing that the transfers they obtain today is a compensation for the interest payments they made during 2015-22.

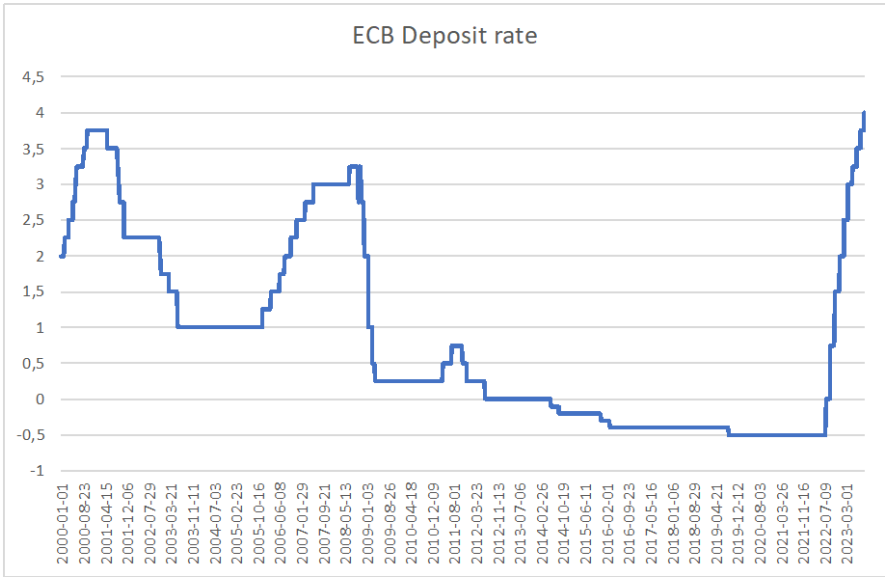
In order to compute these interest payments made by banks we have to take into account the fact that from September 2019 until July 2022, the ECB operated a two-tier reserve system (for more detail on this system see Boucinha, et al. (2022). The origin of this two-tier system was the fact that in September 2019 the deposit rate (which had been negative since 2014) was lowered to the record low level of -0.5% (see Figure 6). The ECB had ears for the complaints of the banks that found the paying of 0.5% on their deposit accounts at the central banks too onerous. Therefore the ECB agreed to exempt part of the bank reserves from the payment of this interest charge. The total exemption was put at a constant €950 billion, until July 2022 when the deposit rate became zero and the two-tier system was discontinued (see Figure A2).

We calculated the total amount of interest payments made by banks on their deposit accounts from 2015 until 2022 (when the deposit rate turned positive), taking into account the two-tier system that was in operation during 2019-22. We obtain a total payment by banks over the period 2015-22 of €61 billion. This compares with €146 billion that is being paid out today on an annual basis. In one year time banks will receive a compensation which is more than double the interest payments they made over a period of seven years.

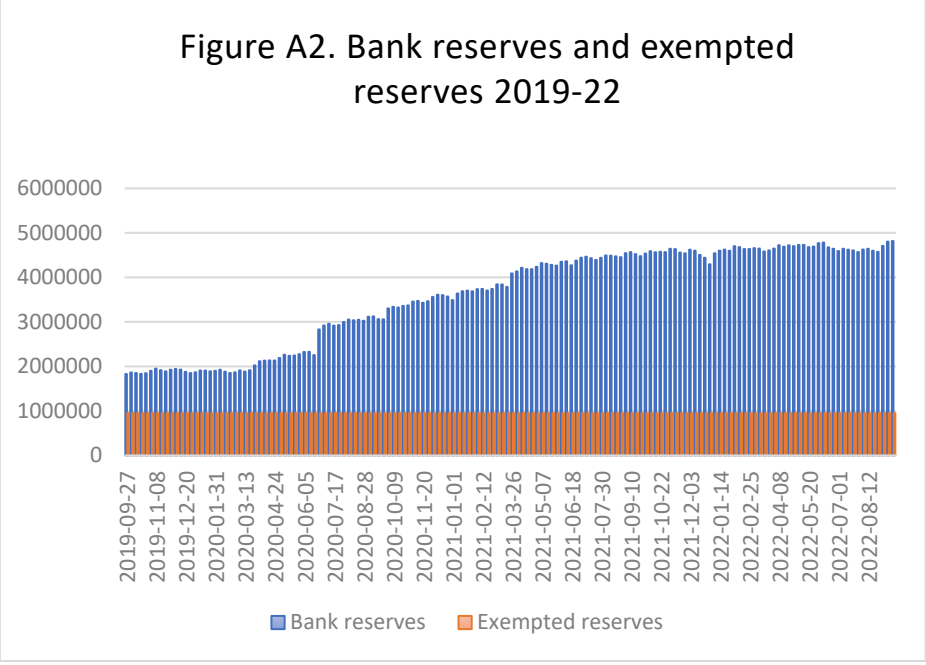
What is striking from this short historical analysis is that the ECB was willing to exempt part of the banks' deposits from the negative interest rate, in response to the banks' complaints of having to make these payments. Now that the banks receive massive transfers that dwarf what they had to pay in the past, the ECB has (up to now) been unwilling to impose a similar two-tier system that would exempt part of the banks' deposits from receiving interest transfers. It would be incomprehensible if the ECB were to continue its opposition to the introduction of a two-tier system that would alleviate the burden on taxpayers, in the same

way as it was willing to alleviate the burden on banks when they were hit by a negative interest rate.

Figure A1



Source: ECB



Source: ECB

Appendix 2:

The high reserve countries (i.e., countries situated in the top 50% of the distribution are listed in the following table (note that they belong mostly to the Northern Eurozone countries):

Table A1. High reserve sample (countries and month)

Country	Month
Ireland	Oct-22
Estonia	Jun-23
Cyprus	June-August 2023
Greece	September-November 2022
Portugal	September-November 2022
Spain	September-November 2022
Austria	September 2022-August 2023
Belgium	September 2022-August 2024
Finland	September 2022-August 2025
France	September 2022-August 2026
Germany	September 2022-August 2027
Luxembourg	September 2022-August 2028
Malta	September 2022-August 2029
Netherlands	September 2022-August 2030

Source: European Central Bank

Appendix 3: High Quality Liquid Assets (HQLA)

Illustrative Summary of the LCR

(percentages are factors to be multiplied by the total amount of each item)

Item	Factor
Stock of HQLA	
A. Level 1 assets:	
• Coins and bank notes • Qualifying marketable securities from sovereigns, central banks, PSEs, and multilateral development banks • Qualifying central bank reserves • Domestic sovereign or central bank debt for non-0% risk-weighted sovereigns	100%
B. Level 2 assets (maximum of 40% of HQLA):	
Level 2A assets	
• Sovereign, central bank, multilateral development banks, and PSE assets qualifying for 20% risk weighting • Qualifying corporate debt securities rated AA- or higher • Qualifying covered bonds rated AA- or higher	85%
Level 2B assets (maximum of 15% of HQLA)	
• Qualifying RMBS • Qualifying corporate debt securities rated between A+ and BBB- • Qualifying common equity shares	75% 50% 50%
Total value of stock of HQLA	

Source: Bank for International Settlement (BIS), (2013), Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools, Basle, https://www.bis.org/publ/bcbs238.pdf

Note: the percentages in the last column represent the percent of the value of the assets that can be counted as liquidity in the LCR

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