Accounting Policies, Distribution Rules, and the Financial Performance of Central Banks

Igor Goncharov, Zoltán Novotny-Farkas, and Carmine Pizzo

Abstract This paper provides comprehensive evidence on the financial performance of 148 central banks and its determinants over the period of 2010–2022. We observe a deterioration in central banks' capital buffers (i.e., equity) and profitability over our sample period, with the year 2022 seeing the largest percentage of central banks reporting losses (40%). While this deterioration in financial performance reflects the outcome of economic factors such as inflation and increased balance sheet size, we show that central banks' financial reporting choices and distribution rules also play a substantial role. Specifically, we find that financial reporting choices that aim to increase central bank transparency by allowing economic signals to be reflected in financial statements in an unbiased and timely manner (e.g., adoption of IFRS and fair value reporting) are associated with higher volatility of central bank profits and a higher likelihood of central bank losses and capital shortfalls. In turn, discretionary accounting policies, such as general risk provisions, can help central banks smooth their performance, but they have been less effective in reducing the likelihood of adverse performance in recent years. We further find that central banks build stronger capital buffers when distribution rules allow central banks to decide on the level of dividends or facilitate intertemporal dividend smoothing, but there is no evidence that equity targets reduce the likelihood of capital shortfalls. Because economic factors that increase the likelihood of losses and negative equity (e.g., inflation, bloated balance sheets) will likely persist in the coming years, our findings highlight potential issues with central bank (financial) independence. The paper ends by discussing reporting options central banks might take to mitigate these effects.

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1 Introduction

Central banks are exposed to risks, which affect their periodic financial performance and equity. Recent rises in interest rates and associated drops in market values of assets have a strong impact on central bank financials. The central bank literature has long debated whether central banks must be well capitalized and have a healthy balance sheet structure (e.g., Stella, 1997, 2008; Archer & Moser-Boehm, 2013; Nordström & Vredin, 2022; Wessels & Broeders, 2022; Bell et al., 2023). As the balance sheet equation that equates assets to equity and liabilities also holds for central banks, any declines in asset values must be covered by either decreases in equity or increases in liabilities (e.g., currency in circulation) that would allow a central bank to continue running its operations (e.g., Reis, 2013; Hall & Reis, 2015).

Theoretically, it is often argued that negative equity should not pose an issue for central banks that are able to generate seigniorage profits when inflation picks up and interest rates rise. However, this argument ignores the institutional implications of both central bank earnings and equity. Importantly, accounting earnings form the basis of central banks' distributions to the government. In case of large losses or negative equity, the government may be concerned about the implications of missing central bank dividends or the need to recapitalize a central bank. In addition, the public may misperceive poor financial performance for the poor execution of the monetary policy, damaging the transmission mechanism for policy (Archer & Moser-Boehm, 2013). To avoid these public or political pressures, Goncharov et al. (2023) find that central banks take actions to avoid losses.

Central banks' actions to avoid losses such as managing earnings through discretionary accounting choices pose unique risks of their own, including the loss of accountability and credibility (central banks' main asset), or sending signals that contradict central bank monetary policy statements. Furthermore, when reporting pressure is high and reporting agents run out of pure accounting options (e.g., tapping into general risk provisions), prior literature argues they may resort to using non-accounting or real decisions to report desirable performance figures (e.g., Graham et al., 2005). In the case of central banks, such real decisions may include the choice of macroeconomic parameters such as the interest rate or the value of a foreign currency peg (Goncharov et al., 2023).

Motivated by the (perceived) importance of financial performance of central banks, this paper reviews trends in central bank financial performance over the last decade, focusing on both periodic financial performance measures (profitability, losses) and central bank capital (i.e., equity). We begin our analysis by examining economic factors that may systematically affect central bank financial performance. For example, we consider inflation, balance sheet size, and economic growth. Furthermore, because prevailing accounting rules determine what items are recog-

nized on the face of financial statements and how they are measured, this paper examines the impact of major accounting rules for central bank earnings and equity. Specifically, we focus on both accounting frameworks (e.g., International Financial Reporting Standards or IFRS, Eurozone accounting rules) and specific accounting policies that are expected to have important implications for central bank financial performance, the volatility of earnings, and the likelihood of reporting adverse financial results, i.e., losses and negative equity.

In terms of specific accounting policies, we consider the financial statement effects of reporting fair value and foreign currency revaluations in the income statement. Unlike historical (amortized) cost, fair value reporting is expected to reflect economic signals in financial statements in an unbiased and timely manner, but its introduction can substantially increase the volatility of earnings and equity (Barth et al., 1995; Hodder et al., 2006). We also consider general risk provisions that are banned under IFRS because of their discretionary nature, but they can help central banks smooth out fluctuations of their financial performance measures and dividend distributions to the treasury. Finally, we investigate the role of various central bank dividend distribution rules on central bank equity and the likelihood of incurring negative equity.

Using the information on 148 central banks over years 2010–2022, we find that central banks experience a large decline in profitability with a sizeable share of loss-making observations (23%) during our sample period that includes a spike in inflation and substantial interest rate increases after the height of the COVID-19 pandemic. This resulted in a marked decline in the equity-to-assets ratio for central banks in developed and Eurozone countries from over 10% in 2010 to less than 5% in 2022. We find that the year 2022 was possibly the worst year on record for central bank financial performance with the highest share of central banks reporting a loss (40%) and negative equity (13%). The results of our regression analyses show that this poor financial performance is (partly) explained by larger balance sheets that expose central banks to new types of risks (e.g., interest rate risk, market price risk) and higher inflation, which led to rising interest rates that caused increases in central bank interest expenses and (un)realized losses due to declines of asset values, especially for central banks that apply IFRS and fair value reporting.

Further exploring the role of accounting rules, we find that most central banks now use IFRS and over half of central banks record fair value revaluations of some of their financial assets and foreign currency revaluations in the income statement. The use of IFRS and fair value reporting has increased over time (Goncharov & Novotny-Farkas, 2024). In turn, because IFRS does not allow general risk provisions, such provisions are mostly used by central banks that apply local GAAP (i.e., accounting rules used by local firms and commercial banks) or those using central-bank-specific accounting frameworks (e.g., Eurozone rules).[1] We find these accounting choices have economically large associations with the likelihood

[1] Goncharov and Novotny-Farkas (2024) find that central banks often deviate from IFRS requirements, and some central banks using IFRS report general risk provisions.

of incurring losses and negative equity. For example, while recognizing foreign exchange revaluations in income is associated with a 55% (96%) higher probability of incurring losses (negative equity), the use of general risk provisions is associated with a 73% (88%) lower likelihood of losses (negative equity). We find that this result is attributable to substantially higher (lower) volatility of central bank earnings under fair value revaluations in the income statement (when using general risk provisions) and holds after accounting for differences in macroeconomic conditions and past performance.

Unlike accounting rules, distribution rules seem to have a less pronounced relationship with central bank financial performance. This result may explain why some central banks effectively achieve their preferred dividend policy by changing accounting rules rather than seemingly less flexible distribution rules. Indeed, we find that accounting changes that have important implications for central bank earnings and dividends are more common during our sample period than changes in distribution rules.[2] Expectedly, we find a higher equity-to-assets ratio and a lower incidence of negative equity when central banks have more discretion in determining the distribution, can draw on external resources when needed or smooth the dividend distribution. In turn, government discretion in setting dividends and any form of mandatory dividends are associated with a lower equity-to-assets ratio and a higher incidence of negative equity. Somewhat surprisingly, we find mixed results for distribution rules that rely on equity targets, perhaps because they are inappropriately configured or set equity targets that provide insufficient buffers against the high losses that some central banks incurred during our sample period.

We conclude the paper by discussing the implications of our results. Because central banks face similar reporting pressures as firms do,[3] we argue that the literature on corporate reporting can be helpful in both understanding how central banks can (and do) respond to reporting pressures, and what implications such behavior may have for central bank independence and the role of central bank financial reporting as a communication device. Although we use the literature on corporate reporting, we caution against "mechanically" comparing or equating central bank performance to that of profit-oriented firms or commercial banks. Specifically, in the case of central banks, while financial losses may provide useful signals of performance, one should not per se view financial losses as evidence of poor monetary policy performance, as such (mis)perception could alter the behavior of central banks in important and unintended ways. To mitigate this risk, central banks must educate their stakeholders to avoid the misinterpretation of their accounting numbers.

[2] For example, we find that 14% of central banks in our sample switched their accounting framework (e.g., switched from local GAAP to IFRS), and 21% of central banks made changes to their accounting policy on the measurement or recognition of fair value revaluations during our sample period. However, we find none of central banks introduced changes to four distribution rules, and only 11% of central banks made some changes to at least one of the other six distribution rules that we consider in our analysis.

[3] We report some anecdotes in Sect. 5; see also Goncharov et al. (2023).

This paper adds to the scarce empirical literature on central bank finances. While previous studies mostly provide case-based evidence on financial performance of a handful of large central banks or discuss expected rather than actual performance (e.g., Christensen et al., 2015; Hall & Reis, 2015), we add to Goncharov and Novotny-Farkas (2024) and Goncharov et al. (2023) by providing large-scale empirical evidence on central bank financial performance and the effects of financial reporting choices. We also add to Archer and Moser-Boehm (2013) by systematically analyzing the implications of distribution rules for central bank capital.

2 Sample, Accounting Frameworks and Central Bank Accounting Choices

To provide a comprehensive overview of recent trends in central bank financial performance and their determinants, we use a sample of 148 central banks with available financial statements data on S&P Capital IQ for the period 2010–2022.[4] Using the data from Goncharov and Novotny-Farkas (2024), we identify central banks' accounting frameworks and their key accounting policies from the notes to the financial statements, auditor reports, and other published sources. We were able to retrieve accounting frameworks and key accounting policies for 138 central banks and 1735 central-bank-year observations. The data on central bank dividend distribution rules is based on our coding of central banks' charters obtained from the IMF's Central Bank Legislation Database (CBLD).

Unlike firms, central banks enjoy substantial discretion in choosing accounting frameworks, i.e., the set of rules detailing how to recognize, measure, and report transactions in financial statements. For instance, some central banks adopt IFRS, while others develop their own accounting standards to suit their reporting needs. In this respect, transparent accounting frameworks (e.g., IFRS) can improve central banks' accountability by providing more comparable information and timely incorporation of economic signals into financial statements.

We find that central banks adopt three types of accounting frameworks: (1) IFRS (e.g., Bank of England, Reserve Bank of Australia), (2) local GAAP (e.g.,

[4] S&P Capital IQ provides as-reported information on main financial statement positions. While using these data allows us to analyse a comprehensive sample of central banks, the reported figures may not fully reveal the extent of central bank losses when central banks report losses intransparently as discussed in Sect. 6. For example, some central banks may report accumulated losses outside of equity and provide little information on the balance sheet to help identify any accumulated losses. Specifically, the National Bank of Slovakia reported accumulated losses under other assets and provided detailed information on the magnitude of accumulated losses only in the footnotes to the financial statements. Such reporting practices complicate the comparative analysis of central bank financial statements. As we use as-reported figures in our tests, we acknowledge that the actual extent of central bank (equity) losses may be higher if financial statements were recast to provide more comparable figures.

Table 1 Central banks' use of accounting frameworks and accounting policies

Central bank accounting frameworks	*N*	%
IFRS	969	55.82
GAAP	257	14.80
CB-Specific	509	29.32
Total	1735	100
Central bank accounting policies		
FX_P&L	862	58.88
FV_P&L	840	58.13
GRP	389	24.80

This table reports descriptive statistics for central banks' accounting frameworks and policies. *IFRS* is an indicator taking the value of one for central-bank-years using IFRS, and zero otherwise. *GAAP* is an indicator taking the value of one for central-bank-years using local GAAP, and zero otherwise. *CB-specific* is an indicator taking the value of one for central-bank-years using a central-bank-specific accounting framework, and zero otherwise. *FX_P&L* is an indicator taking the value of one for central-bank-years recognizing foreign exchange revaluations in the income statement, and zero otherwise. *FV_P&L* is an indicator taking the value of one for central-bank-years measuring financial assets at fair value and recognizing the revaluation difference in the income statement, and zero otherwise. *GRP* is an indicator taking the value of one for central-bank-years reporting general risk provisions, and zero otherwise

Swiss National Bank, Bank of Japan), and (3) central-bank-specific accounting frameworks (e.g., the U.S. Federal Reserve, hereafter the Fed, and European Central Bank, hereafter the ECB). Goncharov and Novotny-Farkas (2024) show that over the past decades the share of central banks adopting IFRS has significantly increased. During our sample period, 56% of central banks report under IFRS (Table 1). Conversely, the share of central banks using local GAAP (i.e., non-IFRS accounting frameworks that apply for commercial banks or firms in the country where a central bank is located) has decreased. While about a third of central banks use a central-bank-specific framework, only 15% use local GAAP.

However, due to little external enforcement, central banks also enjoy substantial discretion in *which* accounting policies they apply. For instance, some central banks using IFRS might deviate from some IFRS requirements, such as fair value recognition rules (Goncharov & Novotny-Farkas, 2024).[5] Thus, we also examine the use of three specific accounting policies that significantly affect central banks' financial performance, that is: (1) the recognition of foreign exchange revaluations in the

[5] The most common deviations from IFRS are disregarding the requirement that foreign exchange and fair value revaluations are ought to be reported in the income statement (Goncharov & Novotny-Farkas, 2024).

income statement (*FX_P&L*), (2) the recognition of financial assets revaluations in the income statement (*FV_P&L*), and (3) the use of general risk provisions (*GRP*). While recognizing fair value and foreign exchange revaluations in the income statement improves transparency and decreases the possibility that financial statement users miss or misinterpret relevant information (Hirst & Hopkins, 1998), it also exposes central banks' profits to changes in market conditions, such as changes in interest and exchange rates.[6] Although general risk provisions are banned under IFRS because of their highly discretionary nature and the concern that firm managers may use this discretion opportunistically (e.g., to increase bonuses), they are a valid tool for central banks to absorb future losses and smooth the earnings and dividend stream to the government.

Table 1 reports descriptive statistics for key accounting policies and finds that 59% of central banks recognize foreign currency revaluations in the income statement and/or report financial assets at fair value with asset revaluations recognized in income, but only 25% of central banks use general risk provisions. However, as in Goncharov and Novotny-Farkas (2024), we find that the use of fair value reporting and general risk provisions significantly differs across accounting frameworks (untabulated). In line with the assumption that IFRS adoption fosters accounting transparency (Armstrong et al., 2010), we find that most IFRS adopters record fair value and foreign currency revaluations in the income statement. Conversely, most central banks applying a central-bank-specific framework use general risk provisions. We expect these differences to have important implications for the magnitude and the volatility of central bank profits, the likelihood of a central bank reporting losses and capital shortfalls, especially when distribution rules are not taking these accounting differences into account (e.g., by requiring the distribution of unrealized fair value gains).

3 Trends in Central Bank Profitability and Equity

We begin our analysis by examining trends in central bank financial performance using two complementary metrics: profitability and equity. These measures are connected as lower profitability and accounting losses increase the probability of depleting equity and reporting capital shortfalls. Furthermore, examining equity in addition to examining profitability is important because some accounting gains and losses are reported directly in equity, bypassing the income statement (e.g., revaluations of available-for-sale securities under IFRS).

Unlike commercial firms, central banks do not aim to maximize profits (Stella, 2008; Archer & Moser-Boehm, 2013). However, central banks' distribution rules

[6] For instance, due to the appreciation of the Swiss Franc, the Swiss National Bank recognized a substantial exchange rate loss (26 billion CHF) in the income statement for 2015. Due to these exchange rate losses, the SNB reported an accounting loss of 23 billion CHF in that year.

require their profits to be transferred to their governments as dividends, significantly contributing to government budgets. Besides, previous literature in economics often focuses on central bank equity. Although central banks cannot go bankrupt, negative equity indicates that a central bank is unable to cover some of its outstanding liabilities with its assets and may require recapitalization by the government (de Haan & Eijffinger, 2016), compromising central bank independence (Bernanke, 2010; Goncharov & Novotny-Farkas, 2024).

Figure 1 shows the state of central banks' profitability during our sample period. Panel A plots the histogram of return on assets or ROA (i.e., the ratio of central bank profits to total assets) following Goncharov et al. (2023), but for our more recent sample period. The average (median) central bank in our sample has an ROA of about 1% (0.5%) (see Table 2). We find a high propensity of central banks to report small positive profits (first interval of the histogram to the right of zero) over small losses (first interval to the left of zero). Goncharov et al. (2023) attribute this discontinuity in the distribution of profits around zero to central bank loss avoidance behavior.

Panel B of Fig. 1 shows trends in ROA and reveals that although central banks in developing countries have, on average, a higher ROA than central banks in developed countries, all central banks experience a large decline in profitability over recent years. These substantial declines may explain why we observe a sizeable share of loss-making observations (23%) during our sample period, which includes a spike in inflation and substantial interest rate increases after the height of the COVID-19 pandemic (see Table 2). Indeed, Panel C of Fig. 2 shows that 40% of central banks globally reported a loss in 2022. Comparing these statistics to the earlier period (1992–2014) from Goncharov et al. (2023) reveals that 2022 is the worst year on record since the early 1990s.[7] Although central banks in developing countries generally report losses more frequently than central banks in developed countries, the increase in the share of loss-making central banks in 2022 is more pronounced for developed than developing countries. As a result, the median ROA of central banks in developed countries has dropped to 0 in 2022. Despite low profitability, very few Eurozone central banks report a loss during our sample period, possibly due to the use of accounting discretion.[8] However, because of both large

[7] Prior to 1990s many central banks were not reporting financial statements or the income statement. The previous peak was observed in 2004 with 24% of central banks reporting a loss. However, note that this paper and Goncharov et al. (2023) rely on different databases, i.e., S&P Capital IQ here versus BvD Bankscope, and there are differences in the coverage of central banks between the two datasets, which complicate the timeseries comparisons of descriptive statistics. At the time of writing this paper, only 106 central banks have released their income statement for 2022 and were covered by S&P Capital IQ.

[8] Our review of central bank financial statements revealed that central banks use general risk provisions to avoid losses. For example, in 2022, the ECB has released general risk provisions in the amount equal to ECB's loss before provisions. As a result, the ECB reported a profit of 0 for 2022, narrowly avoiding a loss. However, Eurozone central banks have substantially depleted their general risk provisions that were built up during the period of low interest rates and relatively high profitability.

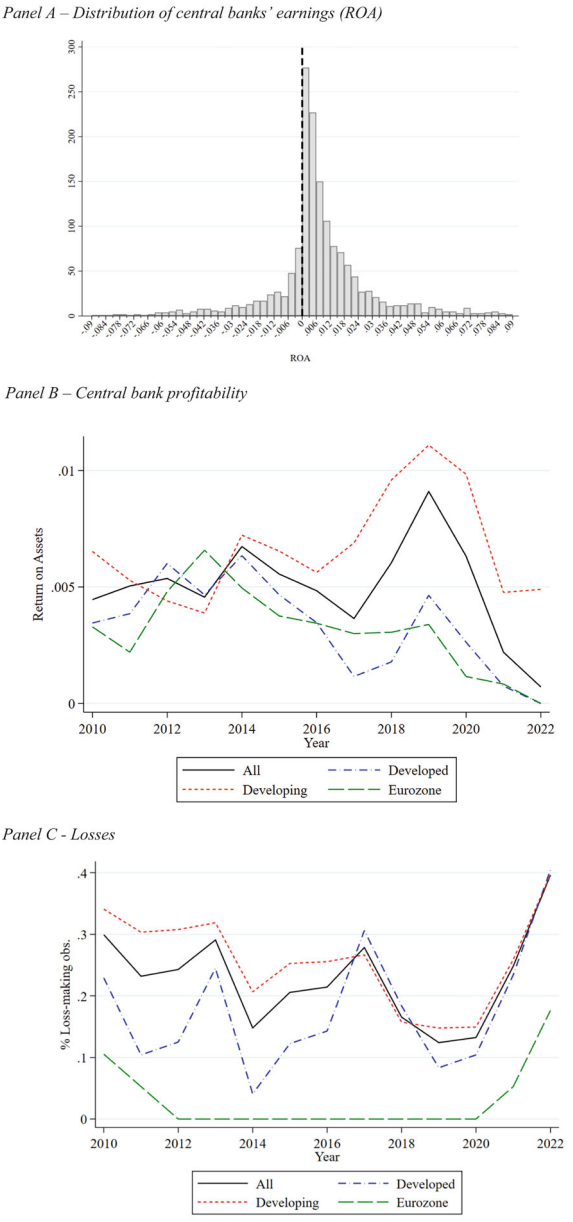

Fig. 1 Trends in central banks' profitability. Notes: This figure reports the evolution of central bank profitability over our sample period (2010–2022). *Panel **A*** plots the distribution of central banks' return on assets (*ROA*), where ROA is defined as earnings divided by average total assets. The distribution of *ROA* is trimmed at [−0.09; 0.09]. The dotted vertical line shows when *ROA* equals zero. The number of observations falling into each bin is reported on the vertical axis. *Panel **B*** plots the annual median *ROA*, separately for developed, developing, and Eurozone countries. *Panel **C*** plots the percentage of loss-making central banks (*Loss*), separately for developed, developing, and Eurozone countries

Table 2 Descriptive statistics

	N	Mean	St. Dev	Min	p25	p50	p75	Max
ROA	1622	0.009	0.037	−0.657	0.000	0.005	0.016	0.319
Neg. Equity	1805	0.092	0.289	0.000	0.000	0.000	0.000	1.000
Loss	1743	0.229	0.421	0.000	0.000	0.000	0.000	1.000
σ(ROA)	1517	0.016	0.029	0.000	0.002	0.006	0.020	0.387
Equity/Assets	1816	0.081	0.128	−0.864	0.024	0.069	0.138	0.801
Assets ($)	1784	21.252	4.177	9.094	18.244	21.135	24.378	33.185
IFRS	1735	0.559	0.497	0.000	0.000	1.000	1.000	1.000
GAAP	1735	0.148	0.355	0.000	0.000	0.000	0.000	1.000
CB-specific	1736	0.294	0.456	0.000	0.000	0.000	1.000	1.000
FX_P&L	1464	0.589	0.492	0.000	0.000	1.000	1.000	1.000
FV_P&L	1445	0.581	0.494	0.000	0.000	1.000	1.000	1.000
GRP	1569	0.248	0.432	0.000	0.000	0.000	0.000	1.000
GDP Growth	1898	0.029	0.058	−0.542	0.013	0.031	0.051	0.868
Recession	1898	0.163	0.369	0.000	0.000	0.000	0.000	1.000
Δ Exchange Rate	1656	0.060	0.244	−0.271	−0.003	0.007	0.072	5.867
Inflation	1848	0.058	0.196	−0.026	0.014	0.031	0.060	5.572
Developed	1911	0.333	0.472	0.000	0.000	0.000	1.000	1.000

This table reports summary statistics for the variables used in the empirical analysis. *ROA* is computed as central bank earnings over average total assets. *Neg. Equity* is an indicator taking the value of one for all central-bank-years with negative equity, and zero otherwise. *Loss* is an indicator taking the value of one for all central-bank-years with losses (i.e., ROA < 0), and zero otherwise. *σ(ROA)* is the three-year standard deviation of *ROA*. *Equity/Assets* is the ratio of central bank equity to total assets. *Assets ($)* is the natural logarithm of total assets in thousands, converted in current US dollars. *IFRS* is an indicator taking the value of one for central-bank-years using IFRS, and zero otherwise. *GAAP* is an indicator taking the value of one for central-bank-years using local GAAP, and zero otherwise. *CB-specific* is an indicator taking the value of one for central-bank-years using a central-bank-specific accounting framework, and zero otherwise. *FX_P&L* is an indicator taking the value of one for central-bank-years recognizing foreign exchange revaluations in the income statement, and zero otherwise. *FV_P&L* is an indicator taking the value of one for central-bank-years measuring financial assets at fair value and recognizing the revaluation difference in the income statement, and zero otherwise. *GRP* is an indicator taking the value of one for central-bank-years reporting general risk provisions, and zero otherwise. *GDP Growth* is the percentage change in real GDP, measured in 2015 US dollars. *Recession* is an indicator for central-bank-years with negative GDP growth, and zero otherwise. *Δ Exchange Rate* is change in the exchange rate of the local currency against the US Dollar. *Inflation* is the country rate of consumer price inflation. *Developed* is an indicator for developed economies based on the United Nations classification

losses following recent interest rate increases and running out of accounting options that Eurozone central banks can use for avoiding losses (De Nederlandsche Bank, 2022), we observe an increase in the share of loss-making Eurozone banks in 2022.[9]

[9] For example, the Deutsche Bundesbank released all of its general risk provisions (€19 billion) in 2023, but still incurred a net loss of over €2 billion.

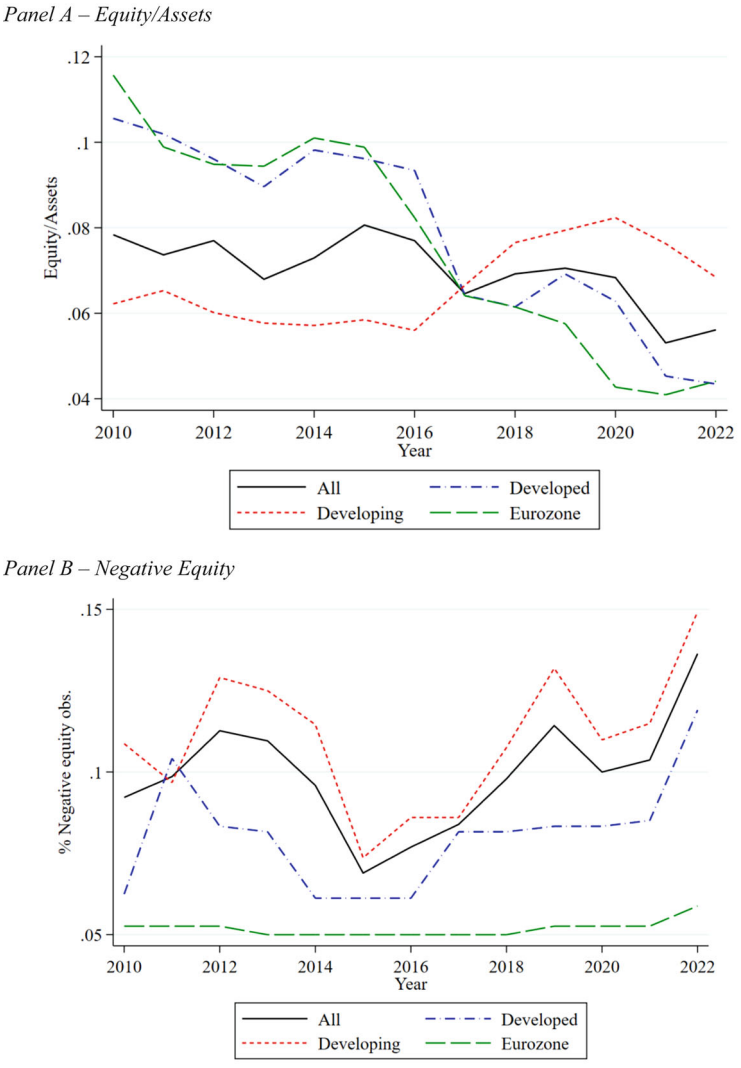

Fig. 2 Trends in central banks' equity. Notes: This figure reports the evolution of central bank capital over our sample period (2010–2022). *Panel **A*** plots the annual median equity-to-assets ratio (*Equity/Assets*), separately for developed, developing, and Eurozone countries. *Panel **B*** plots the annual percentage of central banks reporting negative equity (*Neg. Equity*), separately for developed, developing, and Eurozone countries. For this figure, we recast the financial statements of the National Bank of Slovakia to reveal its negative capital (i.e. calculated the difference between reported equity position and the component of other assets attributable to accumulated losses). Note that the total number of observations in each group (e.g., Eurozone) varies over time due to data availability in S&P Capital IQ

The increased frequency of losses, especially in recent years, might reduce capital buffers, raising concerns about central banks' financial strength (Goncharov & Novotny-Farkas, 2024). Thus, Fig. 2 examines the evolution of central bank capital buffers during our sample period. We observe a marked decline in the equity-to-assets ratio for central banks in developed and Eurozone countries from over 10% in 2010 to less than 5% in 2022. Despite their high average equity-to-assets ratio, central banks in developing countries report negative equity more often than their counterparts from developed countries.[10] Overall, the reduction in capital buffers and the increased frequency of losses in recent years suggest that discretionary accounting policies, such as general risk provisions, have been less effective in shielding central banks from adverse outcomes. Indeed, the year 2022 has the highest share of central banks reporting negative equity (13%) since the early 1990s (Panel B of Fig. 2).

So far, our graphical evidence shows two seemingly contradictory findings. On the one hand, central banks in developing countries are, on average, more profitable and better capitalized than central banks in developed or Eurozone countries. On the other hand, central banks in developing countries report losses and negative equity more often than other central banks. However, the analysis thus far ignores the critical role of central banks' accounting policies. For example, central banks might use general risk provisions to smooth reported income when interest rates rise and asset values decline. In this respect, some accounting policies can reduce the likelihood of reporting losses and negative equity, especially during turbulent times. Thus, we provide some preliminary evidence on the role of accounting policies on central banks' financial performance.

In Table 3, we report univariate comparisons of the average profitability (*ROA*), profit variability ($\sigma(ROA)$), likelihood of reporting losses (*Loss*), and negative equity (*Neg. Equity*) for central banks that recognize foreign exchange (*FX_P&L*) or fair value (*FV_P&L*) revaluations in income or report general risk provisions (*GRP*). We find that central banks adopting more transparent accounting policies, such as recognizing fair value or foreign exchange revaluations in income, have, on average, higher profit variability. This higher profit variability significantly increases the likelihood of central bank losses and capital shortfalls. For example, recognizing foreign exchange revaluations in income is associated with a 55% (=[0.256–0.165]/0.165) and 96% higher probability of incurring losses and negative equity, respectively. Conversely, the use of general risk provisions helps central banks to smooth their performance and is associated with a reduced likelihood of losses (negative equity) by 73% (88%).

[10] We observe only two central banks in developed economies (the National Bank of the Republic of Belarus and the Bank of Israel) consistently operating with negative equity during our sample period. Furthermore, recasting the financial statements of the National Bank of Slovakia (i.e., calculating the difference between reported equity position and the component of other assets attributable to accumulated losses) reveals that the bank had negative capital during our sample period.

Table 3 Central bank financial performance and accounting policies

	FX_P&L			*FV_P&L*			*GRP*		
	0	1	*p*-value	0	1	*p*-value	0	1	*p*-value
ROA	0.004	0.013	<0.001	0.005	0.126	<0.001	0.009	0.006	0.102
Loss	0.165	0.256	<0.001	0.158	0.262	<0.001	0.283	0.077	<0.001
Neg. Equity	0.055	0.108	<0.001	0.063	0.109	0.003	0.121	0.015	<0.001
σ(ROA)	0.005	0.025	<0.001	0.008	0.235	<0.001	0.021	0.006	<0.001

This table reports univariate tests for the differences in the means of *ROA, σ(ROA), Loss,* and *Neg. Equity* by accounting policy. *ROA* is computed as central bank profit over average total assets. *Loss* is an indicator taking the value of one for all central-bank-years with losses (i.e., ROA < 0), and zero otherwise. *Neg. Equity* is an indicator taking the value of one for all central-bank-years with negative equity, and zero otherwise. *σ(ROA)* is the three-year standard deviation of *ROA*. *FX_P&L* is an indicator taking the value of one for central-bank-years recognizing foreign exchange revaluations in the income statement, and zero otherwise. *FV_P&L* is an indicator taking the value of one for central-bank-years measuring financial assets at fair value and recognizing the revaluation difference in the income statement, and zero otherwise. *GRP* is an indicator taking the value of one for central-bank-years reporting general risk provisions, and zero otherwise

4 Factors Associated with Central Bank Financial Performance

In this section, we formally investigate factors associated with central bank profitability and financial strength. To do so, we estimate the following OLS specification:

$$\begin{aligned} Y_{i,t} = \beta_0 + \beta_1 \text{ Accounting rules}_{i,t} + \beta_2 \text{ Distribution rules}_{i,t} \\ + \beta_3 \text{Economic factors}_{i,t} + \alpha_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where *Y* is one of our measures of central bank financial position and performance: (1) return on assets (*ROA*), defined as profit over average total assets; (2) the three-year standard deviation of *ROA* (*σROA*); (3) an indicator for loss-making observations (*Loss*); and (4) an indicator for observations with negative equity (*Neg. Equity*). We use three sets of independent variables that capture central bank accounting frameworks or their accounting policies, distribution rules, and economic factors.

We begin our analysis by considering the economic drivers of central bank financial performance. Although previous literature discusses why some central banks incurred negative equity and newspapers often report on cases of extraordinary central bank performance (e.g., Stella, 2005; Archer & Moser-Boehm, 2013), prior literature provides little guidance on what factors systematically drive central bank financial results. Furthermore, the relationship between macroeconomic factors and central bank financial results can be context- or time-specific. For example, an economic crisis may lead to a large write-off of marketable securities held at fair value on a central bank's balance sheet, but also increase the value of foreign currency assets and lead to large revaluation gains in case of the devaluation of local

currency, because foreign currency holdings are denominated in local currency on a central bank's balance sheet. Thus, we explore the role of different economic factors such as the level (*Developed*) and the rate of economic development (*GDP Growth*), the impact of economic recessions (*Recession*), currency exchange rate fluctuations (*Δ Exchange Rate*), and inflation (*Inflation*). All macroeconomic variables come from the World Development Indicators except for currency exchange rates against the US dollar, which we obtain from the Bank of International Settlements.

We also consider recent expansions of central bank balance sheets due to quantitative easing (QE) or perusing a certain exchange rate regime by including the lagged natural logarithm of total assets (*Assets ($)*). While significant expansions of central bank balance sheets during the Global Financial Crisis allowed central banks to generate large profits in its aftermath and make large distributions to the government, bloated balance sheets expose central banks to various risks (e.g., interest-rate risk, foreign exchange risk, credit risk). Some of these risks have materialized when the inflation and interest rates increased in recent years: While the interest income on these assets remained largely flat or did not increase much, central banks have incurred larger interest rate expenses by paying larger interest on reserves of commercial banks (Kjellberg & Åhl, 2022). Furthermore, higher interest rates lead to lower discounted values of assets held at fair value. Central banks that do not mark assets to their market values realize fair value losses when they sell assets that were purchased during times of low interest rates (and low inflation). An interesting empirical question is whether any increases in profitability due to larger balance sheets outweigh the accounting losses due to balance sheet expansion (e.g., because of asset write-offs or negative interest margins) over the 2010–2022 period.

Finally, to account for persistent trends in central bank financial performance, we are interested in the relationship between lagged central bank's financial position (*Equity/Assets*) and current central bank performance. All our estimations include year fixed effects (α_t) and cluster standard errors at the central bank level.[11]

Table 4 reports the results. We find that higher inflation is negatively related to our measure of central bank accounting profitability (*ROA*) and positively associated with the volatility of central bank performance (σROA). A one percentage point increase in inflation reduces central bank ROA by 0.03 percentage points (columns 1 to 3). This result is most likely explained by higher interest rates—central banks' response to rising inflation—that significantly increase interest rate expenses and lead to a number of central banks reporting losses or narrowly avoiding losses. Indeed, we find that higher inflation increases the probability of reporting accounting losses (*Loss*) and our results for the relationship between accounting

[11] We assign all Eurozone central banks to the same cluster because Eurozone central banks jointly make decisions that affect their balance sheets.

Table 4 Factors associated with central bank financial performance: accounting rules and economic factors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$ROA_{i,t}$			$\sigma(ROA)_{i,t\text{-}2:t}$			$Loss_{i,t}$			*Neg. Equity*$_{i,t}$		
$IFRS_{i,t}$		0.008**			0.015***			0.034			−0.024	
		(0.003)			(0.003)			(0.052)			(0.042)	
CB-specific$_{i,t}$			−0.006*			−0.015***			−0.123*			−0.038
			(0.003)			(0.003)			(0.063)			(0.056)
GDP Growth$_{i,t}$	0.001	−0.001	0.003	−0.016	−0.019	−0.009	−0.401	−0.410*	−0.363	0.133	0.143	0.149
	(0.030)	(0.030)	(0.029)	(0.020)	(0.018)	(0.019)	(0.242)	(0.246)	(0.249)	(0.155)	(0.219)	(0.213)
Recession$_{i,t}$	−0.004	−0.003	−0.003	0.005	0.006	0.005	−0.017	−0.024	−0.027	0.036	0.033	0.033
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.050)	(0.051)	(0.051)	(0.030)	(0.032)	(0.032)
Δ Exchange Rate$_{i,t}$	0.026**	0.027**	0.027**	−0.003	−0.001	−0.001	−0.161	−0.144	−0.125	−0.089**	−0.096**	−0.085**
	(0.012)	(0.012)	(0.012)	(0.006)	(0.006)	(0.007)	(0.130)	(0.131)	(0.121)	(0.039)	(0.043)	(0.038)
Inflation$_{i,t}$	−0.029***	−0.029***	−0.029***	0.016***	0.014***	0.012**	0.268*	0.246	0.216	0.265***	0.285***	0.271***
	(0.009)	(0.009)	(0.009)	(0.005)	(0.004)	(0.005)	(0.161)	(0.155)	(0.141)	(0.057)	(0.064)	(0.061)
Developed$_i$	−0.004*	−0.001	−0.002	−0.008*	−0.002	−0.001	−0.057	−0.046	−0.005	−0.037	−0.048	−0.018
	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.057)	(0.054)	(0.052)	(0.037)	(0.044)	(0.052)
*Assets ($)*$_{i,t\text{-}1}$	0.000	0.000	0.000	0.000	0.000	0.000	0.012**	0.012**	0.012**	0.007**	0.007*	0.007*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)
Equity/Assets$_{i,t\text{-}1}$	0.070***	0.066***	0.071***	−0.010	−0.018	−0.007	−0.714***	−0.697***	−0.652***	−1.246***	−1.318***	−1.324***
	(0.012)	(0.012)	(0.012)	(0.022)	(0.022)	(0.022)	(0.175)	(0.175)	(0.167)	(0.275)	(0.296)	(0.296)

(continued)

Table 4 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$ROA_{i,t}$			$\sigma(ROA)_{i,t-2;t}$			$Loss_{i,t}$			$Neg.\ Equity_{i,t}$		
Constant	0.002	−0.002	0.004	0.008	−0.000	0.012	0.049	0.025	0.073	0.039	0.058	0.052
	(0.007)	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)	(0.105)	(0.112)	(0.106)	(0.069)	(0.076)	(0.075)
Fixed Effects	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Observations	1524	1432	1433	1393	1310	1311	1509	1417	1418	1555	1456	1457
Adjusted R-squared	0.081	0.089	0.086	0.038	0.095	0.091	0.092	0.096	0.108	0.311	0.334	0.336

This table reports OLS coefficients for Eq. (1). *ROA* is computed as central bank profit over average total assets. *σ(ROA)* is the three-year standard deviation of ROA. *Loss* is an indicator taking the value of one for all central-bank-years with losses (i.e., ROA < 0), and zero otherwise. *Neg. Equity* is an indicator taking the value of one for all central-bank-years with negative equity, and zero otherwise. *IFRS* is an indicator taking the value of one for central-bank-years using IFRS, and zero otherwise. *CB-specific* is an indicator taking the value of one for central-bank-years using a central-bank-specific accounting framework, and zero otherwise. *GDP Growth* is the percentage change in real GDP, measured in 2015 US dollars. *Recession* is an indicator for central-bank-years with negative GDP growth, and zero otherwise. *Δ Exchange Rate* is change in the exchange rate of the local currency against the US Dollar. *Inflation* is the country rate of consumer price inflation. *Developed* is an indicator for developed economies based on the United Nations classification. *Assets ($)* is the natural logarithm of total assets in thousands, converted in current US dollars. *Equity/Assets* is the ratio of central bank equity to total assets. Standard errors (in parentheses) are clustered by central bank. We assign all Eurozone central banks to the same cluster. All estimations include year fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively

profitability and inflation are more pronounced for the period of 2021–2022 when central banks started raising interest rates.[12]

This result highlights an important difference between the definition of central bank income commonly used in the economics literature and the definition used by IFRS, and other accounting frameworks applied by central banks. When a central bank issues currency, it records the face value of the currency in circulation as a liability and the cost of printing money as an expense (KPMG, 2012). Because monetary seigniorage is defined as the net change in base money deflated by consumer price level, the economic income of the central bank increases with inflation (Reis, 2015). However, because currency in circulation is held at its nominal value on central banks' balance sheets, increases in inflation do not have income-increasing effects on central banks' accounting profitability.[13]

Expectedly, because the depreciation (appreciation) of the local currency leads to significant unrealized foreign exchange gains (losses), we find a positive relationship between central bank profitability (*ROA*) and local currency depreciation (*Δ Exchange Rate*). We also find that currency depreciations (appreciations) reduce (increase) the likelihood of incurring negative equity (*Neg. Equity*).

The statistically weak results for some economic factors may be explained by the strong tendency of central banks to manage their earnings and smooth their performance figures (e.g., by using general risk provisions). For example, some of the central banks set aside general risk provisions for future increases in interest rates, effectively reallocating higher future expenses due to interest rate increases to earlier periods when these central banks were exposed to stable conditions and reported higher profits (e.g., the Deutsche Bundesbank).

We find that larger balance sheets (proxied by *Assets ($)*) increase the likelihood of central bank losses and negative equity. For example, a one standard deviation increase in the logarithm of total assets *Assets ($)* (4.177) increases the probability of losses by 5.1 percentage points or 22% of the unconditional mean. However, the net average effect of *Assets ($)* on profitability over 2010–2022 is very close to zero and central banks are yet to realize most of the losses due to recent interest rate increases.[14]

[12] Specifically, we estimated Eq. (1) by interacting *Inflation* with an indicator variable taking the value of one for years 2021–2022, and zero otherwise. Due to space constraints, we do not tabulate these results, but they are available from the authors upon request.

[13] Using a sample of central banks from the period that largely precedes our analysis (i.e., 1992–2014), Goncharov et al. (2023) find no significant association between inflation and accounting profitability. However, they find central banks that face reporting pressures may delay raising interest rates when inflation takes up because such interest rate increases have income-decreasing effects and may lead to losses. To support this conclusion, the authors show that interest rates are lower and the inflation is higher for central banks that report small positive profits (more likely to be affected by reporting pressures) than those that report small losses (less likely to be affected by reporting pressures).

[14] We obtain similar results when estimating Eq. (1) separately using observations from the Eurozone or from central banks implementing QE (i.e., the Fed, Swiss National Bank, Bank of Japan, Bank of England, and Sveriges Riksbank).

It is important to note that during the sample period central banks with QE have transferred significant amounts of money to the government after incurring high profits for many years. For example, the Fed has reported a combined profit of 1.08 trillion US dollars over 2010–2022 and transferred over a trillion US dollars in dividends to the Treasury over the same period. These transfers did not allow the central banks to build sufficient (equity) reserves during the period of relatively stable economic conditions. Furthermore, the majority of central banks do not have an arrangement with their government that would allow them to automatically recoup losses and recapitalize when they fully recognize losses due to higher interest rates. This increases concerns for central bank independence. Even when dividend distribution rules allow for automatic recapitalization in case of losses, Goncharov et al. (2023) find that central banks face reporting pressures and may as a result not act fully independently.

Finally, we find that central bank performance tends to be persistent as central banks with better financial position (*Equity/Assets*) tend to report higher future profitability, incur less losses, and are thus less likely to incur negative equity.

We next examine whether our results for different accounting frameworks and policies hold after accounting for differences in economic circumstances among central banks. We find that IFRS adopters have higher profitability and profit variability than other central banks, on average (columns 1 to 6 of Table 4). Conversely, central-bank-specific frameworks are associated with lower profit variability, possibly because they allow the use of discretionary general risk provisions to smooth reported income. Furthermore, we also observe a negative, albeit statistically weak, relationship between central-bank-specific frameworks and the level of profits or the likelihood of central bank losses.

Further, consistent with our univariate results, Table 5 reports that recognizing foreign exchange and fair value revaluations in income is strongly related to the volatility of reported profits. This higher profit volatility explains why *FX_P&L* and *FV_P&L* are simultaneously associated with higher levels of profitability and the likelihood of reporting losses. Recognizing general risk provisions is negatively associated with the volatility of reported profits and the likelihood of central bank losses or negative equity.

Overall, our evidence suggests that central banks face a trade-off in adopting more market-based accounting frameworks (e.g., IFRS) and policies (e.g., foreign exchange or fair value revaluations in the income statement). On the one hand, market-based accounting frameworks and policies allow financial statements to reflect economic signals in an unbiased and timely manner. For example, when interest rates rise, market-based accounting frameworks allow central banks to report securities at their current value and transparently recognize the resulting (large) losses on financial statements. On the other hand, by increasing the likelihood of reporting losses and negative equity, these accounting frameworks and policies may lead to public pressure, trigger negotiations about central bank dividends and recapitalization, and thus endanger central banks' independence (Goncharov & Novotny-Farkas, 2024).

Table 5 Central bank financial performance and accounting policies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$ROA_{i,t}$			$\sigma(ROA)_{i,t-2:t}$			$Loss_{i,t}$			$Neg.\ Equity_{i,t}$		
$FX\_P\&L_{i,t}$	0.005*			0.018***			0.076*			0.060*		
	(0.003)			(0.003)			(0.044)			(0.033)		
$FV\_P\&L_{i,t}$		0.005*			0.012***			0.087*			0.052	
		(0.003)			(0.003)			(0.045)			(0.035)	
$GRP_{i,t}$			−0.002			−0.011***			−0.178***			−0.074**
			(0.002)			(0.003)			(0.040)			(0.032)
$GDP\ Growth_{i,t}$	0.005	−0.001	0.001	−0.005	−0.005	−0.014	−0.431*	−0.411	−0.362*	0.212	0.250	0.205
	(0.031)	(0.031)	(0.031)	(0.018)	(0.018)	(0.018)	(0.257)	(0.261)	(0.216)	(0.231)	(0.230)	(0.230)
$Recession_{i,t}$	−0.001	−0.004	−0.004	0.010	0.009	0.007	−0.014	−0.008	0.003	0.038	0.032	0.047
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.054)	(0.056)	(0.054)	(0.035)	(0.035)	(0.037)
$\Delta\ Exchange\ Rate_{i,t}$	0.043**	0.049**	0.025**	−0.001	0.005	−0.006	−0.389***	−0.363***	−0.180	−0.143**	−0.110*	−0.109**
	(0.021)	(0.021)	(0.011)	(0.014)	(0.009)	(0.006)	(0.108)	(0.126)	(0.143)	(0.060)	(0.057)	(0.048)
$Inflation_{i,t}$	−0.035*	−0.040**	−0.027***	0.024*	0.017*	0.018***	0.362***	0.328***	0.277*	0.281***	0.248***	0.299***
	(0.019)	(0.018)	(0.009)	(0.014)	(0.009)	(0.006)	(0.102)	(0.113)	(0.164)	(0.051)	(0.044)	(0.072)
$Developed_i$	−0.005	−0.005	−0.005	−0.006**	−0.007*	−0.006*	−0.029	−0.017	0.009	−0.024	−0.023	−0.007
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.050)	(0.052)	(0.042)	(0.036)	(0.039)	(0.042)
$Assets\ (\$)_{i,t-1}$	−0.000	0.000	0.000	0.000	0.000	0.000	0.012**	0.011**	0.010**	0.007**	0.007*	0.007*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
$Equity/Assets_{i,t-1}$	0.063***	0.069***	0.071***	−0.018	−0.019	−0.011	−0.515***	−0.621***	−0.582***	−1.225***	−1.267***	−1.280***
	(0.015)	(0.014)	(0.013)	(0.026)	(0.025)	(0.023)	(0.161)	(0.172)	(0.162)	(0.342)	(0.321)	(0.305)

(continued)

Table 5 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$ROA_{i,t}$			$\sigma(ROA)_{i,t-2:t}$			$Loss_{i,t}$			$Neg.\ Equity_{i,t}$		
Constant	0.004	0.002	0.005	0.004	0.007	0.015	−0.018	0.008	0.100	−0.011	0.007	0.051
	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)	(0.010)	(0.115)	(0.119)	(0.104)	(0.073)	(0.077)	(0.073)
Fixed Effects	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Observations	1246	1238	1320	1150	1145	1213	1234	1225	1307	1248	1245	1332
Adjusted R-squared	0.076	0.094	0.079	0.154	0.102	0.069	0.085	0.095	0.110	0.274	0.300	0.325

This table reports OLS coefficients for Eq. (1). *ROA* is computed as central bank profit over average total assets. *σ(ROA)* is the three-year standard deviation of ROA. *Loss* is an indicator taking the value of one for all central-bank-years with losses (i.e., ROA < 0), and zero otherwise. *Neg. Equity* is an indicator taking the value of one for all central-bank-years with negative equity, and zero otherwise. *FX_P&L* is an indicator taking the value of one for central-bank-years recognizing foreign exchange revaluations in the income statement, and zero otherwise. *FV_P&L* is an indicator taking the value of one for central-bank-years measuring financial assets at fair value and recognizing the revaluation difference in the income statement, and zero otherwise. *GRP* is an indicator taking the value of one for central-bank-years reporting general risk provisions, and zero otherwise. *GDP Growth* is the percentage change in real GDP, measured in 2015 US dollars. *Recession* is an indicator for central-bank-years with negative GDP growth, and zero otherwise. *Δ Exchange Rate* is change in the exchange rate of the local currency against the US Dollar. *Inflation* is the country rate of consumer price inflation. *Developed* is an indicator for developed economies based on the United Nations classification. *Assets ($)* is the natural logarithm of total assets in thousands, converted in current US dollars. *Equity/Assets* is the ratio of central bank equity to total assets. Standard errors (in parentheses) are clustered by central bank. We assign all Eurozone central banks to the same cluster. All estimations include year fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively

5 Dividend Distribution Rules

Dividend distribution rules play an important role for central banks' financial performance. In this section, we examine the relationship between central banks' financial performance, accounting rules, and distribution rules. Because most dividend rules require that central banks distribute their profits to the government, high dividend distributions can deplete central banks' capital and impact central bank independence (Archer & Moser-Boehm, 2013). To prevent this, carefully designed dividend distribution rules may allow central banks some flexibility in deciding on the amount of dividends, take the level of central bank equity into account when determining dividends, facilitate the automatic recapitalization of central banks in case of (capital) losses or allow central banks to smooth their dividend payments over time (Hall & Reis, 2015). In this respect, dividend distribution rules and accounting policies are two complementary drivers of central banks' financial strength (i.e., equity). On the one hand, dividend distribution rules allocate income between distributable and retained income. On the other hand, accounting policies determine the level of accounting income used for dividend distribution. For instance, general risk provisions can smooth dividend distribution by smoothing accounting income.[15]

Central banks' dividend distribution rules exhibit vast heterogeneity. Some dividend distributions are based on explicit rules, while others allow discretionary decisions by central banks, their shareholders (the government), or both parties. Further, dividend distribution rules can simultaneously include several features, such as equity targets, dividend smoothing arrangements, and the ability to draw on external capital (i.e., a negative dividend) in case of certain events. In our analysis, we rely on the classification of dividend distribution rules in Archer and Moser-Boehm (2013) and broadly classify central banks' dividend distribution rules based on two features: (1) which party makes the dividend decisions (*Central Bank*, *Government*, and *Joint*), and (2) how the dividend amount is set (*External Resource*, *Equity Target*, *Distribution Smoothing*, *Earnings Retention*, *Promised Distribution*, *Mandatory Distribution*, and *Exclude FX_FV*). In general, dividend distribution rules involving non-trivial equity targets, retaining (part of) the surplus, or providing central banks with greater discretion can help central banks improve their financial position (Archer & Moser-Boehm, 2013). However, because central banks have some discretion in implementing dividend distribution rules or might deviate from

[15] Anecdotal evidence suggests that central banks have greater discretion in changing accounting rules than distribution rules. For instance, the Fed reports accumulated losses as a deferred asset. The underlying assumption is that these losses reduce future transfers to the Treasury before reserves are rebuilt. This accounting policy provides two benefits. First, it avoids the possibility of ever reporting negative equity. Second, it ensures that the Fed does not pay dividends until accumulated losses are fully covered (Archer & Moser-Boehm, 2013).

these rules under government pressure and pay higher dividends, such effects might not be observable in practice.[16]

Table 6 examines the relationship between our dividend distribution rules and central banks' financial strength, proxied by the likelihood of reporting negative equity (*Neg. Equity*) and the equity-to-assets ratio (*Equity/Assets*). In Columns (1) and (5), we report the results for all central banks, while in Columns (2)–(4) and (6)–(8) we examine the relationship for each accounting framework separately. We find that dividend decisions made by governments (*Government*) are associated with lower equity buffers, especially for central banks with central-bank-specific frameworks. Importantly, governments' dividend decisions are a major determinant of negative equity for central banks with central-bank-specific frameworks. Conversely, when central banks have discretion on dividend decisions (*Central Bank*), the equity buffer is higher for central banks adopting local GAAP, and there is a significant reduction in the probability of reporting negative equity for all central banks and most accounting frameworks. We also observe that joint dividend decisions (*Joint*) increase the equity-to-assets ratio, but this effect is mainly concentrated among IFRS adopters.

Furthermore, we do not find a significant positive association between dividend distribution rules featuring equity targets (*Equity Target*) and central banks' equity-to-assets ratio. Indeed, we find that equity targets help increase equity buffers only for central banks reporting under local GAAP. A possible explanation for these results is that the dividend distribution rule might set a low equity target. Moreover, we observe a positive relationship between distribution smoothing mechanisms (*Distribution Smoothing*) and equity buffers. Expectedly, allowing central banks to draw additional capital resources (*External Resource*) increases equity buffers under most frameworks, but it does not insure against reporting negative equity. Finally, the resulting equity buffer is lower when central banks have a promised (*Promised Distribution*) or mandated dividend distribution (*Mandatory Distribution*) such as a dividend equaling a fixed percent of paid-in capital or a certain fixed amount of currency per share.

Overall, these results suggest that financial strength is higher (lower) when central banks (governments) have more discretion in determining the dividend amount. Besides, the ability to draw external resources (*External Resource*) when needed and to smooth the dividend distribution (*Distribution Smoothing*) is associated

[16] For example, the Swiss National Bank faced following demands after reporting accounting losses: "I'm not going to assume from a first-half loss that there won't be a year-end dividend . . . Until now, we are maintaining our long-term view of a 1 billion franc dividend at year-end." (*Reuters*, July 31, 2015). Governments can also raid central bank reserves regardless of the prevailing dividend distribution rules. For example, "[i]n the U.S., Congress grabbed $19 billion from a Federal Reserve capital surplus account in December to help fund infrastructure projects, a move Fed Chairwoman Janet Yellen said impinged on the central bank's independence" (*Wall Street Journal*, May 8, 2016). In turn, central banks can be exposed to political pressures, negatively impacting their independence, despite automatic recapitalization rules if a central bank has to go cap-in-hand to the government.

Table 6 The impact of dividend distribution rules

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Neg. Equity$_{i,t}$				*Equity/Assets*$_{i,t}$			
	All	IFRS	GAAP	CB-specific	All	IFRS	GAAP	CB-specific
Dividend decision:								
Central bank$_{i,t}$	−0.106***	−0.068**	−0.216	−0.155*	0.003	0.003	0.036*	−0.007**
	(0.032)	(0.032)	(0.208)	(0.082)	(0.002)	(0.004)	(0.019)	(0.003)
Government$_{i,t}$	0.090	0.111	−0.210	0.611***	−0.006*	−0.001	−0.006	−0.009*
	(0.170)	(0.116)	(0.135)	(0.204)	(0.003)	(0.004)	(0.011)	(0.005)
Joint$_{i,t}$	0.051	0.087	0.063	−0.022	0.007***	0.011***	0.006	0.000
	(0.048)	(0.074)	(0.154)	(0.036)	(0.002)	(0.003)	(0.014)	(0.003)
Dividend amount:								
External Resource$_{i,t}$	−0.027	0.008	−0.216	0.150	0.005**	0.006**	0.056*	−0.005
	(0.051)	(0.046)	(0.262)	(0.140)	(0.002)	(0.003)	(0.028)	(0.006)
Equity Target$_{i,t}$	0.077	0.041	0.172	0.099	−0.003	−0.006*	0.037*	−0.003
	(0.051)	(0.055)	(0.176)	(0.079)	(0.003)	(0.003)	(0.021)	(0.004)
Distribution Smoothing$_{i,t}$	−0.001		−0.248	0.022	0.010**		0.006	−0.005
	(0.073)		(0.155)	(0.141)	(0.005)		(0.012)	(0.011)
Earnings Retention$_{i,t}$	0.014	0.084	−0.174	0.002	−0.000	−0.001	0.019	0.005
	(0.044)	(0.082)	(0.163)	(0.031)	(0.002)	(0.003)	(0.015)	(0.003)
Promised Distribution$_{i,t}$	−0.194			−0.144	−0.085***			−0.103*
	(0.125)			(0.226)	(0.026)			(0.058)
Mandatory Distribution$_{i,t}$	0.046	−0.033		0.021	−0.007*	−0.010		0.008
	(0.064)	(0.087)		(0.152)	(0.004)	(0.007)		(0.007)
Exclude FX_FV$_{i,t}$	0.074	0.042	0.008	−0.191	0.001	0.004	−0.017	−0.002
	(0.048)	(0.042)	(0.147)	(0.144)	(0.002)	(0.003)	(0.017)	(0.006)

(continued)

Table 6 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Controls:								
GDP Growth$_{i,t}$	0.296	0.166	4.459***	0.454	0.025	0.044	−0.446***	0.081
	(0.281)	(0.358)	(1.078)	(0.438)	(0.038)	(0.048)	(0.156)	(0.065)
Recession$_{i,t}$	0.017	−0.045	0.275**	−0.028	0.009**	0.009*	−0.019	0.011**
	(0.042)	(0.045)	(0.114)	(0.030)	(0.003)	(0.006)	(0.017)	(0.005)
	Neg. Equity$_{i,t}$				*Equity/Assets*$_{i,t}$			
Δ Exchange Rate$_{i,t}$	0.031	−0.021	−0.077	0.037	0.090***	0.122***	−0.036	0.098
	(0.121)	(0.143)	(0.440)	(0.183)	(0.027)	(0.025)	(0.094)	(0.058)
Inflation$_{i,t}$	0.404	0.321	0.654	1.211	−0.199***	−0.243***	−0.097	0.038
	(0.375)	(0.346)	(0.955)	(0.754)	(0.041)	(0.041)	(0.093)	(0.076)
Developed$_i$	−0.043	−0.065	0.081	−0.220*	−0.006***	−0.009**	0.019	0.004
	(0.044)	(0.057)	(0.165)	(0.107)	(0.002)	(0.003)	(0.011)	(0.005)
*Assets ($)*$_{i,t-1}$	0.006	0.004	−0.005	−0.013	0.001**	0.001***	0.003	0.000
	(0.005)	(0.006)	(0.019)	(0.012)	(0.000)	(0.000)	(0.002)	(0.001)
Equity/Assets$_{i,t-1}$	−1.371***	−0.756*	−1.834***	−1.053	0.953***	0.956***	0.886***	0.862***
	(0.401)	(0.380)	(0.426)	(0.780)	(0.016)	(0.018)	(0.040)	(0.035)
Constant	−0.001	−0.037	0.224	0.490	−0.008	−0.019**	−0.102*	−0.009
	(0.116)	(0.162)	(0.669)	(0.336)	(0.007)	(0.009)	(0.059)	(0.017)
Fixed effects	Year	Year	Year	Year	Year	Year	Year	Year
Observations	1054	575	136	336	1054	575	136	336
Adjusted R-squared	0.333	0.148	0.676	0.539	0.918	0.922	0.910	0.860

This table reports OLS coefficients for Eq. (1). *Neg. Equity* is an indicator taking the value of one for all central-bank-years with negative equity, and zero otherwise. *Equity/Assets* is the ratio of central bank equity to total assets. *IFRS* is an indicator taking the value of one for central-bank-years using IFRS, and zero otherwise. *GAAP* is an indicator taking the value of one for central-bank-years using local GAAP, and zero otherwise. *CB-specific* is an indicator taking the value of one for central-bank-years using a central-bank-specific accounting framework, and zero otherwise. *Central Bank* is an indicator taking the value of one when a central bank has discretion over earnings distribution, and zero otherwise. *Government* is an indicator taking the value of one when the government controls the earnings distribution, and zero otherwise. *Joint* is an indicator taking the value of one for central-bank-years where the central banks and the government jointly decide on the earnings distribution, and zero otherwise. *External Resource* is an indicator taking the value of one for central-bank-years having the possibility to draw additional resources (i.e., a negative dividend) from governments or governmental agencies to enhance their financial strength, and zero otherwise. *Equity Target* is an indicator taking the value of one for central-bank-years with capital targets or target-like mechanisms that can adjust dividend distribution to enhance financial strength, and zero otherwise. *Distribution Smoothing* is an indicator taking the value of one for central-bank-years whose dividend distribution is adjusted based on past performance, and zero otherwise. *Earnings Retention* is an indicator taking the value of one for central-bank-years retaining a fixed part of their earnings as surplus to enhance their financial strength, and zero otherwise. *Promised Distribution* is an indicator taking the value of one for central-bank-years with a promised or standardized earnings distribution with limited conditionality, and zero otherwise. *Mandatory Distribution* is an indicator taking the value of one for central-bank-years with a mandatory and unconditional earnings distribution, and zero otherwise. *Exclude FX_FV* is an indicator taking the value of one for central-bank-years that exclude from the calculation of distributable earnings the (unrealized) revaluations gains or losses on financial assets or foreign exchange, and zero otherwise. *GDP Growth* is the percentage change in real GDP, measured in 2015 US dollars. *Recession* is an indicator for central-bank-years with negative GDP growth, and zero otherwise. *Δ Exchange Rate* is change in the exchange rate of the local currency against the US Dollar. *Inflation* is the country rate of consumer price inflation. *Developed* is an indicator for developed economies based on the United Nations classification. *Assets ($)* is the natural logarithm of total assets in thousands, converted in current US dollars. Missing coefficients are due to a lack of variation of a given variable in a subsample. Standard errors (in parentheses) are clustered by central bank. We assign all Eurozone central banks to the same cluster. All estimations include year fixed effects. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively

with improved central banks' financial strength. However, we acknowledge that the decision to adopt specific dividend distribution policies is not random. For instance, central banks with greater equity buffers might adopt specific dividend rules to afford larger distributions. Thus, we refrain from drawing a causal interpretation of the effect of central banks' dividend distribution rules on central banks' financial position. However, our descriptive results are informative about patterns of financial performance associated with specific dividend distribution rules.

6 Discussion of the Results and Policy Implications

Our analysis shows that central banks often use accounting rules such as IFRS that aim to increase central bank transparency by reflecting economic signals in financial statements in an unbiased and timely manner, but also expose central banks to greater earnings volatility and increase the likelihood of losses and negative equity. In turn, discretionary accounting policies, such as general risk provisions, can help central banks smooth their performance. However, using provisions for avoiding losses and negative equity depends on a central bank's ability to build them during periods of high performance. Furthermore, such provisions are quickly depleted when central banks face large losses as has been the case after recent increases in interest rates. Prevailing dividend distribution rules can further deteriorate central bank equity if they do not allow central banks to retain a large surplus that can be used for covering losses in the future. Because central banks require sufficient capital buffers to act (financially) independently and economic factors that increase the likelihood of losses and negative equity will likely persist in the coming years, our analysis points to potential challenges for central bank independence and the effectiveness of their monetary policies.

Central bank financial reporting is often inappropriately compared to firm financial reporting, and central bank governors often face similar reactions to their reported figures as firm managers do. For example, after the Swiss National Bank (SNB) announced "an eye-popping net loss" of 30 billion CHF for the first quarter of 2015 due to the revaluation of its foreign currency holdings, a news article quoting a participant of the SNB's shareholders meeting noted that "shortly before the announcement... 'the directors looked very stressed.'" (*AEI* 2015). Because central banks often use same financial reporting standards as firms do, capital market participants can better understand central banks' financial position and performance, but they are also tempted to both use the metrics commonly applied in firm financial analysis and valuation, and interpret central bank performance the same way as the performance of profit-maximizing firms.

There is substantial evidence that capital market participants scrutinize central bank financial statements, looking for information that is relevant for understanding central bank monetary policy (e.g., asset maturities, foreign currency reserves), but also for information that is not directly related to central bank monetary policy such as central bank earnings, accounting policies, and accounting assumptions used

for measuring central bank assets and liabilities (Goncharov & Novotny-Farkas, 2024; Goncharov et al., 2023).[17] As firm managers are (rightfully) blamed for poor performance figures and (unexpected) losses as a result of their strategic decisions and operating policies, the public may misperceive central bank losses as a sign of failed monetary policies (Archer & Moser-Boehm, 2013). By reporting on central bank "profit warnings" and the likelihood of a central bank "going bust" alongside stories on performance figures of publicly quoted firms and commercial banks, news media may amplify these effects. Therefore, insights from the accounting literature that examines accounting and real actions (i.e., those affecting cash flows) of reporting agents that face various reporting pressures (e.g., Kanodia & Sapra, 2016) could be helpful for understanding what central banks are expected to do when facing reporting pressures, what are the consequences of their actions, and what are the possible remedies if certain consequences are deemed undesirable.

Accountability is crucial for firms because it fosters transparency and trust among stakeholders, which can lead to lower costs of capital and improved firm performance (e.g., Leuz & Verrecchia, 2000; Kanodia & Sapra, 2016). By holding firms accountable for their actions and financial reporting, users of firm financial statements can make more informed decisions, reducing information asymmetry and ultimately enhancing market efficiency. More transparent accounting can help central banks achieve greater accountability to its different stakeholders. However, accounting must provide a sufficient degree of discretion to account for unforeseen circumstances and to allow reporting agents to signal private information (e.g., building provisions to signal future defaults). This signaling role of accounting information could be detrimental for central banks if the world of "Fed watchers" reads too much into accounting policy changes or misperceives them as signals of changing monetary policies.

A large literature in accounting and corporate finance shows that—when facing reporting pressures (e.g., to report profits rather than losses or meat and beat other performance benchmarks)—firms manage their earnings to achieve desirable performance results. Corporate managers do so even when taking myopic actions to boost firm performance is harmful in the long term (Jensen, 1986; Stein, 1989; Graham et al., 2005). While most of those manipulations remain undetected (Zakolyukina, 2018), the discoveries of accounting irregularities lead to very large capital market penalties and the loss of trust in corporate reporting (Dechow et al.,

[17] For example, Bank of America Merrill Lynch analysts questioned an unusual new accounting policy when the Fed switched from reporting accumulated losses in equity to reporting them as a deferred asset, noting that "Fed's accounting changes present a further challenge to government credibility, which in turn could contribute to underperformance of the long end of the Treasury curve" (*Financial Times*, January 20, 2011). Furthermore, analysts used footnote disclosures of net pension liabilities from the Fed's financial statements to gauge long-term performance of certain asset classes. Specifically, an analyst inferred from the Fed's disclosures that its "pension fund allocation appears to reflect the Fed's caution about the reflation trade: it seems to underweight assets". However, there were no reasons to believe these changes reflected the opinion of the Fed's staff economists about which assets will outperform (see "The Federal Reserve's pension fund isn't trying to tell you anything" in *Financial Times*, March 30, 2017).

1996; Graham et al., 2008; Giannetti & Wang, 2016). Goncharov et al. (2023) argue and show that central banks are exposed to similar reporting pressures because they face political pressure (especially when reporting to politicians with extreme, left or right, views), public scrutiny over reported figures (e.g., because of the requirement to hold press conferences upon the release of financial statements or issue profit warnings), governments' budgetary pressures (e.g., related to central bank dividend payments), and other reporting pressures that result from issues with de facto central bank independence. The authors demonstrate that central banks have greater flexibility in their reporting than firms do, and that reporting pressures are significant enough to shape the distribution of central bank earnings (especially around a zero-profit threshold). Because financial reporting pressures are likely to persist, how do central banks mitigate these pressures or their effect on their behavior?

Disclosing information on central bank assets used for monetary policy purposes (such as QE assets or foreign currency reserves) does not require the publication of full financial statements. Central banks may thus choose not to report full financial statements or significantly redact their disclosures. The former is likely impossible in the environment of high accountability of all government institutions and because financial statements that follow international accounting norms are required by the IMF and safeguards assessments.[18] However, the Bank of England reported prior to 2015 an IFRS income statement that deviated from IFRS presentation and disclosure requirements and showed only information on earnings before and after tax. Such disclosure practices afford less transparency and may unduly fixate market participants' attention on bottom-line earnings without understanding the context of this figure (Sloan, 1996). If regulators are primarily concerned about the efficiency of central bank operations and their governance, central banks can separately disclose their operating expenses (similar to income statements of the Board of Governors of the Federal Reserve System).

As an alternative, central banks can implement accounting rules that provide more control over financials (see Goncharov & Novotny-Farkas, 2024). For example, general risk provisions are banned by IFRS due to their lack of transparency, but this accounting policy significantly reduces the volatility of profits and the likelihood of losses. Indeed, Goncharov et al. (2023) show that using provisions is one of the main tools for central bank earnings management and that central banks enjoy high discretion in determining the values of these provisions. For example, some central banks use unusually round general risk provisions (i.e., compare provisions of €400,000,000.00 to reporting of other income and expenses, e.g., €626,073,422.88). The ECB chose in 2022 to release provisions in the amount (1.6 billion) that matches losses before provisions (−1.6 billion), thus reporting net earnings for 2022 that were exactly zero and narrowly avoiding a loss. In turn,

[18] One of the few exceptions is the Central Bank of the Republic of China (Taiwan). We were able to find only information on the central bank's balance sheet with no supporting footnote disclosures in English.

recording fair value revaluations in profit or loss does not allow a central bank to tailor its profits if assets are marked-to-market.[19]

While using accounting discretion can help central banks achieve desirable profit and equity targets and to deflect the (undue) attention to central bank performance figures, uncommon and highly discretionary accounting policies can adversely affect public perceptions. The press and market participants scrutinize accounting assumptions and question cases when monetary policies do not align with accounting policies. To illustrate, we provide a case of reading signals in the Deutsche Bundesbank's decision to increase provisions and its projections of future interest rates in the Eurozone: "After setting aside €1.9 billion for 'general risk provisions' and deducting interest expenditure to the tune of €1 billion, [the Deutsche Bundesbank] announced it would transfer €1.9 billion to the German Federal Treasury … 'The continuation of the asset purchases has driven up the Bank's interest rate risk,' President Weidmann said in the report. In 2016, the German central bank made such provisions for the first time as it expected 'very low interest income' from the ECB's asset purchases and the income generated from negative rates in deposits to turn 'quickly' into expenditure if interest rates pick up" (*Deutsche Welle*, February 27, 2018). "With its increased risk provisions, the Bundesbank also contradicts the [ECB's] interest rate policy. Many observers of European monetary policy no longer expect the ECB's interest rate to rise this year and next, due to the economic downturn. Weidmann also did not respond to multiple requests at the press conference to reveal the specific interest rate path. However, he made it clear that … higher interest rates [are] still the baseline scenario of the Bundesbank" (authors' translation from German, *Die Welt*, February 28, 2018).

While central banks may choose to measure assets at their fair values in their financial statements, they have a choice of whether to recognize fair value revaluations in the financial statements (i.e., on the face of the balance sheet and/or in the income statement) or to disclose them (only) in the footnotes to the financial statements. The accounting literature finds that markets respond differently to disclosed than recognized amounts (e.g., Aboody, 1996; Ahmed et al., 2006; Müller et al., 2015; Michels, 2017). Morris and Shin (2007) extend this logic to central banks' reporting. Indeed, these arguments clearly apply for the case of the Fed, where little notice was given to huge unrealized losses in Q3 2018 that were disclosed in the notes but were not recognized because the Fed reports assets on the balance sheet at their amortized (historical) cost. Recognizing these unrealized losses would have wiped out the Fed's equity. Such disclosures can help meet the

[19] Standard setters (e.g., IASB and FASB) differentiate between fair values using only observable market prices (i.e., Level 1 fair values), and those relying on some unobservable data (i.e., Level 2 fair values when market values of similar assets are available, or Level 3 fair values when relying on mark-to-model estimates). Preparers have high discretion in estimating Level 2 and Level 3 fair values (e.g., predictions of future cash flows, discount rate assumptions) and the literature finds that firms and financial institutions often manipulate such valuations (e.g., Huizinga & Laeven, 2012; Hanley et al., 2018; Black et al., 2022; Gad et al., 2023).

accountability demands, while preventing possible negative impacts of recognition on both market perceptions and (importantly) dividends.

Other examples of disclosures that apparently aim to deflect market participants' undue attention to central bank performance figures include "mislabeling" the amounts. For example, the Fed can avoid reporting negative equity by reporting accumulated losses—a component of equity—elsewhere on the balance sheet (e.g., as a deferred asset similar to how accumulated losses were reported by private firms in some countries, or as a negative liability).[20] There are also recent examples of central bank disclosures that refer to other line items than net income in the announcements of central bank annual results. For example, despite releasing general risk provisions, the Deutsche Bundesbank incurred a net loss for 2022, but referred in its press release announcing its annual results only to the amount of income after the utilization of profits (i.e., after transfers from or to equity reserves) as the "distributable profit" for the year 2022, without mentioning the net loss for the period in a deviation to its previous reporting practice.[21] While net income was negative (−€172 million), the figure after the utilization of profits was exactly zero. Following this announcement, some media broadcasted that "Bundesbank reports zero loss for 2022" (*Bloomberg*, March 1, 2023). The accounting literature suggests that disclosure processing costs (i.e., costs of monitoring for, acquiring, and analyzing firm disclosures) affect investor information choices, trades, and equity market outcomes, especially when dealing with unsophisticated investors (e.g., Blankespoor et al., 2020).

Because accounting earnings consist of cash flows (e.g., gains or losses on sale of securities) and accounting adjustments called accruals (e.g., accrued interest, unrealized gains or losses), central banks can either use accounting or real decisions to achieve desirable earnings and equity figures. Evidence from the firm setting indicates that firms usually prefer managing accruals to managing cash flows for target beating, as it is less costly to change accounting records than decisions affecting actual cash receipts or cash expenses (Roychowdhury, 2006). For example, cutting discretionary R&D expenses to meet a profit target may be critical for firms' future market position. However, some studies find that perceptions matter, and the risk of auditors or regulators uncovering such accrual manipulations may change the perceived costs and shift the focus toward cash manipulation, which cannot be easily distinguished from regular operating decisions (Graham et al., 2005; Roychowdhury, 2006). Similarly, central banks face the risk of "being accused of accounting shenanigans" when they use unusual accounting policies that can diminish their credibility (*Reuters*, January 21, 2011). Importantly, accruals only reallocate income over time and accounting choices that move earnings in one direction usually revert within 4 years, moving earnings in the opposite direction

[20] Recognizing accumulated losses as an asset is not possible under IFRS (or US GAAP) because an asset is an economic resource controlled by an entity that has the potential to produce economic benefits (e.g., cash inflows).

[21] See https://www.bundesbank.de/en/tasks/topics/annual-report-2022-904442

(Dechow & Dichev, 2002; Baber et al., 2011). Thus, past accounting decisions constrain central banks' ability to change earnings in the current period. For example, this is the case when a central bank has used up all its general risk provisions that were built up in previous years.

Real decisions that increase central bank earnings include (a) increases in fees that a central bank charges for its services or an imposition of new fees; (b) generating income from other sources (e.g., trading securities for gain maximization); and (c) changes in monetary policy decisions that affect earnings. We discuss the latter two possibilities as they represent, in our view, major risks of exposing central banks to high reporting pressures, especially when they run out of accounting or accrual options. Central banks now hold a larger share of stocks and corporate bonds directly or through funds. For example, *Bloomberg* (March 13, 2024) estimates that the Bank of Japan holds the equivalent of about 7% of the Japanese stock market through ETFs. Trading these shares for pure gain maximization would raise questions about the fit of this activity with the main goals of a central bank, the use of sensitive information for gain trading, and possible disruption of the market from such trades.

Alternatively, there is a possibility that high reporting pressures may affect (on the margin) the decisions of central banks about monetary policy parameters. For example, Goncharov et al. (2023) discuss the possibility that (some) central banks may be less aggressive in raising interest rates because higher interest rates lead to higher interest expenses and the devaluation of assets held at fair value, thus lowering income. The authors find that central banks that avoid losses and face higher reporting pressures have lower interest rates and higher inflation than central banks that face no or little such pressures. These results provide suggestive evidence that central banks' profit considerations may impair the effectiveness of monetary policy.

Extending this evidence, we note that large foreign currency holdings shape the distribution of central bank profits, making it less possible for central banks to control their profits and equity in case of large swings in exchange rates as the case of SNB demonstrates. Using the data and borrowing the methods from Goncharov et al. (2023), we contrast the central banks that have a currency peg to those using floating rates. Panel A of Fig. 3 shows that the distribution of ROA for central banks that have a floating exchange rate exhibits a less pronounced discontinuity around zero than the general population of central banks in Fig. 1. However, central banks may have some control over when and how they set a currency peg. Panel B of Fig. 3 shows results for central banks that maintain a peg (but may set a different exchange rate over time), and Panel C for those that introduce a peg. The discontinuity is more pronounced in these cases and Panel C exhibits a dip right before zero, suggesting the peg value may be calibrated to avoid small losses. Similar "kinks" in the earnings distribution were reported using firm data and attributed to firms managing their earnings and avoiding losses using both accrual and cash flow decisions (Burgstahler & Dichev, 1997). While there are several possible explanations for this association, interpreting this result as evidence of (some) central banks using a peg regime to manage earnings and to avoid losses indicates the presence of externalities of

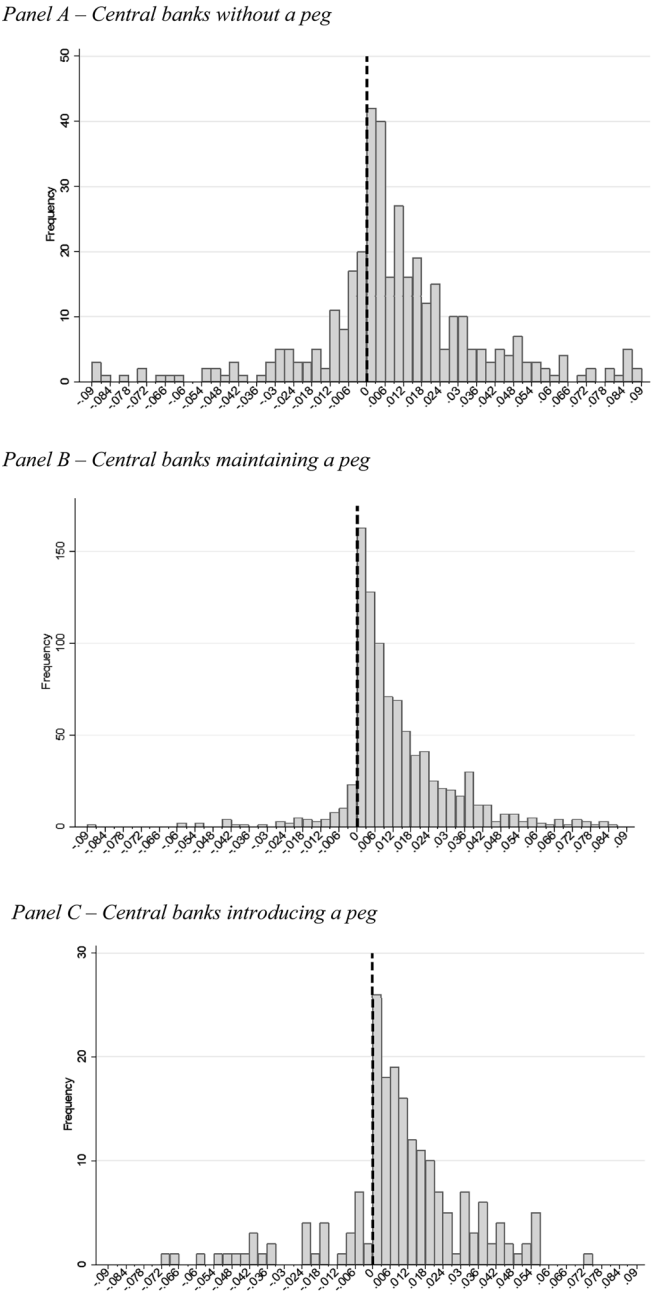

Fig. 3 Central bank earnings (ROA) and currency peg. Notes: This figure plots the distribution of central bank profits over years 1992–2014 ($N = 2591$) for countries without an exchange rate peg during the sample period (*Panel **A***), for observations with an exchange rate peg (*Panel **B***) or those introducing an exchange rate peg in a given year (*Panel **C***). The distribution of ROA is trimmed at $[-0.09; 0.09]$. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis

reporting pressures, especially if central banks cannot change accounting policies or run out of pure accounting options.

Finally, when deciding on accounting rules, their interrelation with dividend distribution rules and their impact on dividend distributions must be considered (Goncharov & Novotny-Farkas, 2024). Accounting rules provide more flexibility when making decisions about dividend transfers even when central banks have rigid dividend distribution rules. It seems that many central banks have sufficient flexibility in choosing how they determine their (distributable) income, but they do not have high flexibility in changing dividend distribution rules that are subject to negotiations with the government and rarely change based on our observations and data.

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