(Why) do central banks care about their profits?

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Abstract

We document that central banks are discontinuously more likely to report slightly positive profits than slightly negative profits, especially amid greater political pressure, the public's receptiveness to more extreme political views, and when governors are reappointable. The propensity to report small profits over small losses is correlated with higher inflation and lower interest rates. We conclude that there are agency problems at central banks, which give rise to discontinuous profit incentives and are related to their policy choices and outcomes. These findings inform a debate about the political economy of central banking and optimal central bank design.

Keywords: Central Banks, Profitability, Non-Traditional Central Banking, Monetary Stability

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The author declares that he has no conflict of interests that relate to the research described in this paper.

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"Central bankers frequently say… profits are an afterthought to higher economic goals, such as controlling inflation. Even losses aren't such a big deal…"

Wall Street Journal, May 8, 2016

"…to many Eurozone central bankers the idea that a central bank might lose money seems almost taboo, if not shameful; it undercuts everything that is supposed to make a central bank credible."

Financial Times, February 16, 2012

"[The Swiss National Bank's Governor] had faced calls to go after he ran up record losses in 2010 to try to halt the rise of the Swiss franc, an effort which cost the central bank 26.5 billion francs."

BBC News, January 9, 2012

"[T]he fear of losses could deter [central banks] from pursuing policies that would benefit the broader economy, economists and former central bankers say... In Japan in the 1990s, concerns over potential losses appear to have lessened the central bank's resolve to expand its balance sheet aggressively…"

Wall Street Journal, May 8, 2016

1. Introduction

Do central banks avoid reporting losses, and if so why? The question is important and timely because, due to the widespread adoption of non-traditional monetary policy (i.e., large-scale asset purchases in the United States, Japan, and the Euro area), interest rate changes can have profound effects on central bank profits,[1] and politicians even in advanced economies link the continuation of central bankers' careers to their policy choices.[2] Central banks' willingness or ability to support the financial system in crises may also depend on whether balance sheet considerations are important.[3] Lastly, especially in times of populism, central bank profitability is discussed as a

[1] Stress tests in Christensen et al. (2015) for the Fed conclude that losses on its Treasury and mortgaged-backed securities holdings from interest-rate risk are moderate, partly because the Fed does not mark-to-market and "may have been lucky in this episode" with a slow recovery, an unusually low and stable inflation, and a delayed liftoff from the zero lower bound. Indeed, "the Fed had losses of $66.5 billion on its securities holdings, if it marked them to market, according to its latest quarterly financial report [for Q3 2018]. That dwarfed its $39.1 billion in capital, effectively leaving it with a negative net worth on that basis, a sure sign of financial frailty if it were an ordinary company" (*Bloomberg*, December 12, 2018). Simulations in Cavallo et al. (2018) indicate that the likelihood of the Fed realizing net losses is around 30 percent at its current levels of reserve balances (of around $2.3 trillion).

[2] "[Trump] left open the possibility of renominating Federal Reserve Chairwoman Janet Yellen once her tenure is up next year, a shift from his position during the campaign that he would 'most likely' not appoint her to another term. 'I do like a low-interest rate policy, I must be honest with you,' Mr. Trump said at the White House, when asked about Ms. Yellen" (*Wall Street Journal*, April 12 2017; see also *Reuters*, April 12 2017).

[3] According to Friedman and Schwartz (1963), the Fed's fear of losses was a factor preventing an aggressive expansionary response to the emerging Great Depression, leading to a more profound and prolonged recession.

guarantor of central bank independence.[4] Such considerations have resurfaced again following major central banks' response to the Covid-19 financial shock.[5] Uncovering whether and which actions central banks take to avoid reporting losses is important for understanding the applicability of theories studying the roots and consequences of central bank balance sheet considerations.[6]

Investigating these questions empirically is difficult because counterfactual profit levels (i.e., central banks' hypothetical profit levels in the absence of such concerns) are in general difficult to observe. This paper addresses this challenge by focusing on a set of central-bank-year observations close to the zero-profit threshold for which the counterfactual can arguably be discerned. Our approach is similar to the approach used in the accounting and corporate finance literature to study whether agency problems in corporations create discontinuous profit incentives. Because of market pressures and career concerns, corporate executives inflate profits to avoid losses and meet profit targets, often taking myopic actions that are harmful in the long term (Jensen 1986; Stein 1989; Graham et al. 2005). In environments where the sign and level of profits matter, like the corporate world, such incentives give rise to discontinuities in firms' profit distribution, whereby a disproportionally large number of firm-year observations meets the target by a small margin relative to the number of observations that falls short of the target by a similar margin (Burgstahler and Dichev 1997; Leuz et al. 2003; Bergstresser et al. 2006; Bhojraj et al. 2009).[7]

We apply similar techniques to central banks. To examine whether external pressures and ensuing agency problems at central banks create pressures to avoid losses, we investigate whether there is a discontinuity in the central bank profits distribution at the zero-profit threshold and whether the size of the discontinuity varies predictably with central banks' ability and incentives to manage their earnings. We examine, for example, whether central banks use accounting discretion to manage their reported earnings. In the final part of the paper, we also examine whether the discontinuity correlates with central banks' monetary policy choices and inflation outcomes.

[4] "As the Fed *raises interest rates* in coming years, *remittances* almost certainly will *decline*… This mix could easily fuel a populist assault on Fed independence in Congress…" (emphasis added, see https://www.moneyandbanking.com/commentary/2015/5/26/do-central-banks-need-capital).

[5] See, for example, "The Death of the Central Bank Myth" by Adam Tooze, *Foreign Policy*, May 13, 2020 and "Losses by Central Banks are Nothing to Fear", *The Economist*, May 7, 2020.

[6] See, among others, Sims (2005), Berriel and Bhattarai (2009), Reis (2013, 2015), Bhattarai et al. (2015), Del Negro and Sims (2015), Hall and Reis (2015), Mendes and Berriel (2015), Benigno (2017), and Benigno and Nisticò (2018).

[7] The broader literature has used similar discontinuity tests to establish manipulation of performance metrics in many different settings, including, among others, education (Urquiola and Verhoogen 2009), medical research and policies (Barreca et al. 2014), government budgeting (Liebman and Mahoney 2017), environment (Pierce and Snyder 2012), sports (Pope and Simonsohn 2011), taxation (Saez 2010), residential mortgage loans (Garmaise 2015), hedge funds (Bollen and Pool 2009), and debt covenants (Dichev and Skinner 2002).

Such relations could exist either because agency problems driving central banks' incentives to manage earnings also distort their policies or because these agency problems are stronger under certain macroeconomic conditions that also influence central banks' policy choices.

Using a large sample of more than 150 central banks spanning more than 20 years, we document that central banks are discontinuously more likely to report small positive profits than small negative profits. These results hold for various subsamples of central-bank years, including those exposed or not exposed to significant risk of losses, as well as central banks that differ in the financial risks of their activities, suggesting that the discontinuity at zero is unlikely to be an artifact of central banks' business model. A similar discontinuity is instead not observed in other parts of the distribution. In addition, cross-sectional variation in the size of the discontinuity strengthens the earnings management interpretation, sheds light on how central banks manage their earnings, and suggests likely underlying causes of such behavior. We show that a suitable choice of discretionary values of provisions is an important element of how central banks manage their reported earnings—before such provisions, the discontinuity is much less pronounced. We further find that the significance and magnitude of the discontinuity at zero varies predictably with central banks' *ability* to manage their reported income (e.g., using the latitude in their accounting standards) and *incentives* to avoid losses (e.g., central bankers' reappointment prospects, the level of political pressure to produce profits, the public's receptiveness to more extreme political views, dividend policies for the distribution of central bank profits to the government, etc.). Permutation tests show that such relations are not observed at other ex-ante not meaningful thresholds.

These results indicate the discontinuity at zero is unlikely to be driven by the nature of the central bank business model or a mechanical propensity to produce small profits rather than small losses. It is instead more likely to be the result of imperfect *de facto* independence of the average central bank in the sample. Though not a necessary condition, the discontinuity at zero also implies that central banks are not impervious to their accounting profitability and sheds light on the likely political economy and agency frictions driving such concerns. Combined with existing theory, these results have implications for central bank design, remittance policies, and public finance.

An interesting follow-up question that emerges from the analysis is whether central banks' discontinuous profit incentives at zero are related to central banks' monetary policy inputs and outcomes. We find that the discontinuity in central bank profits is related to discontinuously higher realized inflation rates, both in levels and relative to the central bank's stated inflation target or professional inflation forecasts. Further interest rates analysis shows that, controlling for macroeconomic conditions, central banks in the small profit region have systematically lower interest rates than central banks in the small loss region. Robustness checks and permutation tests at placebo thresholds show that these inflation and interest rate results are robust and unique to the zero-profit threshold, indicating that they are unlikely to be spurious (i.e., driven by omitted factors unrelated to central banks' discontinuous profit incentives at zero).

These relations could exist for a variety of reasons. For example, it is theoretically possible that frictions driving central banks' discontinuous profit incentives at zero also distort their policies, creating a preference for lower interest rates at the cost of higher inflation rates.[8] Interest rates set by central banks can affect their accounting profitability through different channels. The most direct channel is through the interest paid on reserves. In addition, depending on the central bank's accounting rules and asset composition, interest rates can also influence accounting profits through revaluations of assets that are marked-to-market. Any such effect, however, would tend to have quite large effects on profits and would therefore, by itself, be unlikely to be simply used to turn small losses into small profits. In other words, interest rates are probably too blunt a tool to fine-tune profits, even if the rate reduction was motivated by profitability concerns more broadly.

A more likely explanation for the inflation and interest rate results is that central banks' incentives or ability to manage earnings may be stronger when inflation rates are higher or above target, or in situations in which low-rate policies are appropriate. This may be because reporting losses in such cases would be more likely to threaten the central bank's credibility and independence, or because credibility and independence are more important in such states of the world.[9] Both explanations indicate that central banks' discontinuous profit incentives at zero are not independent of their key policy choices and outcomes, which we find important to document.

Our results have implications for macroeconomic modeling, monetary policy, and the effectiveness and sustainability of quantitative easing (QE) programs, which have become a standard toolkit since the last financial crisis. The usefulness of our results lies in their potential to help assess the likely applicability of existing theories assuming, to a varying degree, that central

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[8] Extant theoretical literature raises the possibility (see, among others, Bhattarai et al. 2015; Del Negro and Sims 2015; Mendes and Berriel 2015).

[9] For example, "The Swiss National Bank expects an annual profit of 54 billion Swiss francs ($55.25 billion) for 2017, the biggest profit in its 110-year history… Its stock price more than doubled last year… the Swiss federal government and the country's 26 cantons will get more cash than usual. Credit Suisse said the result would help the SNB to defend its expansive monetary policy… A large profit makes it easier for the SNB to explain why it has built up all these foreign currency reserves than if they reported a loss." (*Reuters*, January 9, 2018).

bank balance sheet or capital concerns alter their policies on the margin, and help inform future theoretical modeling by showing which factors may contribute to such concerns.

Theories that entertain the possibility of central bank balance sheet considerations include Sims (2005), who shows that central bank capital concerns can lead to higher inflation through self-fulfilling expectations. Jeanne and Svensson (2007) emphasize that resulting inflationary expectations can enable the economy to escape a liquidity trap.[10] Berriel and Bhattarai (2009) embed an exogenous positive-profit constraint in a dynamic New Keynesian model and show the constraint leads the central bank to distort its policy choices, making it less effective at governing the quantity of money, inflation, and the output gap. In Del Negro and Sims (2015) and Benigno and Nisticò (2018), the absence of full fiscal support for fiscally independent central banks generates discontinuous profit concerns that distort their policy choices and compromise their ability to control inflation.[11] Our findings provide support to the key assumption of these papers, and inform on the political and economic environments to which they may be most applicable.

Our results also inform a literature on optimal central bank design. Reis (2013, 2015) and Hall and Reis (2015) study the conditions under which central bank losses can or cannot undermine its solvency. A key result in Hall and Reis (2015) is that a central bank can never become insolvent as long as it can accrue earnings before or after a negative capital shock to smooth its budget constraint. In the absence of any additional pressures on central banks arising from political or behavioral frictions, the level and sign of accounting profits should be entirely irrelevant to central banks. Yet even if all these conditions are met, "markets may [nevertheless] react badly in the false belief that losses imply a loss of policy effectiveness" (emphasis added; Archer and Moser-Boehm 2013, 1). Central bankers may anticipate such irrational reactions and adjust their accounting reports and policy choices accordingly. Therefore, an empirical test of whether and when central banks are impervious to losses is important, despite the clarity of the existing theoretical investigations.

Our findings reject the null hypothesis that central banks are indifferent of whether they report a profit or a loss. Instead, we find evidence that the extent of loss avoidance is related to the political environment in which the central bank operates, as well as to behavioral and agency frictions. One may thus conclude that future modeling should entertain the notion that due to such

[10] In related work, Bhattarai et al. (2015) and Mendes and Berriel (2015) point out that a central bank's fear of losses is also what can make QE effective, because it turns large-scale asset purchases into a commitment device to keep future rates low. Reis (2016) explains how QE can be an effective tool to respond to fiscal crises.

[11] Reis (2015) points out that period insolvency can lead to rule insolvency.

frictions central banks may have discontinuous profit incentives, and that optimal central bank design should be robust to such incentives. However, our empirical design does not have the power to reject that profits are irrelevant to any particular central bank in the sample. Thus, a more nuanced interpretation of our findings is in order, which we attempt in the conclusions.

The paper proceeds as follows. Section 2 outlines our key testable hypotheses and explains the intuition behind our tests. Section 3 describes our data. Section 4 reports our key findings with respect to reported earnings. Section 5 reports results for monetary policy. Section 6 concludes.

2. Institutional setting, testable hypotheses, and empirical strategy

Central banks' budget contraint, incentives, and ability to manage earings

To understand why and how central banks can manage their earnings, it is useful to first establish a clear understanding of the central bank's budget constraint. In contrast to other government branches, central bank accounts are not generally consolidated with the accounts of the central government. The central bank has its own balance sheet and resulting budget constraint. Central bank liabilities consist primarily of (often interest-bearing) reserves and currency in circulation, whereas assets consist primarily of fixed-income securities (government bonds and corporate bonds) and foreign assets (foreign currency and gold). Revenues earned on its assets (e.g., interest income, revaluation gains) are used to cover interest on its liabilities and other expenses (e.g., loan loss and general risk provisions, staff expenses). Operating expenses are often material (about 2% of total assets). In contrast to revaluation gains (or losses), seigniorage revenues do not directly affect central banks' accounting profits.[12]

Central bank accounting profits are transferred to the central government (treasury) in the form of dividends, depending on the particular central bank's distribution rules. When the central bank's income cannot cover its expenses, the shortfall is met with reductions in its equity or through transfers from the central government budget. In the absence of any political or behavioral frictions and as long as the central bank's charter allows for intertemporal smoothing (through past or future reductions in dividends) or guaranteed transfers from the government (through negative

[12] Different to the definition of central bank income used in much of the economics literature, central bank accounting profits typically exclude revaluations of currency in circulation due to inflation. Gains from the devaluation of currency in circulation from higher inflation do not influence central banks' accounting profitability because currency in circulation is recorded on central banks' balance sheets at face value. Expenses from printing money are recorded as an expense, but such expenses are very small (KPMG 2012).

dividends), the central bank faces no serious risk of insolvency and the central bank's financial position is irrelevant and does not affect its policies (Hall and Reis 2015). When such transfers are not available (legally or effectively), incentives to avoid losses may arise. For example, even if a central bank's charter allows for automatic recapitalizations by tapping into the resources of the government, requests for "reverse" dividends associated with central bank losses may be met with discontent by the government or the public, who may interpret any such losses as a sign of weakness, incompetence, or failure. If such concerns enter the calculations of central bankers, incentives to avoid losses may ensue. This consideration is one reason why central bankers may discontinuously prefer to report small profits over small losses.

Central banks have substantial discretion—arguably, more than most firms—in how they report their earnings. This discretion emanates from both the application of accounting rules and significant control over policy decisions that determine their nominal accounting profits. Relative to firms, central banks enjoy more accounting discretion as the common accounting rules are not similarly enforced for central banks. Our review of central bank financial statements revealed that it is quite common that central banks applying International Financial Reporting Standards (IFRS) disclose their *selective* non-compliance with IFRS and modify their reporting to suit their reporting needs. Firms cannot selectively apply IFRS. Some central banks create their own accounting rules (e.g., Eurozone central banks), that allow greater discretion than IFRS. Central banks have also considerable control over the values of the main policy parameters that affect their profits such as short-term interest rates, currency pegs, and involvement in operations that may expose them to considerable losses (e.g., bailouts or purchases of risky assets).[13] They also determine the amount of required reserves that commercial banks must deposit at the central bank and the interest on such deposits. Due to their unique regulatory position and monopoly power on the supply of base money, central banks enjoy a more inelastic demand for their "products" than most firms do.

[13] Anecdotal evidence indicates that the fear of losses enters central banks' decision making. For example, in relation to the ECB's QE programs "analysts had widely expected the ECB to start buying bonds yielding less than its deposit rate of minus 0.4%... But Bundesbank President Jens Weidmann warned shortly before the ECB's March policy meeting that such a move would lead to "guaranteed losses" for the central bank. The ECB subsequently… said it would start buying corporate bonds" ("Windfall for Central Banks Fuels Political Pressure," *Wall Street Journal*, May 8, 2016). At the Bank of England, the Governor Mervyn King notes in his speech that "giving money either to the government or to households directly … means that the Bank of England has no assets to sell when the time comes to tighten monetary policy. And when Bank Rate eventually starts to return to a more normal level, as one day it will, the Bank would then have no income… That is a road down which the Bank will not go, and does not need to go" (October 23, 2012; p. 6). Similarly, "when the Swiss National Bank (SNB) abandoned its exchange-rate peg last month, causing the franc to soar by a nosebleed-inducing 20%, it seemed to be acting out of fear that it would suffer balance-sheet losses if it kept purchasing euros and other foreign currencies" (*The Guardian*, February 16, 2015).

At the same time—and in sharp contrast to private firms—central banks do not have a mandate to maximize their profits, but instead to ensure monetary and financial stability, without any consideration whatsoever to the profits they report.

Testable hypotheses and empirical strategy

Our empirical analysis aims to shed light on whether central banks consider any aspect of the profits they report by examining whether central banks report small profits much more frequently than small losses. We also investigate which actions they take to avoid losses, and whether such actions are more likely when frictions that favor profit concerns are more acute.[14] Technically, we test the null of a continuous function against the alternative of a discontinuous function. Economically, the null hypothesis is that central banks are indifferent about their earnings at all levels, including whether they report a profit or a loss. The alternative hypothesis is that central banks prefer profits over losses and manage their reported earnings to avoid losses. Under this alternative hypothesis, central banks' have a preference for profits over losses and as a result their earnings are at times different from what they would have been in the absence of such preferences. (Profit levels per se can have "real" consequences, as they determine or affect the level of dividends distributed to the government, and therefore the government's budget.)

The key empirical challenge we face is that we do not observe the counterfactual level of profits that central banks would have reported in the absence of such incentives. The key idea of the paper is to focus on a subset of observations for which we can arguably elicit an average counterfactual: profits just above or just below zero. The reasoning underlying our tests is that in a frictionless world, there is no strong reason why a central bank would systematically generate a very small profit as opposed to a very small loss.[15] The reason is that any level of profits, including zero, is not a fundamentally important number in a neoclassical theory of central banking—indeed, profits are supposed to be entirely irrelevant. A discontinuity in the profit distribution at any point would be unexpected in a frictionless model. The profit distribution should be smooth. By contrast, a disproportionally large number of central bank-year observations just above zero (relative to just below) is a natural consequence in a model where central banks (or the agents acting on their behalf) have preference for profits over losses, and can take actions to avoid losses. In other words,

[14] We use the term "frictions" to refer to balance-sheet or income-related factors that may generate discontinuous profit incentives at zero and a preference for profits over losses; recall that in neoclassical theory central banks should be indifferent about the level of profits they report.

[15] We later critically examine reasons other than a preference to avoid losses that could also lead to a discontinuity and a rejection of the null hypothesis.

a discontinuity in the profit distribution at any point, including zero, is a sufficient, but not necessary, condition for central banks to care about the profits.

This leads to the following testable hypotheses:

H_0: *No discontinuity exists in central banks' profit distributions.*

H_1: *A discontinuity exists at zero in central banks' profit distributions.*

H_{1a}: *The discontinuity is larger when ability or incentives to manage profits are more pronounced.*

H_{1b}: *No discontinuity exists when ability or incentives to manage profits are low or not present.*

To examine these hypotheses, we test for a discontinuity in central banks' profit distribution at zero, and check whether the magnitude and significance of the discontinuity vary systematically with factors that proxy for central banks' *ability* and *incentives* to manage earnings.

Our focus on the small profit and loss region is motivated by the earnings management literature (Burgstahler and Dichev 1997; Leuz et al. 2003; Bergstresser et al. 2006; Bhojraj et al. 2009). In our setting, central banks with small losses provide a useful set of central-bank year observations that are relatively less affected by incentives to report profits. Central banks can easily make small losses go away. If they choose not to do so, it suggests that profit concerns are likely to be less important for these central banks. Small profits are instead a natural target for central banks with a preference for profits over losses. There are good reasons why central banks who seek to avoid reporting a loss will naturally target small rather than large profits.[16] Large profits may not be a desirable target if, for example, central banks face pressures to provide stable dividends to their governments or if they fear that large reserves may be "raided" in the future.[17] Such pressures may also induce profitable central banks to engage in downward profit management. (Indeed, our evidence on the opportune use of provisions to fine-tune earnings is consistent with the idea that central banks may also prefer small profits over large profits.) In

[16] To the extent that accounting estimates are used to manage earnings upwards into the large profit region, it effectively borrows profits from future years, thus making it more difficult for a central bank to attain the zero threshold in future years. Changing accounting rules to meet reporting targets or outright manipulations are costly as being accused of "accounting shenanigans" can be highly damaging to central banks' reputation and credibility. Commenting on a recent accounting change, making it impossible for the Fed to show capital losses, the financial press writes "these kind of moves do not promote confidence in the Fed, but rather cause concerns within markets. We will not make too much of a fuss over this…, but the overall theme of reduced government credibility is strengthened by it… In our view the ongoing decline in credibility translates into a higher chance of a downgrade in the sovereign credit rating." ("The Fed can't go bankrupt. Anymore," *Financial Times*, January 20, 2011).

[17] In respect to the Fed, see "Groans as Congress again uses Fed's capital fund to plug holes," *American Banker*, February 8, 2018, and "Congress raids the Federal Reserve's piggy bank once again, this time to help pay for the new budget deal," *CNBC*, February 9, 2018. Similarly, for the Reserve Bank of India, "the government's view that [central bank reserves] is "its" money… why should it not put it to better use?" (*Financial Times*, January 21, 2019).

addition, focusing on a narrow region has additional econometric advantages, as it makes profit and loss observations more comparable to each other in terms of fundamentals. The downside of this approach is that the results, and in particular the estimated coefficients may not enjoy strong external validity about incentives that may prevail at other parts of the distribution.

To conserve space in this section, we only give an exhaustive list of the *ability* and *incentives* factors we consider in the empirical section. They cover a variety of agency, political, behavioral, and accounting factors, motivated by the theoretical work on central bank balance sheet considerations and the corporate finance and accounting literature on earnings management in profit-maximizing firms. In particular, we examine to which extent central banks use opportune levels of discretionary provision values to manage their earnings.

Monetary Policy Choices and Outcomes

In a final set of tests, we investigate whether the central banks' discontinuous profit incentives at zero are associated with systematically different monetary policy inputs and outcomes.

A link could exist, for example, because the same agency frictions that drive central bank managers' incentives to manage earnings also alter their policy choices, which could lead to different policy outcomes. By "leaning against the wind" central banks may generate losses. For example, increases in monetary policy rates aimed to curtail inflation or maintaining a peg can reduce central banks' profitability by increasing interest paid on interest-bearing liabilities and reducing net interest margins. Increases in policy rates can also generate capital losses through both decreases in the market values of securities that are marked-to-market and the devaluation of foreign assets. Central banks concerned with making losses may thus avoid or delay increases in interest rates that are harmful to their profitability, which could lead to higher inflation rates. (Because seigniorage revenues do not directly affect central banks' accounting profits, they do not give a rationale for profit-concerned central bankers to generate higher inflation.) Central banks with profit concerns may thus set lower interest rates at the cost of higher inflation rates.

However, even if agency problems at central banks create incentives to manage earnings, this does not necessarily imply that such incentives or practices distort their policies or cause different macroeconomic outcomes. Profit concerns may correlate with lower interest rates and higher inflations rates for other reasons. For example, central banks' incentives or ability to manage earnings may simply be stronger when inflation rates are higher or in situations in which low interest rates are appropriate. Reporting losses in such states may be more threatening to their credibility and independence. Under this interpretation, our results inform under which macroeconomic conditions central bank profit concerns are likely to be prevalent.

To study whether central banks' tendency to avoid losses is associated with higher inflation rates, we examine whether inflation rates are discontinuously higher as we move from just below to just above the zero-profit threshold. We also examine whether controlling for macroeconomic conditions, central banks in the small-profit region set systematically lower interest rates than central banks in the small-loss region. Using permutation tests, we test whether the relationships between profits, inflation, and short-term interest rates also exist at other placebo thresholds, or whether they are unique to the zero-profit threshold. We caution the reader, however, that given well-known conceptual problems associated with Taylor rule type regressions (Cochrane 2011) and further considerations introduced by the use of cross-country data, the interest-rate results should be viewed as exploratory, rather than as conclusive evidence.

3. Data

We use data from several sources. Financial statement information and accounting rules come from Bankscope and are supplemented with hand-collected data on loan loss and general risk provisions. Central banks measure income and assets following either accounting rules that also apply to commercial banks (e.g., IFRS) or specifically developed rules. We use financial statements and measures reflecting the accounting rules that apply to the particular central bank. We collect information from both consolidated and unconsolidated financial statements because some central banks report both sets of accounts and we have no priors that they manage profit in one but not the other type of accounts.[18] We measure central bank profitability as the return on assets (ROA): the ratio of net income over total assets, where total assets are calculated as the average between the beginning and end of the fiscal year to which the net income applies.[19]

For inclusion in the sample, we require that a central bank has information on net income and total assets in the current and previous year. The analysis focuses on national central banks

[18] Using both sets of accounts implies that we sometimes have two observations for each bank-year. In robustness checks, we repeat our key analyses after excluding the "duplicate" observations of central banks with both accounts.
[19] Durtschi and Easton (2005) and Durtschi and Easton (2009) argue that the discontinuity in the profit distribution can result from scaling profits by a variable that differs between profit and loss observations. To ensure that the deflator does not change the shape of the distribution, we follow their analysis and examine whether average total assets differ between (unscaled) profits and losses of similar magnitude (e.g., +/-1, 10, 100 million). We do not find any systematic differences in our scaler.

and excludes data on supranational central banks (ECB) and local central bank branches. This approach yields a sample of 2,591 bank-year observations that covers 23 years and 155 countries.

Table 1 provides an overview of the resulting sample of central banks. The starting point of our analysis is 1992, when Bankscope began coverage of central banks. As can be observed in Table 1, not all countries have data for all years. The average number of observations per country is 16.7, with high-income countries having more complete coverage. Low-income countries have lower coverage, especially in the earlier years. In the analysis that follows, we examine the robustness of our key results across time and across high- and low-income countries.

(Insert Table 1 about here)

Because much of the analysis in the paper focuses on the narrow interval around the zero-profit threshold, Table 1 reports the frequency with which different central banks are in this region (i.e., in the first bin to the left and to the right of zero, [-0.003, +0.003), labeled "small profit or small loss region"). Out of 155 central banks, 108 (70%) are in this region at least once and 78 (50%) are in it at least twice. Table 1 also reports the frequency of loss observations for each central bank. Out of 155 central banks, 98 (63%) reported losses at least once during the sample period. The minimum number (frequency) of loss observations per central bank is 0 (0%), the maximum is 18 (100%), and the average is 2.8 (18%). In the analysis that follows, we also report results excluding central banks that may be naturally insulated from losses.

We complement the Bankscope data with data from several sources. Information about central banks' dividend distribution rules are taken from Archer and Moser-Boehm (2013). Macroeconomic indicators such as economic development, inflation rates, and growth rates of GDP come from the World Development Indicators. Data on short-term interest rates are taken from the International Financial Statistics of the International Monetary Fund (IMF). Dincer and Eichengreen (2014) and Dreher et al. (2008) provide information on central bank *de jure* independence and the central bank's governor tenure, respectively. We use political-party affiliation of the country's chief executive from Beck et al. (2001) (their extended dataset covers 179 countries up to 2012). Data on institutional characteristics such as government effectiveness, rule of law, and corruption are taken from Kaufmann et al. (2010). Data on banking, currency, and sovereign crises are taken from Laeven and Valencia (2012). Data on loan loss and general risk provisions are hand-collected from central banks' annual financial statements. The Appendix reports detailed definitions and data sources for all variables used in the paper.

Not all variables are available for all central banks and/or for the entire sample period. Therefore, in what follows, we begin with a detailed descriptive analysis of the propensity to avoid losses and various country-year characteristics, whereas we consider the role of one factor at a time. We then turn to a multivariate regression framework, which examines whether the correlation between various factors affects their respective roles in shaping central banks' loss avoidance. This analysis, as discussed further below, is more affected by missing observations.

4. Results

4.1. Is a discontinuity present in central banks' profits distribution?

The first panel of Figure 1 reports the distribution of central bank "profits" (net income scaled by total assets) for all observations in our sample, truncated at +/– 9% for better readability.[20] Consistent with hypothesis 1, we observe that a disproportionately large number of central bank-year observations exceeds the zero-profit threshold by a small margin (i.e., first bin to the right of zero) relative to the number of observations that falls short of zero by a similar margin (i.e., first bin to the left of zero), resulting in a sharp discontinuous jump at the zero-profit threshold.

(Insert Figure 1 about here)

McCrary (2008) developed a test to identify whether a probability density function has a statistically significant discontinuity at any given point. It is a Wald test of the null hypothesis of a continuous distribution at the point of interest, against the alternative of a discontinuous distribution. To implement this test, we estimate the density function of ROA for each side of the zero-profit threshold and its 95% confidence intervals.[21] As can be observed in Panel B of Figure 1, the fitted density function to the right of zero is much higher than the density to the left of zero and their confidence intervals do not overlap, indicating a statistically significant discontinuity at zero. The McCrary (2008) t-test, reported at the upper-right corner of the figure, is equal to 14.3 and indicates that the null hypothesis of a continuous distribution at zero is rejected at the 1% level.

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[20] We use the optimal bin size, which is proportional to the interquartile range of the distribution and the sample size (see Scott 1992). In our sample, the optimal bin size is 0.003. "Outlier" countries with observations outside the +/-9% range include, e.g., Zimbabwe, Argentina, Czech Republic, and Pakistan.

[21] We use a nonparametric local polynomial density estimator to examine the continuity of the profits' density function in the neighborhood of zero. To conduct this test, we first partition ROA into equally spaced bins, using the approach suggested by McCrary (2008) that leads to a finely-gridded histogram. We then smooth the obtained histogram by using the frequencies (number of observations) from each of these bins as the dependent variable and estimating two local linear regressions, one for each side of zero-profit threshold. The reported McCrary t-statistic is based on the log difference in heights between the left and the right limit of the density of profits at zero-profit level.

To examine whether this result is unique to the zero-profit threshold, we test for discontinuities at other points of the distribution using a permutation test. In particular, we compute the McCrary (2008) t-statistic for each of the other 59 thresholds to the left and to the right of zero in Figure 1 (i.e., -0.090, -0.087, …, 0.084, 0.087). Assuming these thresholds are (quasi) random, the ranking of the value of the McCrary t-statistic at zero relative to the t-statistic values of placebo thresholds ($rank$) is informative of the probability (p-value) of obtaining a result at least as extreme as the test statistic at zero by chance. The p-value can be estimated using the *percentile rank*, which is equal to $rank/(n+1)$, where n denotes the number of permutations. A high value would indicate that the discontinuity at zero is likely spurious. The intuition is as follows: tail values are rare, and thus if the discontinuity at zero is not spurious, we should not observe extreme t-statistics around placebo thresholds more often than would be explained by chance.[22] For a sample of 59 placebo thresholds, a p-value of 5% corresponds to a rank of 3 (i.e., rank ≤ 3 imply a 5% or lower probability of obtaining a t-statistic as extreme as the one at zero for other profit thresholds).

Panel C of Figure 1 plots the resulting t-statistics for each threshold, including zero. The zero-profit threshold has the highest t-statistic value among all thresholds ($rank = 1$), indicating a very low likelihood that the discontinuity at zero is spurious. While moving the threshold in steps of one interval provides greater transparency (replicability) to the reader and ensures we use unique alternative thresholds, the p-value estimates lack precision and are bounded from below due to low n. For a maximum value of $n = 59$ the lowest possible p-value is equal to 1.7%. In our sample it is somewhat higher at 1.8% because the McCrary t-statistic cannot be computed for 4 thresholds.[23]

To further increase the precision of the estimated p-value, we use 100 random thresholds and exclude any duplications until we reach the required number of placebo t-statistics. We keep n low enough to ensure that we are not oversampling from certain regions. We obtain a *rank* = 1 and a *percentile rank* = 1%. Our inferences here and in the tests below do not change if we use a larger number of unique permutations, suggesting that the convergence of estimates is achieved at

[22] The computations and steps of this analysis are similar to data-based bootstrap approach described in Hein and Westfall (2004) and used in other papers that employ a permutation test. Such a test does not require any parametric assumptions regarding the distribution of the test statistic and employs similarly-calculated p-values for statistical inference.

[23] The McCrary t-statistic includes in the numerator the log difference of the coefficients on the intercept from local linear regressions on both sides of the threshold. The t-statistic is not defined when one of those coefficients is zero or negative. Examining raw values of the coefficients (before applying the logarithmic transformation) reveals that the difference between the coefficients is economically small.

relatively low n. For example, using 500 random thresholds, we continue to find that the McCrary t-statistic at zero ranks higher than t-statistics at placebo thresholds (i.e., *rank* = 1 and *percentile rank* = 0.2%). In subsequent permutation tests, we base our statistical inferences on the percentile ranks from 100 and 500 random thresholds, because they have higher precision than the tests using the 59 thresholds from the optimal bin sizes.

Overall, these results reject the null hypothesis that the distribution of profits is continuous and indicate that there is statistically significant discontinuity at the zero-profit threshold that is very robust and unique to the zero-profit threshold. The remaining analysis in the paper aims to understand the possible drivers of the discontinuity at the zero-profit threshold and its possible implications for central bank behavior and policies.

4.1.1. Earnings management vs. mixture of distributions alternative

The results in Figure 1 are consistent with the interpretation that central banks manage their earnings to avoid reporting a loss. The McCrary (2008) test is in fact often used in applications where a discontinuous density function, due to agents' manipulation of the running variable, is itself the main object of interest. The test is informative of manipulation when the density function is otherwise continuous and manipulation of the running variable is monotonic around the threshold. The latter is likely satisfied in our case as we predict—and later show evidence of—only an upward and no downward manipulation of ROA around the zero-profit threshold.

It is important, however, to note that the distribution in Figure 1 differs from profit distributions documented in some of the extant earnings management literature. For example, the typical distribution for U.S. listed firms shows an otherwise bell-shaped probability density with a "kink" around zero: too few firms report small losses *and* too many firms report small profits (e.g., Burgstahler and Dichev 1997); researchers interpret this as evidence that firms manipulate earnings by turning small losses into small profits. Figure 1 paints a different picture. The mass is missing not only in the density just below zero. Instead, we observe too few observations of both small *and* medium-sized losses. It is as if the whole left-hand side has been "squashed down".

If this shape is due to earnings management, it suggests that central banks have a much greater ability to influence their profits than U.S. listed firms, consistent with central banks' greater accounting discretion and stronger control over the key parameters affecting their profitability. In settings where incentives to manage earnings are high and enforcement is weak, the shape of firms' earnings distribution is in fact more comparable to Figure 1 (see, e.g., Coppens and Peek (2005) for private firms in EU countries with weaker legal institutions). In such settings, the peak of the distribution usually coincides with the first positive interval and the ratio of small profits to small losses can reach as high as 6, similar to Figure 1 (see, e.g., Burgstahler et al. 2006).

The discontinuity in Figure 1, however, could also be due to factors other than earnings management. The most likely alternative explanation is that it is an artefact of *pooling* together central banks whose profit distributions are bounded below at zero with central banks that report profits in all regions of the profit distribution and continuously so around the zero-profit threshold. Some central banks' profits could be bounded below at zero because they do not pay interest on reserves, have small operating expenses, no significant risk exposures (i.e., no significant interest rate, currency, asset price or credit risk exposures) and are therefore unlikely to generate losses.

We now examine whether the data also rejects the null hypothesis when we recognize this potential explanation for the baseline result. We begin by re-running the McCrary test after excluding central banks whose profits may be bounded below at zero. Since data on central banks' liabilities and assets composition are not publicly available with sufficient granularity to accurately capture their risk exposures, we use their realized profits during the sample period. We hypothesize that central banks that never reported a loss are more likely to have distributions that are bounded from below at zero. Dropping these central banks from the sample is a rather conservative test because some central banks may have never reported a loss precisely because they manage earnings. For example, if some central banks can manage earnings over a long period of time or use earnings management to temporarily hide losses until they can take actions to eliminate them, dropping such central banks from the sample raises the threshold for rejecting the null hypothesis.

We find that out of 155 central banks in the sample, 57 never reported a loss during the sample period. Removing these central banks from the sample, however, does not change the results. The central banks' profits distribution exhibits again a sharp discontinuity at zero, which remains statistically significant at 1% (see Figure 2). The permutation test for discontinuities at other (placebo) thresholds, reported at the top of the figure, shows that the zero-profit threshold has the highest t-statistic among all other thresholds (*rank* = 1 and *percentile rank* <1%). Overall, these results indicate that it is very unlikely that the discontinuity at zero is simply an artefact of central banks whose profit distributions are likely to be bounded from below at zero.

(Insert Figure 2 about here)

Further, in Figure 3, we examine whether a discontinuity at zero is observed across central banks that appear to differ in the financial risks of their activities, measured using the volatility of their realized profits. We assume that central banks with higher volatility are more likely to have higher risk exposures from their activities. In the top panel of Figure 3 we plot the profit distributions of central banks with low, medium, and high volatility based on the volatility of their profits over the entire sample period, using the top (0.003) and bottom (0.011) tertiles of the volatility distribution as cut-off points. To account for the possibility that central banks' risk activities change over time, we also compute volatilities using a three-year rolling window and report the corresponding distributions and tests in the second panel of Figure 3. The top and bottom tertile cut-off values in this case are equal to 0.013 and 0.004, respectively.[24]

(Insert Figure 3 about here)

If a discontinuity was present only in the low-volatility-of-earnings subsample, this would strengthen the concern that the main result is driven by a mixture of distributions. This is not what we find. We find that a discontinuity is present in all subsamples. Specifically, selecting central banks with high volatility of profits naturally increases the fraction of loss observations. Yet, in all cases the discontinuity at zero remains economically and statistically significant with *rank* = 1 and *percentile rank* < 1%. Another notable pattern that emerges from these comparisons is that as we select on central banks with higher volatility, we begin to see a small kink in the loss region just below the zero-profit threshold. Supposing that central banks with high volatility of earnings have less control over their earnings overall, this finding suggest these central banks still can and do make small adjustments to their reported earnings. Overall, these results indicate that it is less likely that the discontinuity at zero is a mechanical by-product of a mixture of distributions rather than by earnings management.[25]

4.2. Which factors drive the discontinuity?

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[24] In all cases, we use all available observations for which we can compute the volatility measure. For the volatility measure based on the entire sample period, we need a minimum of two observations per country. This reduces the sample from 2,591 to 2,589 observations. For the measure using the 3-year rolling window, we need observations for the past three years. This reduces the sample further to 1,957 observations.

[25] Additional robustness tests in the Internet Appendix provide further supportive evidence. We show that the discontinuity is present after excluding central bank observations that do not incur interest expenses (Figure IA-1 of the Internet Appendix). It also exists in sub-samples that contain central banks that are more likely to be exposed to material risks, e.g., the last decade which contains the financial crisis (Figure IA-2), all country-years that experience a systemic banking, currency, or sovereign debt crisis (Figure IA-3), and developing countries (Figure IA-4). Importantly, we note that the distributional properties of ROA are not consistent with the notion that central banks are generally immune to losses and earn stable profits that do not change much over time (Table IA-1 of the Internet Appendix). The overall standard deviation of ROA is 0.062, with within and between variation equal to 0.054 and 0.034, respectively. The persistence coefficient of ROA is 0.644, which is comparable to the persistence that prior studies estimate for U.S. listed firms (about 0.7-0.8). See, e.g., Sloan (1996).

In this section, we aim to inform more thoroughly the interpretation of our results by testing sub-hypotheses H1a and H1b. This analysis aims to uncover how and why central banks manage their earnings, but also helps to further attenuate the concern that the discontinuity is a byproduct of the central bank business model and pooling.

4.2.1. Comparative statics with respect to *ability* to manage earnings

Accounting standards: IFRS vs. local accounting standards

The ability of central banks to manage earnings is influenced by many factors, including accounting rules. The multitude of accounting regimes is too large to allow for a statistical analysis that distinguishes between them. However, as a general rule, central banks using IFRS have less room for discretion than those using non-IFRS regimes. The reason is that IFRS does not allow general-purpose provisions, limits the use of off-balance sheet items that can be used to hide losses, and requires that a greater share of assets and liabilities are marked-to-market. Barth et al. (2008) find that firms using IFRS are less likely to manage earnings than firms using local accounting standards. One may thus expect that central banks using IFRS have a lower ability to manage earnings and thus exhibit a less pronounced discontinuity.

(Insert Figure 4 about here)

Figure 4 shows indeed that while the discontinuous jump at zero is present under both IFRS and local accounting standards—consistent with the ability to manage earnings under both sets of accounting standards—it is economically smaller under IFRS. As the McCrary (2008) test does not allow for a statistical comparison of the size of two discontinuities, in what follows we employ a regression analysis to statistically compare the difference in the incidence of slightly higher profits vs. slightly lower profits between the two sets of central banks (i.e., the variable that is used to split the sample) at the zero-profit threshold, x^s=0, and at other placebo thresholds, $x^s \neq 0$. In particular, using a symmetric window around the threshold, [x^s-0.003; x^s+0.003), we begin by estimating the following OLS specification for x^s=0:[26]

$$I_{i,t} = \beta_0 + \beta_1 D_{i,t} + \varepsilon_{i,t}, \qquad (1)$$

where $I_{i,t}$ is equal to one if central bank i in period t reports an ROA in the [x^s, x^s+0.003) interval, and equals zero if it reports an ROA in the [x^s-0.003; x^s) interval. $D_{i,t}$ in this case is set equal to

[26] We do not estimate a logit model, because, depending on sample composition, some variables perfectly predict the outcome, which leads to their automatic exclusion from the logit model, due a mechanical problem caused by the functional form of the logit that does not extend to the OLS.

one if the central bank uses local accounting standards, and equals zero if it uses IFRS. Since the model is estimated with OLS for the observations around x^s=0, the constant term β_0 equals the number of observations in [0, 0.003) to the total number of observations in [-0.003, +0.003) when $D_{i,t} = 0$. A value greater than 0.5 indicates that small profits are more frequent than small losses for central banks under IFRS. The coefficient of the explanatory variable, β_1, measures the difference in this ratio when $D_{i,t} = 1$. If there is more ability to manage earnings under local accounting standards, we expect a positive and statistically significant $\hat{\beta}_1$. The point estimates can also be used to back out the odds ratios of small profits to small losses under each accounting standard (i.e., they equal to $\frac{\widehat{\beta}_0}{1-\widehat{\beta}_0}$ when $D_{i,t} = 0$ and $\frac{\widehat{\beta}_0+\widehat{\beta}_1}{1-(\widehat{\beta}_0+\widehat{\beta}_1)}$ when $D_{i,t} = 1$).

Results are reported at the bottom of Figure 4. We find that $\hat{\beta}_0$ equals 0.768. Importantly, $\hat{\beta}_1$ is positive and is statistically significant at the 5% level, consistent with the hypothesis that central banks under local accounting standards are statistically significantly more likely to report small profits than small losses, relative to central banks that follow IFRS. The estimated coefficients indicate that this difference is economically large. For example, the odds ratio of small profits to small losses is 6.5 under local accounting standards and 3.3 under IFRS.

To further evaluate whether this relationship is unique to x^s=0 or whether it also exists for other thresholds, x^s≠0, we perform a permutation test, similar to the test performed on Figure 1. We begin by excluding the small profit and loss region, [-0.003, +0.003), and estimate Eqn. (1) using same-length intervals, [x^s-0.003; x^s+0.003), around all other 57 thresholds to the left and to right of zero in Figure 4 with at least 30 observations (for meaningful t-statistics). If the previous results at x^s=0 are spurious (due to chance or an underlying economic relation between accounting standards and central bank profitability e.g., IFRS is generally more conservative than other accounting standards for central banks with certain characteristics), we would expect the coefficients of β_1 at placebo thresholds to often be positive and statistically significant. If instead results at x^s=0 are driven by loss avoidance, we expect the estimated coefficients at placebo thresholds to often be indistinguishable from zero. Results are reported at the bottom of Figure 4. We find that the average $\hat{\beta}_1$ at placebo thresholds is near zero (0.007, standard error = 0.024). The $\hat{\beta}_1$ at the x^s=0 has the second highest t-statistic (*ran*k = 2). Permutation tests using 100 or 500 random thresholds give *percentile ranks* of 2% and 3%, respectively, indicating that the estimated probability that the relation at zero is spurious is 3% or less.

Loan-loss and general-risk provisions

To examine more specifically *how* central banks may be using accounting discretion to manage their profits, we study their use of loan-loss and general-risk provisions—the primary earnings management tool examined by the earnings management literature on commercial banks (Healy and Wahlen 1999). This type of provisions provides a useful earnings management tool for central banks for several reasons. Loan-loss and general-risk provisions is a major accrual (i.e., non-cash) item and a major expense component on central banks' income statement. Moreover, there is a high degree of discretion in the determination of their values, and they are typically recorded at the end of the fiscal year, allowing central banks to precisely estimate the effect their particular choice of values will have on their reported year-end profits.

Consistent with central banks having a higher degree of discretion than commercial banks in accounting for provisions, we observe that some central banks report unusually round numbers as estimates of general risk provisions. To illustrate, Table IA-2 in the Internet Appendix reports a case of a central bank using round numbers only for this item (provisions of €1,400,000,000 vs. interest expense of €1,905,144,704). Other examples include central banks selectively switching back and forth from round to non-round numbers.[27] We are not aware of cases when (large) commercial banks behave similarly. Because banks hold a complex portfolio of assets, exposed to different risks, and those risks are estimated using (often regulated) analytical tools, a bank's auditor would have to question any material and discretionary deviation from the calculated figure.

To test whether central banks tailor provisions to fine-tune their reported profits, we begin by studying the shape of central bank profit distributions before and after accounting for provisions. Figure 5 reports the two distributions. The distribution of profits before provisions appears to be significantly more symmetric than the distribution of profits after provisions. Interestingly, we observe fewer loss observations in the distribution of reported profits (i.e., including provisions) than in the distribution of profits excluding provisions, in particular near the zero-profit threshold. After accounting for provisions, the loss region of the distribution is substantially less populated, while the number of observations in the first positive bin increases markedly, resulting in a larger discontinuity. The incidence of small profits to small losses is significantly higher after including provisions, both statistically and economically.

[27] For example, Austria in 2010, 2011, 2013, and 2014, Belgium 1998, Cyprus 2010-2012, Estonia 2012-2014, France 1998-2001, Ireland 2014, Italy 2005-2014, Japan 2013-2015, Macao 2007-2011, Malta 2012-2015, Portugal 2013-2014, Slovakia 2012-2015, and San Marino 2005-2013.

In particular, pooling the observations in the small-profit and small-loss regions of the two distributions and estimating Eqn. (1) where $D_{i,t}$ is set equal to one for post-provision profits, and equal to zero for pre-provision profits, yields a $\hat{\beta}_1$ equal to 0.177 that is statistically significant at the 1% level (see bottom of Figure 5). The coefficient estimates indicate an economically large difference between the two discontinuities, as the odds ratio of small profits to small losses after provisions is 4.83, while the odds ratio before provisions is only 1.87. The permutation tests further show that this relation is not observed at other parts of the distribution. The average $\hat{\beta}_1$ at placebo thresholds is near zero (-0.001) with a *rank*=1 and a *percentile rank* <1%.

(Insert Figure 5 about here)

As provisions are typically an expense that would increase, rather than decrease, the frequency and size of losses, the results in Figure 5 are consistent with central banks *releasing* provisions when they would otherwise suffer losses, thus migrating their earnings into the (small) profit region. The high number of observations in the first positive bin, however, can also be partially driven by downward earnings management (i.e., reporting larger provision expenses to avoid large profits). To better understand how central banks may be using provisions to manage earnings in both directions, in Figure 6 we trace the migration patterns of the observations across profitability bins due to provisions. Starting from the distribution of profits before provisions, we study where observations move after accounting for provisions. Two distinct patterns emerge.

First, movements to a "higher" bin (i.e., a higher level of after-provision profits) are more likely when pre-provision ROAs are in the loss region. This is more evident in Panel B of Figure 6, which expresses the number of observations that move to a higher or a lower bin as a fraction of the number of observations in the bin before provisions were included. We observe that when pre-provision ROAs are in the loss region, the fraction of observations that moves to a higher bin is typically more than 20%. Instead, when pre-provision ROAs are in the profit region, this fraction is typically less than 10%. Regression results in Internet Appendix Table IA-3 confirm that this difference is statistically significant.[28]

[28] Using the observations in Panel A of Figure 6 we estimate an OLS regression model to examine whether the probability that a central bank moves to a higher bin (i.e., a higher level of profits) when provisions are included, varies systematically with the level/region of the central bank's pre-provision ROA. We distinguish between four regions of pre-provision ROA: large loss (ROA<-0.003), small losses (0.003≤ROA<0), small profits (0≤ROA≤0.003), and large profits (ROA>0.003). We find that central banks with pre-provision ROAs in the two loss regions are significantly more likely to release provisions and move into a higher bin than central banks in the two profit regions by 26 percentage points (=0.127+0.267-0.061-0.071; t-stat.=2.03). Central banks in the small loss region have the highest propensity to move up (and report after-provision profits); this propensity is 14 p.p. higher than for central banks in the large loss region (t-stat.=2.32).

Second, movements to a "lower" bin (i.e., a lower level of after-provision profits) are common in general, consistent with the idea that provisions are generally an expense. However, virtually no central bank in the *first* positive bin crosses the zero-profit threshold into the loss region. Despite the large number of observations in the first positive bin, only *one* observation shifts into the loss region when provisions are included, in sharp contrast to adjacent positive bins where downward shifts are much more likely. Regression results in Table IA-3 confirm that central banks in the small positive region are significantly less likely to report provision expenses that will move them into a lower bin—and into the loss region in this case—than central banks in the other parts of the distribution.[29] These results are consistent with central banks using provisions to manage earnings and avoid losses. They also support our thesis that manipulation around the zero-threshold is unidirectional—a necessary condition for a rejection of a continuous function to be informative of manipulation.

(Insert Figure 6 about here)

Overall, the results so far provide strong support to the earnings management hypothesis and show that central banks use discretion in accounting rules to tailor their profits quite precisely. The fact that excluding provisions does not eliminate the discontinuity in Figure 5 further indicates that they also use other earnings management tools, which may include other accounting tools (e.g., mark-to-model valuations) as well as policy variables they control (e.g., short-term interest rates, exchange rates). In section 5, we further test whether profitability concerns are correlated with central banks' monetary policy choices and outcomes.

4.2.2. Comparative statics with respect to *incentives* to manage earnings

In this section, we examine whether the magnitude of the discontinuity varies predictably with central banks' and central bank policymakers' incentives to avoid losses. To preserve space results are summarized in Table 2.[30] For each factor, we report the estimation results from the equivalent regression at the zero-profit threshold and the permutation test results for placebo thresholds. In all cases, $D_{i,t}$ is coded as to predict a positive $\hat{\beta}_1$ under the earnings management hypothesis.

(Insert Table 2 here)

[29] We relate the probability that a central bank moves into a lower bin (i.e., a lower level of profits) to the region of the central bank's pre-provision ROA, distinguishing again between four regions (large loss, small loss, small profit, and large profit). We find that the only region for which observation do not move down is the small loss region.

[30] Nevertheless, to provide the greatest possible level of transparency to the reader, Figure IA-5 reports the profit distributions for each factor.

The existing literature in profit-maximizing firms finds that earnings management and loss avoidance are the result of external pressures and ensuing agency problems due to manager career concerns (Jensen 1986; Stein 1989; Graham et al. 2005; Bennett et al. 2017). Such factors may also be present in central banks. Even when the central bank's dividend distribution rules provide for automatic recapitalizations by tapping into the resources of the central government, central bank losses may be met with discontent by politicians or the public, or they may be interpreted as a sign of weakness or failure. If the possibility of such discontent enters the calculation of central bankers, incentives to avoid losses may ensue even if no neo-classical economic reason exists for avoiding losses. One may thus hypothesize that incentives to avoid losses are greater when political pressure is greater, or when central bankers are more receptive to such pressures. Measuring such pressures is difficult in general, but may be possible in particular cases.

For example, central bank governors' *career concerns* may provide incentives to avoid losses. Indeed, we find that small profits are 2.16 times more likely than small losses when central bank governors are not re-appointable as opposed to 7.02 times more likely when they are re-appointable. The difference is statistically significant. Estimating Eqn. (1) for x^s=0, where $D_{i,t}$ is equal to one if the central bank governors are re-appointable, and equals zero if they are not re-appointable, yields a $\hat{\beta}_1$ equal to 0.192 that is statistically significant at 1%. The permutation tests also show that this relation is unlikely to be observed in other parts of the distribution. In particular, the average $\hat{\beta}_1$ at placebo thresholds is close to zero (0.008) and the estimated probability that an equally strong relation is observed in other parts of the distribution is less than 2.2%.

As noted above, loss avoidance may also be rooted in central banks' concerns that losses will be interpreted as signs of "bad" policies and "weak" central banks, even if such interpretations would be unfounded, irrational, or due to "behavioral" factors not easily captured by neoclassical models. For example, behavioral theories are used to explain why corporate managers avoid losses (Burgstahler and Dichev 1997), and survey evidence supports the view that corporate managers inflate profits relative to benchmarks to prevent market turmoil, further questions, and negative publicity, although doing so can be harmful in the long run (Graham et al. 2005).

One may thus expect that such pressures are stronger when countries are governed by *extreme political parties*, because the populations in these countries have revealed themselves to be more receptive to populist arguments. Central banks in such countries may have more difficulty convincing governments or the public of the necessity or normalcy of occasional negative profits; losses might more likely be interpreted as evidence of failed policies or otherwise politicized at the expense of the independence of the central bank.[31] We find indeed that when central banks face a more extreme leader of either left or right affiliation, they are more likely to report small profits than small losses (i.e., $\hat{\beta}_1$ equals 0.120 and is significant at 1%). However, the permutation tests indicates that this relation may not be unique to the zero-profit threshold. The percentile ranks at random thresholds indicate that there is a 10% chance of a similar, at least equally strong, relation in other parts of the distribution. These findings suggest that either the relation at zero is spurious (e.g., due to omitted factors) or that when countries are governed by extreme leaders, earnings management incentives extend beyond the small profit region (e.g., central banks have incentives to report larger profits more generally, and not just small profits over small losses).

Similarly, incentives to avoid losses may be stronger when losses are more likely to receive more *public scrutiny*. Although central banks with private shareholders are institutionally shielded from their control,[32] we expect that any losses these central banks may generate are more likely to receive public attention; frequent reporting in the press about the profitability of the Swiss National Bank may serve as an illustration. Publicly traded central banks hold press conferences to discuss their financial performance and issue profit warnings that may draw attention to balance sheet considerations. All else equal, these banks may therefore find it more opportune to avoid the reporting of negative profits. We find that publicly traded central banks exhibit a higher propensity to report small profits than small losses, with $\hat{\beta}_1$ equal to 0.167, and is statistically significant at 1%. These results, however, should be viewed with caution as only five central banks (Belgium, Greece, Japan, Switzerland, and South Africa prior to 2002) are publicly traded, and obviously many other variables can potentially describe their features. The average $\hat{\beta}_1$ at placebo thresholds is very small (-0.024) with *percentile ranks* = 5.9% (8.4%) for 100 (500) random thresholds.

Next, we explore the role of *budgetary considerations*. Governments may become accustomed to receiving dividends from central banks that help support their budgets, and avoid unpopular increases in taxation.[33] Failing to provide a constant stream of dividends may bring

[31] See also a broader discussion in Goodhart and Lastra (2018) on threats to central bank independence in the aftermath of the global financial crisis from the rise in populism in Western economies and the expanded central bank mandates.
[32] "The rights of ordinary shareholders to select management and determine strategy are severely circumscribed and allow no role in the formulation of public policy. Dividends to private shareholders are predetermined or limited in law, making these central banks wholly or mostly independent of the profit motive, and removing a potential conflict of interest between financial advantage and public welfare" (Archer and Moser-Boehm 2013, 7).
[33] The Federal Reserve, for example, has sent close to $100bn in profits per year to the Treasury during much of post-financial crisis period. This income stream to the government is bound to shrink when the Fed raises interest rates or shrinks its balance sheet (*Wall Street Journal*, January 10 2017); see also

central banks under pressure to continue to produce profits.[34] We expect that such pressures are greater when the central bank faces a more fiscally conservative government, or when the scope of central bank operations is large relative to the size of the government's budget.[35] (To the extent that the size of the central bank's scope is predetermined—because central banks are constrained to perform certain operations— this treatment may afford some degree of exogenous variation.)

Results in Table 2 are consistent with these predictions. We find that the propensity to report small profits as opposed to small losses is systematically higher when the country's leader is affiliated with a right-leaning party rather than a left-leaning party, and for central banks with above-median operating expenses relative to the government's total tax revenues.[36] The estimated coefficients of β_1 are equal to 0.089 and 0.122, respectively, and are both statistically significant at 5%. The permutation tests at placebo thresholds indicate that similar relations are unlikely to be observed at other parts of the distribution. The average estimated coefficients at placebo thresholds are very small (-0.008 and -0.002) with percentile ranks of at most 7.9% and 3%, respectively. We find similar results if we scale operating expenses with GDP (i.e., the size of the country's economy, not tabulated) or use the central bank's total assets to GDP ratio, reflecting more broadly the total size of a central bank's balance sheet relative to the size of the economy.

Budgetary pressures are also influenced by central bank *dividend distribution rules*. As shown in the theoretical literature, dividend rules influence whether central banks can "soften" their budget constraints (Reis 2013; Hall and Reis 2015). Central banks whose charter allows for negative dividends can draw more easily on external resources to cover their obligations when internally generated income is insufficient; the ability to reduce dividend payments to the

https://www.federalreserve.gov/econresdata/notes/feds-notes/2017/confidence-interval-projections-of-the-federal-reserve-balance-sheet-and-income-20170113.html.

[34] Anecdotal evidence is plentiful. For example, "[o]ne rationale for the SNB 'gold initiative' was to bullet-proof the SNB's balance sheet against losses… The fear was that the SNB's balance-sheet losses might anger cantonal leaders to such a degree that the central bank's independence would be threatened" (Eichengreen and Weder de Mauro, Project Syndicate, February 12, 2015). Similarly, the Banque de France in its 2010 annual report states that "[t]he strict management… of its invested monetary income is the best guarantee of the Banque de France's independence. This strict management allows the Bank to: finance its development completely independently, while also paying a regular dividend to the French State" (p. 57).

[35] An alternative way to interpret this proxy is that it measures the relative cost of running a central bank for the government if the central bank accounts were consolidated with those of the government. Failing to independently cover their expenses puts pressure on the government's budget, particularly when such expenses are a large fraction of the government budget.

[36] Mechanical relations between operating expenses and profitability push in the opposite direction (i.e., higher operating expenses produce lower profitability), which is not true for alternative measures such as the fraction of average central bank profits to tax revenues of the government, because more profitable central banks are more likely to be in the profit region.

government below the level of period profits to absorb future or past losses serves a similar function. Such central banks may thus have weaker incentives to avoid losses, because they face no risk of period insolvency. To test this hypothesis, we use information on central bank dividend rules from Archer and Moser-Boehm (2013, Annex 2), available for 30 countries. We label central banks that can draw on resources from the government to cover losses or that can smooth intertemporally as having a "soft" budget constraint.[37] We assign all remaining central banks from the Archer and Moser-Boehm sample into a second group. These central banks are either limited in the fraction of profits they can retain, or their dividend distribution decisions are taken jointly with the government. We label these central banks as facing a "hard" budget constraint and expect them to have greater incentives to manage earnings and avoid losses.[38]

Results in Table 2 indicate that central banks with hard budget constraints are significantly more likely to report small profits than central banks with soft budget constraints ($\hat{\beta}_1$ = 0.328, significant at 1%). As before, this relation is not present at placebo thresholds (the average simulated coefficient is -0.045, with a percentile rank of at most 2%). We obtain similar results if instead of the central bank dividend distribution rules, we use their actual dividend payments during the sample period, which are available for most central banks in our sample. In this case, we designate central banks with negative dividends at some point during the sample period or with consistently low dividend payout ratios (i.e., below 50%) throughout the sample period as having a "soft" budget constraint. Instead, central banks that pay dividends to their government even when they make losses or that have consistently high payout ratios (i.e., higher than 50%) are classified as having a hard budget constraint.[39] Overall, these results are consistent with the hypothesis that central banks that face hard budget constraints have stronger incentives to avoid losses.

[37] The latter includes (i) central banks that face an equity target (or equivalent) that allows future surpluses to be retained to an unusual extent to cover losses and/or rebuild equity or allows to build buffers toward a target level, (ii) central banks that have full discretion in the determination of general-purpose provisions without any specific limit, and (iii) central banks with smooth distributions, where dividends are determined based on a trailing average of net income in past years.

[38] The "soft" budget constraint group includes Chile, Czech Republic, Finland, Iceland, India, Israel, Germany, Korea, Malaysia, Mexico, Netherlands, Peru, Poland, Philippines, Thailand, Turkey, Singapore, Slovakia, South Africa, Spain, Switzerland, Sweden, and the United States. The "hard" budget constraint group includes Australia, Canada, Denmark, Japan, New Zealand, and the United Kingdom.

[39] Payout ratios below 50% correspond to the bottom tertile of the dividend distribution. Values >50% correspond to the middle and top tertiles of the distribution, with the latter beginning at 90%. Including separate dummies for the middle and top tertiles yields very similar results for both groups. The coefficients of both dummies are positive and statistically significant with similar coefficients, indicating that both groups are exposed to dividend pressures.

Next, we examine whether *negative equity* insulates central banks from budgetary considerations.[40] When the central bank's equity is deeply negative and the payout rule is such that profits must not be distributed to the Treasury until all past cumulative losses are replenished, receiving dividends from the central bank in the foreseeable future is virtually impossible, no matter the realization of period profits. This impossibility may effectively shield the central bank from political pressure to generate profits.[41] Results in Table 2 are broadly consistent with this hypothesis. Estimating Eqn. (1) around the zero-profit threshold, where $D_{i,t}$ is set equal to one if central bank *i* has positive equity at the beginning of period *t*, and equal to zero if it has negative equity, yields a $\hat{\beta}_1$ equal to 0.221 that is significant at 10%, indicating that central banks with positive equity are more likely to report small profits than small losses relative to central banks with negative equity. Taken at face value, these results might suggest that, in contrast to concerns expressed in the literature (e.g., Stella 1997), negative equity may in fact help sustain rather than jeopardize independence. However, because of the low number of central banks with negative equity (Chile, Slovakia, and Israel), we do not attach high confidence to this interpretation. The permutation test results also show that this relation is not very likely to be unique to the zero-profit threshold (i.e., the percentile rank of 500 random draws is 11.6%, above the 10% typical cut-off point of statistical significance). Similar to our earlier results for extreme leaders, this finding indicates that either the relation with respect to negative equity is spurious (i.e., driven by omitted variables), or that negative equity reduces incentives to manage earnings upwards more generally.

Finally, we explore the role of central bank *de jure independence*. We find that legally independent central banks exhibit a somewhat larger discontinuity: $\hat{\beta}_1$ for $x^s = 0$ is equal to 0.074, statically significant at 10%. This result is consistent with the hypothesis that legally independent central banks may have stronger incentives to avoid losses, perhaps to justify or defend their independence. This finding highlights the distinction between *de jure* and *de facto* independence. For example, *de jure* independence still allows for re-appointable central bank governors, which is a feature that may weaken de facto independence. The larger discontinuity for de jure independent central banks may also reflect the endogeneity of central bank independence

[40] Central banks are exposed to the risk of negative profits more frequently than to the risk of negative equity. Whereas roughly a third of central banks in our sample either reported a loss or were on the brink of reporting a loss in any given year, only 7% of central banks had negative equity during our sample period. Virtually all central banks (86%) reported a loss or were close to reporting a loss at least once during our sample period.

[41] We are grateful to Luboš Pástor for this insight.

(i.e., they are independent because they consistently avoid losses).[42] Permutation tests show that the average $\hat{\beta}_1$ at placebo thresholds is 0.035 with percentile rank values below 5%.

Overall, these cross-sectional differences in the magnitude and significance of the discontinuity are consistent with various frictions leading central banks to engage in earnings management and are difficult to reconcile with the notion that the discontinuity is simply a mechanical byproduct of the central bank business model. Next, we subject these results to two key robustness tests.

Robustness checks

First, we re-estimate an augmented version of Eqn. (1) including the volatility of earnings (i.e., the standard deviation of ROA) as a control to account for the possibility that central banks' business model and risk exposures correlate with our incentive and ability measures. As can be observed in Table 3, with the exception of operating expenses and de jure independence which loose statistical significance, these controls have no material effect on our earlier results, both economically and statistically. The insignificant coefficient for operating expenses is not surprising, because larger operating expenses (which are fairly stable for most central banks) are mechanically inversely related to the volatility of their reported profitability.

(Insert Table 3 about here)

In a second robustness test in Table 4, we also estimate a multivariate version of Eqn. (1) to both account for correlations between the various incentive and ability measures and control for a broader set of central bank characteristics and economic conditions (e.g., de jure independence, whether the central bank pays interest on reserves, exchange rate peg, growth rate of GDP).[43] To use the largest possible sample, in our baseline specifications for each incentive motive, we use the indicator that is available for a largest number of observations.

(Insert Table 4 about here)

The resulting sample is 223 observations for 63 unique central banks in the baseline test, and 168 observations for 45 central banks in our most saturated specification with the broadest set of controls. The sample shrinks compared to the univariate analyses because many of the factors

[42] We find no significant differences with respect to the country's broader institutions and respect for the law as captured by World Bank measures of the rule of law, government effectiveness, and corruption (Figure IA-6).

[43] As can be observed in Table IA-4, the correlations between various factors are generally low. VIF tests for each speciation in Table 4 indicate multicollinearity is not a concern. The highest VIF among all model specifications is 1.71, which is well below 10—a commonly used threshold for acceptable VIF.

used there are not available for the same set of observations. Indeed, a key reason for the earlier univariate analysis is to use the largest available sample in each case. The analysis in Table 4 should thus be seen as a complement, intending to verify whether earlier results hold when we control for correlations between the various ability and incentives measures and a broader set of controls. For further robustness, in the last specification of Table 4 we also offer results using a slightly wider interval using two instead of one bin around zero, [0.006, -0.006). This increases the sample size in the most saturated specification to 298 observations and 55 central banks.

Results are very similar to those obtained earlier. (We point out exceptions where applicable.) Corroborating our prior inferences, we find that governor career concerns, extreme party affiliation, publicly traded central banks, and dividend distribution rules retain their positive and statistically significant coefficients. Balance sheet size and IFRS, instead, do not matter once we control for other factors.[44] The latter is consistent with prior literature on corporations that finds incentives prevail over any constraining effects of accounting rules (Leuz et al. 2003). The statistically insignificant coefficient for IFRS may also be simply due to lack of power due to reduced sample size. Notably, the growth rate of GDP is statistically insignificant for the narrower interval and becomes marginally significant when we enlarge the sample, consistent with the idea that narrow-interval regressions compare countries with similar business cycle conditions. The same holds for the exchange rate peg and economic development. Other central bank characteristics (i.e., de jure independence, paying interest on reserves, and volatility of profits) are instead never statistically significant.

Overall, the results of these tests corroborate the results of our earlier univariate analysis, providing strong support to the hypothesis that agency problems at central banks create profitability concerns and incentives to avoid losses. Next, we examine whether these profitability concerns are also associated with changes in these central banks' policy choices and outcomes.

5. Do profit concerns relate to monetary policy?

In this section, we study whether central banks' discontinuous profit incentives are associated with discontinuities in their key monetary policy inputs and outcomes.

Inflation

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[44] Using operating expenses instead of balance sheet size as an alternative size indicator also yields a statistically insignificant coefficient as in Table 3.

We begin by examining whether inflation rates—central banks' key policy mandate—are discontinuously higher as we move from just below to just above the zero-profit threshold. In particular, we estimate polynomial regressions using inflation rates as the dependent variable. Polynomial regression models use all available observations (i.e., including those further away from the threshold) and control for underlying relationships between the dependent variable (inflation rate) and the running variable (central bank profitability) due to omitted variables using high-order polynomials of the running variable. Specifically, we estimate the following model:

$$Inflation_{i,t} = \beta \cdot Profit_{i,t} + \sum_{s=1}^{n} \left[\beta_s \cdot roa_{i,t}^{s} + \gamma_s \cdot roa_{i,t}^{s} * d_{i,t} \right] + \delta \cdot z_{i,t} + \alpha_i + \varepsilon_{i,t}, \quad (2)$$

where $Inflation_{i,t}$ denotes the inflation rate in country i in year t. $Profit_{i,t}$ is a dummy variable that equals 1 if the central bank i in year t reported a profit (i.e., $roa_{i,t} \geq 0$), and equals 0 otherwise. $\sum_{s=1}^{n} \left[\beta_s roa_{i,t}^{s} + \gamma_s roa_{i,t}^{s} * d_{i,t} \right]$ indicates polynomials of profitability. We use a flexible functional form allowing for nonlinearities with polynomials up to order *n* and a different functional form for profit and loss observations.[45] $z_{i,t}$ and α_i denote time-varying country characteristics and country-fixed effects, respectively. $\varepsilon_{i,t}$ denotes the idiosyncratic error-term.

A positive and statistically significant β indicates that the conditional expectation of inflation rates, $E(\pi/x)$, is discontinuously higher as one moves from just below to just above the zero-profit threshold. Allowing for a nonlinear relationship between the dependent variable and $roa_{i,t}$ is important, as forcing a linear relation may lead to a spurious discontinuity. In our baseline specifications, we employ polynomials of up to order six ($n = 6$) and perform robustness checks using polynomials of different order as well as narrow interval regressions around the threshold, which do not rely on the polynomial order.

(Insert Table 5 about here)

Results are reported in Table 5. In columns (1) to (5) we report results with inflation rate as the dependent variable and with various sets of controls. Column (1) reports results for a baseline specification without any controls apart from the polynomials. Columns (2)-(4) control for economic conditions and other country and central bank characteristics that may correlate with

[45] We have no a priori reason to expect this relationship to be the same on both sides of the threshold in general (Lee and Lemieux 2010) and in our context in particular. Therefore, and to avoid forcing a result due to a rigid functional-form assumption, we allow for different polynomial coefficients on both sides.

inflation rates.[46] To control for time-invariant country and central bank characteristics that may be poorly captured by our set of controls, column (5) uses country-fixed effects instead. Column (6) reports results of a similar fixed-effect specification using the inflation gap (inflation minus the central bank's stated inflation target) as the dependent variable for the subsample of central banks with explicit inflation targets. Column (7) further replaces the dependent variable with "inflation surprises"—i.e., the difference between a country's inflation rate relative to the IMF's inflation forecasts for the same year in its World Economic Outlook report.

In all cases, we find a positive and statistically significant coefficient for $Profit_{i,t}$. The point estimate ranges between 0.014 to 0.049, indicating the central banks in the small profit region have discontinuously higher inflation rates by 1.4 to 4.9 percentage points than central banks in the small loss region. The estimated coefficient tends to get bigger as we control for economic conditions.[47] This is not surprising as better economic conditions correlate negatively with both inflation rates and central bank profitability (i.e., more developed economies tend to have lower inflation and their central banks are less likely to report losses). The point estimate in the fixed-effects specification is 0.038. The magnitude of the estimated coefficients are economically plausible considering that the sample mean and standard deviation of inflation rates are 6.73 and 8.26, respectively.[48] Corresponding specifications using the inflation gap or inflation surprises as alternative dependent variables, yield smaller estimates of 0.020 and 0.014, respectively.

Figure 7 offers a visual illustration of results in Table 5. The figure shows the predicted inflation rates for different levels of central bank profitability based on column (1) of Table 5. The horizontal axis divides roa into bins that contain a small range of roa-values. Each circle on the plot corresponds to the average inflation rate for a particular bin. (Bins are constructed so that each bin falls on either side of the zero-profit threshold, depicted by the vertical line, so that no bin contains the threshold in its interior.) The solid line indicates the average predicted values for each

[46] Existing literature shows that countries with autonomous central banks experience lower inflation (Banian et al. 1983; Bade and Parkin 1987), although whether these correlations constitute causal effects and therefore justify efforts to increase central bank independence is disputed (Walsh 2005).

[47] To be able to compare our estimates, we keep our sample constant across the various specifications using for all specifications the subsample of observations for which all control variables up to column (3) are available.

[48] Theses magnitudes appear plausible also compared to the estimates by Adler et al. (2012) on the impact of central bank *capital* levels (as opposed to *marginal profit* levels in our study) on monetary policy and inflation outcomes; see also Stella (2008), Klüh and Stella (2008) and Benecká et al. (2012) for a critical evaluation of these findings. In untabulated robustness checks, we also confirm the jump for both high- and low-income countries. The estimated coefficient is larger for low-income countries: 0.043 as opposed to 0.025 for high-income countries, reflecting the higher average inflation rates between the two groups. For low-income countries, average inflation rate in the sample is 0.087 with a standard deviation of 0.103 as opposed to 0.027 and 0.025, respectively, for high-income countries.

bin. The dashed lines indicate the 95% confidence interval. A clear and significant discontinuity in inflation rates exists at the zero-profit threshold. The figure to the right of the discontinuity, which is precisely estimated, also shows a highly non-linear relationship between inflation and central bank profitability. The non-linear "tilt" towards higher inflation rates in the small profits region (bins 1 and 2) is consistent with the idea that this region captures central-bank observations that are more likely to be affected by agency problems associated with higher inflation rates.

(Insert Figure 7 about here)

One concern with results in Table 5 is that they rely on the choice of the polynomial order. In robustness checks, we thus confirm that similar results are obtained if we use polynomials of different order e.g., 5 or 7 (Table IA-5). In further robustness tests, using a similar permutation test as in previous analyses, we confirm that a similar relation is unlikely to be observed at other ex-ante non-meaningful thresholds. In particular, we estimate the third specification of Eqn. (2) in Table 5 (with the large set of controls and observations) for each of the other 59 thresholds in Figure 1.[49] We find that the average coefficient at placebo thresholds is near zero (-0.006) and that the $\hat{\beta}$ at $x^s = 0$ has the highest t-statistic (*rank* = 1). None of the placebo coefficients has a t-statistic>1.96 (i.e., significant at 5%). Additional permutation tests at 100 and 500 random thresholds give *percentile ranks* of 0.01 and 0.002, respectively, indicating that a significant discontinuity in inflation rates at other thresholds is very unlikely (Table IA-6). To offer a visual illustration, in Panels B and C of Figure 7 we re-produce the figure in Panel A for two placebo thresholds, -0.012 and 0.012. Both figures show no significant discontinuities in inflation rates.

In further untabulated robustness checks, we also perform similar analyses using narrow interval regressions. Instead of relying on polynomials to control for omitted factors, narrow interval regressions restrict the sample to narrow intervals of profitability where central bank fundamentals may be more similar. As these are slope rather than discontinuity tests, there is a concern that a positive $\hat{\beta}$ may be simply reflecting a positive linear relation between inflation rates and central bank profitability due to omitted factors unrelated to earnings management. We thus estimate corresponding specifications for both the narrow interval around zero, [-0.003; +0.003), and other same length intervals, [x^s-0.003; x^s+0.003), around all other thresholds to the left and to the right of zero with at least 30 observations, using the specification in column (3) of Table 5. Similar to Table 5, we find that $\hat{\beta}$ at $x^s = 0$ is equal to 0.036 and statistically significant at 1%.

[49] Using the fourth specification or the fixed effects model leads to similar results.

We also find that the estimated coefficient at zero has the highest value and t-statistic (*rank* = 1) among all other thresholds, indicating that a similar relation as at zero is not observed at other thresholds, which all return insignificant results. Permutation tests for 100 and 500 random thresholds, yield *percentile ranks* of 0.04 and 0.02, providing further support.

Interest rates

In a second set of tests, we examine whether not only inflation rates, but also interest rates are systematically different for central banks in the small profit region as opposed to the small loss region. To explore this possibility, we estimate a Taylor rule regression around the zero-profit threshold (i.e., in the [-0.003, 0.003) region). Taylor rules assume that within each operating period, the central bank has a target for the nominal short-term interest rate that is based on the state of the economy and adjusts the short-term interest rate when inflation and output deviate from their desired target (Clarida et al. 1998; Chadha et al. 2004; Carare and Tchaidze 2005). We are interested in testing whether central banks in the small profit region have systematically lower interest rates than central banks in the small loss region (i.e., $\beta < 0$) relative to those rates a central bank would set based on its forecast of the inflation and output gap:[50]

$$Interest\,rates_{i,t} = \alpha_i + \beta \cdot Profit_{i,t} + \gamma_1 \cdot Inflation_{i,t+1} + \gamma_2 \cdot Output\,gap_{i,t+1} + \rho \cdot Interest\,rates_{i,t-1} + \alpha_i + \varepsilon_{i,t}, \qquad (3)$$

where $Interest\,rates_{i,t}$ denotes the short-term nominal interest rate in country i at the start of year t. $Profit_{i,t}$ is a dummy variable that equals 1 if the central bank in country i in year t reported a small profit, and equals 0 if it reported a small loss. $Inflation_{i,t+1}$ denotes the inflation rate between period t and $t+1$. $Output\,gap_{i,t+1}$ denotes the output gap as deviations of output between period t and $t+1$ from its long-term equilibrium level using the Hodrick-Prescott (HP) filter.[51] The coefficients γ_1 and γ_2 measure how strongly the central bank responds to inflation and abnormal economic growth patterns. Lagged short-term interest rates, $Interest\,rates_{i,t-1}$,

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[50] The forward-looking Taylor regressions (i.e., models using macroeconomic forecasts and macroeconomic conditions in *t*+1) have fewer econometric and conceptual issues than backward-looking Taylor rule regressions, which only use lagged values of macroeconomic variables.

[51] In untabulated robustness tests, we confirm that results are robust to using deviations of the log output or unemployment from their quadratic trend and find qualitatively similar results.

accounts for interest rate "smoothing," with ρ measuring the degree of interest rate smoothing.[52] To account for unobservable country-fixed effects, α_i, and because of the lead-lag structure of this model, equation (3) is usually estimated using the Generalized Method of Moments (GMM).[53] The set of instruments, $z_{i,t}$, includes current macroeconomic variables that are known to the central bank at t and are helpful in predicting the future inflation and output gaps.[54] We access the validity of our exclusion restrictions using the Hansen's J test for overidentified restrictions (Hansen 1982).

The results are reported in Table 6. We find that central banks that report small profits at the end of year t have systematically lower interest rates at the beginning of year t by 1.1% in column (1) or about 40 basis points in column (2) when we additionally control for differences in real exchange rates. In further tests, we also examine whether an equally strong negative relationship is obtained for other thresholds to the left and to right of zero. In particular, using same length intervals, [x^s-0.003; x^s+0.003), we estimate equation (3) for all other thresholds with at least 30 observations. We find that two placebo thresholds generate a significant negative $\hat{\beta}$, but in both cases the estimated coefficients are much closer to zero than the one at zero-profit threshold (-0.004 and -0.002 vs. -0.010). The average $\hat{\beta}$ (across 13 estimations with n>30) is 0.006.

(Insert Table 6 about here)

Interpretation

Overall, our results in Tables 5 and 6 indicate that central banks in the small profit region have discontinuously higher inflation rates and systematically lower interest rates than central banks in the small loss region. This finding is robust to different specifications and it is unique to the zero-profit threshold. The uniqueness of the relation indicates that it is unlikely to be spurious (i.e., driven by omitted factors, unrelated to central banks' preference for profits over losses).

We next discuss the possible likely (and unlikely) drivers of this result. The starting point of any interpretation is that a central bank being in the small-profit region as opposed to the small-

[52] A central bank may smooth interest rate changes because of considerations about model uncertainty, fears of disrupting capital markets, possible loss of credibility from sudden large policy reversals, or for consensus building (Clarida et al. 1998). Lagged interest rates may also capture policy responses to *serially correlated policy shocks* not captured by inflation and output gaps (Rudebusch 2002) and data *measurement errors* in the timing of fundamentals (Orphanides 2001; Carare and Tchaidze 2005).

[53] Eurozone countries do not have an independent interest rate policy and are excluded from this analysis.

[54] As in the previous literature (Clarida et al. 1998; Chadha et al. 2004; Carare and Tchaidze 2005), we use the lagged values of inflation, output gap, M2 growth, and the spread between the long-term bond rate and the short-term treasury bill rate. Because national central banks in some countries are likely to respond to changes in the U.S. interest rates, we also include lagged values of the Fed interest rate. To increase the performance of the model, we use lagged changes (rather than levels) of the inflation and the output gap (i.e. our independent variables) and add as an instrument the lagged change in the dependent variable (see Blundell and Bond 1998).

loss region is a likely indication of profit concerns. A central bank in the small-loss region could have made small losses go away. If it chose not to, it suggests that it does not face strong incentives to manage earnings. In addition, because the distribution of profits is not continuous, but instead looks manipulated, the inflation and interest rate results should *not* be interpreted as one would interpret a regression discontinuity. The results do not necessarily indicate that small profits cause lower interest rates and higher inflation rates. They indicate that central banks' discontinuous profit incentives at zero are not independent of their key monetary policy inputs and outputs.

We now explore reasons for why such profit concerns, may be related to lower interest rates and higher inflation rates. First, it is theoretically possible that frictions driving central banks discontinuous profit incentives at zero also distort their policies, creating a preference for lower interest rates at the cost of higher inflation rates. Interest rates set by the central bank can affect its earnings in a variety of ways. The most direct channel is interest paid on reserves, which directly affects earnings. A more nuanced channel is the revaluation of central banks' asset portfolio due to changes in interest rates. This channel would only apply to a specific subset of central banks that mark-to-market changes in asset values and report such revaluations as part of their income. (For example, the U.S. Federal Reserve's accounting system isolates the bank from this channel.) For banks subject to this channel, increases in interest rates would reduce the market value of the long-term bonds they hold, creating a preference to avoid or delay increases in interest rates.

If maintaining lower interest rates also causes higher inflation, this channel might be part of a joint explanation for both the inflation and interest-rate results. Under this explanation, higher inflation rates are the result (or side effect) of interest rate policies that the central bank took (or is expected to take), due to the same political pressures that led it to manage earnings. It should be noted, however, a 40-basis point change of policy rates would tend to cause greater than 0.3% change in asset values, which is the size of the profit bins we use. In other words, interest rates are probably too blunt a tool to fine-tune profits from small losses into small profits, even if the rate reduction was motivated by profitability concerns more broadly.

A more likely and benign explanation is that central banks' incentives (or ability) to manage earnings are stronger when inflation rates are higher or above their target or in situations where the macroeconomic environment warrants low interest rates. For example, high inflation, even if for no fault of the central bank, may bring about greater popular skepticism about the effectiveness of an independent central bank and its leaders. Reporting a loss in such a situation might bring unwanted attention. Interestingly, the converse logic would lead to the same empirical finding: being found managing earnings may decrease the credibility of the central bank, leading to reduced demand for its currency and higher inflation.

Importantly, what can *not* explain the interest rate and inflation rate results is the idea that central banks set lower interest rates in order to achieve higher inflation and thus increase seignorage revenues. As mentioned earlier, seigniorage is not reported as part of profits. Hence, central banks do not have incentives to generate inflation in order to inflate reported earnings.

In sum, we find evidence that the tendency to report small profits is systematically related to higher inflation rates and lower policy rates, which allows for a variety of interpretations. All of them suggest that agency problems in central banks are interrelated with their monetary policy choices and outcomes. We therefore find these links important to document, although we cannot pinpoint the precise channel or the direction of causality. Also, given the methodological difficulties and measurement errors associated with Taylor-rule type regressions aiming to capture the determinants of central banks' monetary policy rates (Cochrane 2011), the results should not be viewed as conclusive evidence of effects of political pressure on central bank policies. Further analysis, beyond the scope of this paper, is needed to understand whether agency problems and discontinuous profit incentives have a causal effect on central bank policies.

6. Conclusions

This paper provides empirical facts that inform a thus-far theoretical debate on whether central banks are entirely impervious to their profits, no matter the level, and a debate on how profit concerns may relate to optimal central bank design and monetary policy. We devise an empirical test of whether central banks have a preference for profits over losses. The key idea behind our test is that discontinuity in the profit distribution at zero is a natural consequence of central banks concerned with the sign of their profits and taking actions to avoid reporting losses.

We document the presence of such a discontinuity, as well as various factors that drive its significance and magnitude. We find that provisions are a significant tool, though not the only tool, central banks use to manage their reported earnings and avoid losses. We also find that measures of political and market pressure, central bankers' career concerns, and the ability to manage profits using accounting discretion are significant predictors of small profits versus losses.

These findings support the view that there are agency problems at central banks; such agency problems might manifest themselves also in other ways that are more important than converting small losses into small profits.

Indeed, profit concerns as revealed by reporting small profits as opposed to small losses are correlated with discontinuously higher inflation rates and lower interest rates, indicating that frictions driving central banks' preference for profits over losses are not independent of their policy choices and outcomes. However, these findings do not necessarily imply that profit concerns cause lower interest rates and higher inflation. Instead, the findings might perhaps indicate that the agency problems we document are more prevalent when high inflation is high or above target, or when macroeconomic conditions warrant lower interest rates.

Interpreting these facts literally within existing models might lead one to conclude that risks to monetary stability may be greater than is often assumed, especially in countries in which factors that generate central bank profit concerns are present. An extreme interpretation would be that especially amid large-scale asset repurchases and increased political pressure,[55] the risks of higher-than-desirable inflation may be more pronounced than generally assumed.

This interpretation should be put into perspective, however. Many central banks (e.g., the Bank of Japan) have long conducted monetary policy with large-scale asset purchases, and the apparent risks to monetary stability have not materialized until now. The central banks of Chile, Israel, and Slovakia have successfully operated with negative equity for a sustained period of time, which casts doubt on the influence balance sheet concerns have on the functioning of central banks.

That said, the facts we present about central banks' profit concerns are in important respects different from concerns about negative equity positions. Profit concerns may exist simply for political or "behavioral" reasons, such as the difficulty in communicating losses to the public, shareholders, or other constituents. As we document, many central banks seem to be exposed to sufficient political pressure and career concerns, such that incentives for profit considerations enter their decision-making. De jure independence and optimally designed dividend rules may not be sufficient to entirely shield central banks from political pressure.

Whereas we focused on profit patterns around zero to infer the influence of political pressure on central banks because small profits and losses provide measurable counterfactuals, central bank profit concerns are, if present, likely to be more general than a preference for the *sign* of profits. On the one hand, private benefits for central bankers and politicians might be greatest when the central bank maximizes the discounted stream of profits. However, the best strategy for a central bank to maintain independence might be to report small positive profits. Doing so might

[55] See *Fortune*, "Read the Full Cease-and-Desist Letter a Senior Congressman Just Sent to Janet Yellen," February 3, 2017, for recent developments in the United States.

help "keep the [central bank] out of the press, and the press out of the [central bank]" (Lambert 2005, 63) and may thus attenuate the government's attention to a potential source of revenue that could be accessed either by changing the central banks' dividend rules or their rules on reserve requirements.[56] An outright nationalization of the central bank, as proposed by Italy's "Five Star" movement, is a less subtle but (in the short term) no less effective way for the government to seize central bank profits.[57] Similarly, losses—even when fully justified—may just give governments the excuse and leverage needed to take control of the central bank finances and end policy independence. Small positive profits might therefore be the globally optimal choice of profit levels for a central bank that seeks to maintain its independence.

To some, the results presented in this paper substantiate a concern about calls for legislation that would require the Fed to propose a Taylor-like rule and explain any deviations from it.[58] For the same reason that central banks do not like to report losses and may be willing to distort policy choices to avoid this outcome as per our results, one may fear that central bankers may also be reluctant to deviate too far from an announced monetary policy rule, even when economic conditions warrant the deviation. If so, a rule that aims to promote transparency could end up distorting policy decisions.

Lastly, based on our results and the above considerations, one might conclude that devising accounting rules that allow central banks to avoid the disclosure of losses could enable central banks to steer clear of political pressures that may otherwise influence their policy-making.

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[56] Changes to the latter were the method by which the US Congress effectuated multiple payouts from the Federal Reserve in recent years. See Binder and Spindel (2017) on the 2015 incident.

[57] See https://www.corriere.it/elezioni-2018/notizie/commissione-banche-tutte-strane-richieste-partiti-aada926c-007d-11e8-9961-f20884a97d4b.shtml.

[58] Todd Keister contributed this insight.

References

Adler, G., P. Castro, and C. E. Tovar. 2012. Does central bank capital matter for monetary policy? IMF Working Paper, IMF.

Archer, D., and P. Moser-Boehm. 2013. Central bank finances. BIS Papers No 71, Bank for International Settlements.

Bade, R., and M. Parkin. 1987. *Central bank laws and monetary policy*: Department of Economics, University of Western Ontario.

Banian, K., L. Laney, and T. Willett. 1983. Central bank independence: An international comparison. *Economic Review Federal Reserve Bank of Dallas* 13 (March):199-217.

Barreca, A. I., M. Guldi, J. M. Lindo, and G. R. Waddell. 2014. Saving Babies? Revisiting the effect of very low birth weight classification. *The Quarterly Journal of Economics* 126 (4):2117-2123.

Barth, M. E., W. R. Landsman, and M. H. Lang. 2008. International accounting standards and accounting quality. *Journal of Accounting Research* 46 (3):467-498.

Beck, T., G. Clarke, A. Groff, P. Keefer, and P. Walsh. 2001. New tools in comparative political economy: the database of political institutions. *World Bank Economic Review* 15 (1):165-176.

Benecká, S., T. Holub, N. L. Kadlčáková, and I. Kubicová. 2012. Does central bank financial strength matter for inflation? An empirical analysis. CNB Working Paper, Czech National Bank.

Benigno, P. 2017. A central bank theory of price level determination. CEPR Discussion Paper DP 11966.

Benigno, P., and S. Nisticò. 2018. Non-neutrality of open-market operations. CEPR Discussion Papers 10594, LUISS Guido Carli.

Bennett, B., J. C. Bettis, R. Gopalan, and T. Milbourn. 2017. Compensation goals and firm performance. *Journal of Financial Economics* 124 (2):307-330.

Bergstresser, D. B., M. A. Desai, and J. Rauh. 2006. Earnings manipulation, pension assumptions, and managerial investment decisions. *Quarterly Journal of Economics* 121 (1):157-195.

Berriel, T. C., and S. Bhattarai. 2009. Monetary policy and central bank balance sheet concerns. *The B.E. Journal of Macroeconomics* 9 (1):1935-1690.

Bhattarai, S., G. B. Eggertsson, and B. Gafarov. 2015. Time consistency and the duration of government debt: a signalling theory of quantitative easing. NBER Working Paper No. w21336, Pennsylvania State University.

Bhojraj, S., P. Hribar, M. Picconi, and J. McInnis. 2009. Making sense of cents: an examination of firms that marginally miss or beat analyst forecasts. *The Journal of Finance* 64 (5):2361-2388.

Binder, S., and M. Spindel. 2017. *The myth of independence: how congress governs the Federal Reserve*. Princeton, NJ: Princeton University Press.

Blundell, R., and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87 (1):115-143.

Bollen, N. P. B., and V. K. Pool. 2009. Do hedge fund managers misreport returns? Evidence from the pooled distribution. *The Journal of Finance* 64 (5):2257-2288.

Burgstahler, D., and I. Dichev. 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics* 24 (1):99-126.

Burgstahler, D., C. Leuz, and L. Hail. 2006. The importance of reporting incentives: earnings management in European private and public firms. *The Accounting Review* 81 (5):983-1016.

Carare, A., and R. Tchaidze. 2005. The use and abuse of Taylor rules: how precisely can we estimate them? Working paper 05/148, IMF.

Chadha, J. S., L. Sarno, and G. Valente. 2004. Monetary policy rules, asset prices, and exchange rates. *IMF Staff Papers* 51 (3):529-552.

Christensen, J. H. E., J. A. Lopez, and G. D. Rudebusch. 2015. A probability-based stress test of Federal Reserve assets and income. *Journal of Monetary Economics* 73:26-43.

Clarida, R., J. Galí, and M. Gertler. 1998. Monetary policy rules in practice: Some international evidence. *European Economic Review* 42 (6):1033-1067.

Cochrane, J. H. 2011. Determinacy and identification with Taylor rules. *Journal of Political Economy* 119 (3):565-615.

Coppens, L., and E. Peek. 2005. An analysis of earnings management by European private firms. *Journal of International Accounting, Auditing and Taxation* 14 (1):1-17.

Darvas, Z. 2012. Real effective exchange rates for 178 countries: a new database. Working Paper 2012/06, Bruegel.

Del Negro, M., and C. A. Sims. 2015. When does a central bank′s balance sheet require fiscal support? *Journal of Monetary Economics* 73:1-19.

Dichev, I. D., and D. J. Skinner. 2002. Large-sample evidence on the debt covenant hypothesis. *Journal of Accounting Research* 40:1091-1123.

Dincer, N. N., and B. Eichengreen. 2014. Central bank transparency and independence: updates and new measures. *International Journal of Central Banking* 11 (March):189-253.

Dreher, A., J.-E. Sturm, and J. de Haan. 2008. Does high inflation cause central bankers to lose their job? Evidence based on a new data set. *European Journal of Political Economy* 24 (4):778-787.

Durtschi, C., and P. Easton. 2005. Earnings management? The shapes of the frequency distributions of earnings metrics are not evidence ipso facto. *Journal of Accounting Research* 43 (4):557-592.

———. 2009. Earnings management? Erroneous inferences based on earnings frequency distributions. *Journal of Accounting Research* 47 (5):1249-1281.

Friedman, M., and A. Schwartz. 1963. *A monetary history of the United States, 1867–1960*: NBER Publications, Princeton University Press.

Garmaise, M. J. 2015. Borrower misreporting and loan performance. *The Journal of Finance* 70 (1):449-484.

Goodhart, C., and R. Lastra. 2018. Populism and central bank independence. *Open Economies Review* 29 (1):49-68.

Graham, J. R., C. R. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40 (1-3):3-73.

Hall, R. E., and R. Reis. 2015. Maintaining central-bank financial stability under new-style central banking. Working paper, Stanford University.

Hansen, L. P. 1982. Large sample properties of generalized method of moments estimators. *Econometrica* 50 (4):1029-1054.

Healy, P. M., and J. M. Wahlen. 1999. A review of the earnings management literature and its implications for standard setting. *Accounting Horizons* 13 (4):365-383.

Hein, S. E., and P. Westfall. 2004. Improving tests of abnormal returns by bootstrapping the multivariate regression model with event parameters. *Journal of Financial Econometrics* (2):451-471.

Hodrick, R. J., and E. C. Prescott. 1997. Postwar U.S. business cycles: an empirical investigation. *Journal of Money, Credit and Banking* 29 (1):1-16.

Jeanne, O., and L. E. O. Svensson. 2007. Credible commitment to optimal escape from a liquidity trap: the role of the balance sheet of an independent central bank. *American Economic Review* 97 (1):474-490.

Jensen, M. C. 1986. Agency cost of free cash flow, corporate finance, and the market for takeovers. *American Economic Review* 76 (2):323-329.

Kaufmann, D., A. Kraay, and M. Mastruzzi. 2010. The Worldwide Governance Indicators: methodology and analytical issues. World Bank Policy Research Working Paper No. 5430.

Klein, M. W., and J. C. Shambaugh. 2008. The dynamics of exchange rate regimes: fixes, floats, and flips. *Journal of International Economics* 75 (1):70-92.

Klüh, U., and P. Stella. 2008. Central bank financial strength and policy performance: an econometric evaluation. IMF Working Paper, IMF.

KPMG. 2012. Current trends in central bank financial reporting practices. KPMG's Central Bank Network Advisory Group.

Laeven, L., and F. Valencia. 2012. Systemic banking crises database: an update. IMF Working Paper, IMF.

Lambert, R. 2005. Inside the MPC. Bank of England Quarterly Bulletin, Bank of England.

Lee, D. S., and T. Lemieux. 2010. Regression discontinuity designs in economics. *Journal of Economic Literature* 48 (2):281-355.

Leuz, C., D. Nanda, and P. D. Wysocki. 2003. Earnings management and investor protection: an international comparison. *Journal of Financial Economics* 69 (3):505-527.

Liebman, J. B., and N. Mahoney. 2017. Do expiring budgets lead to wasteful year-end spending? Evidence from federal procurement. *American Economic Review* 107 (11):3510-3549.

McCrary, J. 2008. Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics* 142 (2):698-714.

Mendes, A. G., and T. C. Berriel. 2015. Central bank balance sheet, liquidity trap, and quantitative easing. Working paper, PUC-Rio.

Orphanides, A. 2001. Monetary policy rules based on real-time data. *American Economic Review* 91 (4):964-985.

Pierce, L., and J. A. Snyder. 2012. Discretion and manipulation by experts: Evidence from a vehicle emissions policy change. In *The B.E. Journal of Economic Analysis & Policy*, 1935-1682.

Pope, D., and U. Simonsohn. 2011. Round numbers as goals: Evidence from baseball, SAT takers, and the lab. *Psychological Science* 22 (1):71-79.

Reis, R. 2013. The mystique surrounding the central bank's balance sheet, applied to the European crisis. *American Economic Review* 103 (3):135-140.

———. 2015. Comment on: "When does a central bank's balance sheet require fiscal support?" by Marco Del Negro and Christopher A. Sims. *Journal of Monetary Economics* 73:20-25.

———. 2016. QE in the future: the central bank's balance sheet in a fiscal crisis. Working paper, London School of Economics.

Rudebusch, G. D. 2002. Term structure evidence on interest rate smoothing and monetary policy inertia. *Journal of Monetary Economics* 49 (6):1161-1187.

Saez, E. 2010. Do taxpayers bunch at kink points? *American Economic Journal: Economic Policy* 2 (3):180-212.

Scott, D. W. 1992. *Multivariate density estimation: theory, practice, and visualization*. New York, NY: John Wiley & Sons, Inc.

Sims, C. A., ed. 2005. *Limits to inflation targeting*. edited by B. S. Bernanke and M. Woodford. Vol. 32.

Sloan, R. G. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71 (3):289-315.

Stein, J. C. 1989. Efficient capital markets, inefficient firms: a model of myopic corporate behavior. *The Quarterly Journal of Economics* 104 (4):655-669.

Stella, P. 2008. Central bank financial strength, policy constraints and inflation. IMF Working Paper, IMF.

Urquiola, M., and E. Verhoogen. 2009. Class-size caps, sorting, and the regression-discontinuity design. *American Economic Review* 99 (1):179-215.

Walsh, C. E. 2005. Central bank independence. In: The New Palgrave Dictionary of Economics, Macmillan Publishers Ltd (Ed.).

Appendix: Variable definitions and sources

Variable name	Definitions and data sources
ROA	Net income of a central bank *i* in year *t* divided by its average total assets. The data are from Bankscope.
Profit or $I_{i,t}$	An indicator variable that equals 1 if ROA of central bank *i* in year $t \geq 0$, and 0 otherwise.
Central bank governor re-appointable	An indicator variable that equals 1 if a central bank governor is re-appointable, and 0 otherwise. The country is deemed to allow the reappointment of a central bank governor if at least one central bank governor served more than one legal term during the sample period. The data on central bank governors' time in office are from Dreher et al. (2008).
Extreme party affiliation (left or right)	An indicator variable that equals 1 if a country's chief executive is affiliated with the nationalist party, and 0 otherwise. The data are from (Beck et al. 2001) and are available for years 1992-2012.
Publicly traded	An indicator variable that equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. The data are from Bankscope.
Right-wing party affiliation	An indicator that equals 1 if the country's chief executive is affiliated with the right-leaning party (conservative, Christian democratic, or right-wing), and 0 if the country's chief executive is affiliated with the left-leaning party (communist, socialist, social democratic, or left-wing). The data are from Beck et al. (2001) and are available for years 1992-2012.
Right-leaning party affiliation	An indicator that equals 1 if the country's chief executive is affiliated with the right-leaning party (conservative, Christian democratic, or right-wing), and 0 otherwise. The data are from Beck et al. (2001) and are available for years 1992-2012.
Left-leaning party affiliation	An indicator that equals 1 if the country's chief executive is affiliated with the left-leaning party (communist, socialist, social democratic, or left-wing), and 0 otherwise. The data are from Beck et al. (2001) and are available for years 1992-2012.
Central bank operating expenses to government tax revenues	The ratio of central bank personnel expenses from Bankscope to the country's total tax revenues from World Bank.
Central bank total assets to GDP	The ratio of central bank total assets from Bankscope to the country's GDP from World Bank.

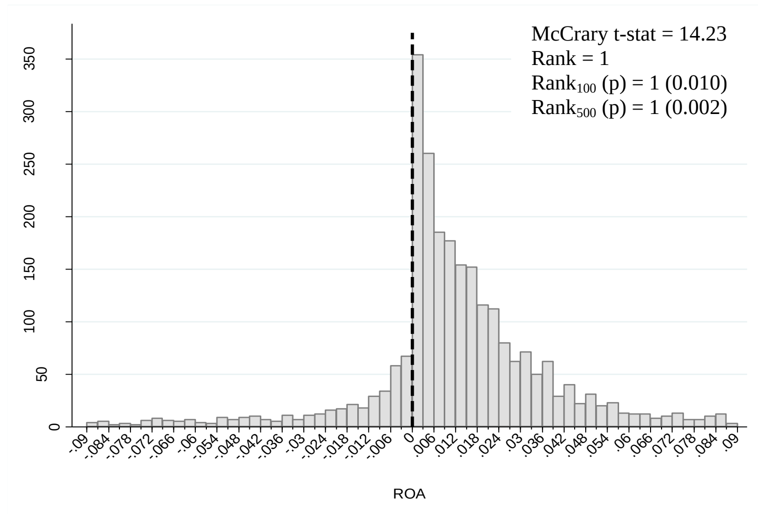
Central bank de jure independence	An index of central bank independence (CBIW) from (Dincer and Eichengreen 2014). The index scores answers to 24 questions covering different aspects of central bank legal independence (incl. policy choice, objectives, and governance structures). The index has a theoretical range from 0 to 1 with higher values indicating more independent central banks. The index is available for years 1998-2010. We use the value of the index in 1998 for the time period between 1994 and 1997. We assign values of the index from 2010 for years 2011-2014. All central banks in Eurozone countries receive the same score.
Central bank has positive equity	An indicator variable that equals 1 if the central bank's equity at the beginning of year t is positive, and 0 otherwise. The data are from Bankscope.
High dividend payout ratios	An indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greater or equal to 50% or when a central bank pays dividends despite incurring a loss. The indicator variable equals 0 if the central bank dividend payout ratio is less than 50% or when a central bank receives dividends from the government. The data are from Bankscope.
Dividend distribution rules	An indicator variable that equals 1 for central banks with the "hard" budget constrain, and 0 for central banks with the "soft" budget constrain. The assignment into "hard" and "soft" budget constraints is based on the classification of central bank dividend rules for 30 countries in Archer and Moser-Boehm (2013, Annex 2). Central banks classified as having a "soft" budget constrain can draw on external resources to cover losses or are allowed to reduce dividend payments to cover future or past losses (Chile, Czech Republic, Finland, Iceland, India, Israel, Germany, Korea, Malaysia, Mexico, Netherlands, Peru, Poland, Philippines, Thailand, Turkey, Singapore, Slovakia, South Africa, Spain, Switzerland, Sweden, and the United States). Central banks classified as having a "hard" budget constrain are either substantially limited in the amount of profits they can retain or their dividend distribution decisions are taken jointly with the government (Australia, Canada, Denmark, Japan, New Zealand, and the UK).
Rule of law	Rule of law captures the extent to which economic agents have trust in and abide by legal institutions, such as contract enforcement, property rights, and the courts. The index is expressed in standard normal units, ranging from approximately -2.5 to 2.5. Higher values indicate greater rule of law. We use the world-average value (index = 0) for our sample splits. In the analysis of incentives for loss avoidance, the variable is converted into an indicator that equals 1 if the index takes a negative value, and 0 otherwise. The data are from Worldwide Governance Indicators (see Kaufmann et al. 2010).

Government effectiveness	The government-effectiveness index captures the quality of public services and the degree of its independence from political influence. The index is expressed in standard normal units, ranging from approximately -2.5 to 2.5. Higher values indicate greater government effectiveness. We use the world-average value (index = 0) for our sample splits. The data are from Worldwide Governance Indicators (see Kaufmann et al. 2010).
Control of corruption	Control of corruption captures perceptions of the use of power by political elites for private gain. The index is expressed in standard normal units, ranging from approximately -2.5 to 2.5. Higher values indicate greater control of corruption. We use the world-average value (index = 0) for our sample splits. The data are from Worldwide Governance Indicators (see Kaufmann et al. 2010).
Local accounting standards	An indicator variable that equals 1 if a central bank prepares financial statements in accordance with local standards, and 0 if it follows IFRS. The data are from Bankscope.
Exchange-rate peg	An indicator variable that equals 1 if a country has an exchange-rate peg based on classification of Klein and Shambaugh (2008), and 0 otherwise. The data are from Klein and Shambaugh (2008) and are available for all the years in our sample period.
Do not incur interest on reserve	An indicator variable that equals 1 if the central bank interest expense from Bankscope equals zero, and 0 otherwise.
ROA volatility	A standard deviation of central bank *i*'s ROA over the sample period. The data are from Bankscope.
Crisis	An indicator for countries and years that experience a systemic banking crisis, currency crisis, or sovereign debt crisis (due to default or restructuring). The data are from Laeven and Valencia (2012).
Inflation	The country rate of consumer price inflation in a given year. The data are from World Bank.
Inflation less target	The country rate of consumer price inflation in a given year less the central bank inflation target for that year. The data on inflation targets are from Siklos (2017).
Inflation surprises	The difference between a country's consumer price inflation at the end of the year relative to the IMF's inflation forecasts in the World Economic Outlook in April of the same year.
Growth rate of nominal GDP	The percentage change in nominal GDP based on the data from World Bank.
Low-income countries	An indicator variable that equals 1 if a country is a low-income economy in a given year, and 0 otherwise. Low-income economies are defined based on GNI per-capita threshold of less than $12,475 (see World Bank).

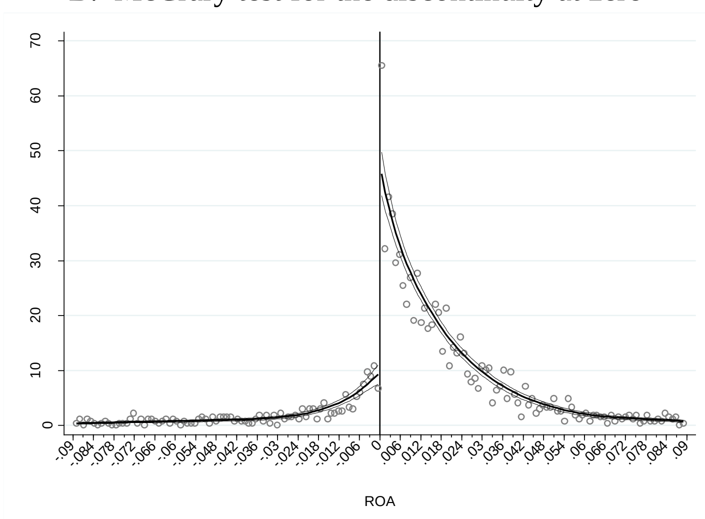
Interest $rate_{i,t}$	In the forward-looking Taylor rule, the short-term Treasury-bill interest rate in country i at the beginning of year t. The data are from International Financial Statistics (IFS), IMF.
Output $gap_{i,t+1}$	In the forward-looking Taylor rule, the output gap of country i between period t and $t+1$, calculated as the difference between the actual GDP and the predicted GDP based on the Hodrick and Prescott (1997) filter.
Real effective exchange $rate_{i,t}$	In the forward-looking Taylor rule, the real effective exchange rate of the country i during period t based on the data from Darvas (2012).

Figure 1: Distribution of central bank profits and McCrary (2008) test for discontinuity at zero

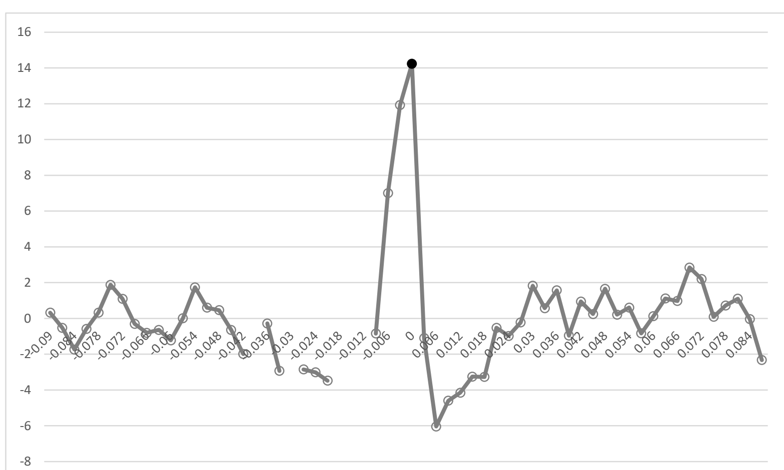
A. Distribution of central bank profits



B. McCrary test for the discontinuity at zero

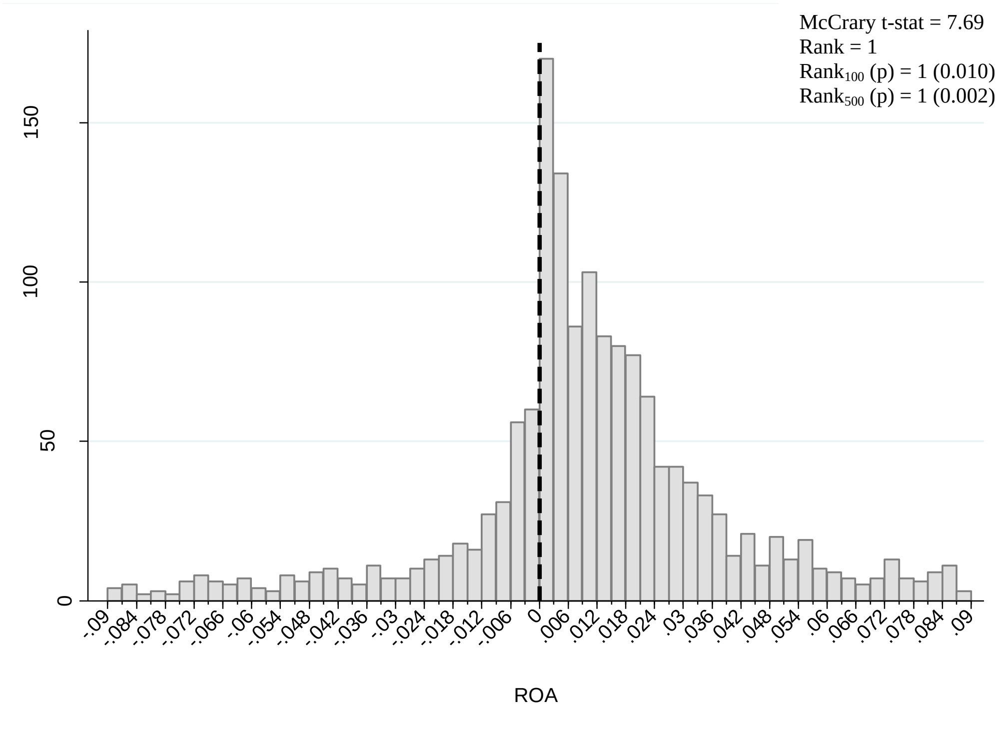


C. Values of the McCrary t-statistic for different thresholds



Notes: This figure plots the distribution of central bank profits over years 1992-2014 (N = 2,591). ROA is defined as central bank net income divided by average total assets. The distribution of ROA is trimmed at [-0.09; 0.09]. Panel A reports the histogram of ROA. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The McCrary t-test, reported in the upper right corner of the histogram, examines whether the discontinuity at zero is significant. "Rank" refers to the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for the 59 other thresholds reported in the figure (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087; see Panel C). $Rank_{100}$ ($Rank_{500}$) is the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding 0. The respective percentile ranks (p) are reported in brackets. Panel B shows the estimated density function around the zero-profit threshold and its upper and lower confidence intervals. Panel C plots the values of the McCrary t-statistic for 60 thresholds; the black circle indicates the value of the McCrary t-statistic for the zero-profit threshold.

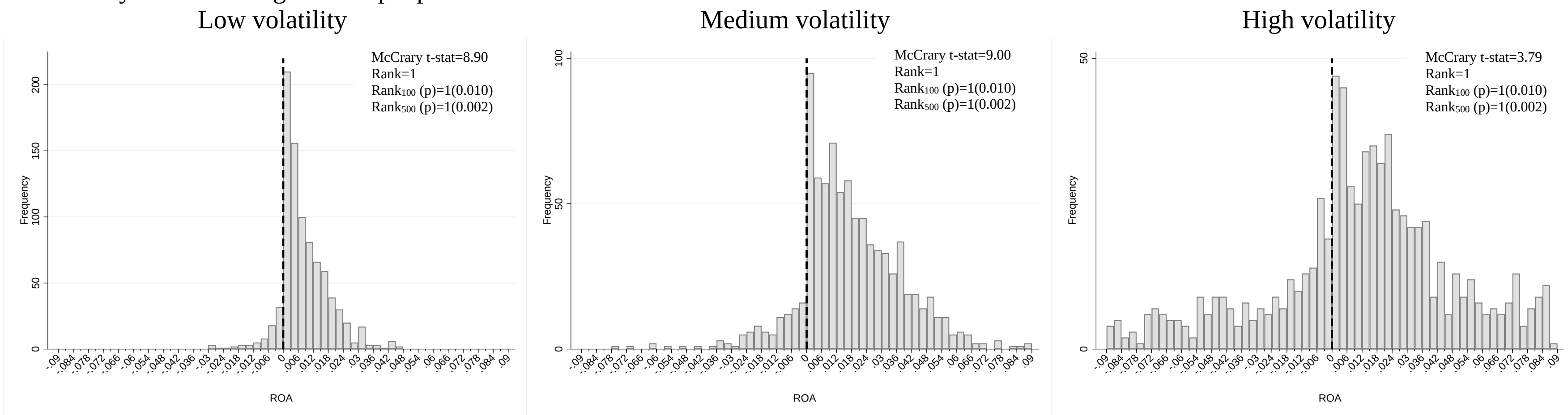
Figure 2: Distribution of central bank profits for central banks that incur losses



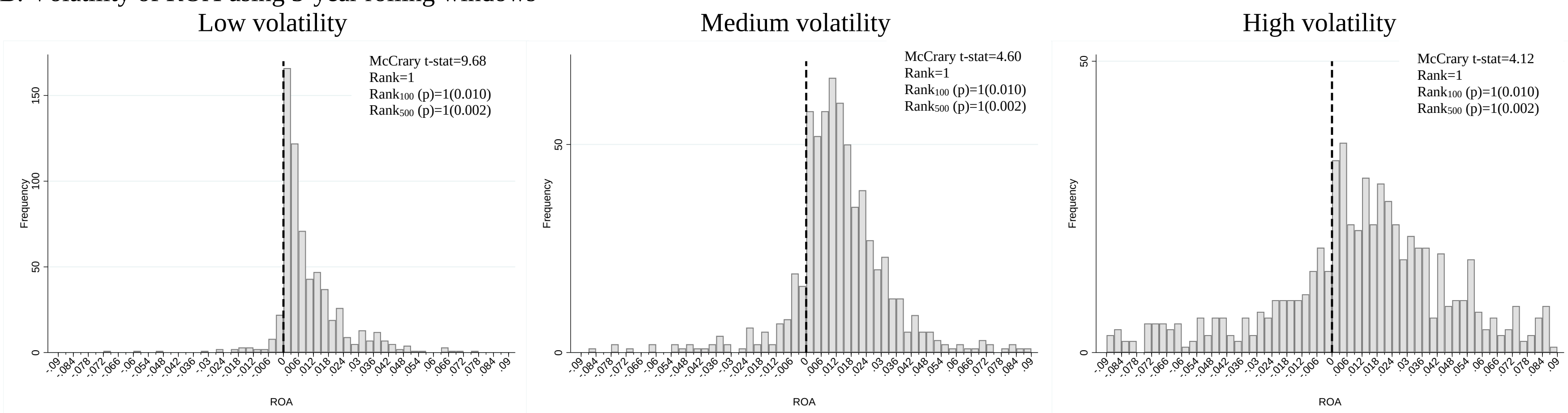
Notes: This figure plots the histogram of central bank profits for central banks that report a loss at least once during the sample period and have at least 10 observations during the sample period. ROA is defined as central bank net income divided by average total assets. The distribution of ROA is 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. The McCrary t-test, reported in the upper right corner of the histogram, examines whether the discontinuity at zero is significant. "Rank" refers to the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for the 59 other thresholds reported in the figure (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087). $Rank_{100}$ ($Rank_{500}$) is the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding 0. The respective percentile ranks (p) are reported in brackets.

Figure 3: Distribution of central bank profits for central banks with low, medium, and high income volatility

A. Volatility of ROA using full sample period



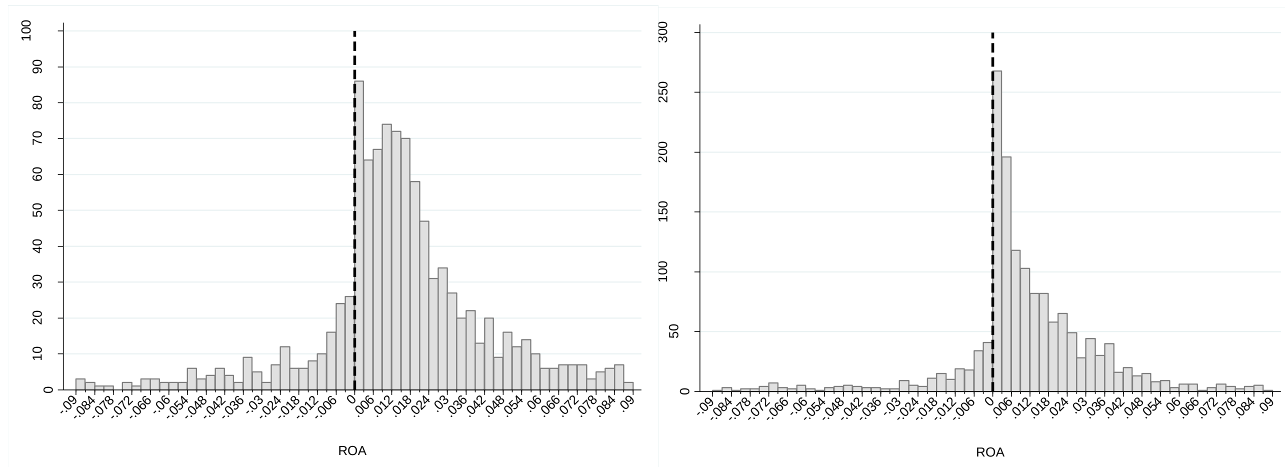
B. Volatility of ROA using 3-year rolling windows



Notes: This figure plots the histograms of central bank profits (ROA) using tertile splits based on central bank income volatility (standard deviation of ROA), which is calculated for each central bank over the entire sample period (Panel A) or over 3-year rolling windows (Panel B). The distribution of ROA in all the graphs 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. The McCrary t-test, reported in the upper right corner of the histogram, examines whether the discontinuity at zero is significant. "Rank" refers to the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for the 59 other thresholds reported in the figure (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087). Rank_{100} (Rank_{500}) is the rank of the McCrary t-statistic at the zero-profit threshold relative to McCrary t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding 0. The respective percentile ranks (p) are reported in brackets.

Figure 4: Distribution of central bank profits and accounting standards

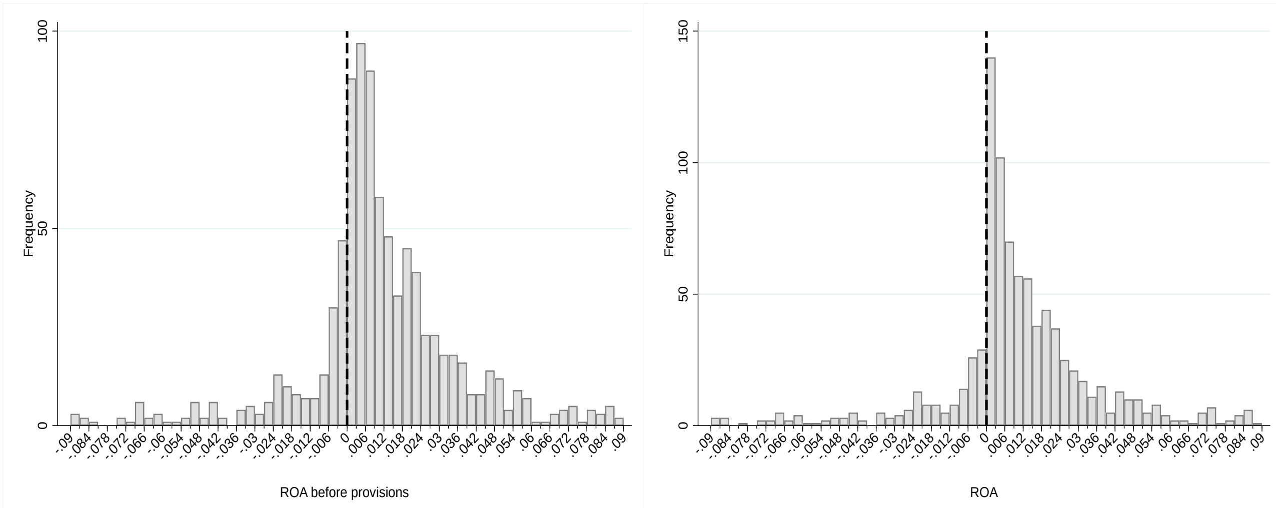
IFRS | Local standards



OLS regression for zero-profit threshold			Simulated estimates for placebo thresholds						
N	Constant	Coefficient	Mean constant	Mean coefficient	Rank of the test t-stat.	Rank (100)	Percentile rank (100)	Rank (500)	Percentile rank (500)
421	0.768***	0.099**	0.487	0.007	2	3	0.030	10	0.020
	(0.040)	(0.044)	(0.017)	(0.024)					

Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on accounting standards. The left (right) plot is for central banks that use International Financial Reporting Standards, IFRS (local accounting standards). 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. The table below the histograms reports results of the OLS regression using a symmetric window around the zero-profit threshold, [-0.003; 0.003). The dependent variable equals 1 if central bank i in period t reports an ROA in the [0, 0.003) interval, and 0 if it reports an ROA in the [-0.003; 0) interval. The independent variable (Local accounting standards) equals 1 if central bank i in period t uses local accounting standards, and 0 if it follows IFRS. Robust standard errors are reported in parentheses. The mean simulated coefficients for placebo thresholds are obtained using the same regression model estimated using the other 57 thresholds in the figure excluding the [-0.003; 0.003) region (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087). The dependent variable here equals 1 if central bank i in period t reports an ROA in the [x^s, x^s+0.003) interval, and 0 if it reports an ROA in the [x^s-0.003; x^s) interval. The standard errors reported in brackets below simulated coefficients are based on the cross-section of estimated coefficients at placebo thresholds. "Rank of the test t-stat." refers to the rank of the t-statistic for the slope coefficient at the zero-profit threshold relative to t-statistics for the other 57 thresholds. Rank and percentile rank 100 (500) is the rank and the percentile rank of the t-statistic at the zero-profit threshold relative to t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding the [-0.003; 0.003) region. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Figure 5: Distribution of profits before and after general risk and loan loss provisions

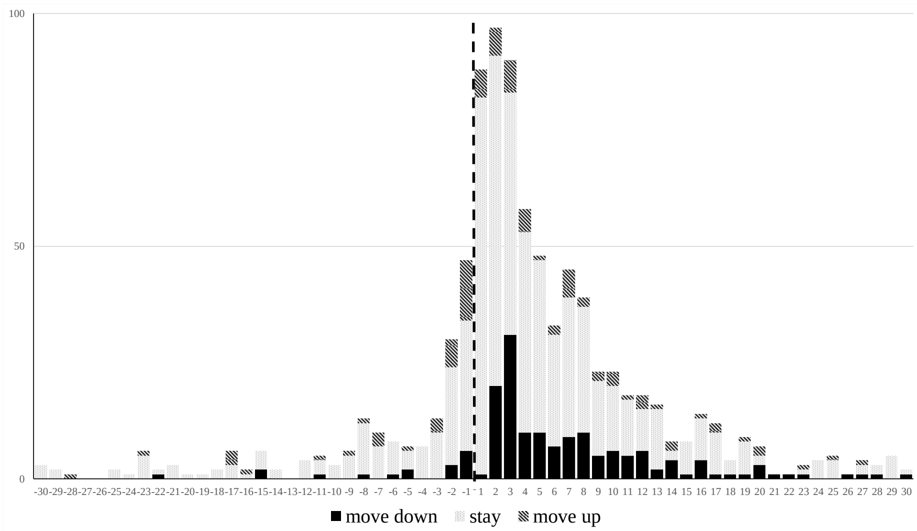


OLS regression at zero-profit threshold			Simulated estimates for placebo thresholds						
N	Constant	Coefficient	Mean constant	Mean coefficient	Rank of the test t-stat.	Rank (100)	Percentile rank (100)	Rank (500)	Percentile rank (500)
304	0.652***	0.177***	0.483	-0.001	1	1	0.010	1	0.002
	(15.846)	(3.504)	(0.025)	(0.019)					

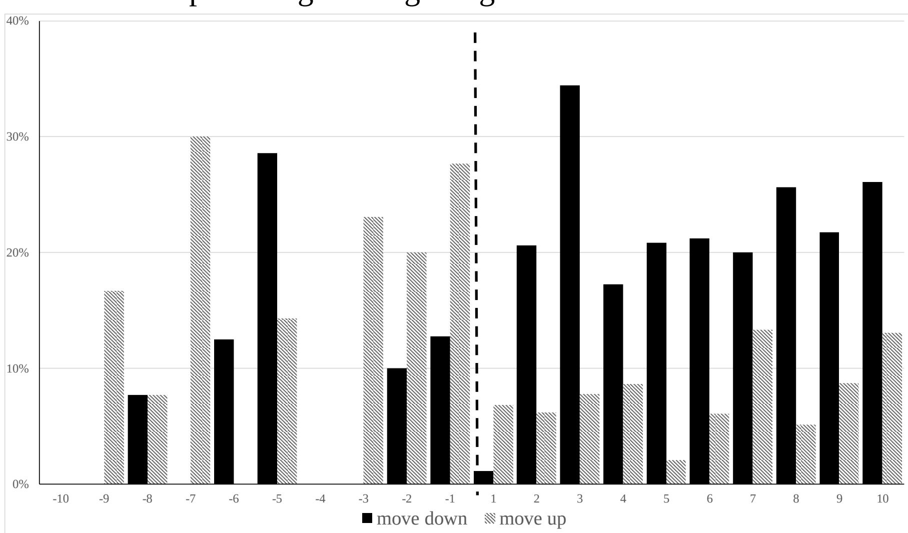
Notes: This figure plots the histogram of central bank profits before (left histogram) and after (right histogram) provisions using hand-collected data on general risk and loan loss provisions. ROA is defined as central bank net income (before or after provisions) divided by average total assets. The 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. The table below the histograms reports results of the OLS regression using a symmetric window around the zero-profit threshold, [-0.003; 0.003). The dependent variable equals 1 if central bank i in period t reports profits in the [0, 0.003) interval, and 0 if it reports profits in the [-0.003; 0) interval. The independent variable (After-provision profits) equals 1 for after-provision profits, and 0 for pre-provision profits. Robust standard errors are reported in parentheses. The mean simulated coefficients for placebo thresholds are obtained using the same regression model estimated using the other 57 thresholds in the figure excluding the [-0.003; 0.003) region (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087). The dependent variable here equals 1 if central bank i in period t reports profits in the [x^s, x^s+0.003) interval, and 0 if it reports profits in the [x^s-0.003; x^s) interval. The standard errors reported in brackets below simulated coefficients are based on the cross-section of estimated coefficients at placebo thresholds. “Rank of the test t-stat.” refers to the rank of the t-statistic for the slope coefficient at the zero-profit threshold relative to t-statistics for the other 57 thresholds. Rank and percentile rank 100 (500) is the rank and the percentile rank of the t-statistic at the zero-profit threshold relative to t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding the [-0.003; 0.003) region. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Figure 6: Migration of observations after accounting for provisions

A. Distribution of profits before provisions



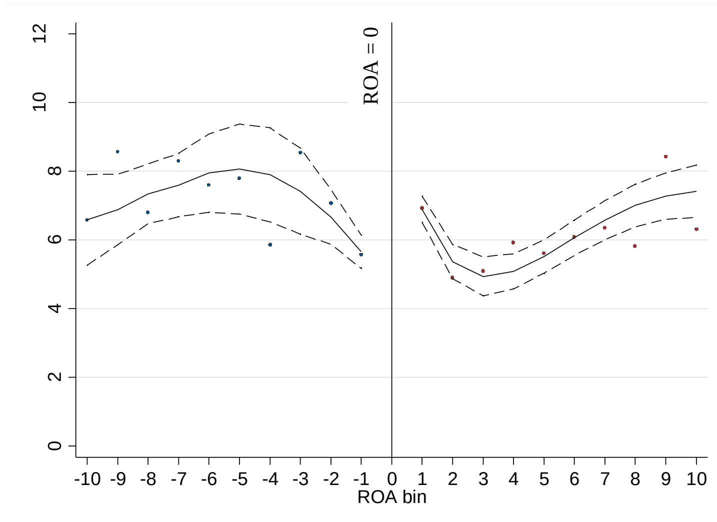
B. The percentage of migrating observations for each bin



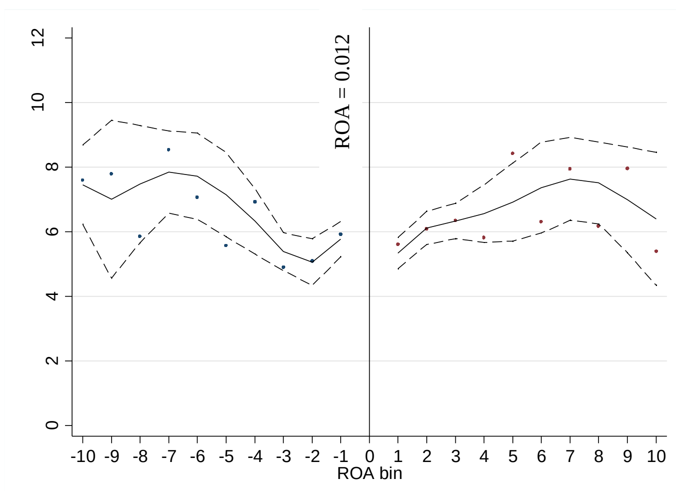
Notes: Panel A uses the histogram of profits before provisions (see Figure 5) and reports for each bin the number of observations in that bin that moves after accounting for provisions to a "higher" bin (i.e. higher level of after-provision profits; shown in black), moves to a "lower" bin (black stripes), or stays in the same bin (light grey). The bins are counted starting from zero and the bin width is the same as in Figure 5, e.g., bin=1 corresponds to ROA before provisions interval [0, 0.003). The number of observations falling into each bin is reported on the vertical axis. The dotted vertical line shows when ROA before provisions equals zero. Panel B reports for the 10 bins to the left and to the right of zero the percentage of observations in each bin that moves to a higher or a lower bin after accounting for provisions.

Figure 7: Predicted inflation rates from polynomial regression

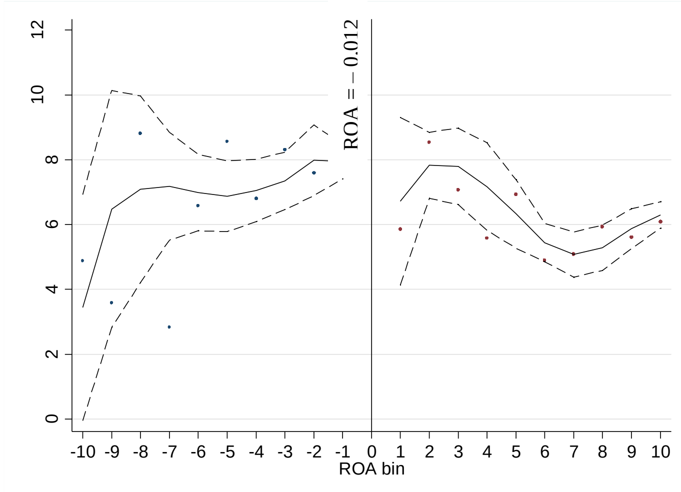
Panel A. Predicted inflation rates at zero-profit threshold ROA=0



Panel B. Predicted inflation rates at placebo threshold ROA=0.012



Panel C. Predicted inflation rates at placebo threshold ROA=-0.012



Notes: The figure plots predicted inflation rates from the polynomial regression reported in column (1) of Table 5. The vertical axis shows inflation rates. The horizontal axis shows the intervals of the ROA distribution. The dots show the mean inflation rates for each ROA interval. The solid line shows the mean predicted inflation rates, and the dotted lines show the 95% confidence interval for predicted values. The vertical line in the middle of each plot shows the profit threshold, which equals ROA=0 in Panel A, ROA=0.012 in Panel B, ROA=-0.012 in Panel C. The ROA bins are counted starting from the threshold and the bin width is the same as in Figure 1, e.g., bin=1 in Panel A corresponds to ROA interval [0, 0.003) and bin=1 in Panel B corresponds to ROA interval [0.012, 0.015).

Table 1: Sample composition by country

Country/Region	First	Obs.	Small profit or small loss	Small profit	Loss	Country/Region	First	Obs.	Small profit or small loss	Small profit	Loss	Country/Region	First	Obs.	Small profit or small loss	Small profit	Loss
Afghanistan	2011	4	0%	0%	25%	Guinea	1996	5	100%	80%	20%	Pakistan	1995	21	5%	5%	0%
Albania	1998	17	0%	0%	6%	Guyana	1995	20	25%	25%	10%	Palestine	2007	7	29%	29%	0%
Angola	1996	14	7%	7%	36%	Haiti	1998	12	50%	50%	25%	Paraguay	2003	6	0%	0%	100%
Argentina	1998	16	0%	0%	6%	Honduras	2006	3	0%	0%	33%	Peru	1994	21	43%	29%	29%
Armenia	1995	18	6%	6%	33%	Hong Kong	1999	28	7%	4%	21%	Philippines	1996	21	19%	14%	38%
Aruba	1994	21	24%	24%	0%	Hungary	1995	20	50%	40%	35%	Poland	1994	21	14%	14%	5%
Australia	1995	21	5%	5%	14%	Iceland	1995	20	25%	15%	35%	Portugal	1993	22	68%	68%	0%
Austria	1993	22	32%	32%	0%	India	1994	22	0%	0%	0%	Qatar	2002	3	0%	0%	0%
Azerbaijan	2001	14	7%	0%	43%	Indonesia	1996	19	16%	5%	21%	Romania	1995	24	8%	8%	42%
Bahamas	1994	21	19%	14%	5%	Iran	1993	12	0%	0%	0%	Russia	1996	20	15%	15%	5%
Bahrain	1994	18	0%	0%	0%	Iraq	2011	4	5%	5%	25%	Rwanda	2002	14	7%	7%	7%
Bangladesh	2000	21	10%	10%	5%	Ireland	1993	22	42%	42%	0%	Saint Kitts & Nevis	1992	24	13%	8%	8%
Barbados	1993	21	43%	33%	19%	Israel	1994	21	10%	10%	57%	Samoa	2001	10	0%	0%	30%
Belarus	1997	17	18%	18%	18%	Italy	1994	21	62%	62%	0%	San Marino	1995	20	35%	35%	0%
Belgium	1994	21	24%	24%	0%	Jamaica	1993	22	9%	9%	41%	Saudi Arabia	1998	16	63%	63%	0%
Belize	1994	21	5%	5%	0%	Japan	1993	23	26%	26%	0%	Senegal	2006	1	100%	100%	0%
Bermuda	1993	22	5%	5%	18%	Jordan	1994	21	71%	38%	33%	Serbia	2001	14	0%	0%	21%
Bhutan	2007	7	14%	0%	29%	Kazakhstan	1998	16	6%	6%	6%	Seychelles	1995	15	0%	0%	13%
Bolivia	2000	15	40%	20%	20%	Kenya	1994	22	5%	5%	14%	Sierra Leone	1998	15	20%	13%	27%
Bosnia & Herzegovina	1999	16	0%	0%	0%	Korea	1995	20	10%	0%	20%	Singapore	1994	22	5%	5%	14%
Botswana	1994	21	5%	0%	19%	Kuwait	1994	22	18%	18%	0%	Slovakia	1994	22	9%	0%	45%
Brazil	1995	20	10%	5%	40%	Kyrgyzstan	2002	13	0%	0%	0%	Slovenia	1993	22	5%	5%	23%
Brunei Darussalam	2013	2	0%	0%	50%	Latvia	1993	22	14%	14%	0%	Solomon Islands	1993	21	5%	5%	38%
Bulgaria	1996	19	0%	0%	5%	Lebanon	2007	2	100%	100%	0%	South Africa	1994	37	30%	14%	27%
Burundi	1994	12	0%	0%	8%	Lesotho	1996	18	11%	11%	11%	Spain	1994	21	0%	0%	0%
Canada	1994	21	0%	0%	0%	Liberia	2006	4	0%	0%	25%	Sri Lanka	1996	19	0%	0%	21%
Cape Verde	2001	9	44%	33%	44%	Lithuania	1995	19	11%	11%	0%	Sudan	2000	9	22%	22%	0%
Cayman Islands	2002	5	40%	40%	0%	Luxembourg	1995	20	80%	80%	5%	Swaziland	1994	22	14%	14%	14%
Chile	1994	20	10%	5%	60%	Macao	1996	19	0%	0%	0%	Sweden	1994	21	10%	10%	19%
Colombia	1998	16	6%	6%	31%	Macedonia	2001	14	14%	7%	29%	Switzerland	1993	22	5%	5%	5%
Costa Rica	1993	22	14%	14%	82%	Madagascar	1996	18	22%	17%	61%	Taiwan	1996	19	0%	0%	0%
Croatia	1999	16	38%	38%	6%	Malawi	1994	23	9%	9%	43%	Tajikistan	2012	3	0%	0%	100%
Curacao	1995	16	0%	0%	0%	Malaysia	1995	19	16%	16%	0%	Tanzania	1993	22	14%	5%	18%
Cyprus	1992	23	26%	26%	0%	Maldives	2000	15	0%	0%	7%	Thailand	1993	22	9%	0%	64%
Czech Republic	1994	21	10%	10%	43%	Malta	1992	23	0%	0%	0%	Timor-Leste	2011	1	100%	100%	0%
Denmark	1993	22	0%	0%	9%	Mauritania	2005	3	0%	0%	0%	Tonga	2004	7	0%	0%	0%
Djibouti	2010	5	40%	0%	40%	Mauritius	1992	24	0%	0%	17%	Trinidad & Tobago	1994	21	5%	5%	0%
Dominican Republic	2003	11	0%	0%	100%	Mexico	1996	9	11%	0%	44%	Tunisia	1995	18	0%	0%	0%
Ecuador	2005	6	17%	0%	33%	Moldova	1999	16	0%	0%	25%	Turkey	1994	27	15%	7%	26%
Egypt	2013	3	0%	0%	0%	Mongolia	1997	18	6%	0%	44%	Uganda	2000	16	13%	6%	44%
El Salvador	1993	21	76%	76%	0%	Montenegro	2005	7	29%	29%	0%	Ukraine	1997	16	13%	13%	0%
Estonia	1993	22	5%	0%	14%	Morocco	1994	21	0%	0%	0%	United Arab Emirates	1993	22	0%	0%	0%
Ethiopia	1995	9	0%	0%	0%	Mozambique	1997	17	76%	76%	0%	United Kingdom	1998	18	50%	50%	0%
Fiji	1995	20	0%	0%	0%	Namibia	1999	16	6%	6%	13%	United States	2010	10	0%	0%	20%
Finland	1994	22	32%	32%	0%	Nepal	1997	13	0%	0%	23%	Uruguay	2000	14	14%	7%	57%
France	1993	25	36%	32%	4%	Netherlands	1993	22	0%	0%	0%	Uzbekistan	2003	4	25%	25%	0%
Gambia	1995	10	20%	10%	50%	New Guinea	1996	16	0%	0%	31%	Vanuatu	2003	5	0%	0%	0%
Georgia	1999	16	6%	6%	6%	New Zealand	1995	20	5%	5%	5%	Venezuela	2006	6	100%	100%	0%
Germany	1994	21	19%	19%	0%	Nicaragua	1993	20	25%	10%	40%	Yemen	2000	15	0%	0%	7%
Ghana	1993	34	15%	15%	6%	Nigeria	1993	22	23%	23%	0%	Zambia	1996	16	50%	44%	25%
Greece	1994	21	33%	33%	0%	Norway	1993	23	26%	17%	30%	Zimbabwe	1997	15	7%	7%	40%
Guatemala	2006	9	0%	0%	78%	Oman	1992	23	0%	0%	0%						

Notes: The table shows the sample composition by country. The columns "Small profit or small loss" and "Small profit" report the fraction of a central bank observations that fall into the ROA region [-0.003; 0.003) and [0; 0.003), respectively. The column "Loss" records the incidence of losses of any magnitude.

Table 2: Loss avoidance and prevailing incentives

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS regression at zero-profit			Simulated estimates for placebo thresholds						
Prevailing incentives	N	Constant	Coefficient	Constant	Coefficient	Rank of the test t-stat	Rank (100)	Percentile rank (100)	Rank (500)	Percentile rank (500)
Central bank governor re-appointable	389	0.683***	0.192***	0.476	0.008	1	2	0.020	11	0.022
		(0.060)	(0.063)	(0.030)	(0.027)					
Extreme party affiliation (left or right)	352	0.830***	0.120***	0.485	0.010	2	10	0.099	50	0.100
		(0.021)	(0.041)	(0.017)	(0.036)					
Publicly traded	421	0.833***	0.167***	0.483	-0.024	2	6	0.059	40	0.084
		(0.019)	(0.019)	(0.016)	(0.055)					
Right-wing party affiliation	222	0.827***	0.089**	0.469	-0.008	1	8	0.079	24	0.048
		(0.034)	(0.044)	(0.031)	(0.037)					
Central bank operating expenses to government tax revenues	206	0.790***	0.122**	0.475	-0.002	2	3	0.030	14	0.028
		(0.045)	(0.052)	(0.029)	(0.044)					
Central bank total assets to GDP	403	0.789***	0.083**	0.485	-0.0003	3	3	0.030	18	0.036
		(0.032)	(0.039)	(0.020)	(0.028)					
Dividend distribution rules	85	0.672***	0.328***	0.497	-0.045	1	2	0.020	4	0.009
		(0.058)	(0.058)	(0.026)	(0.084)					
High dividend payout ratios	276	0.726***	0.169***	0.491	-0.019	1	2	0.020	5	0.010
		(0.046)	(0.051)	(0.031)	(0.025)					
Central bank has positive equity	411	0.625***	0.221*	0.491	-0.035	3	10	0.099	58	0.116
		(0.121)	(0.123)	(0.027)	(0.023)					
Central bank de jure independence	326	0.803***	0.074*	0.452	0.035	1	4	0.040	14	0.028
		(0.033)	(0.041)	(0.044)	(0.039)					

Notes: The table examines the difference in the propensity to report small profits over small losses for sample splits based on prevailing incentives for loss avoidance. The table reports the results of the OLS regressions $I_{i,t} = \beta_0 + \beta_1 D_{i,t} + \varepsilon_{i,t}$ using a symmetric window around the threshold, [x^s-0.003; x^s+0.003). $I_{i,t}$ equals 1 if central bank i in period t reports an ROA in the [x^s, x^s+0.003) interval, and 0 if it reports an ROA in the [x^s-0.003; x^s) interval.

$D_{i,t}$ is a set of indicator variables reported in the first column and described in the Appendix. The variables are coded in such a way that higher values (=1) predict greater propensity to report small profits over small losses. *Central bank governor re-appointable* equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Publicly traded* equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. *Right-wing party affiliation* equals 1 if the country's chief executive is affiliated with the right-leaning party, and 0 if the country's chief executive is affiliated with the left-leaning party. *Central bank operating expenses to government tax revenues* equals 1 if a central bank reports above-median ratio of central bank personnel expenses to the country's total tax revenues, and 0 otherwise. *Central bank total assets to GDP* equals 1 if a central bank reports above-median ratio of central bank's total assets to the country's GDP, and 0 otherwise. *Dividend distribution rules* equals 1 if a central bank has a "hard" budget constraint based on our coding of central bank dividend rules, and 0 if it has a "soft" budget constraint. *High dividend payout ratios* equals 1 if the central bank dividend payout ratio is greater than 50% or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% or when a central bank receives dividends from the government. *Central bank has positive equity* equals 1 if a central bank reports positive equity at the end of year *t-1*, and 0 if it has negative equity in *t-1*. *Central bank de jure independence* equals 1 if a central bank has an above-median index of central bank independence, and 0 otherwise. Columns (1)-(3) report results for x^s=0 (i.e. regression at zero-profit threshold). Robust standard errors are reported in parentheses below the coefficient estimates. In columns (4) and (5) the mean simulated coefficients for placebo thresholds are obtained using the same regression model estimated for the other 57 thresholds in Figure 1 excluding the [-0.003; 0.003) region (with n>30). The standard error reported in brackets below the value of simulated coefficients is based on the cross-section of the estimated coefficients at placebo thresholds. In column (6) "Rank of the test t-stat." refers to the rank of the t-statistic for the slope coefficient at the zero-profit threshold relative to t-statistics for the other 57 thresholds. In columns (7)-(10) the rank and percentile rank 100 (500) is the rank and the percentile rank of the t-statistic at the zero-profit threshold relative to t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding [-0.003; 0.003) region. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table 3: Regression results after controlling for ROA volatility

Ability and incentive factors	(1) Constant	(2) Coefficient of test variable	(3) Coefficient of ROA volatility	(4) N	(5) R^2
Local accounting standards	0.773***	0.099**	-0.379	419	0.011
	(0.042)	(0.045)	(0.528)		
Central bank governor re-appointable	0.688***	0.191***	-0.217	389	0.032
	(0.060)	(0.063)	(0.404)		
Extreme party affiliation (left or right)	0.838***	0.128***	-0.558	351	0.009
	(0.022)	(0.042)	(0.540)		
Publicly traded	0.839***	0.164***	-0.409	419	0.006
	(0.020)	(0.019)	(0.576)		
Right-wing party affiliation	0.856***	0.085*	-1.859	221	0.020
	(0.039)	(0.044)	(1.519)		
Central bank operating expenses to government tax revenues	0.935***	0.028	-6.545**	206	0.078
	(0.068)	(0.063)	(2.553)		
Central bank total assets to GDP	0.793***	0.081**	-0.274	401	0.008
	(0.034)	(0.040)	(0.473)		
Dividend distribution rules	0.726***	0.297***	-2.720	85	0.081
	(0.088)	(0.070)	(3.371)		
High dividend payout ratios	0.725***	0.169***	0.047	276	0.040
	(0.046)	(0.051)	(0.285)		
Central bank has positive equity	0.634***	0.215*	-0.304	409	0.009
	(0.122)	(0.123)	(0.498)		
Central bank de jure independence	0.846***	0.063	-2.771	326	0.022
	(0.042)	(0.042)	(1.772)		

Notes: The table replicates results of Table 2 after controlling for the standard deviation of ROA. It reports the results of the OLS regressions $I_{i,t} = \beta_0 + \beta_1 D_{i,t} + \beta_2 ROA\ volatility_{i,} + \varepsilon_{i,t}$ using a symmetric window around the zero-profit threshold, [-0.003; 0.003). $I_{i,t}$ equals 1 if central bank i in period t reports an ROA in the [0, 0.003) interval, and 0 if it reports an ROA in the [-0.003; 0) interval. $D_{i,t}$ is a set of indicator variables reported in the first column and described in the Appendix. The variables are coded in such a way that higher values (=1) predict greater propensity to report small profits over small losses. *Local accounting standards* equals 1 if a central bank follows local accounting standards, and 0 if it follows IFRS. *Central bank governor re-appointable* equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Publicly traded* equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. *Right-wing party affiliation* equals 1 if the country's chief executive is affiliated with the right-leaning party, and 0 if the country's chief executive is affiliated with the left-leaning party. *Central bank operating expenses to government tax revenues* equals 1 if a central bank reports above-median ratio of central bank personnel expenses to the country's total tax revenues, and 0 otherwise. *Central bank total assets to GDP* equals 1 if a central bank reports above-median ratio of central bank's total assets to the country's GDP, and 0 otherwise. *Dividend distribution rules* equals 1 if a central bank has a "hard" budget constraint based on our coding of central bank dividend rules, and 0 if it has a "soft" budget constraint. *High dividend payout ratios* equals 1 if the central bank dividend payout ratio is greater than 50% or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% or when a central bank receives dividends from the government. *Central bank has positive equity* equals 1 if a central bank reports positive equity at the end of year *t-1*, and 0 if it has negative equity in *t-1*. *Central bank de jure independence* equals 1 if a central bank has an above-median index of central bank independence, and 0 otherwise. *ROA volatility* is the standard deviation of central bank ROA over the sample period. Robust standard errors are reported in parentheses below the coefficient estimates. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table 4: Multivariate analysis

	(1) Profit	(2) Profit	(3) Profit
Local accounting standards	0.079	0.137	0.130**
	(0.060)	(0.083)	(0.062)
Governor re-appointable	0.169**	0.187**	0.177***
	(0.073)	(0.092)	(0.063)
Extreme party affiliation (left or right)	0.128***	0.128**	0.097**
	(0.031)	(0.050)	(0.041)
Publicly traded	0.067**	0.114*	0.133***
	(0.028)	(0.063)	(0.046)
Central bank total assets to GDP	0.022	-0.022	0.011
	(0.049)	(0.085)	(0.062)
High dividend payout ratios	0.143***	0.132*	0.119**
	(0.051)	(0.068)	(0.046)
Central bank has positive equity	0.201	0.176	0.207
	(0.181)	(0.194)	(0.157)
Central bank de jure independence		0.069	0.032
		(0.068)	(0.056)
Do not incur interest on reserves		-0.014	-0.097
		(0.084)	(0.102)
ROA volatility		1.552	-0.032
		(1.422)	(1.143)
Exchange-rate peg		0.072	0.097*
		(0.075)	(0.052)
Growth rate of nominal GDP		-0.401	-0.328*
		(0.251)	(0.188)
Low-income countries		0.102	0.105*
		(0.074)	(0.057)
Constant	0.337*	0.192	0.195
	(0.190)	(0.236)	(0.192)
R^2	0.11	0.14	0.15
Observations	223	168	298

Notes: The table reports results of the OLS regression analysis using a symmetric window around the zero-profit threshold [-0.003; 0.003). Column (3) widens this window to [-0.006, 0.006). The dependent variable equals 1 if central bank i in period t reports an ROA in the small profit interval, and 0 if it reports an ROA in the small loss interval. *Local accounting standards* equals 1 if a central bank follows local accounting standards, and 0 if it follows IFRS. *Central bank governor re-appointable* equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Publicly traded* equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. *Central bank total assets to GDP* equals 1 if a central bank reports above-median ratio of central bank's total assets to the country's GDP, and 0 otherwise. *High dividend payout ratios* equals 1 if the central bank dividend payout ratio is greater than 50% or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% or when a central bank receives dividends from the government. *Central bank has positive equity* equals 1 if a central bank reports positive equity at the end of year *t-1*, and 0 if it has negative equity in *t-1*. *Central bank de jure independence* equals 1 if a central bank has an above-median index of central bank independence, and 0 otherwise. *Do not incur interest on reserves* equals 1 if a central bank reports no interest expenses, and 0 otherwise. *ROA volatility* is the standard deviation of central bank ROA over the sample period. *Exchange-rate peg* equals 1 if a country has an exchange-rate peg, and 0 otherwise. *Growth rate of nominal GDP* is the percentage change in nominal GDP. *Low-income countries* equals 1 if a country is a low-income economy, and 0 otherwise. The detailed variable definitions and data sources are reported in the Appendix. Robust standard errors are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table 5: Loss avoidance and inflation rates—polynomial regressions

	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation less target	(7) Inflation surprises
Profit	0.029*	0.038***	0.046***	0.049**	0.038**	0.020**	0.014**
	(0.016)	(0.014)	(0.017)	(0.023)	(0.017)	(0.010)	(0.007)
Growth rate of nominal GDP		-0.014	-0.011	-0.018	-0.033	-0.014	-0.022**
		(0.022)	(0.022)	(0.027)	(0.023)	(0.016)	(0.011)
Low-income countries		0.016	0.015	0.009	-0.003	-0.010**	-0.003
		(0.011)	(0.011)	(0.012)	(0.009)	(0.004)	(0.003)
Rule of law		-0.028***	-0.030***	-0.034***			
		(0.006)	(0.006)	(0.008)			
Right-leaning party affiliation			0.017	0.013			
			(0.014)	(0.016)			
Left-leaning party affiliation			0.012	0.011			
			(0.008)	(0.009)			
Extreme party affiliation (left or right)			-0.017*	-0.019*			
			(0.009)	(0.011)			
Governor re-appointable			-0.026	-0.035			
			(0.019)	(0.025)			
Central bank de jure independence				-0.008			
				(0.016)			
Polynomials	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	Yes	Yes	Yes
R^2 / Whithin R^2	0.020	0.150	0.170	0.190	0.025	0.110	0.025
Observations	1,775	1,775	1,775	1,417	1,775	350	1,766
Countries	117	117	117	88	117	31	117

Notes: The table reports results of the OLS regression analysis using all central banks with available observations. The dependent variable in columns (1)-(5) is the rate of consumer price inflation. The dependent variable in column (6) is the rate of inflation minus the target inflation rate. Column (6) uses only central banks that target inflation. The dependent variable in column (7) is the rate of inflation minus the IMF's inflation forecasts in the World Economic Outlook in April of the same year. *Profit* is an indicator variable that equals 1 if a central bank reports a profit (i.e., $roa_{i,t} \geq 0$), and 0 if it reports a loss. *Growth rate of nominal GDP* is the percentage change in nominal GDP. *Low-income countries* is an indicator variable that equals 1 if a country is a low-income economy in a given year, and 0 otherwise. *Rule of law* is an index of the rule of law, capturing the extent to which economic agents trust and abide by legal institutions. *Right-leaning party affiliation* is an indicator that equals 1 if the country's chief executive is affiliated with the right-leaning party, and 0 otherwise. *Left-leaning party affiliation* is an indicator that equals 1 if the country's chief executive is affiliated with the left-leaning party, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Governor re-appointable* is an indicator variable that equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Central bank de jure independence* is an index of central bank legal independence. Polynomials include a vector of polynomials of ROA up to the order of 6 and their interactions with the profit dummy. We trim ROA at the 1st and 99th percentiles to control for outliers. Standard errors are reported in parentheses and are based on robust standard errors clustered by central bank. All Eurozone central banks are assigned to the same cluster. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

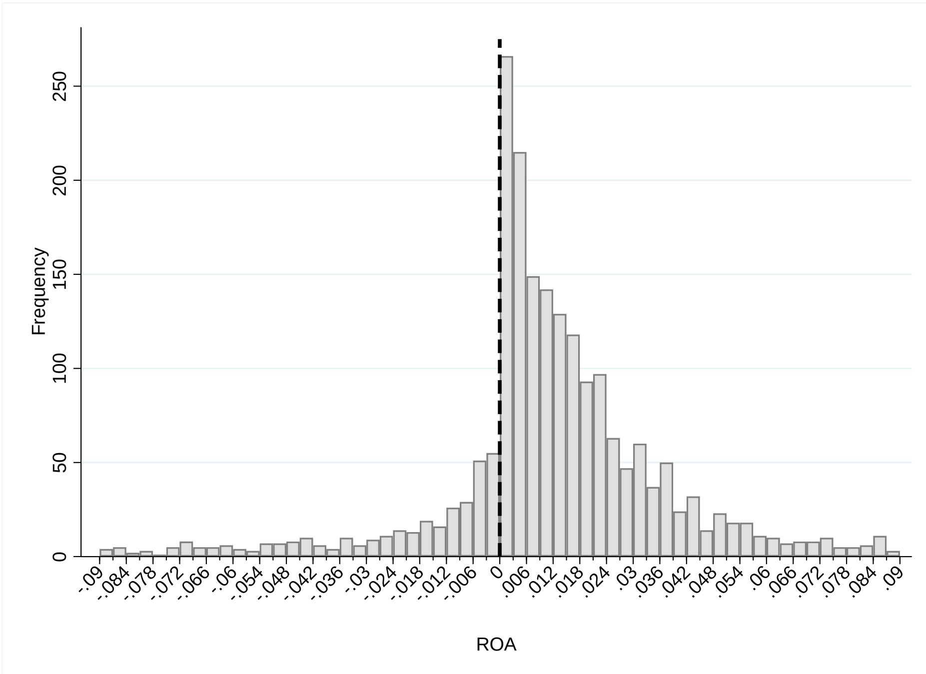
Table 6: Loss avoidance and interest rates

	Interest rates	
	(1)	(2)
Profit	-0.011***	-0.004**
	(0.001)	(0.002)
Inflation	0.770***	0.616***
	(0.016)	(0.031)
Output gap	0.084***	0.036***
	(0.004)	(0.006)
Lagged interest rates	0.532***	0.616***
	(0.010)	(0.019)
Real exchange rate		-0.00006***
		(0.00001)
Hansen's J-test (p-value)	0.34	0.41
Observations	140	129

Notes: The table reports results of the OLS regression analysis using a symmetric window around the zero-profit threshold [-0.003; 0.003). The table reports the estimates of a forward-looking Taylor rule using the GMM estimator with a robust weighting matrix. The dependent variable is the interest rate on short-term Treasury bills of the country *i* at the beginning of year *t*. *Profit* is an indicator for whether a central bank reports a profit or a loss in year *t*. *Inflation* denotes the inflation rate of the country *i* between period *t* and *t+1*. *Output gap* of the country *i* between period *t* and *t+1* is calculated as the difference between the actual GDP and the predicted GDP based on HP filter. *Real exchange rate* is the real effective exchange rate of the country *i* during period *t*. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

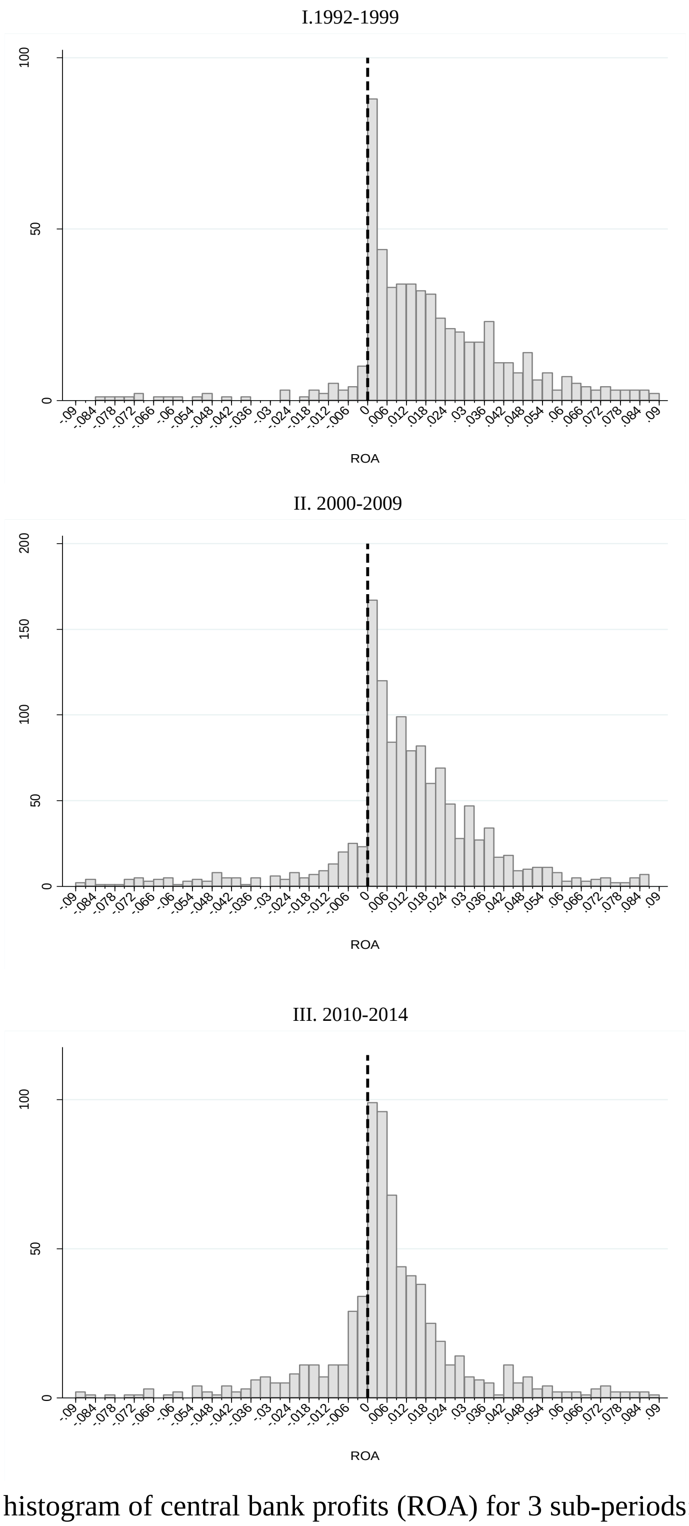
INTERNET APPENDIX

Figure IA-1: Distribution of central bank profits for central banks that incur interest on reserves



Notes: This figure plots the histogram of central bank profits for central banks that incur interest on reserves (i.e., central banks with positive interest expense on Bankscope). 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.

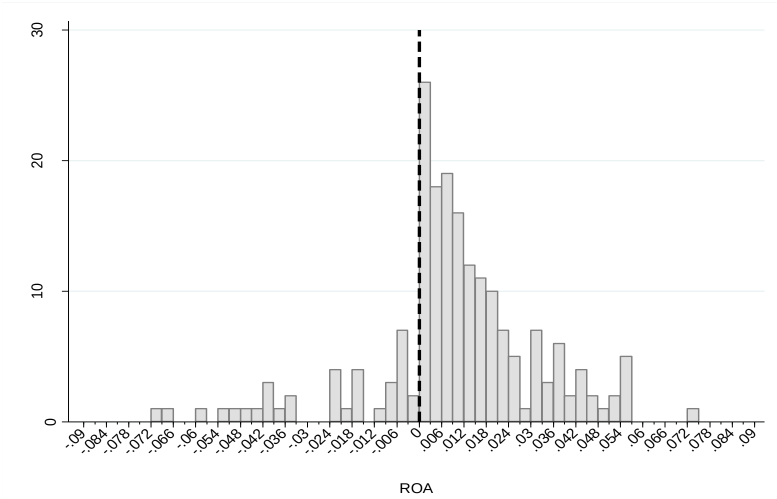
Figure IA-2: Distribution of central bank profits for each of the three decades in the sample



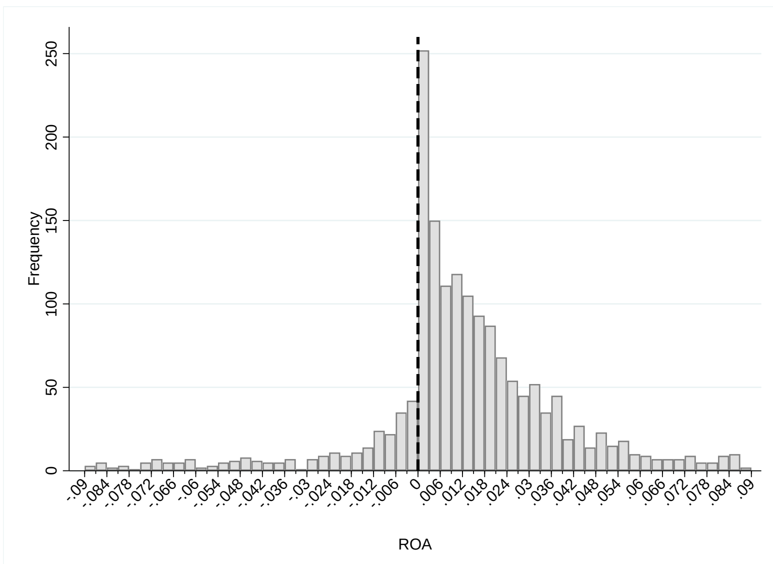
Notes: This figure plots the histogram of central bank profits (ROA) for 3 sub-periods: 1992-1999, 2000-2010, and 2010-2014. The distribution of ROA in all the graphs is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis.

Figure IA-3: Distribution of central bank profits in the (non-)crisis years

I. Crisis years



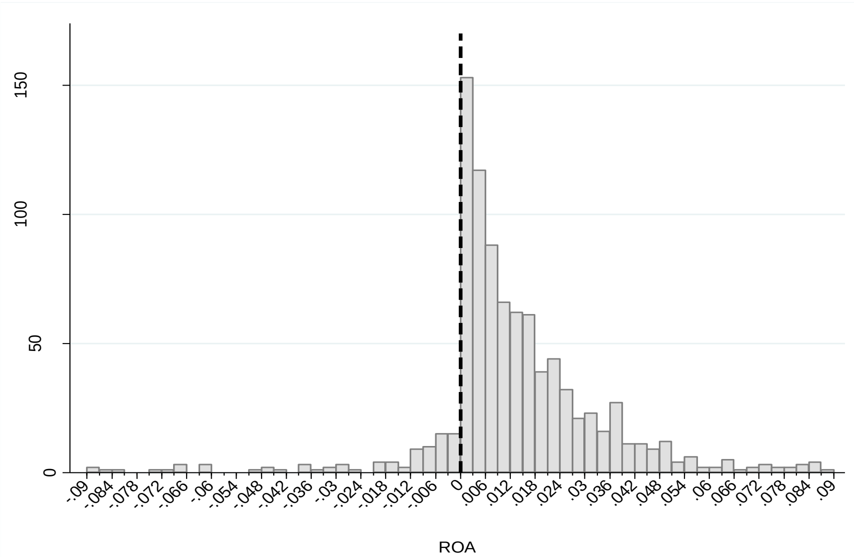
II. Non-crisis years



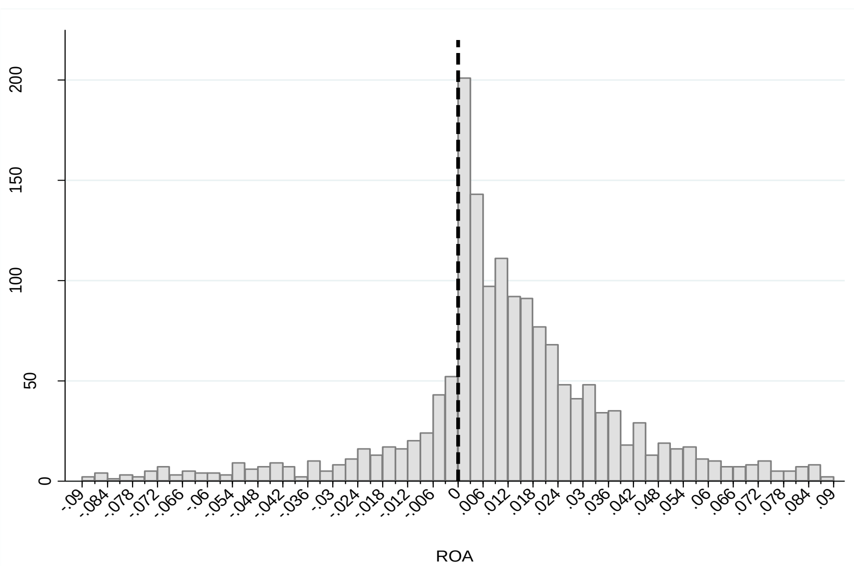
Notes: This figure plots the histogram of central bank profits for countries and years that experience a systemic banking crisis, currency crisis, or sovereign debt crisis (due to default or restructuring). The distribution of ROA in both graphs is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis.

Figure IA-4: Distribution of central bank profits in high-income vs. low-income countries

I. High-income countries



II. Low-income countries

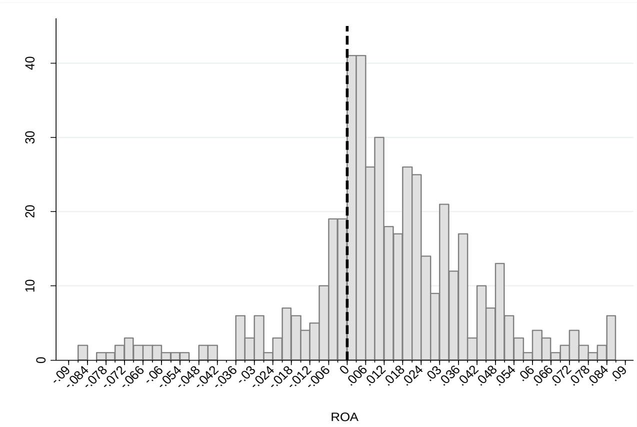


Notes: This figure plots the histogram of central bank profits for high-income and low-income economies. The low-income economies have GNI per capita based on the World Bank cut-off point of less than $12,475. High-income economies have GNI per capita that exceeds $12,475. ROA is defined as central bank net income divided by average total assets. The distribution of ROA in both graphs 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.

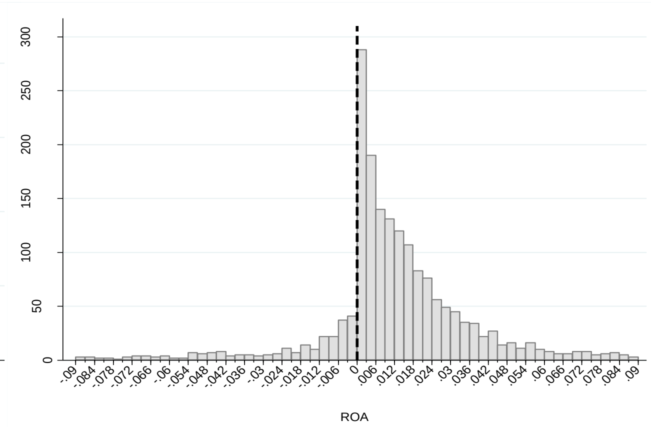
Figure IA-5: Distribution of central bank profits and incentives to manage earnings

I. Central bank governor re-appointable vs. not

Not re-appointable

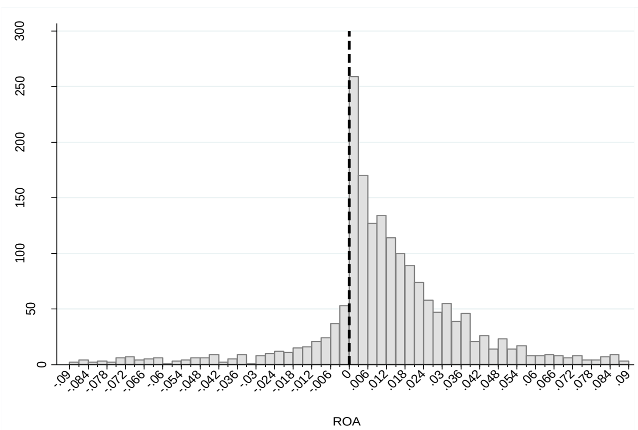


Re-appointable

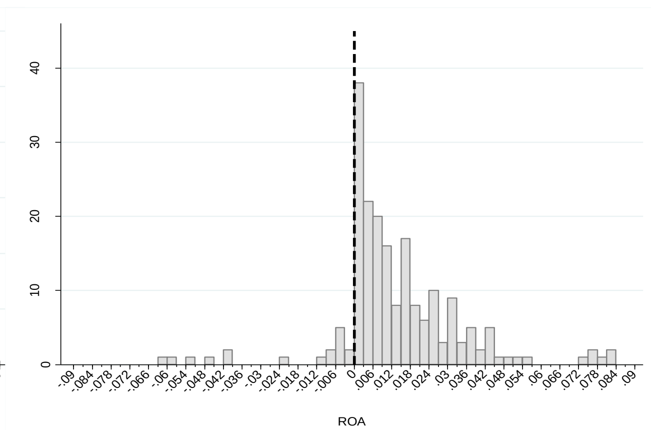


II. Country leader affiliated with extreme (left- or right-wing) parties vs. centrist parties

Centrist parties

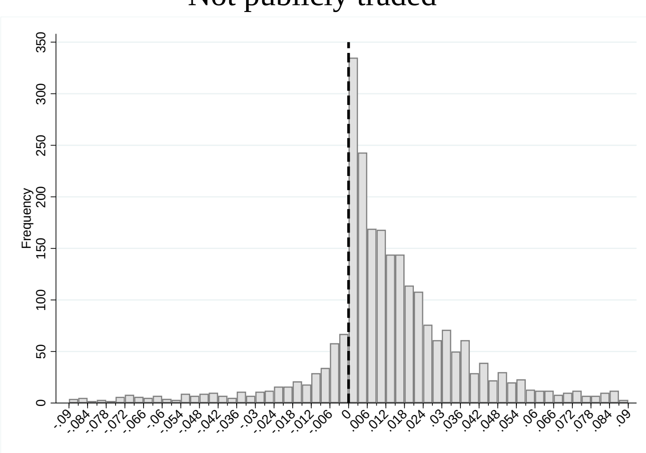


Extreme parties

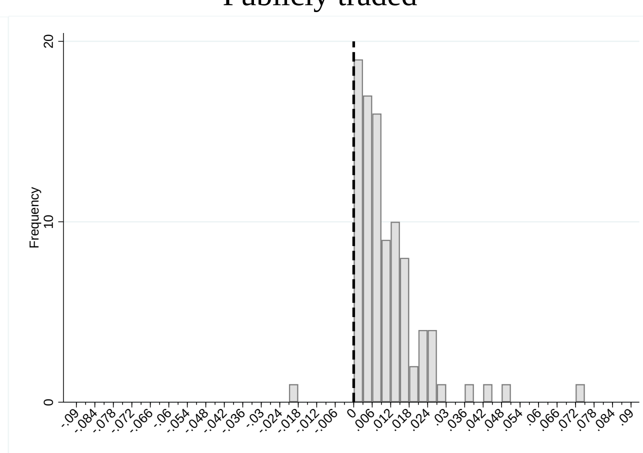


III. Central bank is publicly traded vs. not

Not publicly traded

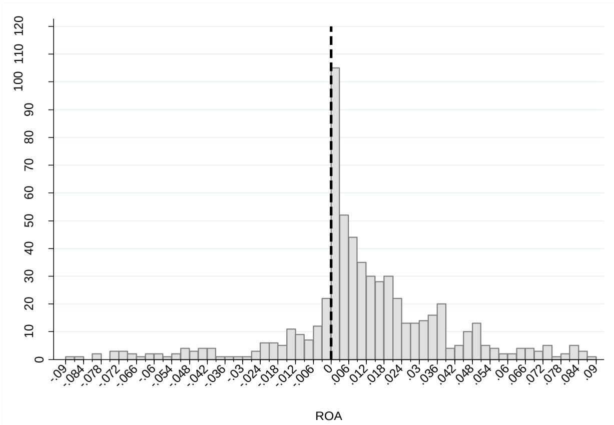


Publicly traded

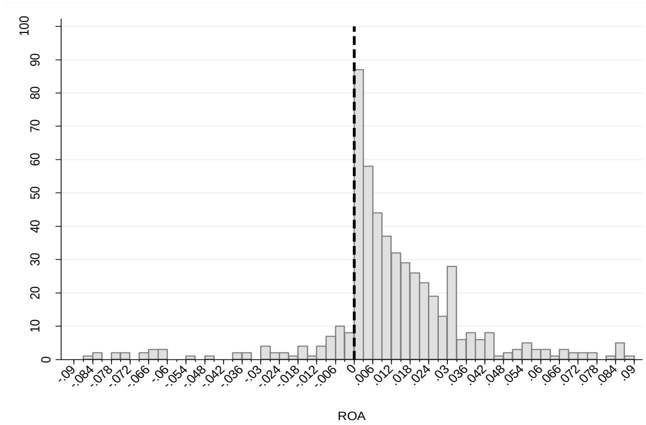


IV. Country leader affiliated with left-leaning party vs. right-leaning parties

Left-leaning parties

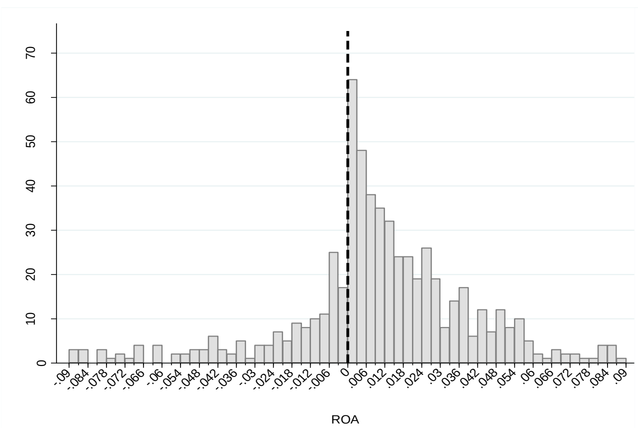


Right-leaning parties

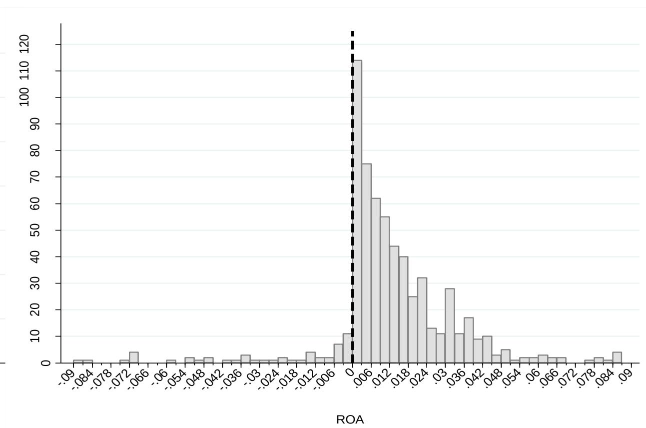


V. Central bank operating expenses to total government income from taxes

Below median

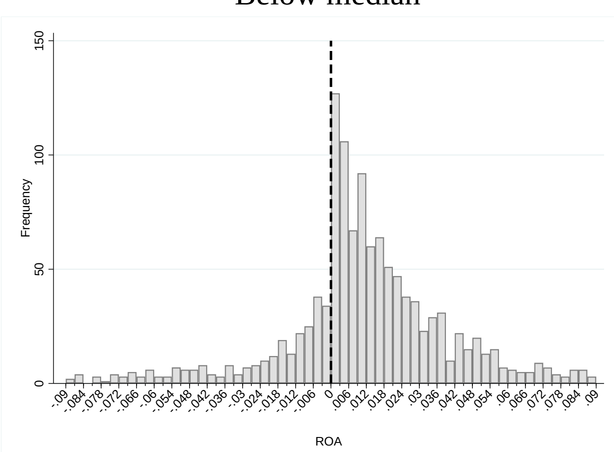


Above median

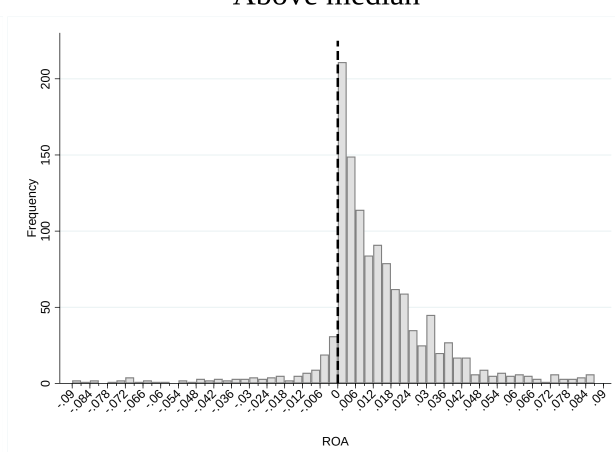


VI. Size of a central bank's balance sheet

Below median

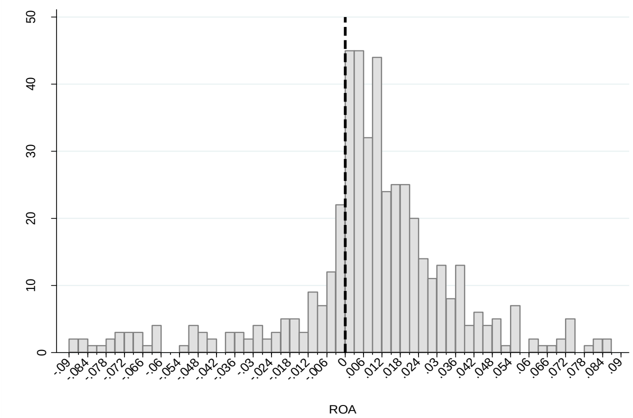


Above median

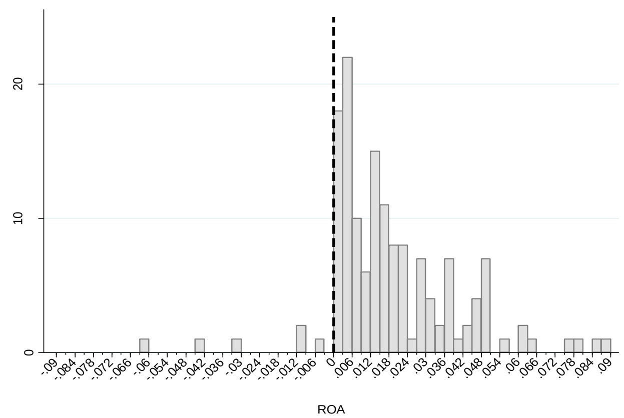


VII. Dividend distribution rules

"Soft" budget constraint

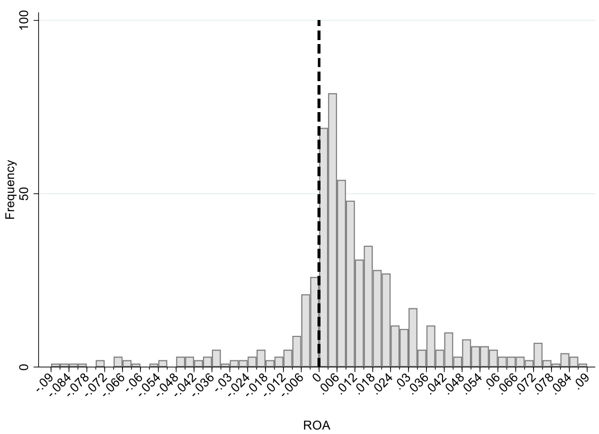


"Hard" budget constraint

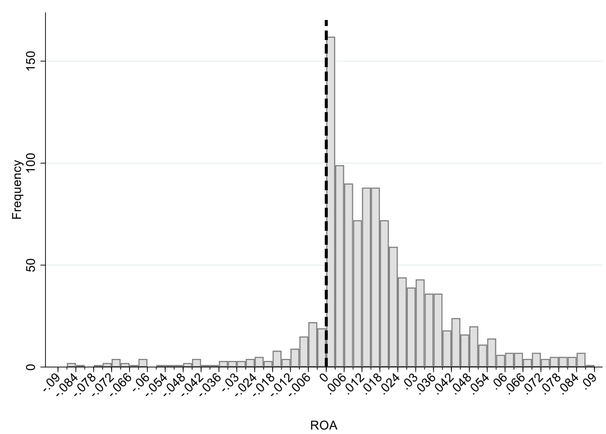


VIII. Dividend payout ratios

Payout < 50%

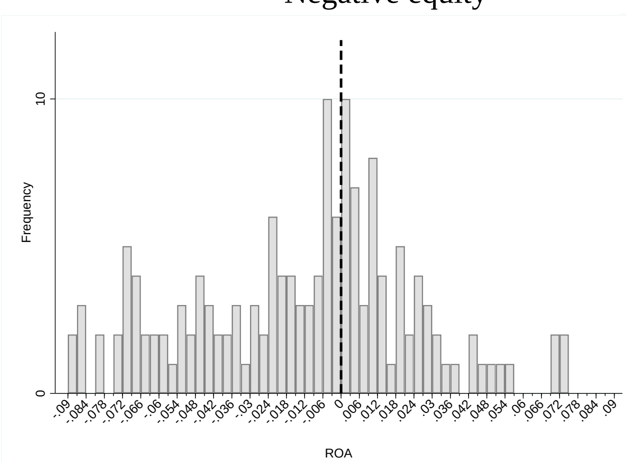


Payout ≥ 50%

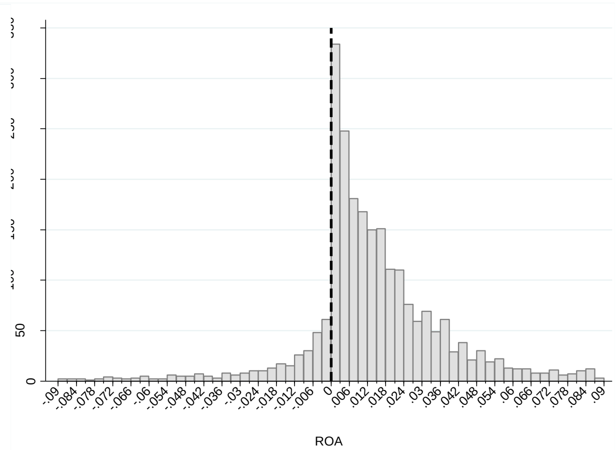


IX. Sign of central bank's equity

Negative equity

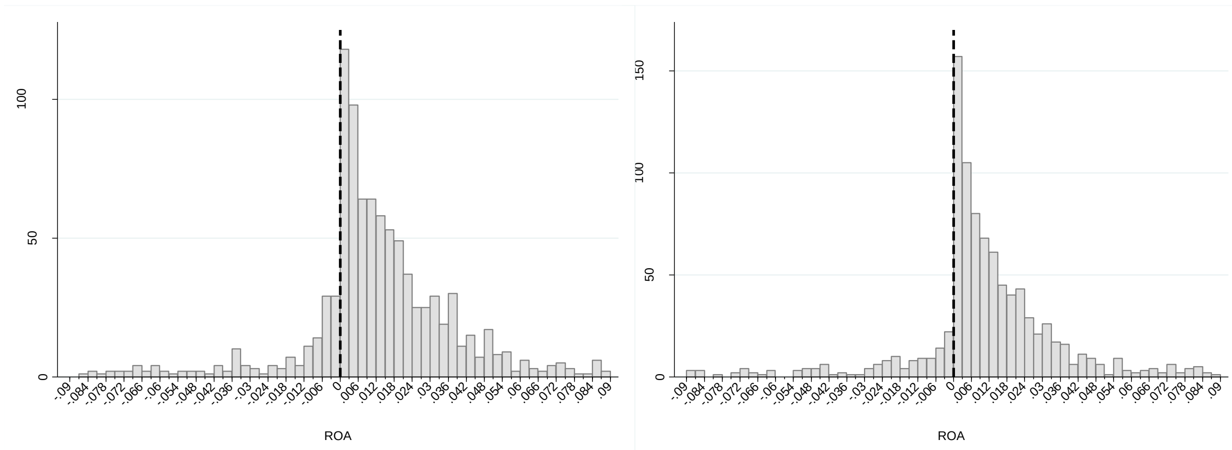


Positive equity



X. Central bank de jure independence

Below-median de jure independence   Above-median de jure independence

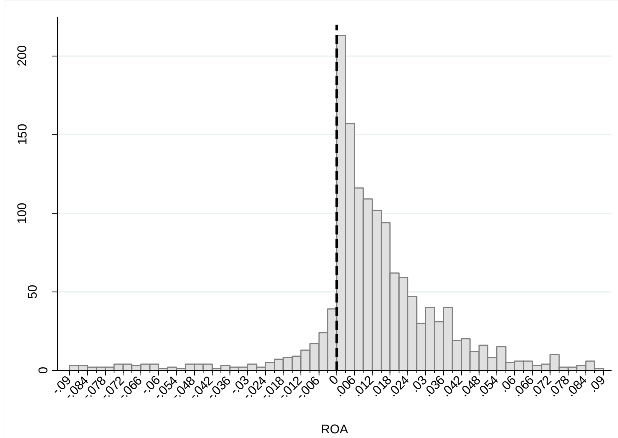


Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on prevailing incentives for loss avoidance. The variables used to split the sample and data sources are described in the Appendix. The distribution of ROA in all the plots is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis.

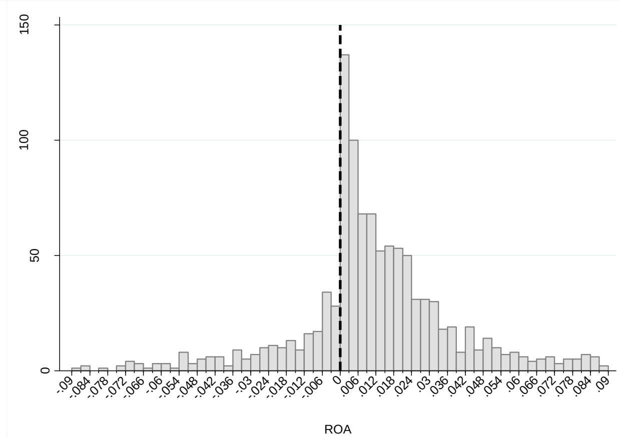
Figure IA-6: Distribution of central bank profits and country institutional environment

I. Rule of law

Above median

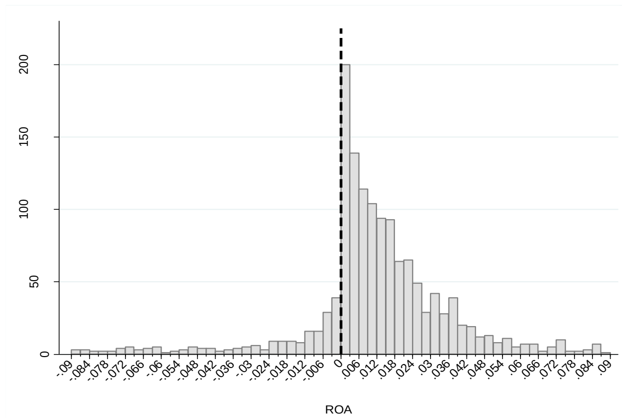


Below median

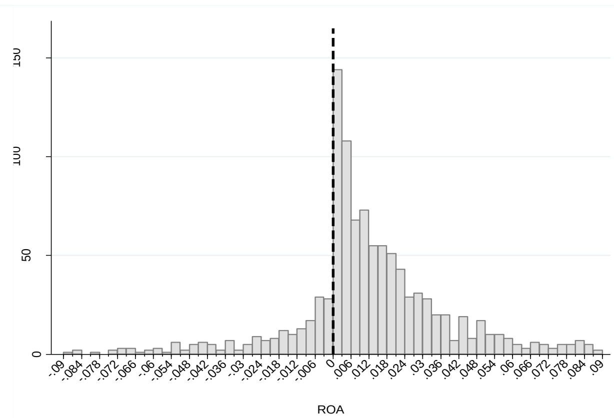


II. Government effectiveness

Above median

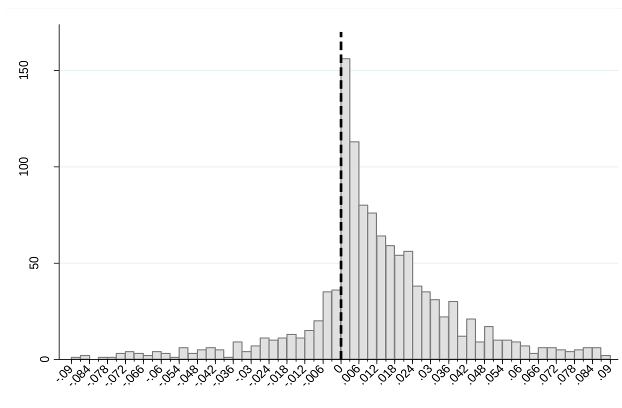


Below median

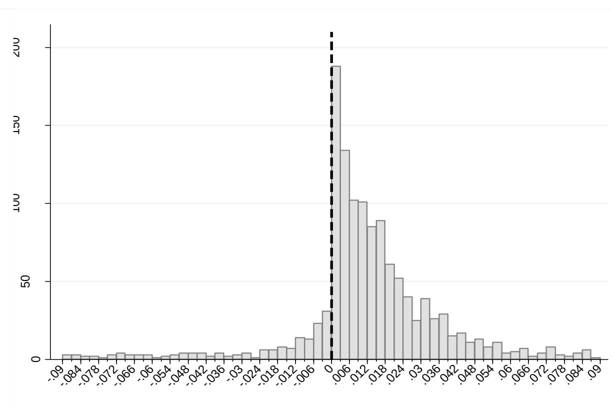


III. Control of corruption

Above median



Below median



Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on the World Bank measures of country institutions. The variables used to split the sample and data sources are described in the Appendix. The distribution of ROA in all the plots 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.

Table IA-1: Properties of central bank ROA

	(1) Overall standard deviation	(2) Within standard deviation	(3) Between standard deviation
ROA volatility	0.062	0.054	0.034

	(1)
Persistence of ROA	0.644*** (0.159)

Notes: The table shows descriptive statistics for ROA (N=2,591). The bottom rows of the table pool all available central bank observations and estimate the OLS regression $roa_{t+1} = \alpha_0 + \alpha_1 roa_t + \varepsilon_{t+1}$. The table reports the coefficient α_1 (persistence coefficient) and its robust standard error, clustered by central bank (all Eurozone central banks are assigned to the same cluster) and shown in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table IA-2: An example of general risk provisions

PROFIT AND LOSS ACCOUNT				
		NOTES *	Amounts in euros	
			2011	2010
1.1	Interest income		5,670,887,600	4,246,495,233
1.2	Interest expense		-1,905,144,704	-1,046,659,055
1	**Net interest income**	[14]	**3,765,742,896**	**3,199,836,178**
2.1	Realized gains/losses arising from financial operations		492,609,599	337,418,565
2.2	Write-downs on financial assets and positions		-383,086,734	-196,855,279
2.3	Transfers to/from the provision for general risks for exchange rate, price and credit risks		-1,400,000,000	-1,350,000,000
2	**Net result of financial operations, write-downs and transfers to/from risk provisions**	[15]	**-1,290,477,135**	**-1,209,436,714**
3.1	Fee and commission income		25,546,913	26,718,544
3.2	Fee and commission expense		-9,610,318	-8,276,351
3	**Net income from fees and commissions**	[16]	**15,936,595**	**18,442,193**
4	**Income from participating interests**	[17]	**147,034,395**	**262,501,505**
5	**Net result of the pooling of monetary income**	[18]	**589,957,577**	**613,140,317**
6.1	Interest income		1,066,284,482	951,699,657
6.2	Dividends from equity shares and participating interests		234,402,039	246,933,580
6.3	Gains, losses and write-downs		-251,616,205	14,512,795
6.4	Other components		27,949,087	24,460,021
6	**Net income from financial assets related to the investment of reserves and provisions**	[19]	**1,077,019,403**	**1,237,606,053**
7	**Other transfers from provisions**		**1,227**	**2,582**
8	**Other income**	[20]	**109,315,525**	**72,581,736**
	TOTAL NET INCOME		**4,414,530,483**	**4,194,673,850**

Notes: Bank of Italy’s annual report for 2011, p. 238.

Table IA-3: The propensity of profit observations to migrate to a higher or lower profit level after accounting for provisions

	(1) Move to a higher bin	(2) Move to a lower bin
Large losses	0.127*	0.085***
	(0.076)	(0.026)
Small losses	0.267***	0.131***
	(0.080)	(0.046)
Small profits	0.061**	0.014
	(0.024)	(0.013)
Large profits	0.071***	0.244***
	(0.014)	(0.053)
ROA volatility	0.510	-0.197
	(0.467)	(0.439)
Adj. R^2	0.13	0.22
Observations	880	880

Notes: The table reports results of the OLS regression $Higher\ bin_{i,t}$ or $Lower\ bin_{i,t} = \beta_1 Large\ losses_{i,t} + \beta_2 Small\ losses_{i,t} + \beta_3 Small\ profits_{i,t} + \beta_4 Large\ profits_{i,t} + \beta_5 ROA\ volatility_i + \varepsilon_{i,t}$, where $Higher\ bin_{i,t}$ is equal to one if a central bank moves to a higher bin (i.e., a higher level of profits) when provisions are included, and is equal to zero otherwise. $Lower\ bin_{i,t}$ is equal to one if a central bank moves to a lower bin (i.e., a lower level of profits) when provisions are included, and is equal to zero otherwise. The explanatory variables are dummy variables indicating the level/region of the central bank's pre-provision ROA. $Large\ losses_{i,t}$ is equal to one for central banks that were in the large loss region i.e., reported pre-provision losses larger than -0.003. $Small\ losses_{i,t}$ is equal to one for central banks that were in the small loss region i.e., pre-provision ROA [-0.003, 0). $Small\ profits_{i,t}$ is equal to one for central banks that were in the small profit region i.e., pre-provision ROA [0, 0.003). $Large\ profits_{i,t}$ is equal to one for central banks that were in the large profit region i.e., reported pre-provision profits larger than 0.003. The coefficients on dummy variables show the percent of central bank observations in the respective region of pre-provision profits that move to a higher (column 1) or a lower (column 2) bin after reporting provisions. $ROA\ volatility_i$ is a central bank's standard deviation of ROA over the entire period. Standard errors are reported in parentheses and are based on robust standard errors clustered by central bank. All Eurozone central banks are assigned to the same cluster. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table IA-4: Correlation between the test variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Local accounting standards	1.000												
(2) Governor re-appointable	-0.123	1.000											
	0.02												
(3) Extreme party affiliation (left or right)	-0.033	0.110	1.000										
	0.54	0.04											
(4) Publicly traded	0.131	0.097	0.073	1.000									
	0.01	0.06	0.17										
(5) Central bank total assets to GDP	0.019	0.143	-0.140	0.038	1.000								
	0.70	0.01	0.01	0.45									
(6) High dividend payout ratios	0.006	-0.075	-0.020	0.046	0.136	1.000							
	0.92	0.22	0.77	0.44	0.03								
(7) Central bank has positive equity	0.046	0.107	0.078	0.044	0.064	0.053	1.000						
	0.35	0.04	0.15	0.37	0.21	0.39							
(8) Central bank de jure independence	0.352	-0.159	-0.025	0.068	0.317	-0.050	-0.007	1.000					
	0.00	0.00	0.68	0.22	0.00	0.44	0.90						
(9) Do not incur interest on reserves	-0.042	0.096	0.127	0.121	0.002	0.241	0.069	-0.139	1.000				
	0.43	0.08	0.03	0.02	0.98	0.00	0.20	0.020					
(10) ROA volatility	-0.061	-0.070	0.127	-0.049	-0.137	-0.061	-0.088	-0.120	-0.013	1.000			
	0.21	0.17	0.02	0.32	0.01	0.31	0.08	0.03	0.81				
(11) Exchange-rate peg	0.034	0.170	0.082	-0.027	0.461	0.220	0.087	0.208	0.037	-0.190	1.000		
	0.50	0.00	0.13	0.59	0.00	0.00	0.09	0.00	0.50	0.00			
(12) Growth rate of nominal GDP	0.049	-0.014	0.052	-0.102	0.004	0.013	-0.029	0.111	-0.027	-0.001	-0.007	1.000	
	0.32	0.79	0.34	0.04	0.94	0.83	0.56	0.05	0.62	0.98	0.89		
(13) Low-income countries	-0.183	-0.057	0.083	-0.220	-0.388	-0.246	-0.134	-0.202	-0.186	0.142	-0.258	0.098	1.000
	0.00	0.26	0.12	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.05	

Notes: The table reports Pearson correlation coefficients for the variables used in the regression analysis. The sample consists of central bank observations that report either a small profit or a small loss, that is, ROA interval [0; 0.003) and [-0.003; 0), respectively. The p-values are reported below the correlation coefficients. *Local accounting standards* equals 1 if a central bank follows local accounting standards, and 0 if it follows IFRS. *Central bank governor re-appointable* equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Publicly traded* equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. *Central bank total assets to GDP* equals 1 if a central bank reports above-median ratio of central bank's total assets to the country's GDP, and 0 otherwise. *High dividend payout ratios* equals 1 if the central bank dividend payout ratio is greater than 50% or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% or when a central bank receives dividends from the government. *Central bank has positive equity* equals 1 if a central bank reports positive equity at the end of year *t-1*, and 0 if it has negative equity in *t-1*. *Central bank de jure independence* equals 1 if a central bank has an above-median index of central bank independence, and 0 otherwise. *Do not incur interest on reserves* equals 1 if a central bank reports no interest expenses, and 0 otherwise. *ROA volatility* is the standard deviation of central bank ROA over the sample period. *Exchange-rate peg* equals 1 if a country has an exchange-rate peg, and 0 otherwise. *Growth rate of nominal GDP* is the percentage change in nominal GDP. *Low-income countries* equals 1 if a country is a low-income economy, and 0 otherwise. The detailed variable definitions and data sources are reported in the Appendix.

Table IA-5: Robustness of Table 5 results to the use of the n^{th}-order polynomial

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Polynomials up to the order of 5					Polynomials up to the order of 7				
	Inflation	Inflation	Inflation	Inflation less target	Inflation less target	Inflation	Inflation	Inflation	Inflation less target	Inflation less target
Profit	0.039**	0.040**	0.028**	0.015**	0.002	0.047***	0.050***	0.043***	0.020**	0.015**
	(0.015)	(0.019)	(0.013)	(0.007)	(0.005)	(0.014)	(0.019)	(0.016)	(0.010)	(0.007)
Growth rate of nominal GDP	-0.011	-0.018	-0.033	-0.014	-0.022*	-0.012	-0.019	-0.034	-0.014	-0.022**
	(0.022)	(0.027)	(0.023)	(0.017)	(0.011)	(0.022)	(0.027)	(0.023)	(0.016)	(0.011)
Low-income countries	0.016	0.010	-0.003	-0.009**	-0.003	0.015	0.009	-0.003	-0.010**	-0.003
	(0.011)	(0.012)	(0.009)	(0.004)	(0.003)	(0.011)	(0.013)	(0.009)	(0.004)	(0.003)
Rule of law	-0.029***	-0.034***				-0.030***	-0.034***			
	(0.006)	(0.008)				(0.006)	(0.008)			
Right-leaning party affiliation	0.017	0.014				0.017	0.014			
	(0.014)	(0.016)				(0.014)	(0.016)			
Left-leaning party affiliation	0.012	0.011				0.012	0.011			
	(0.008)	(0.010)				(0.008)	(0.009)			
Extreme party affiliation (left or right)	-0.016*	-0.019*				-0.017*	-0.019*			
	(0.009)	(0.010)				(0.009)	(0.011)			
Governor re-appointable	-0.026	-0.034				-0.026	-0.035			
	(0.019)	(0.025)				(0.018)	(0.025)			
Central bank de jure independence		-0.008					-0.008			
		(0.016)					(0.016)			
Polynomials	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	No	No	No	Yes	Yes	No
R^2 / Whithin R^2	0.170	0.180	0.022	0.100	0.021	0.170	0.190	0.026	0.110	0.025
Observations	1,775	1,775	1,775	1,417	1,775	1,775	1,775	1,775	1,417	1,775
Countries	117	117	117	88	117	117	117	117	88	117

Notes: The table reports results of the OLS regression analysis using all central banks with available observations. The dependent variable in columns (1)-(5) is the rate of consumer price inflation. The dependent variable in column (6) is the rate of inflation minus the target inflation rate. Column (6) uses only central banks that target inflation. The dependent variable in column (7) is the rate of inflation minus the IMF's inflation forecasts in the World Economic Outlook in April of the same year. *Profit* is an indicator variable that equals 1 if a central bank reports a profit, and 0 if it reports a loss. *Growth rate of nominal GDP* is the percentage change in nominal GDP. *Low-income countries* is an indicator variable that equals 1 if a country is a low-income economy in a given year, and 0 otherwise. *Rule of law* is an index of the rule of law, capturing the extent to which economic agents trust and abide by legal institutions. *Right-leaning party affiliation* is an indicator that equals 1 if the country's chief executive is affiliated with the right-leaning party, and 0 otherwise. *Left-leaning party affiliation* is an indicator that equals 1 if the country's chief executive is affiliated with the left-leaning party, and 0 otherwise. *Extreme party affiliation (left or right)* equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. *Governor re-appointable* is an indicator variable that equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Central bank de jure independence* is an index of central bank legal independence. Polynomials include a vector of polynomials of ROA up to the order of 5 (columns 1-5) or 7 (columns 6-10) and their interactions with the profit dummy. We trim ROA at the 1st and 99th percentiles to control for outliers. Standard errors are reported in parentheses and are based on robust standard errors clustered by central bank. All Eurozone central banks are assigned to the same cluster. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.

Table IA-6: Permutation tests using polynomial regressions

Polynomial regression at zero-profit threshold (from Table 5)		Simulated estimates for placebo thresholds					
N	Coefficient	Mean coefficient	Rank of the test t-stat.	Rank (100)	Percentile rank (100)	Rank (500)	Percentile rank
1,775	0.046***	-0.006	1	1	0.010	1	0.002
	(0.017)	(0.006)					

Notes: The table reports the coefficient on *Profit* and its standard error from the polynomial regression in column (3) of Table 5. The mean simulated coefficient for placebo thresholds is obtained using the same regression model estimated for the other 59 ROA thresholds in Figure 1 (i.e., -0.09, -0.087, -0.084, …, 0.084, 0.087). The standard error reported in brackets below the simulated coefficient is based on the cross-section of estimated coefficients at placebo thresholds. "Rank of the test t-stat." refers to the rank of the t-statistic at the zero-profit threshold relative to t-statistics for these placebo thresholds. Rank and percentile rank 100 (500) is the rank and the percentile rank of the t-statistic at the zero-profit threshold relative to t-statistics for 100 (500) randomly selected thresholds from the range [-0.09; 0.09) excluding [-0.003; 0.003) region. ***, **, and * represent significance at the 1%, 5%, and 10% levels for the two-tailed tests.