(Why) do central banks care about their profits?

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Abstract

We document that central banks are significantly 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 more lenient monetary policy and higher inflation. We conclude that profitability concerns, although absent from standard theory, are present and effective in practice. These findings inform a debate about the political economy of central banking, monetary stability, and the effectiveness of non-traditional central banking.

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

JEL Classification: E58

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Disclosure Statement
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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

"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

"[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 care about their profits? A fast-growing theoretical literature has emerged that controversially debates this question. The answer is important because whether or not central banks care about their profits is a crucial determinant for the effectiveness of monetary policy, as well as for long-term monetary stability.[1] One strand of the literature, for example, debates the normative question under which conditions central banks *should* or should not care about their profitability. Another strand *assumes* central banks care at least about the sign of their profits, and shows the likely desirable and undesirable consequences of such preferences or constraints. Interestingly, the debate thus far lacks an empirical investigation into its very premise, namely, the

[1] 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).

positive question of whether central banks *are* in fact concerned with the level or sign of their profits. This paper provides a first answer to this question.

The question is 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,[2] and politicians even in advanced economies link the continuation of central bankers' careers to their policy choices.[3] Central banks' willingness or ability to support the financial system in crisis periods may also depend on whether central bank balance sheet considerations are important.[4] Lastly, especially in times of populism, central bank profitability is discussed as a guarantor of central bank independence.[5] Such concerns have resurfaced again following major central banks' response to the Covid-19 financial shock.[6]

Investigating this question empirically is difficult because counterfactual profit levels (i.e., central banks' hypothetical profit levels in the absence of profit 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 one used in the literature to study how corporate executives manage firm earnings. Because of market pressures and career concerns, corporate executives inflate their firm profits to meet profit targets, often taking myopic actions that are harmful in the long term (Jensen 1986; Stein 1989; Graham et al. 2005). The key insight from this literature is that observations with small positive profits are more likely to result from earnings management, whereas profits that fall just below zero are less likely to be driven by such practices

[2] 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. 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).

[3] "[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).

[4] 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.

[5] "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).

[6] 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.

(Burgstahler and Dichev 1997; Leuz et al. 2003; Bergstresser et al. 2006; Bhojraj et al. 2009).[7] We apply similar techniques to central banks. We investigate whether there is a discontinuity in the distribution of central bank profits, factors that influence their ability and incentives to manage earnings, and whether central bank profit concerns are related to monetary policy.

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. The economically large increase in the number of observations at zero defines the shape of the central banks' profit distribution and is consistent with central banks' high ability to manage earnings because of both their greater control over their accounting rules and policy parameters (e.g., interest rate on liabilities), and their monopoly power in the supply of money. These results hold for a sample of central banks exposed to significant risks of losses, suggesting that the discontinuity is unlikely to be an artifact of central banks' business model.

Cross-sectional variation in the size of the discontinuity strengthens the earnings management interpretation and sheds light on how central banks manage their earnings and the likely causes of their profit concerns. We find the significance and magnitude of the discontinuity varies predictably with central banks' *ability* to control their reported income (e.g., through prevailing accounting rules and discretional use of risk provisions) 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 at other random parts of the profit distribution show that such relations are not observed at other ex-ante not meaningful thresholds.

Overall, these results indicate the discontinuity at the zero-profit threshold is unlikely to be driven by the nature of the central bank business model or a mechanical propensity to produce small profits, but it is more likely to be the result of imperfect *de facto* independence of the average central bank in the sample. Observing the variation in accounting choices thus answers the question of whether central banks care about their profitability and sheds light on the political economy factors that drive such profit concerns. Combined with existing theory, these results have implications for central bank design, central bank remittance policies, and public finance.

[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).

An interesting follow-up question that emerges from the analysis is whether the discontinuity in central bank profits is *solely* due to accounting manipulations—such as income smoothing through an opportune use of accounting estimates—or whether profitability concerns are also measurably related to policy choices and outcomes. The extant theoretical literature predicts that central banks concerned with their profitability may avoid or delay increases in interest rates that are harmful to their profitability, leading to higher inflation rates (see, among others, Bhattarai et al. 2015; Del Negro and Sims 2015; Mendes and Berriel 2015).[8]

Consistent with these predictions, we find that the discontinuity in central bank profits is related to higher realized inflation, both in levels and relative to the central bank's stated inflation target or professional inflation forecasts. These results are robust to controlling for country fixed effects. A further analysis of interest rates shows that, controlling for macroeconomic conditions, central banks in the small profit region have systematically lower interest rates at the start of the year than central banks in the small loss region, perhaps because delaying or avoiding increases in interest rates lowers their interest expense and increases profits. Conditioning this result on proxies for accounting discretion reveals that central banks with limited accounting discretion are mainly responsible for this result, consistent with theoretical predictions in Ewert and Wagenhofer (2005) that tightening of accounting rules leads to more earning management through "real" decisions such as policy deviations. Furthermore, exploiting the variation in the use of fair value accounting shows that central banks that report small profits over a year are more likely to decrease interest rates during the year if they have significant assets valued at fair value and record revaluation gains and losses on those assets in their income statement.

Given the conceptual and practical problems associated with reduced-form regressions capturing central banks' monetary policy decisions, we view the results on interest rates and inflation as suggestive and not conclusive. The level of inflation and interest rates in a country can be related to the central bank's profits for various reasons. However, it is difficult to rationalize why monetary policy inputs and outputs would be *discontinuously* different for central banks whose profits are slightly above or slightly below zero, if not because both policy rules and profit levels are endogenous choice variables that respond to the same underlying factors.

[8] Non-neutrality of central bank balance-sheet operations can of course also be broken in ways other than with frictions between central bank and treasury balance sheets. For example, Iovino and Sergeyev (2018) show that a lack of common knowledge about central bank strategy can make QE effective.

Overall, 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 banks' profitability or capital concerns alter their policies on the margin, and help inform future theoretical modeling by showing which factors may contribute to profit concerns.

Theories that entertain the possibility of central bank profit concerns 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.[9] 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 profitability concerns that distort their policy choices and compromise their ability to control inflation.[10] 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, profits should be entirely irrelevant to central banks; profits are not supposed to be an "afterthought" but rather be no thought at all. 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 their profits is important, despite the clarity of the existing theoretical investigations.

[9] 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.
[10] Reis (2015) points out that period insolvency can lead to rule insolvency.

Our findings reject the null hypothesis that central banks are indifferent to their profitability. Instead, we find evidence that the extent of loss aversion 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 profits are an important consideration in central banking, and that optimal central bank design should be robust to such frictions. 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 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 on central bank profit concerns. Section 5 reports results on monetary policy inputs and outcomes. Section 6 concludes.

2. Testable hypotheses and empirical strategy

To understand why central banks may be concerned about their profitability, 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 interest-bearing (required and excess) 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). Central bank 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 transfers from the government (through negative 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). However, when such transfers are not possible (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 losses as a sign of weakness, incompetence or failure. If such concerns enter the calculations of central bankers, profit concerns and incentives to avoid losses may ensue.

Central banks have substantial discretion—arguably, more than most firms—in reporting their profits. This discretion emanates from both the application of accounting rules and significant control over policy decisions that determine their profitability. 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 IFRS, disclose their 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 banks), that allow greater discretion than IFRS. Central banks have also considerable control over the values of the main policy parameters that determine their profits such as interest rates, currency pegs, and involvement in operations that may expose them to considerable losses (e.g., bailouts).[11] They also determine the amount of required reserves that commercial banks must deposit at the central bank and the compensation for such deposits. Due to their unique regulatory position and monopoly power on the supply of base money, central banks enjoy a much more inelastic demand for their "products" than most firms do.

Our primary goal is to test whether central banks are in fact concerned about their profitability and take actions to avoid losses when "frictions" that favor such concerns are more pronounced.[12] Because of heterogeneity across central banks in their ability to adjust specific

[11] Anecdotal evidence indicates that the fear of losses influences central bank policies. 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).

[12] We use the term "frictions" to refer to balance-sheet or income-related factors that may generate profit concerns; recall that in neoclassical theory central banks should not care about their profits.

accounting items and policy parameters to fine-tune profits, we focus our interest on net income as the resulting choice, and not on any particular accounting choice. The null hypothesis is that central banks' policies and accounting profits are entirely determined by fundamental factors. The alternative hypothesis is that central banks are not indifferent about the level and sign of their profits and take actions to manage their profits. Under this alternative hypothesis, central banks' profits are at times different from what they would have been in the absence of profit concerns. (Note that 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 under the alternative hypothesis, this counterfactual level of profits (i.e., the level of profits they would have reported in the absence of profit concerns) is not observable. 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 argument 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. (We will critically examine and weaken that null hypothesis later.) The reason is that 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 discontinuity is a natural consequence of a model in which profits are preferable to losses. If central banks (or the agents acting on their behalf) care about the level or sign of their profits, and if the agents have the ability to affect the profit levels, we expect that central banks are more likely to report small profits than small losses. 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 around 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 reported profits. To conserve space, we only give an exhaustive list of these factors 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.

Our focus on the small profit and loss region is primarily motivated by a desire to establish internal validity of the notion that certain factors induce central bank profit concerns. Similar to the earnings management literature (Burgstahler and Dichev 1997; Leuz et al. 2003; Bergstresser et al. 2006; Bhojraj et al. 2009), we argue that central banks with small losses provide a useful set of central-bank-year observations that are unlikely to be driven by earnings management. 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 profit concerns. Since earnings management is costly, central banks who seek to avoid reporting a loss will naturally target small profits.[13] 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.[14] Such pressures may also induce profitable central banks to engage in downward profit management. The small profit region thus provides a useful set of central bank-year observations that are more likely to be driven by earnings management. 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.

In a second set of tests, we investigate whether the discontinuity is more likely to be the result of accounting manipulations alone, or whether evidence suggests the discontinuity is also associated with changes in the central banks' policy choices and outcomes. The theoretical basis for the latter hypothesis is well grounded in theory. As shown in Del Negro and Sims (2015) and Benigno and Nisticò (2018), among others, the absence of full and frictionless fiscal support

[13] 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).

[14] 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).

generates central bank profitability concerns that distort policy choices and compromise inflation outcomes. By "leaning against the wind" central banks may generate losses. Increases in interest rates aimed to curtail inflationary pressures or maintain a peg can reduce central banks' profitability by reducing their net interest margins and by generating 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 their profitability may thus avoid or delay increases in interest rates, leading to higher inflation rates (Bhattarai et al. 2015; Del Negro and Sims 2015; Mendes and Berriel 2015).

We empirically examine whether central banks' tendency to avoid losses is associated with higher inflation outcomes by comparing inflation rates of central banks in the small profit and loss regions. This allows us to contrast central banks who arguably have no profit concerns with a set of central-bank-year observations, some of which are likely affected by profit concerns. We expect that if the central banks' tendency to avoid losses results in higher inflation rates, we should observe a discontinuity in inflation rates at the zero-profit threshold: the average inflation rates (or inflation rate relative to targets) should be systematically higher as we move from just below to just above the zero-profit threshold. By contrast, a *placebo test* predicts that no discontinuity should be present at any other point in the profit distribution.

To better understand the possible causes of such increases in inflation and their link to central bank profitability, we further examine whether profit concerns are associated with systematically lower interest rates using Taylor rule regression and how this association varies with central banks' ability to manage earnings using accounting estimates. Given well-known conceptual problems associated with such regressions (Cochrane 2011) and further complications introduced by our use of cross-country data, the results of these tests should be viewed as suggestive, not conclusive.

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.[15] 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.[16]

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 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

[15] 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.
[16] 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.

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?

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.[17] We observe a discontinuous increase in the number of observations to the right of the zero-profit threshold. This finding supports Hypothesis 1 and rejects the null hypothesis of a smooth distribution.

(Insert Figure 1 about here)

The bottom panel of Figure 1 plots the expected number of earnings observations and confidence intervals for the intervals to the left and to the right of the zero-profit threshold. The resulting confidence intervals to the left and to the right of zero do not overlap, indicating the

[17] 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.

discontinuity is statistically significant. The McCrary (2008) test reported in the upper-right corner of the figure indicates the discontinuity is statistically significant at the 1% level.[18]

The McCrary (2008) test is useful in applications where a discontinuous density function, due to agents' manipulation of the running variable, is itself the object of interest. The test is informative 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 show evidence of—only an upward and no downward manipulation of ROA around the zero-profit threshold. Our key assumption is that central banks with incentives to engage in downward earnings management will choose to not report a loss. (Results of the next section support this assumption.)

The McCrary test also assumes that observations are independent from each other—an assumption that is unlikely to hold in a panel dataset. To account for possible lack of independence, we test whether the discontinuity is statistically significant using a *cluster bootstrap approach*. We begin by assigning the multiple observations of the same central bank to the same cluster. All observations of Eurozone central banks are assigned to one cluster as they are likely to have a correlated component. We then randomly draw one observation from each cluster and use this sub-sample to calculate the small profits ratio (i.e., the number of observations in the small profit region over the number of observations in the small loss region). We repeat this procedure 1,000 times and compute the bootstrapped standard errors. We find that small profits are 5.28 times more frequent than small losses. Statistically, this is highly significant at 1% with a bootstrapped z-statistic equal to 6.06 (reported under the McCrary test).[19]

It is important 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 (see, 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. There is no

[18] Based on McCrary (2008), we use a nonparametric local polynomial density estimator to examine the continuity of profits' density function in the neighborhood of zero.

[19] To complement the McCrary test of the discontinuity in the profit distribution, Bennett et al. (2017) use a similar bootstrap procedure, but like prior literature they do not account for clustering. For each iteration, they draw a random sample from the original sample.

little "hole" in the density in the area just before 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 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 the 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 small profits to small losses ratio can reach as high as 6, similar to Figure 1 (see, e.g., Burgstahler et al. 2006).

The discontinuity in Figure 1, however, may also be due to factors other than earnings management. For example, it could be an artefact of *pooling* together central banks whose profit distributions are skewed and bounded below at zero—due to the nature of their business—with central banks that report profits in all regions of the profit distribution and continuously so around the zero-profit threshold. Specifically, central banks that do not pay interest on reserves and have no significant interest rate, currency, asset price or credit risk exposures are unlikely to generate losses that render them unable to cover their operating expenses, which can be material (about 2% of total assets). Including such central banks in the sample may generate an artificial discontinuity. Although such extreme examples (no risk exposures, no interest expenses, and relatively low operating expenses) are not representative of most central banks in the sample, this alternative hypothesis is possible and hard to distinguish from the earnings management hypothesis. Much of the remaining analysis in the paper aims to distinguish between these two hypotheses.

We begin by dropping central banks whose profit distributions are likely to be bounded from below because of their business model. Since data on central banks' liabilities and assets composition are not publicly available with sufficient granularity to accurately capture their risk exposures, we use the volatility of their profits during the sample period. We hypothesize that central banks with high volatility are likely to have significant risk exposures and retain only these central banks in the sample. This is a fairly conservative test as some central banks may have low volatilities precisely because they manage earnings. For example, if some central banks have low volatilities because of high ability to manage earnings over a long period of time or because they use earnings management to temporarily hide losses until they can take actions to eliminate them, dropping such central banks from the sample works against the earnings management hypothesis.

We begin by retaining only central banks with a high standard deviation of profits measured over the entire sample period. To account for the possibility that central banks' risk exposures change over time, we also compute standard deviations using a three-year rolling window. For both cases we retain only central banks with standard deviations above the bottom tertile of their respective distributions. Results are presented in Figure 2. Selecting on central banks with high volatility of profits naturally increases the fraction of loss observations. Nevertheless, the discontinuity at the zero-profit threshold remains very strong and highly statistically significant, indicating that it is unlikely to be a mechanical byproduct of pooling. Additional robustness tests in the Internet Appendix provide further supportive evidence.[20]

(Insert Figure 2 about here)

4.2. Which factors drive the discontinuity?

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 not only uncover why and how central banks manage their earnings and their motives for such behavior, but to also attenuate the likelihood that the discontinuity is a mechanical byproduct of the central bank business model and pooling.

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

The ability of central banks to manage earnings is influenced by many factors, including accounting rules. Whereas the multitude of accounting regimes is too large for a statistical analysis, 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 smaller discontinuity.

[20] 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).

Figure 3 shows indeed that while the discontinuity is present under both IFRS and local accounting standards—consistent with the ability to manage earnings under both sets of accounting standards—it is statistically and economically smaller under IFRS. We find that the incidence of small profits to small losses is 3.31 under IFRS as opposed to 6.54 under local accounting standards. The χ^2-test at the bottom of the figure indicates that this difference is statistically significant at 5%. This test is akin to estimating a univariate regression around the threshold [-0.003, +0.003) of the propensity to report a small profit as opposed to a small loss on the variable used to split the sample (i.e., a local accounting standards indicator). The estimated coefficient is positive (0.099, the p-value is the same as for the χ^2-test).

(Insert Figure 3 about here)

To evaluate whether the discontinuity at zero is indeed particular to that number, or whether discontinuities exist also in other parts of the distribution, we also estimate the same regression for other parts of the distribution using a permutation test. Under the manipulation hypothesis, we expect that the estimated coefficients in this case are indistinguishable from zero. Under the null hypothesis that the previous results are spurious and due to noise, we expect the estimated coefficients in this placebo exercise to often be different from zero. In particular, we begin by selecting a random profit threshold $x^s \neq 0$, construct a symmetric interval $[x^s\text{-}0.003; x^s\text{+}0.003)$ around this placebo threshold excluding the small profit and loss region, and use it to estimate the same regression, saving the estimated coefficient and its t-statistic. We repeat this procedure 1,000 times and compute the average value of the estimated coefficients and the simulated p-value that the estimated coefficient has a t-stat $\geq$ 1.96 (i.e., conventional significance level of 5%). The simulated p-values effectively indicate the likelihood of obtaining a statistical rejection of the null hypothesis at random placebo thresholds (see, e.g., Hein and Westfall 2004). We find that the average value of the estimated coefficients is very small and near zero (0.012).[21] The simulated p-value indicates that there is less than 3.4% chance that the estimated coefficient at random placebo thresholds has a t-stat $\geq$ 1.96. Clustering standard errors at the country and Eurozone level yields similar results.[22] Figures IA-5 and IA-6, panel A visualize these results by plotting the distribution

[21] We obtain estimated coefficients that are close to zero when we sample either from only ROA>0 region or only ROA<0 region. This result also holds for the permutation tests reported in the next section.

[22] For these regressions we further require that the number of observations from each draw is at least 30. To ensure that the small number of observations does not affect our permutation tests that do not adjust for clustering, we repeat those tests after requiring that each draw has at least 30 observations and obtain qualitatively similar results. Because of the small number of observations (and clusters), the clustered permutation tests may be unnecessarily conservative.

of simulated standardized coefficients and showing that the mode of this distribution coincides with (or is very close to) zero. Overall, these results indicate that the larger propensity to report slightly larger profits under local accounting standards than under IFRS is unlikely to be observed at random placebo thresholds.

To further understand how central banks may be using accounting discretion to manage their profits we study more closely their reporting of loan loss and general risk provisions. Provisions are the primary earnings management tool examined by the earnings management literature on banks (Healy and Wahlen 1999). They provide an ideal earnings management tool for several reasons. Similar to banks, provisions is a major accrual (non-cash) item and a major expense component on central banks' income statement. 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 these values have on their profits.

Consistent with central banks having a higher degree of discretion than banks in accounting for provisions, we observe that imprecise estimates of general risk provisions are not uncommon among central banks. To illustrate, Table IA-2 in the Internet Appendix reports a case of a central bank selectively using imprecise, 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.[23] 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 some analytical tools, a bank's auditor would likely question any nonmaterial deviations from the calculated figure.

To test whether central banks use provisions to manage their earnings, we begin by studying the shape of their profit distributions before and after accounting for provisions. Figure 4 reports the two distributions. The distribution of profits before provisions is a lot more symmetric than the distribution of profits after provisions. In particular, we observe fewer loss observations in the distribution of reported profits (i.e., including provisions) than the distribution of profits excluding provisions, particularly near the 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 significantly larger discontinuity. We find that

[23] 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.

the incidence of small profits to small losses is 4.83 after provisions as opposed to only 1.87 before provisions. The χ^2-test at the bottom of the figure indicates that this difference is statistically significant at 1%. The estimated coefficient from an equivalent regression is also positive (0.177), while a permutation test for 1,000 random placebo thresholds excluding zero indicates there is less than a 2.6% chance that a similar relation is observed in other parts of the distribution.[24] Economically, the average estimated coefficient at random placebo thresholds is again very small and close to zero (-0.006).

(Insert Figure 4 about here)

As provisions are typically an expense that would increase, rather than decrease, the frequency and size of losses, the patterns in Figure 4 are consistent with central banks releasing provisions when they suffer losses, thus migrating into the (small) profit region. The high number of observations in the first positive bin, however, may also be driven by downward earnings management (i.e., reporting larger provision expenses by central banks that want to avoid large profits). To better understand how central banks may use provisions to manage their earnings, in Table 2 we trace the patterns of movements around the threshold. In particular, starting from the distribution of profits before provisions, we study where observations migrate after accounting for provisions. We report results for the three bins on each side of the threshold containing about 40% of our sample observations with available data on provisions.

(Insert Table 2 about here)

Columns (1)-(3) report information for movements to the right (i.e., higher level of profits). Two distinct patterns emerge. First, we observe that movements to the right are significantly more likely when pre-provision profits are in the loss region (20%-28% vs. 6%-8%; p-value=0.01). Second, nearly all such shifts bring these central banks into the profit region and often into the small profit region, consistent with the idea that central banks use provisions to avoid reporting losses, targeting small profits. Columns (4)-(6) provide similar information for movements to the left (i.e., lower level of profits). Again, two distinct patterns are detected. First, while movements to the left are not unlikely—consistent with the income-decreasing role of provisions—virtually no central bank crosses the zero-profit threshold into the loss region. This is particularly striking

[24] The χ^2-test in Figure 4 is akin to pooling the observations around the zero-profit threshold and estimating the following model: $Profit_{it} = \alpha + \beta After_{it} + \varepsilon_{it}$, where $Profit_{it}$ equals 1 if central bank i is in the small profit region in period t, and equals 0 if it is in the small loss region. $After_{it}$ equals 1 when observations are drawn from the distribution of the profits after provisions, and equals 0 for profits before provisions. For the permutation test, we estimate this regression at 1,000 randomly selected thresholds $x^s \neq 0$.

for observations in the first positive bin. Despite the large number of observations in this bin, only one observation shifts into the loss region—in sharp contrast to all other bins where such shifts are much more likely. This behavior is consistent with underreporting of the provisions to avoid losses. Combined with results from columns (1) to (3), this result also supports our thesis that at least around the threshold manipulation is unidirectional—a necessary condition for the McCrary test. Second, comparing the incidence of shifts to the left between the profit and loss regions in column (4), we also observe that, excluding the first positive bin, shifts to the left are twice as likely for profitable central banks than central banks in the loss region. This suggests that central banks may not only use provisions to avoid losses, but also to manage larger profits downwards, thus creating reserves they can use to avoid losses in the future.

Regardless of their motives, these findings provide strong support for the key premise of our paper, namely, the notion that central banks are not impervious to their profitability and can tailor their profits quite precisely. The fact that excluding provisions does not eliminate the discontinuity in Figure 4 further indicates that they use additional earnings management tools such as other accounting estimates (e.g., mark-to-model valuations) or policy variables under their control (e.g., short-term interest rates, exchange rates). In section 5, we further test whether profitability concerns are associated with changes in central banks' 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. Results are reported in Table 3. For each factor considered, we report the results of the χ^2-test, the estimated coefficient from the equivalent regression at the zero-profit threshold, and the permutation test results.[25]

(Insert Table 3 here)

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

[25] To provide the greatest possible level of transparency to the reader, Figure IA-7 reports the profit distributions for each factor. The distributions of simulated standardized coefficients at random placebo thresholds are reported in panel B of Figures IA-5 and IA-6.

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 economic reason exists for avoiding losses. One may thus hypothesize that incentives to avoid losses are greater when the political pressure is greater, or when the 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 governor *career concerns* may provide incentives to avoid losses. Indeed, we find that central banks are systematically more likely to report small profits than small losses (both economically and statistically) when central bank governors are re-appointable. 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 between them is statistically significant (column 5). This, instead, does not hold for other parts of the distribution. The permutation test yields a very small average coefficient (0.019) that is very rarely statistically significant at conventional levels (p-values=0.015 and 0.023).

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).

Thus one may 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 populism. When countries are governed by extreme nationalist or populist parties, central banks may have more difficulty convincing governments or the public of the necessity of occasional negative profits; losses are more likely to be interpreted as evidence of failed policies and weak central banks in need of ad hoc recapitalizations or politicized at the expense of the central bank.[26] 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. This relation is statistically significant at 5% and is not observed in other parts of the distribution.

[26] 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.

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 market pressures,[27] we expect that any losses they may generate are more likely to receive public attention. Publicly traded central banks hold press conferences to discuss their financial performance and issue profit warnings that may draw attention to balance sheet considerations. We find that publicly traded central banks exhibit a higher propensity to report small profits than small losses. 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 simulated coefficient is again very small and close to zero (-0.010). The simulated coefficients fail to achieve significance based on unadjusted standard errors (p-value<0.001), but the standardized coefficients greater than 1.96 are more common when we adjust for clustering (p-value=0.24).[28]

Next, we explore the role of *budgetary considerations*. Governments may become accustomed to receiving dividends from central banks to support their budgets and avoid unpopular increases in taxation.[29] Failing to provide a constant stream of dividends may bring central banks under pressure to continue to produce profits.[30] 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.[31] (To the extent that the size of

[27] "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).

[28] The increase in the p-value after adjusting for clustering may be due to the negative intracluster correlation of residuals or problems with estimating clustered standard errors when the number of clusters is small. Because we find no good reason to expect negative intracluster correlations, we tend to accept the latter explanation.

[29] The Federal Reserve, for example, has sent close to $100bn in profits per year to the Treasury in the recent past. 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 https://www.federalreserve.gov/econresdata/notes/feds-notes/2017/confidence-interval-projections-of-the-federal-reserve-balance-sheet-and-income-20170113.html.

[30] 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).

[31] 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.

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 3 are consistent with these predictions. We find that the propensity to report small profits is systematically higher when the country's leader is affiliated with a right-leaning party rather than a left-leaning party or for central banks with above median operating expenses relative to the government's total tax revenues.[32] As before, permutation tests indicate that a similar relation is not observed for other parts of the distribution. 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 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.[33] We assign all remaining central banks from the Archer and Moser-Boehm sample into a second group. These central banks are either substantially limited in the amount of profits they can retain or their dividend distribution decisions

[32] It is important to note that 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 centrals banks are more likely to be in the profit region.

[33] 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.

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 avoid losses.[34]

Results in Table 3 indicate that central banks with hard budget constraints are significantly more likely to report small profits than central banks with soft budget constraints. Like before, this does not hold for random placebo thresholds. We obtain similar results using central banks' actual dividend payments during the sample period that 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 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 are classified as having a hard budget constraint.[35] Overall, these results are consistent with the hypothesis that central banks with hard budget constraints have stronger incentives to avoid losses, but inconsistent with the hypothesis that central banks are impervious to losses.

Next, we examine whether *negative equity* insulates central banks from budgetary considerations.[36] 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 pressures to generate profits.[37] Results in Table 3 indicate that central banks with negative equity at the beginning of year t (Chile, Slovakia, and Israel) are indeed less likely to report a small profit as opposed to a small loss than central banks with positive equity and this does not hold for other parts of distribution. Taken at face value, these results might suggest that, in contrast to

[34] 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.

[35] We use the top and bottom tertiles of the dividend distribution as cutoff points, corresponding to 90% and 50% payout ratios, respectively. We thus posit that central banks with average payout ratios below 50% have a greater ability to build buffers and smooth intertemporally than those with payout ratios greater than or equal to 90%. In untabulated tests, we also contrast central banks with dividend payouts lower than 90% and central banks with dividend payouts greater or equal to 90%. Differences between the two groups are more pronounced when we allow for larger disparities in their payout ratios. This classification is also more similar to the one obtained using the dividend rules (the correlation coefficient equals to 0.48 as opposed to 0.12).

[36] Central banks are exposed to the risk of negative profits more frequently than to 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.

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

concerns expressed in existing literature (e.g., Stella 1997), negative equity may help sustain rather than jeopardize independence. However, because of the low number of central banks with negative equity, we do not attach high confidence to this interpretation.

Finally, we also explore the role of central bank *de jure independence*. We find that legally independent central banks exhibit a somewhat larger discontinuity. This result is consistent with the hypothesis that legally independent central banks may have stronger incentives to avoid losses (e.g., to justify or maintain their independence). This 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 impede de facto independence. The larger discontinuity for de jure independent central banks may also reflect the endogeneity of central bank independence (i.e., they are independent because they avoid losses).[38] This relation is not observed in other parts of the distribution. The average estimated coefficient at random placebo thresholds is effectively zero (-0.006) and it is almost never statistically significant.

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.

4.2.3. Multivariate analysis

Table 4 transfers the above analyses to a multivariate framework to account for correlations between the various factors and explore the economic significance of each factor, conditional on the other incentive and ability factors, and the proxies of economic conditions (e.g., GDP growth, exchange rate systems).[39] The sample consists of 61 observations and 18 unique central banks. This is significantly smaller than in earlier analyses because many of these factors are not available

[38] We find no significant differences with respect to central bank policy transparency or the country's broader quality of institutions and respect for the law as captured by World Bank measures of the rule of law, government effectiveness, and control of corruption (Figures IA-8 and IA-9).

[39] In particular, using the subsample of observations around the discontinuity for which all explanatory variables are available, we estimate a regression model in which the dependent variable equals 1 if central bank profit falls into the small-profit region, [0, 0.003), and equals zero if it falls into the small-loss region, [-0.003, 0). All explanatory variables are expressed as dummy variables using the same cut-offs as in Table 3 and are coded so that they all predict positive coefficients when associated with higher incentives to avoid losses. As can be observed in Table IA-3, 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 of the specification that includes all incentive factors (column 8) is 1.58, which is well below 10—a commonly used threshold for acceptable VIF.

for the same set of observations, which makes this approach less attractive than would be desirable. Indeed, a key reason for the univariate analysis is to use the largest available sample in each case. The analysis in Table 4 should thus be seen as a complement. That said, the results are remarkably similar to those obtained in the bivariate analysis above. We point out exceptions where applicable and report results using a slightly wider interval using two instead of one bin around zero, [0.006, -0.006). The wider interval increases the sample size to 114 observations and 21 central banks. The model is estimated with OLS and standard errors are clustered by central bank.[40] As before, all Eurozone central banks are assigned to the same cluster.

(Insert Table 4 about here)

Supporting our prior inferences, we find that career concerns of central bank governors, dividend distribution rules, and the size of central bank operations are the three most important factors: they have the largest impact on the likelihood of reporting a small profit as opposed to a small loss and retain their statistical significance even in the most saturated specifications. In terms of economic significance, our column (10) estimates indicate that when central bank governors are re-appointable, the odds of reporting a small profit as opposed to a small loss are five times larger than when they are not re-appointable (1.69 vs. 0.33).[41] Central banks that face hard budget constraints are two and half times more likely to report small profits than central banks with soft budget constraints (0.84 vs. 0.33). Similarly, central banks that are large relative to their governments are twice as likely relative to those that are small (0.72 vs. 0.33).

Other factors have the expected signs, but are less important either economically or statistically. For example, extreme party and right-wing affiliations are each associated with higher probabilities of reporting small profits than small losses, but we do not have enough variation in this smaller sample to distinguish between them. Publicly traded central banks are also more likely to report small profits, except for the last specification where the variable loses its statistical power. As before, more legally independent (and transparent) central banks are more likely to report small profits than small losses. These factors become statistically significant when we enlarge the sample using the wider [-0.006, 0.006) interval. Like in the univariate analysis, the broader quality of country institutions and economic development are not found to matter. IFRS does not matter once

[40] 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.

[41] The coefficient estimate of each factor can be used to calculate the odds ratio when that particular factor is set to 1: (constant + coefficient)/[1 – (constant + coefficient)].

we control for other factors, consistent with prior literature on corporations that finds incentives prevail over any constraining effects of accounting rules (Leuz et al. 2003). In other words, if incentives are strong, the reporting entities will find a way to manage profits (e.g., through "real" decisions).

Turning to our control variables, paying interest on reserves and having an exchange rate peg have no relation with the propensity to report small profits, but introducing a peg is associated with a higher incidence of small profits rather than losses, suggesting the peg value may be chosen to manage earnings. Finally, the growth rate of GDP is statistically insignificant, consistent with the idea that narrow-interval regressions compare countries with similar business cycle conditions.

Overall, the multivariate analysis in Table 4 corroborates our earlier univariate findings. These analyses rely mostly on cross-sectional variation, which accounts for the bulk of the variation in our data. In the remainder of this section, we provide some within-country evidence using a fixed-effects model, reported in Table 5, exploring variation in the central bank governor's time to regular turnover and the proximity to national elections. All else being equal, we expect that central bank governors are less receptive to external pressures the further away they are from reappointment or end of term. We instead expect that government pressures on central banks are stronger in the run-up to elections (i.e., in the election year or the prior year).

(Insert Table 5 about here)

We find that time to central bank governor regular turnover matters in the expected way. Interaction terms between either the size of the central bank operations or the hard budget constraint—the two variables found to play a key role in central bank profit concerns—with time to regular turnover reveal that these two factors matter less the further away the governor is from re-appointment or end of term. Proximity to elections does not relate significantly to loss avoidance, though the estimated coefficients have the expected signs. Overall, these results, though limited in scope, corroborate key insights from previous analyses in a within-country setting.

5. Do profit concerns relate to monetary policy?

In this section we examine whether central bank profit concerns are related to monetary policy by studying central banks' interest rate policies and inflation outcomes around the discontinuity. Theory predicts that central banks concerned with their profitability may avoid or delay increases in interest rates that are harmful to their profitability, leading to higher inflation rates (see, among

others, Bhattarai et al. 2015; Del Negro and Sims 2015; Mendes and Berriel 2015). The mere expectation of such behavior may also lead to higher inflation rates through self-fulfilling expectations (Sims 2005).

If this were the case, we should observe a discontinuity in inflation rates at the zero-profit threshold: inflation rates should be systematically—and discontinuously—higher for central banks that report small profits relative to central banks that report small losses. There could be, however, alternative non-causal interpretations. It is possible, for example, that an inflationary environment makes earnings management easier or more desirable. These tests are thus meant to document that profit concerns relate to monetary policy outcomes. They are not meant to imply that profit concerns necessarily cause higher inflation.

To probe further the likely validity of a causal interpretation, in a second set of tests we also examine whether controlling for macroeconomic conditions, central banks that end up in the small profit region as opposed to the small loss region have kept interest rates during the year systematically lower. We also examine how this relationship may vary with accounting discretion. Under a causal interpretation, the latter can help assess whether greater accounting discretion is used as a substitute or a complement to "deviations" in policy (e.g., use accounting discretion to buy time till they can take actions that can eliminate losses and risk exposures permanently). In a final test, we also examine how interest rates change in the year, depending on the central bank's accounting policies and potential to generation to generate significant revaluation gains/losses.

We study central banks' inflation rates using both narrow interval regressions around the threshold (i.e., in the [-0.003, 0.003) region) and polynomial regressions using the entire sample. In particular, using the observations around the threshold, we estimate the following model:

$$\pi_{i,t} = \beta d_{i,t} + \delta z_{i,t} + \alpha_i + \varepsilon_{i,t}, \qquad (1)$$

where $\pi_{i,t}$ denotes the inflation rate or inflation gap in country i in year t. $d_{i,t}$ is a dummy variable that equals 1 if the central bank in country i in year t reported a profit (i.e., $roa_{i,t} \geq 0$), and 0 otherwise. $z_{i,t}$ and α_i denotes time-varying country characteristics and country-fixed effects, respectively, while $\varepsilon_{i,t}$ denotes the idiosyncratic error term. A positive and significant β indicates that inflation rates are discontinuously higher as one moves from just below to just above zero.

Results are reported in Table 6. We find inflation rates are systematically higher when we move from just below the zero-profit threshold to just above it. This result becomes stronger in

column (2), which controls for broad economic conditions such as GDP growth, country income levels, and the rule of law.[42] The estimated β coefficient increases from 0.014 to 0.025 and becomes significant at 5%. This is not surprising because better economic conditions correlate negatively with both inflation rates and central bank profitability (i.e., richer countries tend to have lower inflation and their central banks are less likely to report losses). Controlling for factors that drive central bank profit concerns that may also correlate with inflation rates directly has a similar effect, raising the profit coefficient from 0.025 to 0.036 and 0.033, because such factors tend to be associated with lower inflation rates (columns (3) and (4)).[43] In column (5), we further introduce country-fixed effects to control for a broader set of time-invariant country and central bank characteristics that may be poorly captured by our controls. Identification is obtained using variation in inflation rates in the same country when the central bank's profitability is just below or just above zero. Results are again very similar, with a point estimate equal to 0.022.

(Insert Table 6 about here)

In column (6), we report results of a similar fixed-effects 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. Results are very similar. We find that central banks with small positive profits have systematically larger inflation gaps than central banks with small losses by 0.016 percentage points.[44] A similar result is also obtained in column (7) when we replace the dependent variable with "inflation surprises"—i.e., the difference between a country's inflation rate relative to the IFM's inflation forecasts for the same year in its World Economic Outlook report. We find that central banks in the small profit region have about 1 percentage point higher realized inflation than the IMF's projected inflation rate for the year.

Results in Table 6 are also robust to the use of polynomial regressions (see Table IA-4 in the Internet Appendix). These specifications use all available observations (i.e., further away from

[42] 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.

[43] 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).

[44] The magnitudes appear plausible compared to estimates in 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.

the threshold) and control for a possible underlying relationship between inflation rates and central bank profitability using polynomials of $roa_{i,t}$ along with other controls as in Table 6, as follows:

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

where $\sum_{s=1}^{n}\left[\beta_s roa_{i,t}^{s} + \gamma_s roa_{i,t}^{s} * d_{i,t}\right]$ indicates the 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] Like before, we find a positive and statistically significant β, which becomes stronger when we control for broad economic conditions and factors that may influence central banks' inflation rates directly. In terms of magnitudes, our point estimates are higher than in Table 6, ranging from 0.014 to 0.049, due to the presence of more low-income countries in the sample, which tend to have higher average inflation rates.[46]

Figure 5 offers a visual illustration of this result. The figure shows the predicted inflation rates for different levels of central bank profitability from column (1). 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 bin. The dashed lines indicate the 95% confidence interval. A clear and significant discontinuity in inflation rates exists at the zero-profit threshold. A similar relationship is instead not observed at other ex ante non-meaningful thresholds of roa such as -0.012 and 0.012 shown at the bottom of Figure 5. A formal permutation test that uses the fixed effects model from column (5) and estimates the relationship at non-zero thresholds confirms this graphical evidence. The average estimated coefficient for non-meaningful thresholds is close to zero (-0.008) and is rarely significant (p-value = 0.036).

(Insert Figure 5 about here)

Thus, whereas inflation levels may be related to central bank profits at various or all levels of profitability, the discontinuous jump in inflation appears to be unique to the discontinuity around

[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.

[46] In untabulated robustness checks, we 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.

the zero-profit threshold. This result is consistent with the hypothesis that profit concerns distort monetary policy, consistent with theoretical predictions, but it is also consistent with alternative non-causal interpretations. Central banks, for example, may have stronger incentives to manage their earnings and avoid losses when inflation is high or above its target. Reporting losses in such cases maybe more threatening to their independence. Either interpretation indicates that central bank profit concerns are related to monetary policy outcomes.

In the remainder of this section, we probe further the causal interpretation of these results by examining central banks' monetary policy rates around the threshold. Theory predicts that one way in which central banks may avoid losses is by avoiding or delaying increases in interest rates that are harmful to their profitability. If this were the case, we should observe that controlling for macroeconomic conditions, central banks that end up in the small profit region kept interest rates during the year systematically lower than those that end up in the small loss region.

We test this prediction by using as our base-line model a Taylor rule regression that assesses responsiveness of the short-term nominal interest rate to economic fundaments such as inflation and output gap (Clarida et al. 1998; Chadha et al. 2004; Carare and Tchaidze 2005). 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 the economy deviates from its desired target. We are interested in whether the propensity to report small profits over small losses reduces interest rates relative to those that a central bank would set based on its forecast of changes in macroeconomic conditions:[47]

$$r_{i,t} = \alpha_i + \gamma_\pi \pi_{i,t+1} + \gamma_y y_{i,t+1} + \rho r_{i,t-1} + \beta d_{i,t} + \alpha_i + \varepsilon_{i,t}, \quad (3)$$

where $r_{i,t}$ denotes the short-term nominal interest rate in country i at the start of year t. $\pi_{i,t+1}$ denotes the inflation rate between period t and $t+1$. $y_{i,t+1}$ 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.[48] The coefficients γ_π and γ_y measure how strongly the central bank responds

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

[48] In untabulated tests we use deviations of the log output or unemployment from their quadratic trend and find qualitatively similar results.

to inflation and abnormal economic growth patterns. Lagged short-term interest rates, $r_{i,t-1}$, accounts for interest rate "smoothing," with ρ measuring the degree of interest rate smoothing.[49]

To account for unobservable country-fixed effects, α_i, and because of the lead-lag structure of the equation, equation (3) is usually estimated using the Generalized Method of Moments (GMM) with a weighting matrix that accounts for possible correlation in the error term, $\varepsilon_{i,t}$, within countries.[50] 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.[51] We access the validity of our exclusion restrictions using the Hansen's J test for overidentified restrictions reported at the bottom of Table 7 (Hansen 1982).

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 40 basis points in column (2) when we additionally control for differences in real exchange rates. These results are consistent with the theoretical predictions that central bank profitability concerns create incentives to delay or avoid increases in interest rates. In columns (3) and (4) we also study how this relationship varies with accounting discretion by allowing for an interaction between $Profit_{i,t}$ and a dummy variable that indicates whether central bank follows IFRS or local accounting standards. As shown earlier, central banks that do not follow IFRS have more room to manage earnings using accounting discretion. Ewert and Wagenhofer (2005) predict that "real" decisions—here deviations in monetary policy—are used when accounting discretion is not an option, or is relatively costly. Consistent with this prediction, we find that the coefficient of the interaction term is positive and statistically significant, offsetting the negative $Profit_{i,t}$ coefficient. This result

[49] 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).

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

[51] 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).

indicates that accounting and "real" decisions, such as deviations in monetary policy in this case, maybe used as substitutes rather than complements.[52]

(Insert Table 7 about here)

In columns (5) and (6) of Table 7 we also study how interest rates change between the beginning and the end of year t depending on the central bank's accounting policies. Although decreases in interest rates during or at the end of year t, will have a much more moderate effect on interest expenses for the year, they could still help some central banks to generate revaluation gains and avoid losses by increasing the values of assets that are marked-to-market.

To test this prediction, in columns (5) and (6) we allow for an interaction term between $Profit_{i,t}$ and $Significant\ FV\ Assets_{it}$—a new variable that indicates whether interest rate changes could generate significant revaluation gains or losses. In particular, $Significant\ FV\ Assets_{it}$, is a dummy variable that equals one if the central bank is large (i.e., has above-median assets) and records fair value gains and losses in its income statement (i.e., its accounting policies indicate that it carries assets at fair value and reports asset revaluations in its income statement), and equals zero otherwise.[53] The latter includes central banks that predominantly use historical cost or deviate from the IFRS requirement to record certain assets at fair value or the IFRS requirement to report revaluation gains and losses in the income statement.

Consistent with the revaluation prediction above, the coefficient of the interaction term is negative and statistically significant, indicating that central banks that report small profits for year t are also more likely to decrease interest rates during the year if they have significant assets valued at fair value and record revaluation gains and losses on those assets in their income statement. The positive $Profit_{i,t}$ coefficient indicates instead that central banks in the small profit region are more likely to raise interest rates when such increases do not generate revaluation losses.[54]

[52] Predictions with respect to inflation outcomes are ex ante unclear as the use of accounting discretion may also undermine credibility and compromise the central bank's ability to control inflation. Similarly defined interaction terms are not significant at conventional levels in the models that use inflation as the dependent variable.

[53] To determine whether a central bank records its assets at fair value, we hand-collect information on central bank accounting policies from central banks' financial statements. Examples of central banks that use fair value accounting include central banks that fully adopt IFRS and those that report under local accounting rules, but are permitted to use fair value accounting.

[54] To mitigate adverse effects on inflation, it is possible that central banks raise interest rates towards the end of the period, once they have managed to sufficiently reduce their interest expenses and are confident they will not report a loss. A more refined within-year test of this conjecture would require both higher frequency interest rate changes and financial statement information, which are not available for our wide set of countries and long time period.

Given the methodological difficulties and measurement errors associated with regressions aiming to capture the determinants of central banks' monetary policy rates, we view the results of this section as suggestive, rather than conclusive.

6. Conclusions

This paper provides empirical facts that inform a thus-far theoretical debate on whether central banks are impervious to their profits and how profit concerns may interact with optimal central bank design and monetary policy. We devise an empirical test of whether central banks care about the sign of their profits. The key idea is that a discontinuity in the profit distribution is a necessary consequence of central banks being concerned with the sign of their profits.

We document the presence of such a discontinuity, as well as various factors that drive its significance and magnitude. We find that measures of political and market pressure, central bankers' career concerns, and the ability to precisely control profits are significant predictors of small profits versus losses. Small positive profits are also correlated with a more lenient monetary policy and higher inflation levels and inflation gaps. These findings suggest a preference for positive profits is a friction that may be important for future theoretical modeling to consider.

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

[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.

sufficient political pressure and career concerns, such that incentives for profit considerations enter their policy-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 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 recently 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 policy independence. Small positive profits might thus 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 recent 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 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.

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Appendix: Variable definitions and sources

Variable name	Definitions and data sources
ROA or $roa_{i,t}$	Net income of a central bank *i* in year *t* divided by its average total assets. The data are from Bankscope.
Profit or $d_{i,t}$	An indicator variable that equals 1 if ROA of central bank *i* in year $t \geq 0$, and 0 otherwise.
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	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 central banks	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.
Time to governor turnover	The time (in years) remaining until the regular governor turnover. This variable ranges between 0 and 8 years in our sample. The data on central bank governors' time in office are from Dreher et al. (2008).
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.
Close to elections	An indicator variable that equals 1 if elections of the country's chief executive take place in the current year or the following year, and 0 otherwise. The data are from Beck et al. (2001) and are available for years 1992-2012.
Operating expenses	The ratio of central bank personnel expenses from Bankscope to the country's total tax revenues from World Bank.

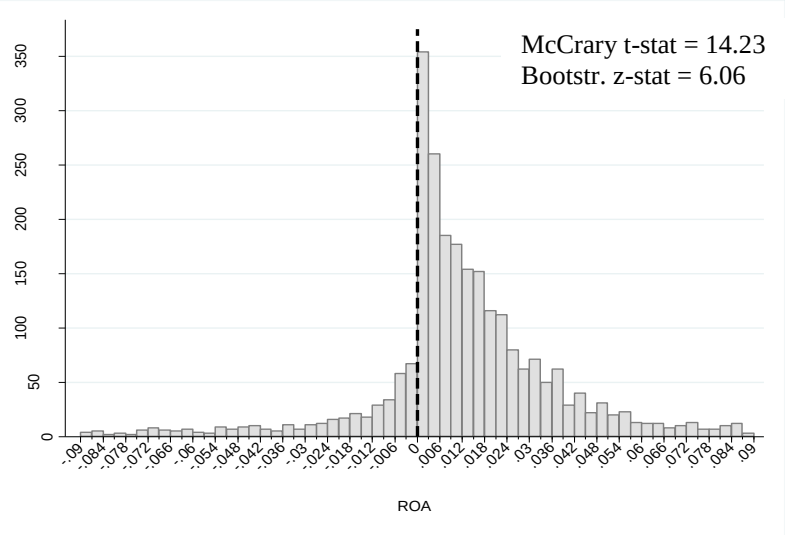
Central bank total assets to GDP	The ratio of central bank total assets from Bankscope to the country's GDP from World Bank.
Central bank legal independence	An index of central bank independence (CBIW) from (Dincer and Eichengreen 2014). The index scores answers to 24 questions covering different aspects 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.
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.
Dividend payment—tertile split	An indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greater than 90% (third tertile of the central bank dividend payout distribution) 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% (first tertile of the central bank dividend payout distribution) 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).

Central bank transparency	An index of central bank policy transparency from Dincer and Eichengreen (2014). The index scores answers to 15 questions covering different aspects of the transparency of central bank operations (incl. openness about policy objectives, economic inputs used for policy decisions, and decision making). The index has a theoretical range from 0 to 15 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.
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. 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).
Do not follow IFRS	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.
Introduce exchange rate peg	An indicator variable that equals 1 if a country introduces an exchange-rate peg in a given year based on classification of Klein and Shambaugh (2008), and 0 otherwise. The data are from Klein and Shambaugh (2008).
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.
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).

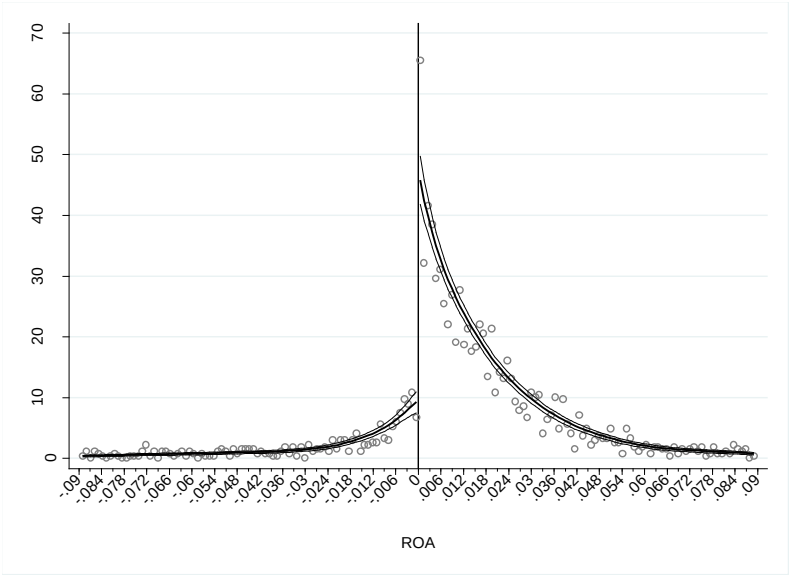
Inflation	The country rate of consumer price inflation in a given year. The data are from World Bank.
Inflation less target	The country rate of consumer price inflation in a given year less the central bank inflation target for that year. The data on inflation targets are from Siklos (2017).
Inflation 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 $12,475 (see World Bank).
Interest rate ($r_{i,t}$)	In the forward-looking Taylor rule, the short-term Treasury-bill interest rate in country *i* at the beginning of year *t*. The data are from International Financial Statistics (IFS), IMF.
Output gap ($y_{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 ($e_{i,t}$)	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).
Significant fair value assets	An indicator that equals 1 if a central bank has above-median assets (scaled by GDP) at the start of year *t* and its accounting policies in year *t* indicate that it carries assets at fair value and reports asset revaluations in the income statement, and 0 otherwise. To determine whether a central bank records its assets at fair value, we hand-collect information on central bank accounting policies from central banks' financial statements. Examples of central banks that use fair value accounting include central banks that fully adopt IFRS and those that report under local accounting rules, but are permitted to use fair value accounting. Central banks that predominantly use historical cost or deviate from IFRS requirement to record certain assets at fair value or the IFRS requirement to report revaluation gains and losses in the income statement are assigned to the non-fair-value group.

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

I. Distribution of central bank profits



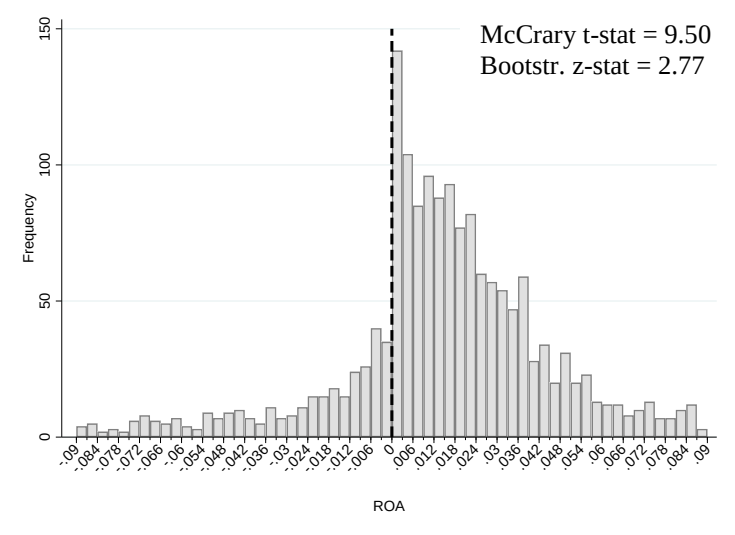
II. McCrary (2008) test for the discontinuity at zero



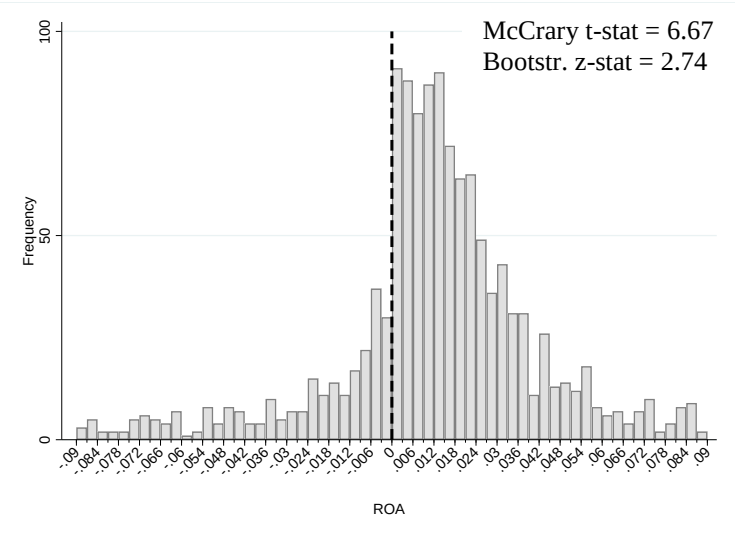
Notes: This figure plots the distribution of central bank profits over years 1992-2014 (N = 2,591). ROA is defined as central bank net income divided by average total assets. The distribution of ROA in both graphs is trimmed at [-0.09; 0.09]. The upper graph reports the histogram of ROA. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The lower graph shows the estimated density function around the zero-profit threshold and its upper and lower confidence intervals. The McCrary t-test and the bootstrapped z-test, reported in the upper left corner of each histogram, examine whether the discontinuity at zero is significant.

Figure 2: Distribution of central bank profits for central banks with high income volatility

I. Volatility of income over sample period

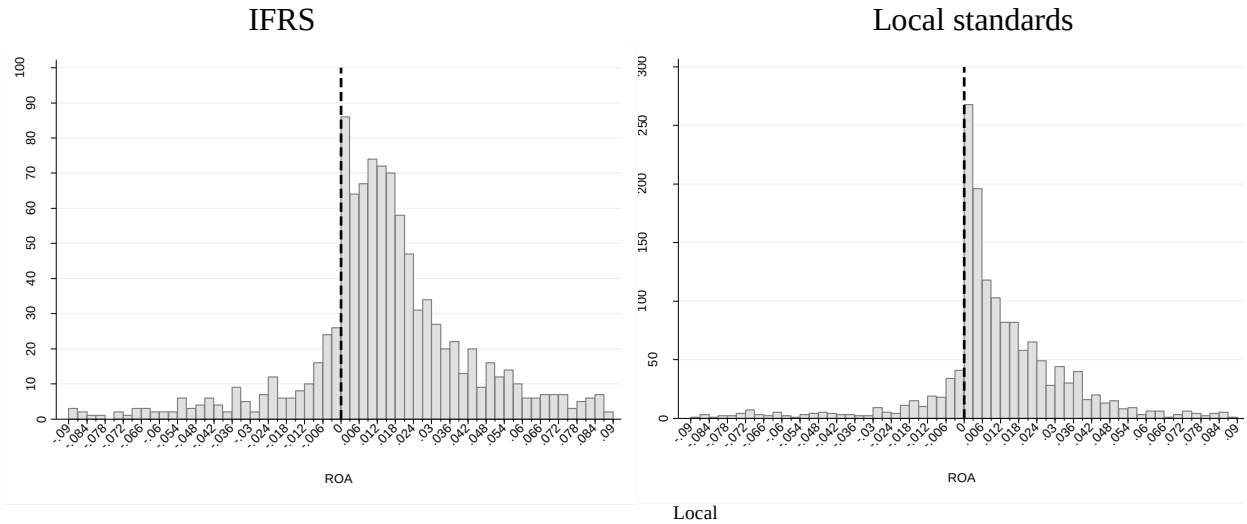


II. Volatility of income for 3-year rolling windows



Notes: This figure plots the histogram of central bank profits (ROA) for central banks in the second and third tertiles of income volatility. Income volatility (standard deviation of ROA) is calculated for each central bank over either entire sample period (upper figure) and over 3-year rolling windows (lower figure). 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 and the bootstrapped z-test, reported in the upper left corner of each histogram, examine whether the discontinuity at zero is significant.

Figure 3: Distribution of central bank profits and accounting standards

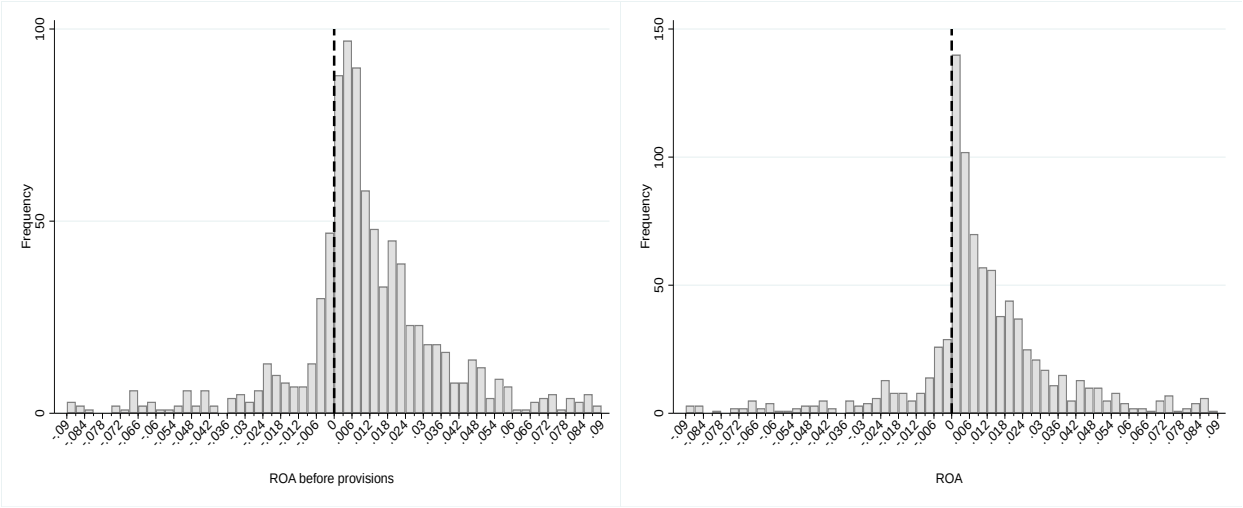


	IFRS	Local standards	Total
Small profit	86	268	354
Small loss	26	41	67
Total	112	309	421
Small profit/small loss	3.31	6.54	

χ^2-test	p-value	OLS regression coefficient	Mean simulated coefficient	No clustering t-stat>1.96	Clustering & n>30 t-stat>1.96
6.08	0.014	0.099	0.014	0.034	0.010

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 the number of observations falling into the small-profit or small-loss region in the adjacent histograms, i.e., central bank's ROA is [0; 0.003) or [-0.003; 0), respectively. The χ^2-test shows whether the number of small profits relative to the number of small losses is different in the two adjacent histograms. The OLS regression coefficient is from the univariate regression around the threshold [-0.003, +0.003) of the propensity to report a small profit as opposed to a small loss on the indicator variable that equals 1 for central banks following local accounting standards, and 0 for central banks following IFRS. The mean simulated coefficient is based on the permutation test that repeats this regression 1,000 times around a random profit threshold $x^s \neq 0$. The simulated p-value computes the percent of permutations that have a t-stat ≥ 1.96. The t-stat is reported before and after adjusting the standard errors for clustering at the country level whereby all Eurozone observations are assigned to the same cluster. The last column additionally requires that each draw has at least 30 observations.

Figure 4: Distribution of profits before and after general risk and loan loss provisions



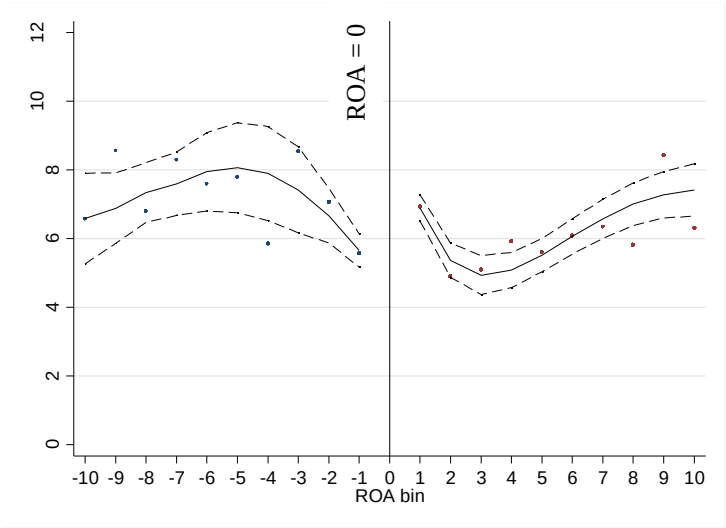
	ROA before provisions	Reported ROA	Total
Small profit	88	140	228
Small loss	47	29	76
Total	135	169	304
Small profit/small loss	1.87	4.83	

χ^2-test	p-value	OLS regression coefficient	Mean simulated coefficient	No clustering t-stat>1.96	Clustering & n>30 t-stat>1.96
12.48	<0.001	0.177	-0.006	0.001	0.026

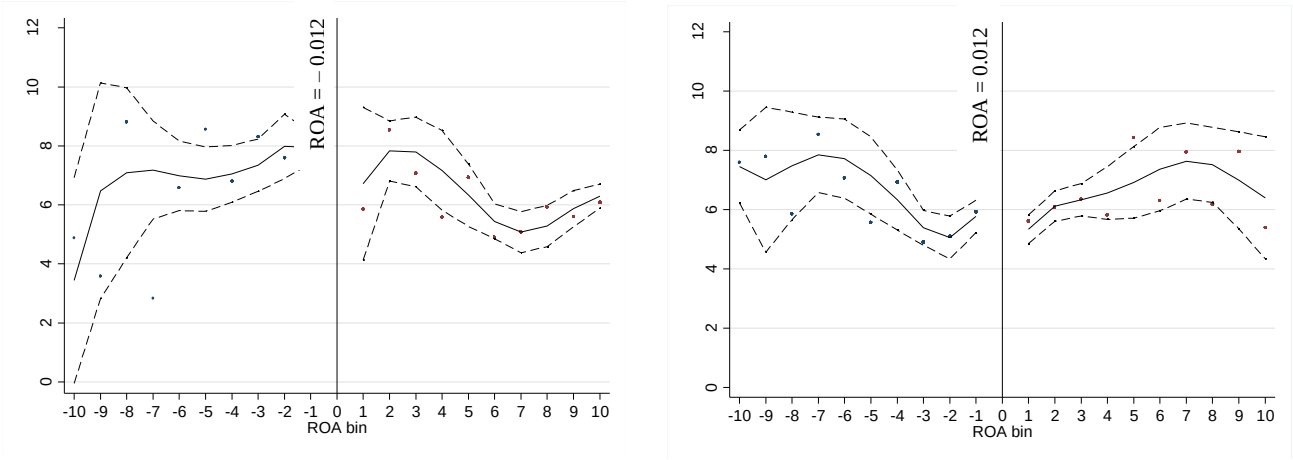
Notes: This figure plots the histogram of central bank profits before (left histogram) and after (right histogram) provisions using hand-collected data on general risk and loan loss provisions. ROA is defined as central bank net income (before or after provisions) divided by average total assets. The 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 the number of observations falling into the small-profit or small-loss region in the adjacent histograms (i.e., central bank's ROA is [0; 0.003) or [-0.003; 0), respectively). The χ^2-test shows whether the number of small profits relative to the number of small losses is different in the two histograms. The OLS regression coefficient is from the univariate regression that pools observations from both histograms and estimates: $Profit_{it} = \alpha + \beta After_{it} + \varepsilon_{it}$, where $Profit_{it}$ equals 1 if central bank i is in the small profit region in period t, and equals 0 if it is in the small loss region, and $After_{it}$ equals 1 when observations are drawn from the distribution of the profits after provisions, and equals 0 for profits before provisions. The mean simulated coefficient is based on the permutation test that repeats this regression 1,000 times around a random profit threshold $x^s \neq 0$. The simulated p-value computes the percent of permutations that have a t-stat ≥ 1.96. The t-stat is reported before and after adjusting the standard errors for clustering at the country level whereby all Eurozone observations are assigned to the same cluster. The last column additionally requires that each draw has at least 30 observations.

Figure 5: Predicted inflation rates from polynomial regression

I. Predicted inflation rates at zero-profit threshold



II. Predicted inflation rates at placebo thresholds



Notes: The figure plots predicted inflation rates from the polynomial regression reported in column (1) of Table IA-4. 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 critical ROA threshold. Panel I examines inflation rates at the zero-profit threshold. The first interval to the right of zero (1) denotes the ROA interval [0; 0.003). The first interval to the left of zero denotes the ROA interval [-0.003; 0). In panel II, the ROA threshold is -0.012 (left plot) and 0.012 (right plot). The first interval to the right of zero (1) denotes the ROA interval that is shifted by 0.003 relative to the threshold. The first interval to the left of zero denotes the ROA interval that is shifted by -0.003 relative to the threshold.

Table 1: Sample composition by country

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

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 risk provisions

		The effect of provisions on reported ROA (based on intervals of ROA distribution)					
Interval of ROA before provisions	N	Migration to the right (increases in ROA) (1)	Migration into the profit region (2)	Migration into the small profit region (3)	Migration to the left (decreases in ROA) (4)	Migration into the loss region (5)	Remain in the same interval (no material ROA change) (6)
–3	13	23%	15%	8%	0%		77%
–2	30	20%	20%	10%	10%		70%
–1 (small losses)	47	28%	28%	19%	13%		60%
+1 (small profits)	88	7%			1%	1%	92%
+2	97	6%			21%	0%	73%
+3	90	8%			34%	1%	58%

Notes: The table reports the likelihood that an observation migrates into a different interval of ROA distribution after accounting for general risk and loan loss provisions. The first column indicates the location of profits (i.e. an interval of ROA distribution) before accounting for provisions. The table reports results using three intervals on both sides of the zero-profit threshold. The other columns show what percentage of observations migrates and the direction of this migration after accounting for provisions.

Table 3: Loss avoidance and prevailing incentives

Prevailing incentives	(1) Sub-sample with low incenives for loss avoidance	(2) Propensity to report small profits	(3) Sub-sample with high incenives for loss avoidance	(4) Propensity to report small profits	(5) P-value of χ^2-test	(6) OLS regression coefficient	(7) Mean simulated coefficient	(8) No clustering t-stat>1.96	(9) Clustering & n>30 t-stat>1.96
Central bank governor re-appointable	Not re-appointable	2.16	Re-appointable	7.02	<0.001	0.192	0.019	0.015	0.023
Country leader affiliation, centrist or extreme (left/right)	Centrist parties	4.89	Extreme parties	19.00	0.049	0.120	-0.004	0.040	0.097
Central bank is publicly traded	Not traded	5.00	Traded	∞	0.052	0.167	-0.010	0.000	0.240
Country leader affiliation, left or right	Left-wing party	4.77	Right-wing party	10.88	0.055	0.089	-0.004	0.027	0.014
Central bank operating expenses to government tax revenues	Below median	3.76	Above median	10.36	0.013	0.122	-0.010	0.015	0.025
Central bank total assets to GDP	Below median	3.74	Above median	6.81	0.026	0.083	-0.012	0.020	0.034
Dividend distribution rules	"Soft" budget constrai	2.05	"Hard" budget constrai	∞	0.005	0.328	0.075	0.054	0.086
Dividend payment – tertile split	Payout < 50%	2.65	Payout ≥ 90%	8.63	0.005	0.170	0.018	0.047	0.053
Central bank has negative equity	Negative equity	1.67	Positive equity	5.48	0.019	0.221	0.006	0.018	0.096
Central bank de jure independence	Below median	4.07	Above median	7.14	0.066	0.074	-0.016	0.007	0.003

Notes: The table shows the propensity to report small profits over small losses for sample splits based on prevailing incentives for loss avoidance. The variables that are used to split the sample are described in the Appendix. Propensity to report small profits is the number of central bank observations with small profits, ROA = [0; 0.003), divided by the number of central bank observations with small losses, ROA = [-0.003; 0). ∞ denotes cases in which the number of small losses in a given sample is zero. The χ^2-test shows whether the number of small profits relative to the number of small losses is different between the subsamples. The OLS regression coefficient is from the univariate regression around the threshold [-0.003, +0.003) of the propensity to report a small profit as opposed to a small loss on the variable used to split the sample (i.e., a local accounting standards indicator). The OLS regression coefficient is from the univariate regression around the threshold [-0.003, +0.003) of the propensity to report a small profit as opposed to a small loss on the variable that is used to split the sample (e.g., 1 if a central bank governor is re-appointable, and 0 otherwise). The mean simulated coefficient is based on the permutation test that repeats this regression 1,000 times around random profit thresholds $x^s \neq 0$. The simulated p-value computes the percent of permutations that have a t-stat ≥ 1.96. The t-stat is reported before and after adjusting the standard errors for clustering at the country level whereby all Eurozone observations are assigned to the same cluster. The last column additionally requires that each draw has at least 30 observations.

Table 4: Multivariate analysis—small profit/loss region

	(1) Profit	(2) Profit	(3) Profit	(4) Profit	(5) Profit	(6) Profit	(7) Profit	(8) Profit	(9) Profit	(10) Profit	(11) Profit
Governor re-appointable	0.321***	0.296***	0.322***	0.377***		0.311***		0.368***	0.373***	0.378***	0.612***
	(0.053)	(0.060)	(0.056)	(0.088)		(0.045)		(0.072)	(0.073)	(0.123)	(0.082)
Publicly traded central banks	0.089**	0.113*	0.088**	0.089***	0.102***	0.098**	0.115***	0.097**	0.098***	0.066	0.088
	(0.031)	(0.060)	(0.031)	(0.029)	(0.027)	(0.035)	(0.032)	(0.035)	(0.034)	(0.074)	(0.077)
Extreme party affiliation	0.005	0.114**		-0.024	0.011	0.000	0.014	-0.028	-0.031	0.008	0.080
	(0.057)	(0.043)		(0.071)	(0.050)	(0.056)	(0.042)	(0.074)	(0.074)	(0.126)	(0.048)
Right-wing party affiliation	0.218**		0.220**	0.205**	0.206*	0.222**	0.218**	0.208**	0.198*	0.175	0.010
	(0.097)		(0.080)	(0.097)	(0.099)	(0.098)	(0.095)	(0.097)	(0.106)	(0.126)	(0.072)
High operating expenses	0.141**	0.169**	0.142**	0.120*	0.141**	0.140**	0.148**	0.120*	0.116	0.168*	0.223**
	(0.057)	(0.074)	(0.058)	(0.067)	(0.067)	(0.058)	(0.058)	(0.065)	(0.068)	(0.094)	(0.091)
Hard budget constraint	0.171**	0.177**	0.172**	0.188***	0.153**	0.167**	0.143**	0.184***	0.178**	0.205*	0.140*
	(0.063)	(0.072)	(0.064)	(0.062)	(0.071)	(0.061)	(0.065)	(0.059)	(0.066)	(0.100)	(0.072)
High central bank legal independence				0.084	0.037			0.082	0.091	0.129	0.186**
				(0.086)	(0.097)			(0.082)	(0.084)	(0.090)	(0.087)
Low central bank transparency						0.034	0.052	0.029	0.067	0.012	-0.281*
						(0.093)	(0.098)	(0.084)	(0.083)	(0.184)	(0.145)
Low rule of law									-0.055		
									(0.089)		
Do not follow IFRS										-0.120	0.007
										(0.140)	(0.107)
Do not incur interest on reserves										0.097	0.155
										(0.119)	(0.106)
Exchange-rate peg										-0.079	-0.114
										(0.103)	(0.085)
Introduce exchange-rate peg										0.257*	0.340***
										(0.134)	(0.102)
Low-income countries										0.029	0.080
										(0.148)	(0.089)
Growth rate of nominal GDP										-0.415	-0.366
										(0.531)	(0.333)
Constant	0.219**	0.323***	0.218***	0.126	0.516***	0.222**	0.523***	0.130	0.132	0.121	-0.041
	(0.080)	(0.072)	(0.073)	(0.121)	(0.079)	(0.080)	(0.088)	(0.111)	(0.116)	(0.183)	(0.132)
R^2	0.156	0.106	0.171	0.148	0.135	0.141	0.136	0.132	0.116	0.079	0.180
Observations	61	61	61	61	61	61	61	61	61	61	114
Countries	18	18	18	18	18	18	18	18	18	18	21

Notes: The table reports results of the OLS regression analysis. The dependent variable *Profit* equals 1 if a central bank reports a small profit in year t, and 0 if it reports a small loss. Columns (1)–(10) use small profits and small losses from the ROA interval [0; 0.003) and [-0.003; 0), respectively. Column (11) widens the interval to [0; 0.006) for small profits and [-0.006; 0) for small losses. All explanatory variables (except for the *Growth rate of nominal GDP*) are expressed as dummy variables using the same cut-off points as in Table 3 and are coded so that they all predict positive coefficients when associated with higher loss avoidance incentives. *Governor re-appointable* equals 1 if a central bank governor is re-appointable, and 0 otherwise. *Publicly traded central banks* equals 1 if the shares of a central bank are quoted on a public exchange, and 0 otherwise. *Extreme party affiliation* equals 1 if a country's chief executive has affiliation with the nationalist party, 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. *High operating expenses* 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. *Hard budget constraint* equals 1 if the central bank dividend payout ratio is greater than 90% (third tertile of the dividend payout distribution) or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% (first tertile of the dividend payout distribution) or when a central bank receives dividends from the government. *High central bank legal independence* equals 1 if a central bank has an above-median index of central bank independence, and 0 otherwise. *Low central bank policy transparency* equals 1 if a central bank has a below-median index of central bank policy transparency, and 0 otherwise. *Low rule of law* equals 1 if a country has a below-median rule of law, and 0 otherwise. *Do not follow IFRS* equals 1 if a central bank follows local accounting standards, and 0 if it follows IFRS. *Do not incur interest on reserves* equals 1 if a central bank reports no interest expenses, and 0 otherwise. *Exchange-rate peg* equals 1 if a country has an exchange-rate peg, and 0 otherwise. *Introduce exchange-rate peg* equals 1 if a country introduces an exchange-rate

peg in year t, and 0 otherwise. *Low-income countries* equals 1 if a country is a low-income economy, and 0 otherwise. *Growth rate of nominal GDP* is the percentage change in nominal GDP. The detailed variable definitions and data sources are reported in the Appendix. Robust standard errors are clustered by central bank and are reported in parentheses. 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 5: Multivariate analysis—within country evidence

	Sign	(1) Profit	(2) Profit	(3) Profit	(4) Profit
Time to governor turnover x High operating expenses	-		-0.139**		-0.129**
			(0.058)		(0.059)
Time to governor turnover x Hard budget constraint	-		-0.104*		-0.110*
			(0.060)		(0.063)
Close to elections x High operating expenses	+			0.055	0.123
				(0.151)	(0.158)
Close to elections x Hard budget constraint	+			-0.211	-0.121
				(0.159)	(0.135)
Time to governor turnover	-/+		0.141**	0.014	0.141**
			(0.052)	(0.032)	(0.054)
Close to elections	-/+		0.065	0.141	0.075
			(0.073)	(0.190)	(0.136)
Extreme party affiliation	+	0.037	-0.052	-0.038	-0.065
		(0.035)	(0.159)	(0.157)	(0.173)
Right-wing party affiliation	+	-0.021	0.126	0.041	0.128
		(0.047)	(0.102)	(0.104)	(0.102)
High operating expenses	+	0.212**	0.416	0.158	0.326
		(0.100)	(0.245)	(0.146)	(0.288)
Do not incur interest on reserves	+	-0.109	0.079	-0.065	0.051
		(0.096)	(0.127)	(0.125)	(0.116)
Exchange-rate peg	-/+	-0.010	0.175	0.169	0.155
		(0.099)	(0.211)	(0.134)	(0.191)
Low-income countries	-/+	-0.094	0.154**	0.170***	0.202**
		(0.142)	(0.061)	(0.059)	(0.072)
Growth rate of nominal GDP	-/+	-0.370	-0.570	-0.525	-0.558
		(0.248)	(0.461)	(0.464)	(0.474)
Within R^2		0.030	0.128	0.074	0.141
Observations		209	209	209	209
Countries		43	43	43	43

Notes: The table reports results of the fixed-effects regressions, which use small profits and small losses from the wider ROA interval [0; 0.006) and [-0.006; 0), respectively. "Sign" refers to the expected sign of the relationship. Column (1) uses all Table 4 variables that show variation over time. The dependent variable *Profit* is an indicator for small profits and equals 1 if the central bank reports a small profit in year t, and 0 if it reports a small loss. *Time to governor turnover* is the time (in years) remaining till the regular governor turnover. *Close to elections* is an indicator variable that equals 1 if elections of the country's chief executive take place in the current year or the following year, and 0 otherwise. *High operating expenses* 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. *Hard budget constraint* is an indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greater than 90% (third tertile of the dividend payout distribution) or when a central bank pays dividends despite incurring a loss, and 0 if the dividend payout ratio is less than 50% (first tertile of the dividend payout distribution) or when a central bank receives dividends from the government. *Extreme party affiliation* is an indicator variable that equals 1 if a country's chief executive is affiliated with the nationalist party, and 0 otherwise. *Right-wing party* affiliation is an indicator that 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. *Do not incur interest on reserves* is an indicator variable that equals 1 if a central bank reports no interest expenses, and 0 otherwise. *Exchange-rate peg* is an indicator variable that equals 1 if a country has an exchange-rate peg, and 0 otherwise. *Low-income countries* is an indicator variable that equals 1 if a country is a low-income economy in year t, and 0 otherwise. *Growth rate of nominal GDP* is the percentage change in nominal GDP. The detailed variable

definitions and data sources are reported in the Appendix. Robust standard errors are clustered by central bank and are reported in parentheses. 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 inflation rates—narrow interval regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation less target	Inflation surprises
Profit	0.014	0.025**	0.036**	0.033*	0.022**	0.016**	0.009*
	(0.012)	(0.010)	(0.014)	(0.017)	(0.010)	(0.006)	(0.005)
Growth rate of nominal GDP		0.066	0.087	0.093	0.013	-0.074**	-0.029
		(0.074)	(0.072)	(0.080)	(0.038)	(0.032)	(0.025)
Low-income countries		0.040**	0.034**	0.020	0.021	0.006***	-0.009
		(0.016)	(0.014)	(0.013)	(0.021)	(0.001)	(0.006)
Rule of law		-0.020**	-0.024***	-0.029***			
		(0.008)	(0.008)	(0.010)			
Right-leaning party affiliation			0.021	0.024			
			(0.018)	(0.022)			
Left-leaning party affiliation			0.023	0.030			
			(0.018)	(0.023)			
Extreme party affiliation			-0.030*	-0.029			
			(0.016)	(0.019)			
Governor re-appointable			-0.045	-0.063			
			(0.029)	(0.039)			
Central bank legal independence				-0.033			
				(0.024)			
Country fixed effects	No	No	No	No	Yes	Yes	Yes
R^2 / Whithin R^2	0.003	0.210	0.270	0.290	0.029	0.311	0.019
Observations	319	319	319	272	319	57	317
Countries	81	81	81	64	81	20	80

Notes: The table reports results of the OLS regression analysis for the sample of central banks that report either a small profit or a small loss (i.e., central bank profitability ROA is [0; 0.003) or [-0.003; 0), respectively). 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 for whether a central bank reports a profit or 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* captures 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* is an indicator variable that equals 1 if a country's chief executive is affiliated 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 legal independence* is an index of central bank independence. 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.

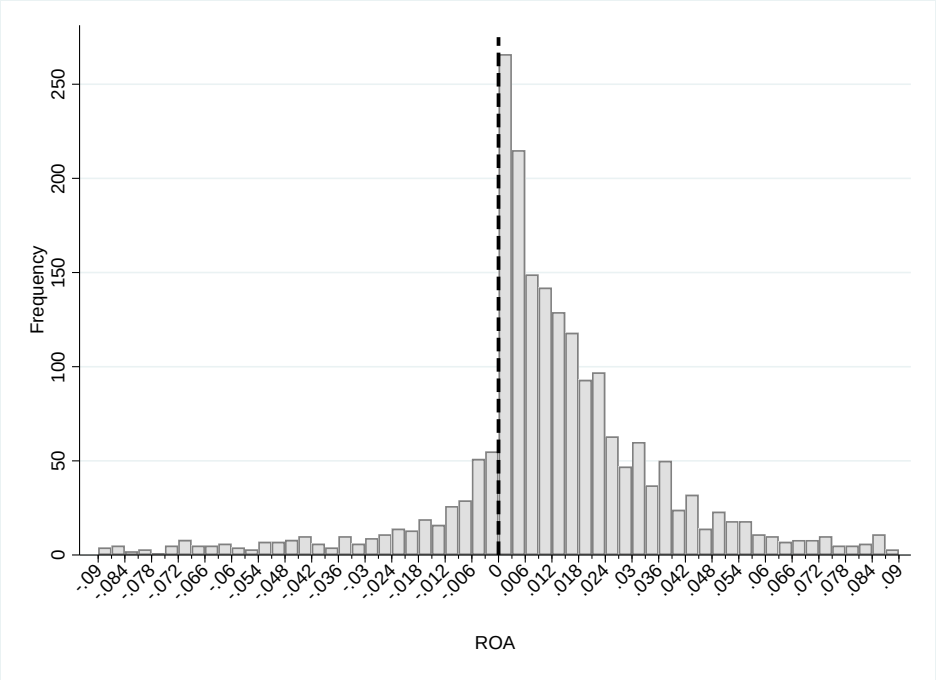
Table 7: Loss avoidance and interest rates

	Interest rates				Δ Interest rates	
	(1)	(2)	(3)	(4)	(5)	(6)
Profit	-0.011***	-0.004**	-0.018***	-0.014***	0.016***	0.014***
	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)	(0.001)
Profit x Do not follow IFRS			0.022***	0.022***		
			(0.003)	(0.003)		
Profit x Significant FV assets					-0.047***	-0.016***
					(0.013)	(0.005)
Inflation	0.768***	0.628***	0.790***	0.621***	-0.066***	0.027*
	(0.008)	(0.030)	(0.017)	(0.032)	(0.013)	(0.014)
Output gap	0.086***	0.010*	0.069***	0.009	-0.051***	-0.008**
	(0.004)	(0.006)	(0.009)	(0.008)	(0.006)	(0.003)
Lagged interest rates	0.533***	0.614***	0.554***	0.621***	-0.170***	-0.196***
	(0.005)	(0.018)	(0.013)	(0.020)	(0.011)	(0.009)
Real exchange rate		-0.00006***		0.00003*		-0.00002*
		(0.00001)		(0.00002)		(0.00001)
Do not follow IFRS			-0.017***	-0.022***		
			(0.003)	(0.003)		
Significant FV assets					0.032***	0.005
					(0.012)	(0.004)
Hansen's J-test (p-value)	0.47	0.39	0.55	0.44	0.73	0.45
Observations	140	129	140	129	127	117

Notes: The table reports results of the regression analysis for a sample of central banks that report either a small profit or a small loss, i.e., central bank profitability ROA is [0; 0.003) or [-0.003; 0), respectively. The table reports the estimates of a forward-looking Taylor rule using the GMM estimator with a weighting matrix that accounts for possible correlation in the error term within countries. The dependent variable is the interest rate on short-term Treasury bills of the country *i* at the beginning of year *t* (columns 1-4) or the change in interest rate on short-term Treasury bills of the country *i* during year *t*. *Profit* is an indicator for whether a central bank reports a profit or a loss in year *t*. *Do not follow IFRS* equals 1 if a central bank follows local accounting standards during year *t*, and 0 if it follows IFRS. *Significant FV assets* is an indicator variable that equals 1 if a central bank has above-median assets and its accounting policies indicate that it carries assets at fair value and reports asset revaluations in the income statement, and 0 otherwise. *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.

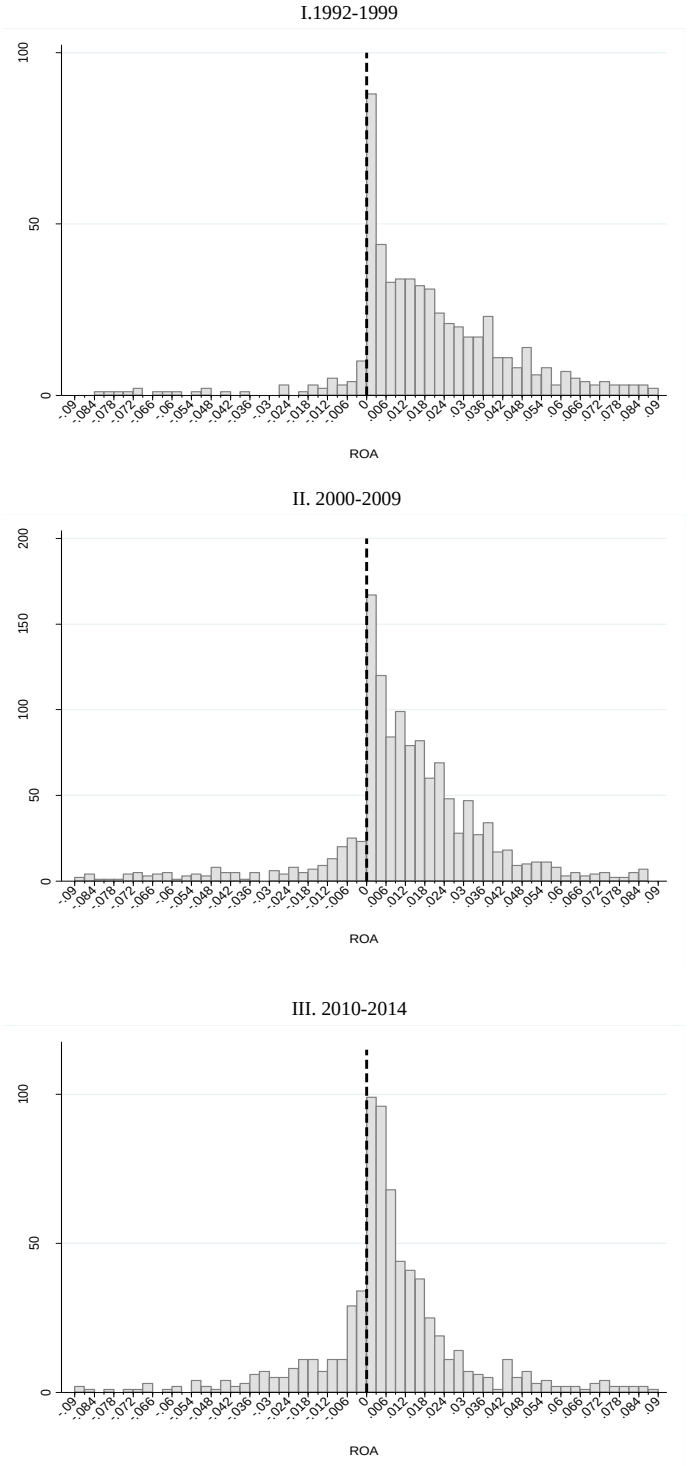
INTERNET APPENDIX

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.

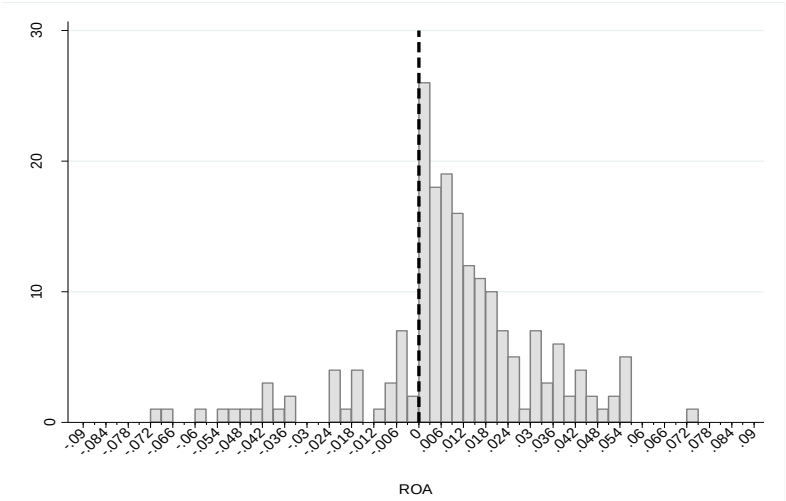
Figure IA-2: Distribution of central bank profits for each of the three decades in the sample



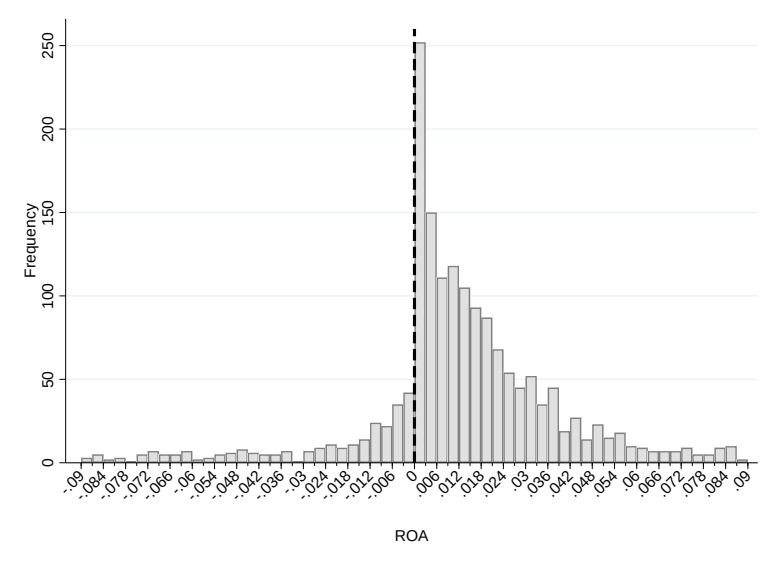
Notes: This figure plots the histogram of central bank profits (ROA) for 3 sub-periods: 1992-1999, 2000-2010, and 2010-2014. The distribution of ROA in all the graphs is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is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

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

I. Crisis years



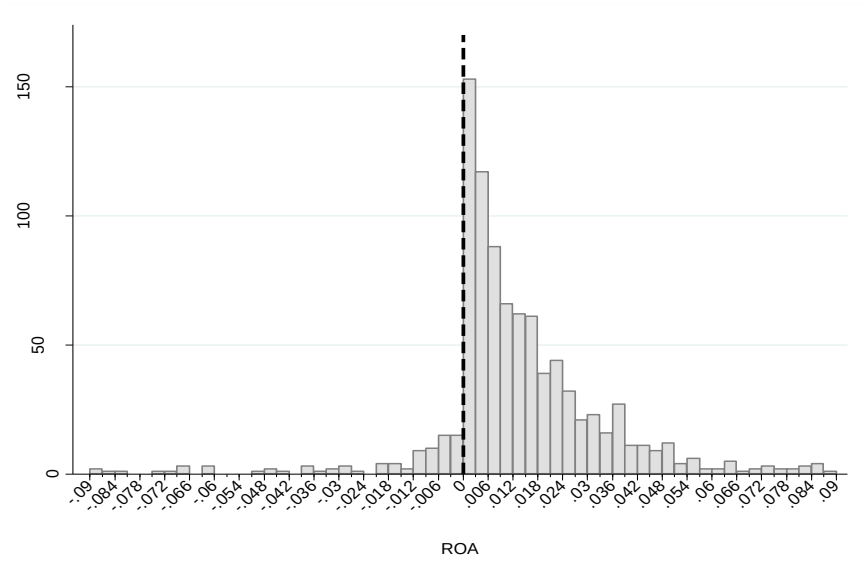
II. Non-crisis years



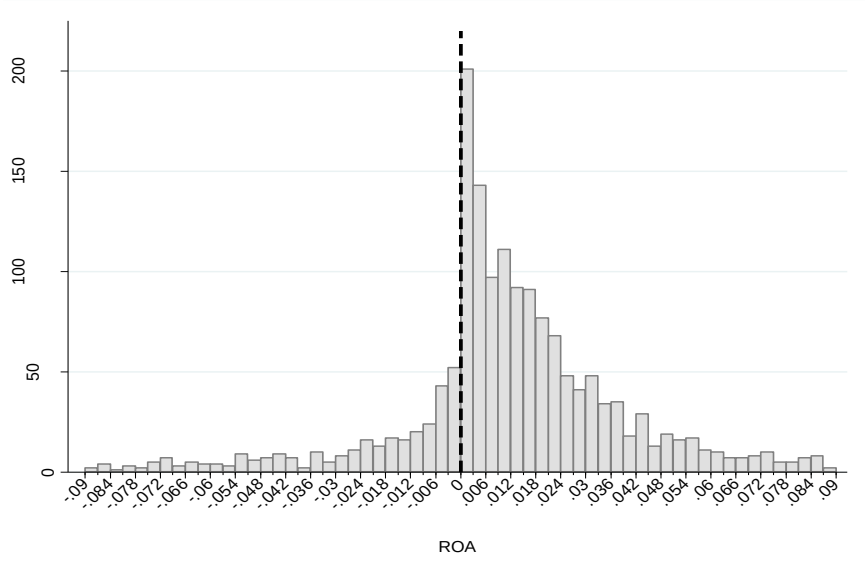
Notes: This figure plots the histogram of central bank profits for countries and years that experience a systemic banking crisis, currency crisis, or sovereign debt crisis (due to default or restructuring). The distribution of ROA in both graphs is trimmed at [-0.09; 0.09]. The dotted vertical line shows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



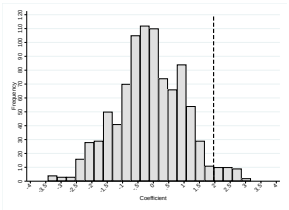
II. Low-income countries



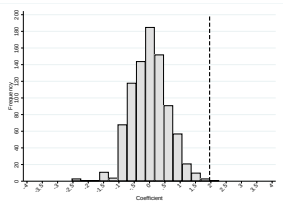
Notes: This figure plots the histogram of central bank profits for high-income and low-income economies. The low-income economies have GNI per capita based on the World Bank cut-off point of less than $12,475. High-income economies have GNI per capita that exceeds $12,475. ROA is defined as central bank 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: Simulated coefficients for random placebo thresholds

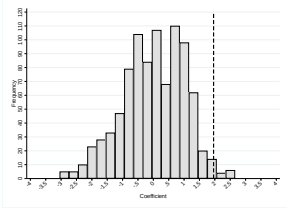
A.I. Central bank profits and accounting standards



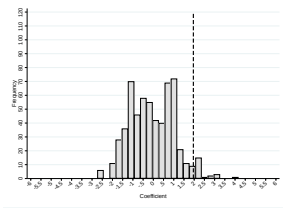
A.II. Distribution of profits before and after general risk and loan loss provisions



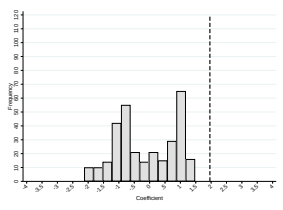
B.I. Central bank governor re-appointable vs. not



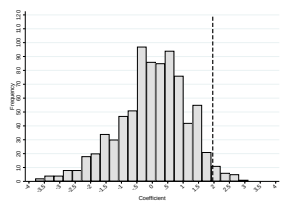
B.II. Country leader affiliated with extreme parties vs. centrist parties



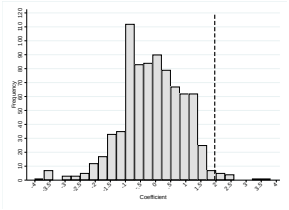
B.III. Central bank is publicly traded vs. not



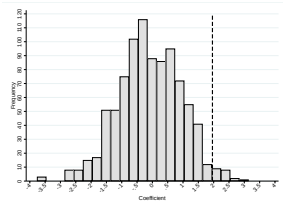
B.IV. Country leader affiliated with left-leaning party vs. right-leaning parties



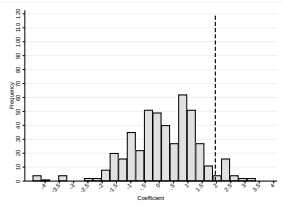
B.V. Central bank operating expenses to total government income from taxes



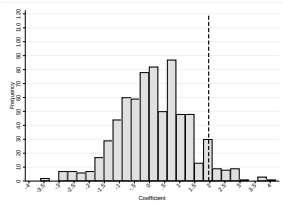
B.VI. Size of a central bank's balance sheet



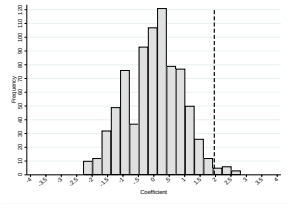
B.VII. Dividend distribution rules



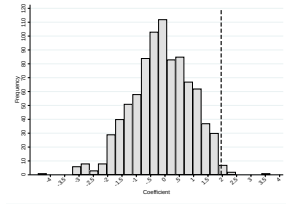
B.VIII. Dividend payment—tertile split



B.IX. Sign of central bank's equity



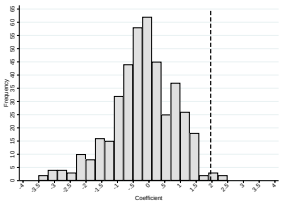
B.X. Central bank legal independence



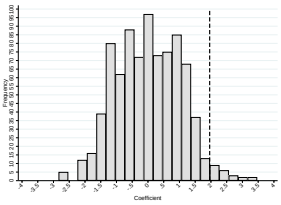
The figure reports the distribution of simulated standardized coefficients (i.e. t-stat.) based on the permutation test described in Table 3 that uses random profit thresholds $x^s \neq 0$. The dotted vertical line indicates the critical value of 1.96.

Figure IA-6: Simulated coefficients for random placebo thresholds (n>30)

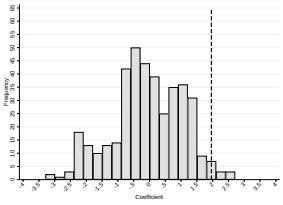
A.I. Central bank profits and accounting standards



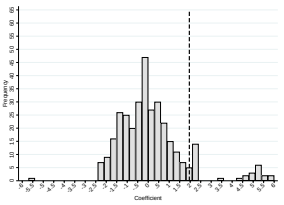
A.II. Distribution of profits before and after general risk and loan loss provisions



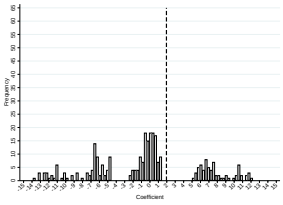
B.I. Central bank governor re-appointable vs. not



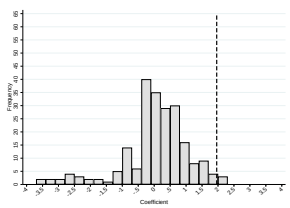
B.II. Country leader affiliated with extreme parties vs. centrist parties



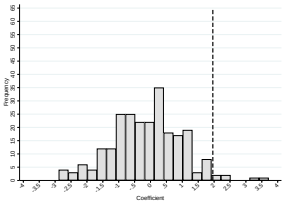
B.III. Central bank is publicly traded vs. not



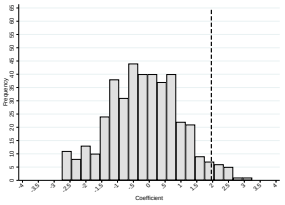
B.IV. Country leader affiliated with left-leaning party vs. right-leaning parties



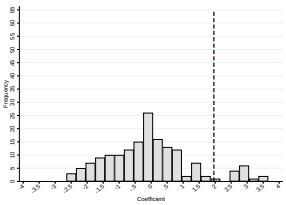
B.V. Central bank operating expenses to total government income from taxes



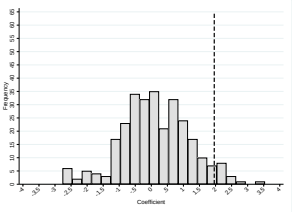
B.VI. Size of a central bank's balance sheet



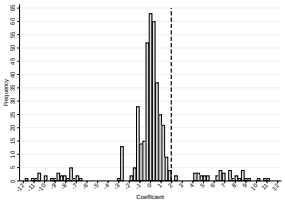
B.VII. Dividend distribution rules



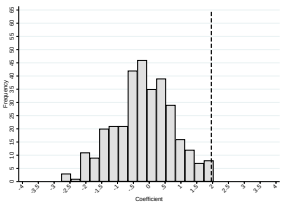
B.VIII. Dividend payment—tertile split



B.IX. Sign of central bank's equity



B.X. Central bank legal independence

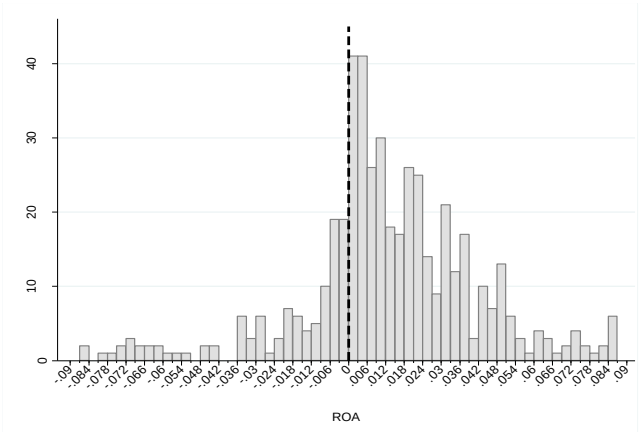


The figure reports the distribution of simulated standardized coefficients (i.e. t-stat.) based on the permutation test described in Table 3 that uses random profit thresholds $x^S \neq 0$. The dotted vertical line indicates the critical value of 1.96. Different to Figure IA-5, each random draw is required to have at least 30 observations and the standard errors are adjusted for clustering at the country level whereby all Eurozone observations are assigned to the same cluster.

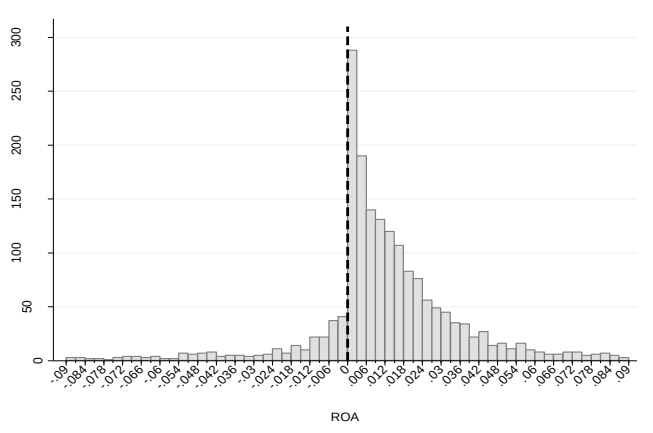
Figure IA-7: Distribution of central bank profits and incentives to manage earnings

I. Central bank governor re-appointable vs. not

Not re-appointable

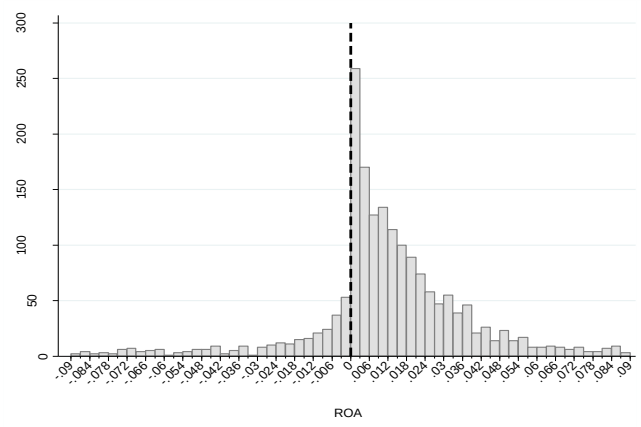


Re-appointable

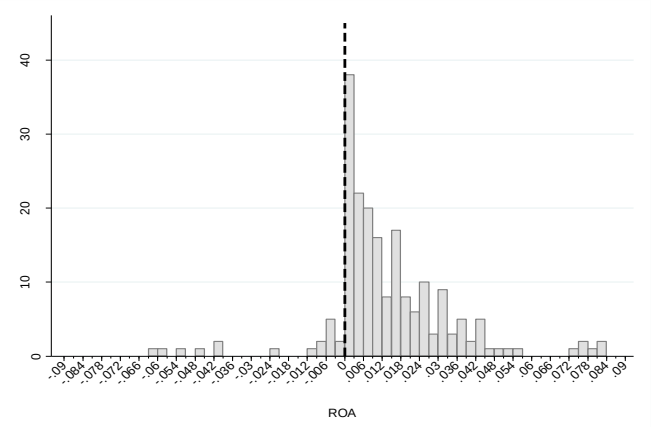


II. Country leader affiliated with extreme (left- or right-wing) parties vs. centrist parties

Centrist parties

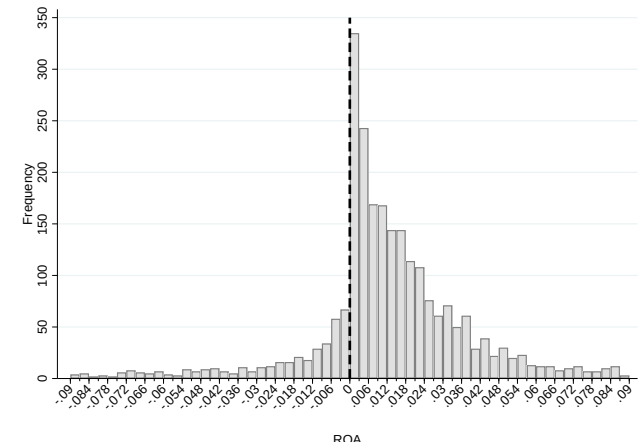


Extreme parties

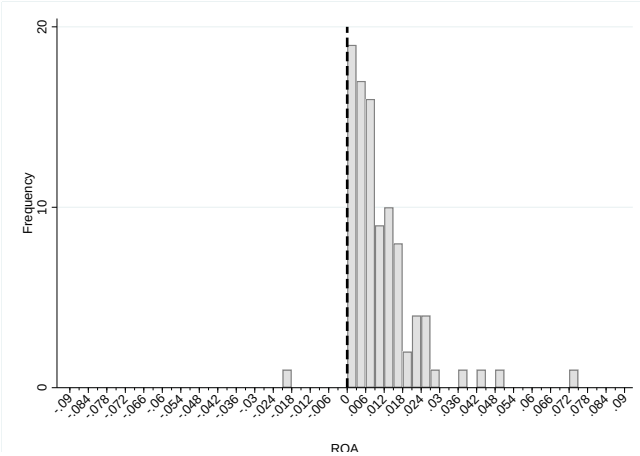


III. Central bank is publicly traded vs. not

Not publicly traded

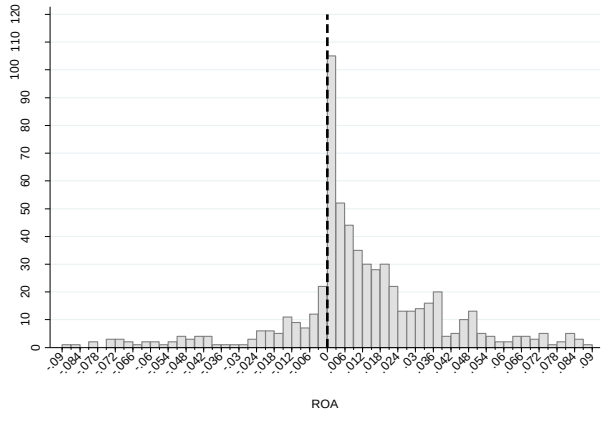


Publicly traded

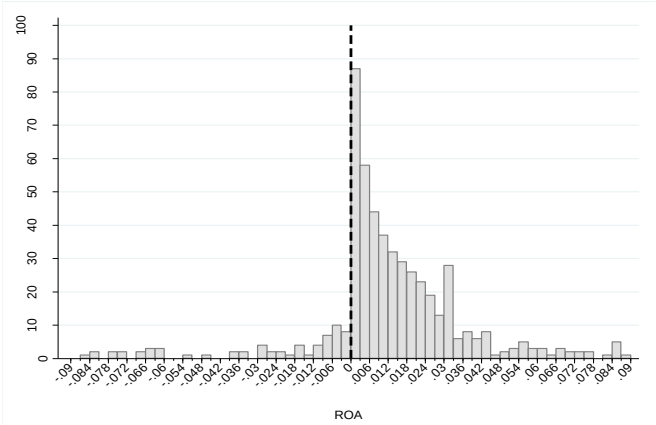


IV. Country leader affiliated with left-leaning party vs. right-leaning parties

Left-leaning parties

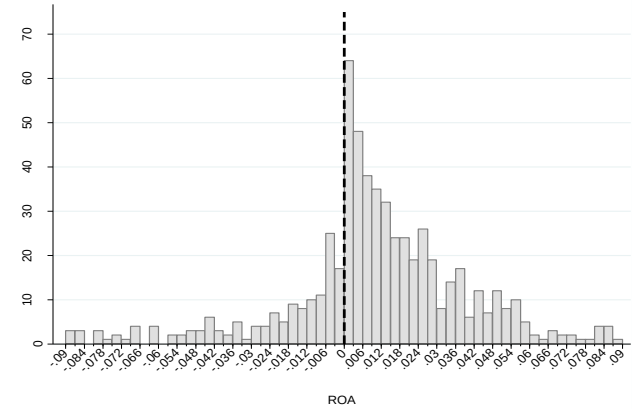


Right-leaning parties

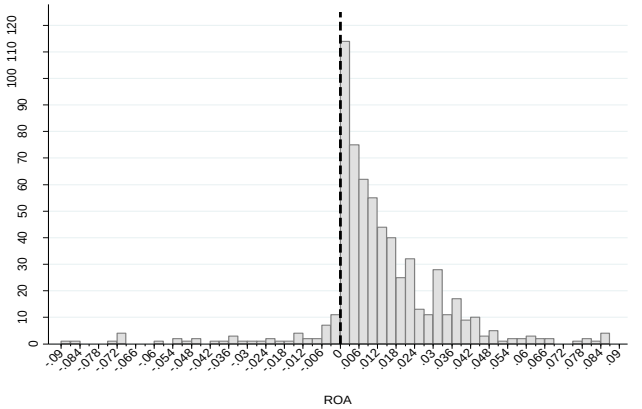


V. Central bank operating expenses to total government income from taxes

Below median

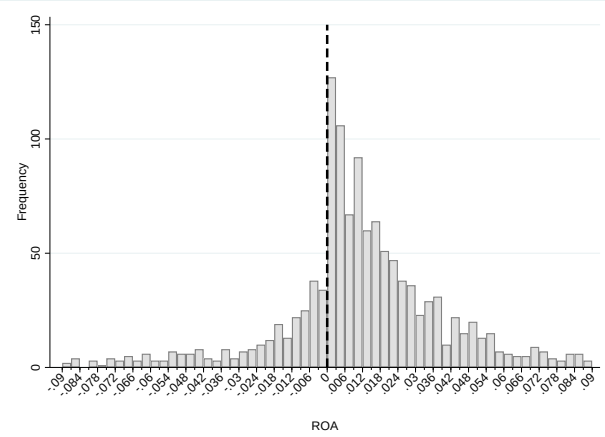


Above median

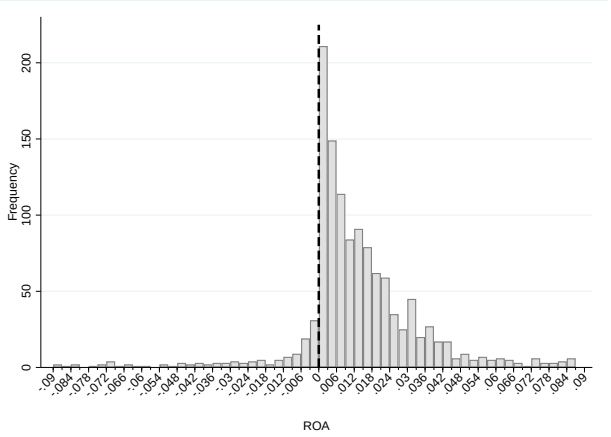


VI. Size of a central bank's balance sheet

Below median

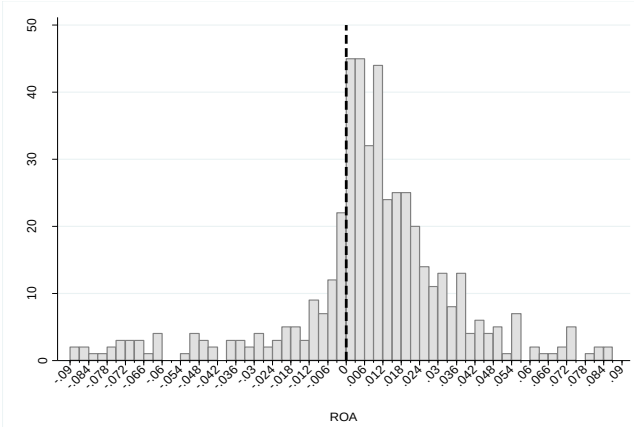


Above median

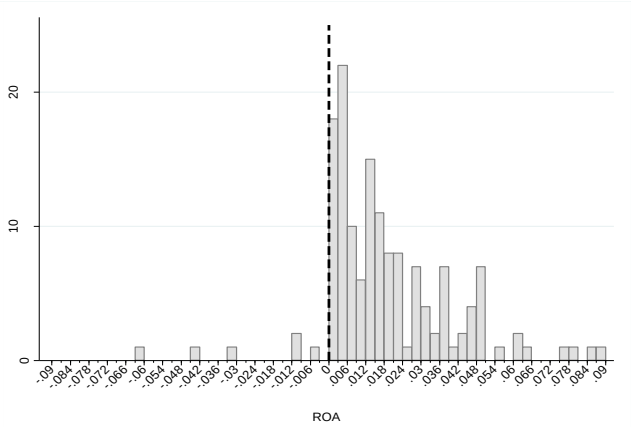


VII. Dividend distribution rules

“Soft” budget constraint

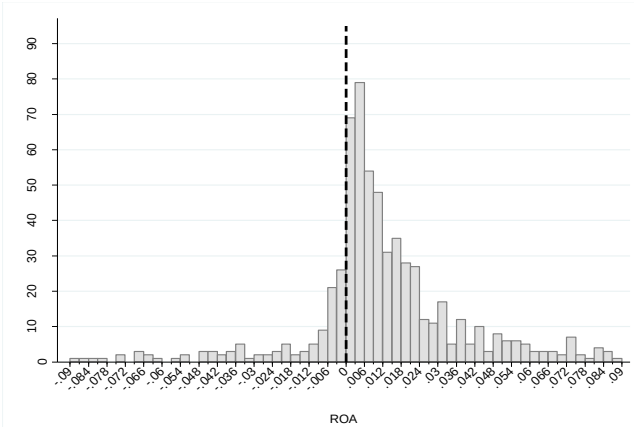


“Hard” budget constraint

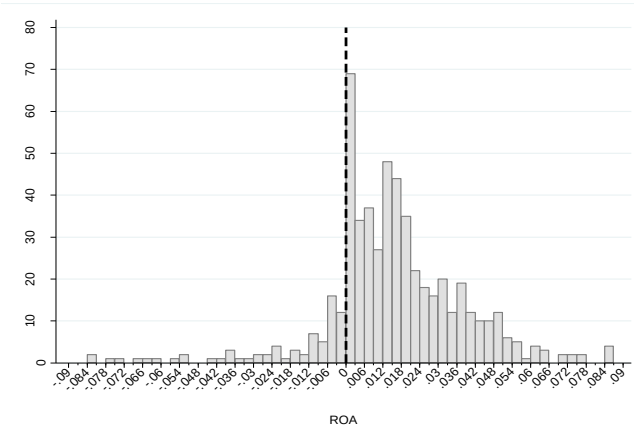


VIII. Dividend payment—tertile split

Payout < 50% (first tertile)

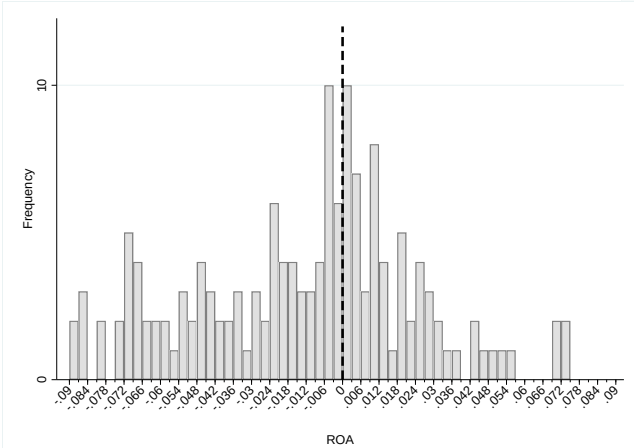


Payout ≥ 90% (third tertile)

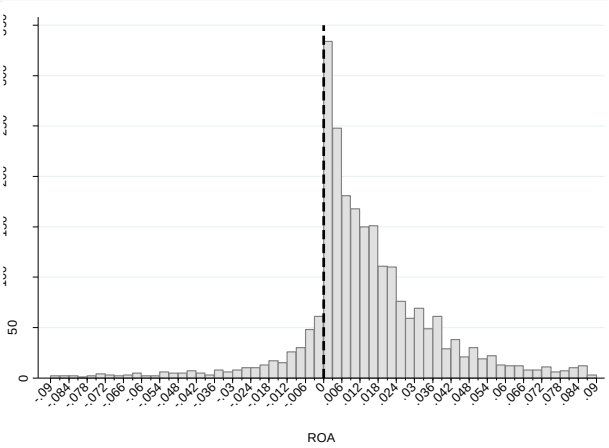


IX. Sign of central bank’s equity

Negative equity

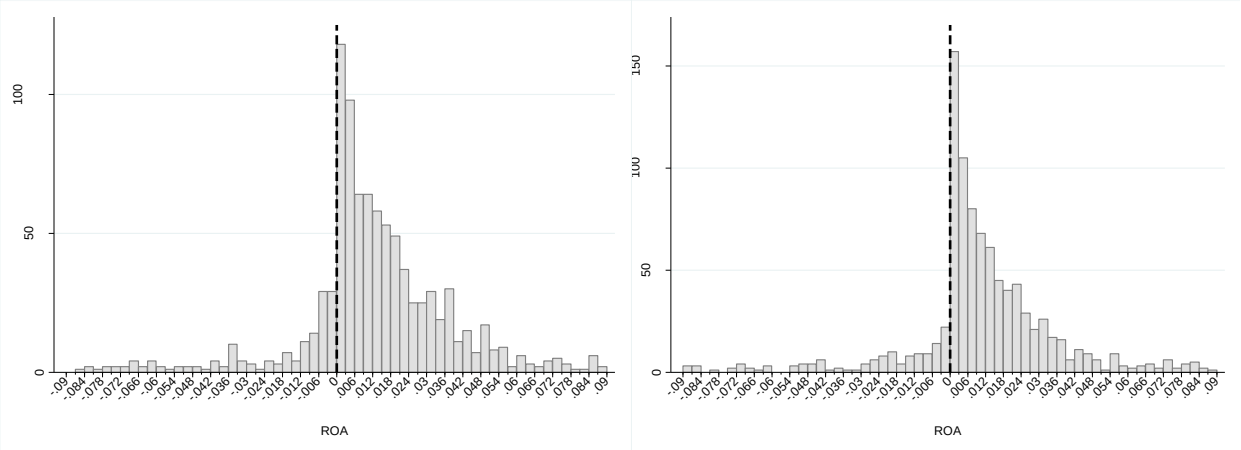


Positive equity



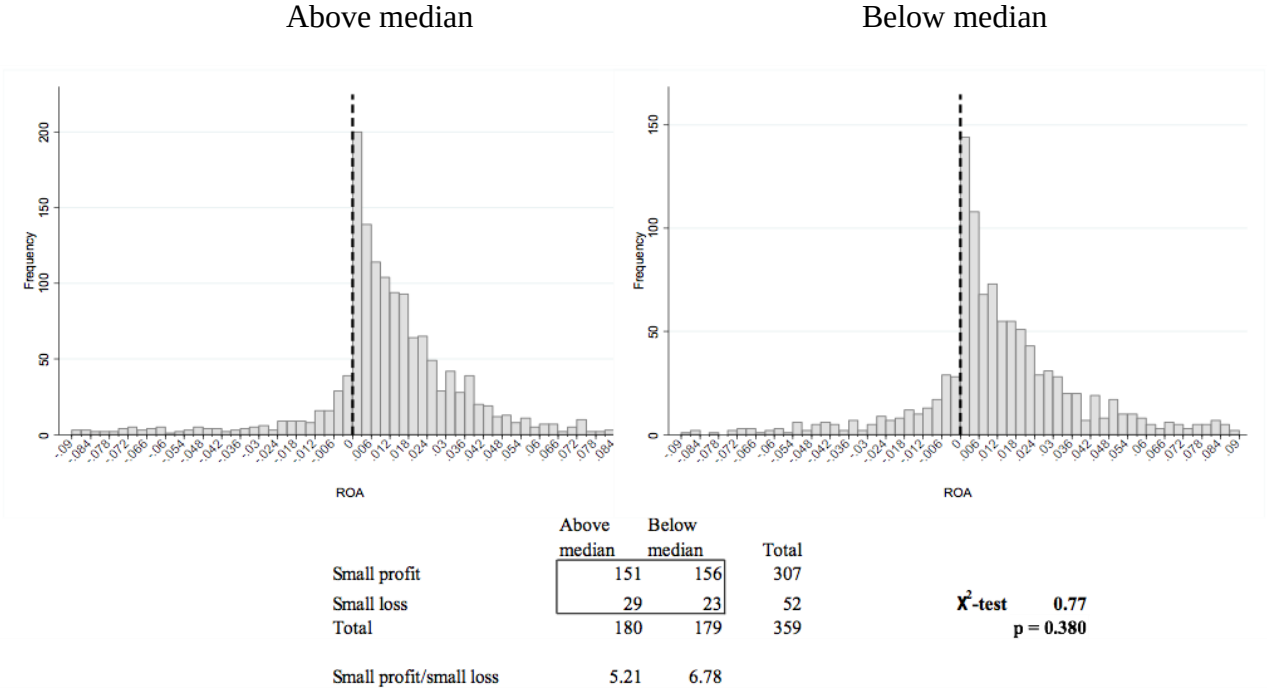
X. Central bank legal independence

Below-median legal independence | Above-median legal 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-8: Distribution of central bank profits and central bank policy transparency



	Above median	Below median	Total
Small profit	151	156	307
Small loss	29	23	52
Total	180	179	359
Small profit/small loss	5.21	6.78	

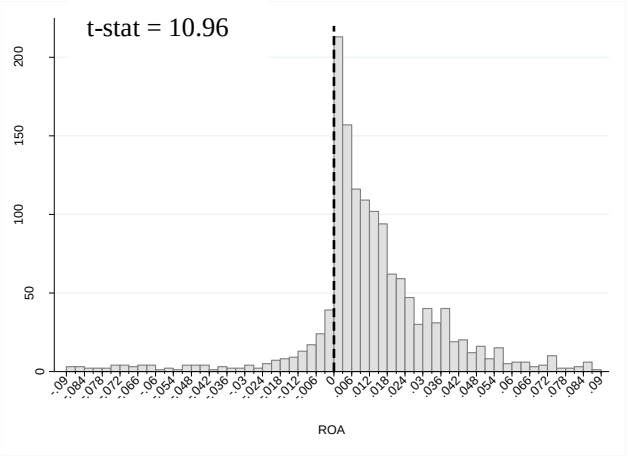
χ^2-test 0.77
p = 0.380

Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on the central bank policy transparency index. The variable used to split the sample and data sources are described in the Appendix. 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 the number of observations falling into small-profit or small-loss region in the adjacent histograms (i.e., central bank profitability ROA is [0; 0.003) or [-0.003; 0), respectively). The χ^2-test shows whether the number of small profits relative to the number of small losses is different in the two adjacent histograms.

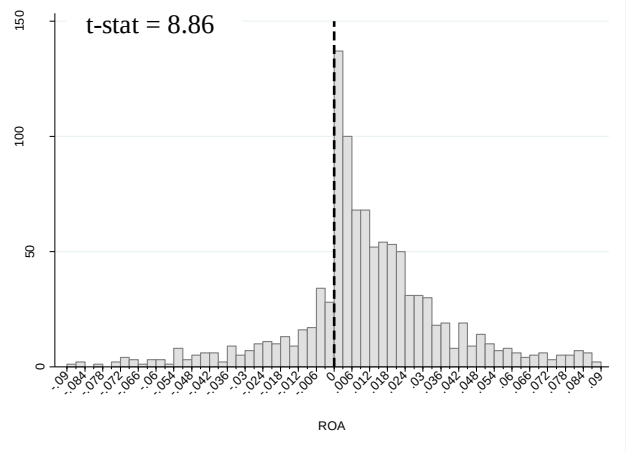
Figure IA-9: Distribution of central bank profits and country institutional environment

I. Rule of law

Above median



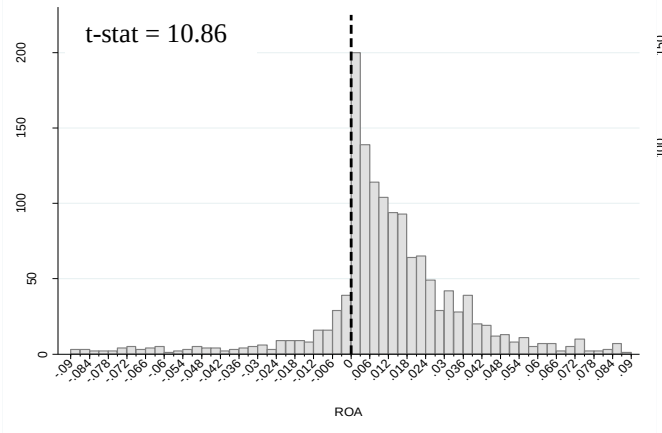
Below median



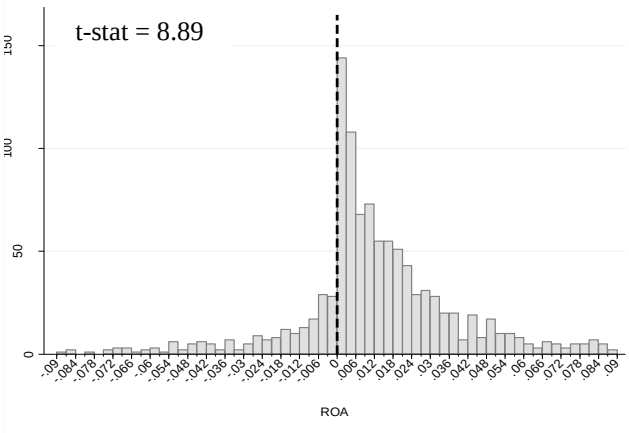
	Above median	Below median	Total	
Small profit	210	140	350	
Small loss	39	28	67	χ^2-test 0.08
Total	249	168	417	p = 0.784
Small profit/small loss	5.38	5.00		

II. Government effectiveness

Above median



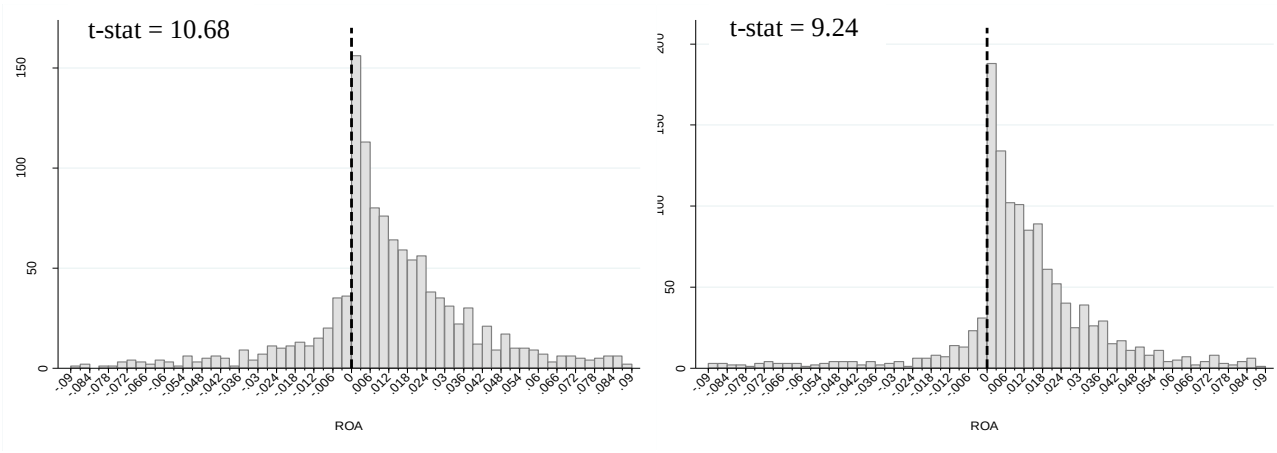
Below median



	Above median	Below median	Total	
Small profit	198	146	344	
Small loss	38	29	67	χ^2-test 0.02
Total	236	175	411	p = 0.899
Small profit/small loss	5.21	5.03		

III. Control of corruption

Above median | Below median



	Above median	Below median	Total
Small profit	159	185	344
Small loss	36	31	67
Total	195	216	411
Small profit/small loss	4.42	5.97	

χ^2-test **1.27**

p = 0.260

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. The table below the histograms reports the number of observations falling into small-profit or small-loss region in the adjacent histograms (i.e., central bank profitability ROA is [0; 0.003) or [-0.003; 0), respectively). The χ^2-test shows whether the number of small profits relative to the number of small losses is different in the two adjacent histograms.

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: Correlation between the test variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Governor re-appointable	1.000														
(2) Extreme party affiliation	0.110	1.000													
	0.04														
(3) Publicly traded central banks	0.097	0.073	1.000												
	0.06	0.17													
(4) Right-wing party affiliation	0.103	-0.010	0.111	1.000											
	0.13	0.88	0.10												
(5) High operating expenses	0.017	0.020	0.048	0.133	1.000										
	0.81	0.78	0.49	0.13											
(6) Hard budget constraint	-0.034	0.096	0.205	-0.060	-0.092	1.000									
	0.66	0.24	0.01	0.54	0.40										
(7) Low central bank legal independence	0.159	0.025	-0.068	-0.260	-0.496	0.114	1.000								
	0.00	0.68	0.22	0.00	0.00	0.16									
(8) Low central bank transparency	0.096	0.099	-0.236	-0.111	-0.162	-0.004	0.388	1.000							
	0.07	0.08	0.00	0.12	0.02	0.96	0.00								
(9) Low rule of law	-0.036	0.067	-0.180	-0.138	-0.339	-0.396	0.049	0.527	1.000						
	0.47	0.21	0.00	0.04	0.00	0.00	0.38	0.00							
(10) Do not follow IFRS	0.123	0.033	-0.131	-0.065	-0.189	-0.117	0.352	0.281	0.131	1.000					
	0.02	0.54	0.01	0.33	0.01	0.13	0.00	0.00	0.01						
(11) Exchange-rate peg	0.170	0.082	-0.027	0.106	0.665	0.155	-0.208	0.080	-0.197	-0.034	1.000				
	0.00	0.13	0.59	0.12	0.00	0.04	0.00	0.14	0.00	0.50					
(12) Introduce exchange-rate peg	0.005	0.014	-0.058	0.017	-0.003	0.076	-0.001	0.065	0.112	0.034	0.256	1.000			
	0.93	0.79	0.23	0.80	0.96	0.32	0.99	0.22	0.02	0.49	0.00				
(13) Do not incur interest on reserves	0.096	0.127	0.121	0.067	-0.096	0.413	0.139	0.233	-0.131	0.042	0.037	0.046	1.000		
	0.08	0.03	0.02	0.34	0.18	0.00	0.02	0.00	0.01	0.43	0.50	0.39			
(14) Low-income countries	-0.057	0.083	-0.220	-0.277	-0.332	-0.414	0.202	0.492	0.658	0.183	-0.258	0.062	-0.186	1.000	
	0.26	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00		
(15) Growth rate of nominal GDP	-0.014	0.052	-0.102	0.061	-0.050	-0.029	-0.111	0.084	0.096	-0.049	-0.007	0.046	-0.027	0.098	1.000
	0.79	0.34	0.04	0.37	0.48	0.71	0.05	0.12	0.05	0.32	0.89	0.35	0.62	0.05	

Notes: The table reports Pearson correlation coefficients for the variables used in Table 4. 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. The variables and data sources are described in the Appendix. All variables (except for the *Growth rate of nominal GDP*) are expressed as dummy variables as explained in the paper and are coded so that they all predict positive coefficients when associated with higher incentives to avoid losses.

Table IA-4: Loss avoidance and inflation rates—polynomial regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation less target	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			-0.017*	-0.019*			
			(0.009)	(0.011)			
Governor re-appointable			-0.026	-0.035			
			(0.019)	(0.025)			
Central bank legal 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 for whether a central bank reports a profit or 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* captures the extent to which economic agents have trust in 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* is an indicator variable that equals 1 if a country's chief executive is affiliated 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 legal independence* is an index of central bank independence. Polynomials include a vector of polynomials of ROA up to the factor 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.