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(Why) Do Central Banks Care About Their Profits?

Abstract

We document that central banks are significantly more likely to report slightly positive profits than slightly negative profits. The discontinuity in the profit distribution is (i) more pronounced amid greater political or public pressure, the public's receptiveness to more extreme political views, and agency frictions arising from governor career concerns, but absent when no such factors are present, and (ii) correlated with more lenient monetary policy inputs and greater inflation. These findings indicate that profitability concerns, while absent from standard theoretical models of central banking, are both present and effective in practice, and inform a theoretical debate about monetary stability and the effectiveness and riskiness of non-traditional central banking.

JEL-Codes: E580.

Keywords: central banks, profitability, non-traditional central banking, monetary stability.

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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

"[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 the sign and size of their profits? The answer to this question is a crucial determinant for the effectiveness of standard and non-standard monetary policy, as well as for long-term monetary stability. According to Friedman and Schwartz (1963), the Fed's fear of losses was a factor preventing an aggressive expansionary response to the Great Depression. The question is timely again as the widespread adoption of non-traditional monetary policy, with large-scale asset purchases both in the US and the Euro area, mechanically link interest rate changes to central bank profits,[1] and as politicians even in advanced economies link the continuation of central bankers' careers to their policy choices.[2]

Commensurate with the importance of the question, a high-powered theoretical debate has emerged. One strand debates the normative question under which conditions central banks *should* or should not care about their profitability. Other authors *assume* central banks care at least about the sign of their profits, and show which desirable and undesirable consequences such preferences or constraints might bring about. Interestingly, however, the debate thus far lacks an empirical investigation into its premise—namely, the positive question whether central banks *are* in fact

[1] "…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 left its deposit-rate floor in place but said it would start buying corporate bonds." ("Windfall for Central Banks Fuels Political Pressure", Wall Street Journal, May 8 2016).

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

concerned with the level or sign of their profits. Of course, investigating this question is difficult, given that counterfactual profit levels are in general difficult to observe. This paper provides a first answer by focusing on a set of central-bank-year observations for which the counterfactual can arguably be discerned with some confidence.

Using a large sample of more than 150 central banks spanning more than twenty years, we document that central banks are discontinously more likely to report small positive profits than small negative profits. The significance and magnitude of the discontinuity varies predictably with various *incentives* of central bankers (such as measures of the level of political pressure to produce profits, the public's receptiveness to more extreme political views, central bankers' career incentives, etc.) as well as with measures of the central banks' *ability* to control their reported income (such as exposure to foreign exchange risk and accounting rules). Moreover, a discontinuity is present *only if* there are enough such factors present. Hence, the discontinuity is unlikely to be a mechanical byproduct of the central banking business model, and more likely the result of imperfect *de facto* independence of the central bank.

The fact that central banks appear to care about the sign of the profits they report is prima facie evidence for the importance central bankers pay to the public's perception of their profitability. However, some implications of this finding depend on whether the discontinuity in central bank profits is more likely solely due to accounting manipulations such as income smoothing—or if, by contrast, profitability concerns are also related to policy choices, as suggested in the commentary and press reports cited above. We find that the discontinuous propensity to avoid losses is related to (i) discontinuously smaller Taylor rule coefficients and (ii) higher inflation, both in levels and relative to target. These results are robust to controlling for country fixed effects. Whereas the level of inflation and short-term interest rates in a country can be related to the central bank's level of profits for various reasons, it is more difficult to imagine why those variables would be *discontinously* 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. Therefore, these results suggest more than a spurious link between the degree of central banks' loss aversion and monetary policy choices.

The usefulness of our findings lies in their potential to (i) help assess the likely applicability of existing theories that vary in the extent to which they assume central banks have profitability or capital concerns, and (ii) help inform future theoretical modeling. Regarding the former, Sims (2005) shows that central bank capital concerns can lead to self-fulfilling hyperinflation equilibria. Jeanne and Svensson (2007) emphasize that resulting inflationary expectations can enable the economy to escape a liquidity trap. Berriel and Bhattarai (2009) embed an exogenous positive-profit constraint in a dynamic new Keynesian model and show that the constraint renders the central bank to distort its policy choices, making it less effective at governing the quantity of money, inflation, and the output gap.

Hall and Reis (2015) agree with the logic of that conclusion, but question its key assumption. They ask the normative question of why a central bank should ever care about its profits, and provide sufficient conditions that make profit concerns irrelevant, in theory.[3] These conditions include that the central bank can accrue earnings before or after a negative capital shock to smooth its budget constraint, that political pressures and career concerns do not affect policy choices, and that the public understands the logic of central bank accounting. Under these assumptions, profits should be entirely irrelevant to central banks; profits are not an "afterthought," but no thought at all. Yet, Archer and Moser-Boehm (2013, 1) point out that 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); central bank behavior may anticipate such reactions. Therefore, an empirical test of the positive prediction that central banks are entirely impervious to their profits is important, despite the clarity of the existing theoretical investigations into the question.

[3] Less closely related, Mendes and Berriel (2015) point out that a positive-profit constraint is also what can make quantitative easing effective because it turns large-scale asset purchases into a commitment device to keep future rates low; a conclusion challenged by Correia et al. (2013). Reis (2016) explains how quantitative easing can be an effective tool to respond to fiscal crises.

Our findings reject the null hypothesis that central banks are indifferent to their profitability. One may hence conclude that future modeling should entertain the notion that profits are an important consideration in central banking.[4] However, our design does not have the power to reject that profits are irrelevant to any particular central bank in the sample. Hence, 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 and their sources. Section 4 reports our key findings on loss avoidance. Section 5 reports results on policy inputs and outcomes. Section 6 concludes.

2. Testable hypotheses and empirical strategy

The primary goal of the present paper is to test whether central banks report higher profits when "frictions" that may favor the generation of profits are more pronounced.[5] The counterfactual profit level is the one that would have occurred if such frictions had not been present, or had been present to a lesser extent. The null hypothesis is that central banks' policies and accounting profits are entirely determined by fundamental factors. Under that hypothesis, there is no difference between actual and counterfactual profit levels. The alternative hypothesis is that central banks produce higher profits than they otherwise would have when certain frictions are present.

The empirical challenge is that, for any central bank-year observation and the corresponding level of "frictions," the counterfactual is impossible to observe directly; it is therefore difficult to distinguish the alternative from the null hypothesis for a generic central-bank-year observation. The key idea of the present paper is to focus on a subset of observations for which we can arguably elicit an average counterfactual with some confidence: those banks that report profits just above or below zero.

[4] Reis (2015) points out that period-insolvency can lead to rule-insolvency in his discussion of Del Negro and Sims (2015).
[5] We use the term "frictions" to refer to balance sheet or income-related factors that may affect central banks' policy.

The argument underlying our first set of tests is that in a frictionless world, there is no strong reason why a central bank would generate a very small profit as opposed to a very small loss. 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. The profit distribution should therefore be smooth; a discontinuity in the profit distribution at any point would be unexpected in a frictionless model.[6] By contrast, a discontinuity is a natural consequence of a model in which profit concerns play a role. In particular, if central banks (or, more specifically, the agents acting on its behalf) care about the sign of the central bank's profits, and if the agents have the ability to affect the profit levels, one should expect to see that, on the margin, central banks are more likely to report small profits than small losses. Formally, the empirical hypotheses are:

H_0: *There is no discontinuity in any set of central banks' profit distribution.*

H_1: *There is a discontinuity at zero in central banks' profit distribution.*

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

H_{1b}: *There is no discontinuity in samples in which no such factors are 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 with various factors that proxy for incentives and ability to increase profits. (To conserve space, we only give an exhaustive list of such factors in the empirical section. They cover a variety of economic, political, behavioral, agency, and accounting considerations.)[7]

In our second set of tests, we investigate whether the discontinuity in the profit distribution is more likely to be the result of accounting manipulations alone, or whether there is suggestive evidence

[6] This is in contrast to for-profit entities, for which a discontinuity at zero profits is well documented (see e.g., Burgstahler and Dichev 1997; Burgstahler and Chuk 2017; Leuz et al. 2003; Bergstresser et al. 2006).

[7] Various measures of incentives and ability to increase profits (described below) may also give rise to higher central bank profits more generally. However, we can only observe a counterfactual profit level for banks around the zero-profit threshold. Our focus is thus explained by the desire to establish internal validity of the notion that certain factors induce central banks to take actions that influence their reported profits. The downside of our approach is that the empirical results, and in particular the magnitude of the estimated coefficients, may not enjoy strong external validity.

that 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. For example, in Hall and Reis (2015), the absence of full and frictionless fiscal support can set the central bank on a path of exploding reserves; a positive-profit constraint can have a similar effect (Berriel and Bhattarai 2009). One may also hypothesize that fiscal support for the central bank is less likely to be expected in a country run by a populist government, given that such a country's population seems less perceptive to subtle arguments about central bank accounting and their relation to public finance. The central bank may thus react with more caution to avoid shortfalls in such a situation. It can do so, among others, by modifying its policy choices. For example, the fear of balance sheet losses can give incentives to central banks to delay increases in interest rates as the economy recovers, leading to higher inflation rates (see, among others, Bhattarai et al. 2015; Mendes and Berriel 2015; Del Negro and Sims 2015).

We empirically examine whether central banks' tendency to avoid losses affects policy by testing if the tendency to avoid losses is associated with differences in Taylor rule coefficients and inflation gaps across country-years with varying levels of *incentive* and *ability* factors present. If loss-avoidance matters for policy choices, Taylor rule coefficients should be smaller for central banks that report a small profit relative to central banks that report a small loss on average, and average inflation rates (or inflation gaps relative to target) should be systematically higher. A placebo test is that no discontinuity should be present at any other point in the profit distribution. By contrast, if the sign of profits is irrelevant for policy choices, short-term rates and inflation should not discontinuously change at any point of the profit distribution, including zero.

Whereas we control for a variety of country- and time-specific factors with fixed effects and a variety of explicit controls, conceptual problems associated with estimating Taylor rule coefficients and standard concerns with cross-county analyses imply that the results of our second set of tests should be viewed as suggestive, not conclusive.

3. Data

We use data from five data sources: Bankscope, the Bank for International Settlements (BIS), the International Financial Statistics (IFS), the World Bank, and from the central bank literature. Financial statement information such as central bank profitability, components of central bank income and expenses, and accounting rules come from Bankscope. Central banks measure assets and income either following accounting rules that also apply to commercial banks (e.g., International Financial Reporting Standards, IFRS), or specifically developed accounting 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.[8]

We measure central bank profitability as the return on assets (ROA): the ratio of net income over total assets, whereas total assets are calculated as the average between the beginning and end of the fiscal year to which the net income calculation applies. 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 (i.e., the information needed to measure a central bank's profitability—our key variable). Our analysis focuses on national central banks and excludes data on supranational central banks (ECB) and local central bank branches. This procedure yields a sample of 2,591 bank-year observations that covers a 23-year period and 155 countries. (By way of comparison, there are currently 193 United Nations member states.)

Table 1 provides an overview of our primary sample of central banks. The starting point of our analysis is 1992, when Bankscope begins 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 a more complete coverage. Low-income countries have lower

[8] This implies that we sometimes have two observations for each bank-year. In robustness checks, we repeat our key analyses after excluding the "duplicate" observations for central banks that report both sets of financial statements.

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)

We complement the Bankscope data with data from several sources. Information about central banks' dividend distribution rules comes from the BIS (Archer and Moser-Boehm 2013). Macroeconomic indicators such as economic development (high/low income countries), inflation rates, and growth rates of GDP come from the World Bank. We obtain data on short-term interest rates from the IMF. Dincer and Eichengreen (2014) and Dreher et al. (2008) provide information on central bank 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) (which covers 179 countries up to 2012). We obtain data on country institutional characteristics such as government effectiveness, rule of law, and corruption from Kaufmann et al. (2010). Data on banking, currency, and sovereign crises are taken from Laeven and Valencia (2012). Table A1 in the Appendix reports detailed definitions and data sources for the 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. After that, we turn to a multivariate regression framework, which gives an indication to which extent the correlation structure between various factors affect their respective roles in shaping central banks' loss-avoidance, but also suffers more from missing observations.

4. Results

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

The top panel of Figure 1 reports the distribution of central bank "profits" (net income scaled by average total assets) for all observations in our sample (truncated at +/- 9% for better readability).[9] We observe an abrupt increase in the number of observations after the zero-profits threshold.

(Insert Figure 1 about here)

We use a McCrary (2008) test to formally test whether the discontinuity around zero is statistically significant.[10] 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 that the discontinuity is statistically significant. The formal test reported in the upper left corner of Figure 1.II indicates indeed that the discontinuity is strongly statistically significant at the 1% level.

Next, we examine whether this discontinuity is present throughout our sample period and across high- and low-income countries. To do so, we first split our sample in three sub-samples, one for each decade in our sample: 1992-1999, 2000-2009, and 2010-2014. Figure 2 shows the discontinuity is present for each of the three decades spanned by our sample. In unreported tests, we also confirm that the discontinuity is present in both crisis and non-crisis periods. In Figure 3 we distinguish between high- and low-income countries in a similar way. Results indicate that the discontinuity is present for both sets of countries. This finding rejects the plausible hypothesis that loss aversion is only a feature of low-income countries, where the rule of law and institutions may be poorer.

(Insert Figures 2 and 3 about here)

[9] 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.

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

Next, we examine whether the discontinuity is an artifact of pooling together central banks that never make losses with central banks that do. In our sample, out of 127 central banks for which we have at least 10 observations, 43 central banks have never reported losses during the sample period.[11] Removing these central banks from our sample does not change the results. Figure 4 reports the profits distribution for central banks that report a loss at least once during the sample period and for which we have at least 10 observations. Like before, we observe a significant discontinuity at zero.

(Insert Figure 4 about here)

Overall, using a large sample of central banks we find that central banks' profits exhibit a sharp discontinuity at the zero-profit threshold. This pattern is present throughout the sample period as well as across high- and low-income countries and it is not an artifact of pooling.

These findings reject the null hypothesis, but support the alternative Hypothesis H1. This is true irrespective of whether the discontinuity is mainly driven by shifting of profits from the small-loss to the small-profit region which would result in increases in average profits, or by mean-preserving profit smoothing over time.[12]

In what follows, we aim to inform more thoroughly the interpretation of these results by testing the sub-hypotheses H1a and H1b, thus shedding light on the cross-sectional determinants of the discontinuity.

[11] Central banks are differentially exposed to losses. For example, comparing central banks that never experienced losses during the sample period with central banks that experienced losses at least once reveals that the former are more likely to use IFRS that requires mark-to-market accounting, to have a currency peg, and to experience a currency crisis, a sovereign crisis, or a sovereign restructuring. They are less likely to experience a banking crisis and have similar foreign assets to total assets ratios. We also find that central banks that pay interest on their liabilities are marginally more likely to experience losses (94.32% of observations in our sample have positive interest expenses, with average interest expense equal to 68.15% of interest income). We also note that the distributional properties of ROA are not consistent with the view that central banks are generally immune to losses and make stable profits that do not change much over time. The overall standard deviation of ROA is 0.062, with within and between variation equal to 0.054 and 0.034, respectively. Similarly, the persistence coefficient of ROA is 0.644, which is quite low and is comparable to the persistence that prior studies estimate for US listed firms (about 0.7-0.8). See Sloan (1996).

[12] The histograms are more likely with the former hypothesis: they show much larger change in the number of observations between the small-loss region and the small-profit region than between the small-profit region and the interval immediately to the right of it (the odds ratio of 5.26 vs. 1.36). A thorough analysis distinguishing between the "profit-lifting" and "income-smoothing" channels would suffer from selection problems owing to variation in the availability of time-series information across central banks and is therefore omitted.

4.2. Which factors drive the discontinuity?

In this section we aim to uncover the factors (frictions) that drive central banks' incentives and ability to avoid losses, and investigate whether the discontinuity disappears when no (or not sufficiently many) such factors are present. By doing so, we not only answer the question which factors are more likely to make central banks loss-averse, but also attenuate the likelihood that the discontinuity is a mechanical byproduct of the "traditional" central bank business model.[13]

Hard vs. soft budget constraints

We begin by exploring the role of central banks' dividend distribution rules. As shown in the extant theoretical literature, dividend distribution rules influence whether central banks can soften their budget constraints (Hall and Reis 2015). Central banks whose charter allows for negative dividends can draw 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 have weaker or no incentives to avoid losses, because they face no risk of period-insolvency.

In a first test of the hard vs. soft budget constraint hypothesis, we use information on the central banks' dividend distribution rules in each country. This information is only available for 30 countries from Archer and Moser-Boehm (2013, Annex 2). Our second approach uses central banks' actual dividend payments during the sample period. This data is available for most central banks in our sample. In the first approach, we label central banks that can draw on external resources to cover losses or that are allowed to reduce dividend payments to cover future or past losses as having a "soft" budget constraint.[14] This group includes Chile, Czech Republic, Finland, Iceland, India, Israel, Germany, Korea, Malaysia, Mexico, Netherlands, Peru, Poland, Philippines, Thailand, Turkey,

[13] It may be the case that central bank assets and liabilities are such that they are more likely to generate small profits than losses or large profits. For example, the Federal Reserve has until recently earned "high income from holding short-term bonds, funded almost entirely with currency, low reserves, and zero or low interest paid on reserves" (Hall and Reis 2015, 12).

[14] 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 towards a target level, ii) central banks that have full discretion in the determination of general purpose provivisions 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.

Singapore, Slovakia, South Africa, Spain, Switzerland, Sweden, and US. 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 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. This group includes Australia, Canada, Denmark, Japan, New Zealand, and the United Kingdom.

Using the second approach, we say that central banks with negative dividends at some point during the sample period or with consistently low dividend payout ratios throughout the sample period, face "softer" budget constraints than central banks with consistently high payout ratios throughout the sample period or central banks that pay dividends even when they make losses. To distinguish between high and low dividend payout ratios, we use the top tertile of the payout distribution as a cutoff point. This corresponds to a payout ratio of 90%. We thus posit that central banks with average payout ratios lower than 90% have a greater ability to build buffers and smooth intertemporally than those with payout ratios greater or equal to 90%.[15] We also contrast the top and the bottom tertiles of the distribution. The bottom tertile has a payout ratio of 50%. Doing so yields a classification more similar to the one obtained using the dividend rules.[16]

Figure 5 reports the distribution for central bank profits for each of the resulting groups. Both approaches yield similar insights. The discontinuity is significantly more pronounced for central banks with "hard" budget constraints. This finding is consistent with the hypothesis that these central banks have stronger incentives to avoid losses, but inconsistent with the null hypothesis that central banks with soft budget constraints are generally oblivious to the profits they report. (When using the second approach, differences between the two groups are more pronounced when allowing for larger

[15] We add central banks that pay dividends in the presence of losses to the group of central banks with consistently high dividend payout ratios throughout the sample period. Central banks that receive dividends from the government (i.e., report negative dividends) are added to the group of central banks that have low payout ratios.

[16] For the overlapping sample, the correlation between the classifications under the two approaches is 0.48 when allowing for a larger disparity in the payout ratios of the two groups as opposed to 0.12 when using the 90% cut-off.

disparities in their payout ratios.) These findings indicate that flexible distribution rules are not sufficient to remove central banks' incentives to avoid losses.

(Insert Figure 5 about here)

The finding that a profit discontinuity is present even under flexible distribution rules suggests that other frictions may be at work. For example, even if the central bank's dividend distribution rules provide for automatic recapitalizations by tapping into the central government's resources, central bank losses may be met with discontent on behalf of politicians. If such political discontent enters the calculation of central bankers, incentives to avoid losses may be present even if there is no de jure reason. (Indeed, a mere reduction in the central bank's contribution to government revenue can generate a political backlash.)

One may further hypothesize that the incentives to avoid losses are greater when the political pressure is greater, or when the central bankers are more receptive to it for one reason or another. In the analyses that follow, we thus explore the role of political, behavioral, agency, and other frictions that may favor loss-avoidance under the alternative hypothesis (but of course not under the null hypothesis, which holds that profits are entirely irrelevant to central banks).

Political pressure and career concerns

Political pressures on central banks may arise for various reasons. One is budgetary considerations. Governments may become accustomed to receiving dividends from central banks to support their budgets and avoid unpopular increases is taxation.[17] Failing to provide a constant stream of dividends may bring central banks under pressure to continue to produce profits.[18] We expect that such pressures are greater when central bank profitability has a relatively greater impact on the

[17] For example, the Federal Reserve 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.

[18] Anecdotal evidence for this idea 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" (see Eichengreen and Weder de Mauro, Project Syndicate, February 12, 2015). In a similar tone, 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).

government's budget, or when the central bank faces a more fiscally conservative government that is more concerned with the government's budget. To the extent that the size of the central bank's scope relative to the government's budget is predetermined, this treatment affords some degree of exogenous variation. One might also hypothesize that an extreme government of any orientation may be more prone to the populistic idea to use central bank profits to fund the government. In such an environment, the central banks' profit level might be subject to more scrutiny, and the central bank may be more keen to avoid headlines triggered by negative profits.

Relatedly, 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. We expect that such pressures are likely stronger when countries are governed by extreme political parties or when central banks are publicly traded. When countries are governed by extreme nationalist or populist parties, central banks may find it more difficult to convince governments or the public on 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. Moreover, although central banks with private shareholders are institutionally shieled from market pressures,[19] 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.)

Pressures to avoid losses may also interact with career concerns of central bank governors. If governments, politicians or the public view losses as a sign of failure, central bank governors may have incentives to avoid losses, particularly when they are re-appointable. Ex ante, one might also guess that pressures and political interference may also be larger in countries where central banks

[19] "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).

enjoy less de jure independence and where the quality of institutions and respect of law is lower (though we offer a reinterpretation of that hypothesis below).

Figure 6 explores the respective roles of the above-discussed factors. To test whether central banks have stronger incentives to avoid losses when the central bank is large relative to the government, and hence the government is more likely to rely on the central bank profit distributions, we split the sample by the ratio of central bank operating expenses to total tax revenues of the government.[20]

(Insert Figure 6 about here)

We find that central banks with above median expense ratios (i.e., with ratios greater or equal to 0.1%) exhibit a larger discontinuity than central banks with below median values.[21] The incidence of small profits is 10.36 times larger than the incidence of small losses for central banks with above median values, while it is only 3.76 larger for central banks with below median values. The difference between the two values is statistically significant at 1%.[22]

Pressures arising from budgetary considerations are also larger when the central bank faces a more fiscally conservative leader. Small profits are 10.88 times more likely than small losses when the country's leader is affiliated with a right-leaning party as opposed to only 4.77 when affiliated with a left-leaning party. The difference between them is statistically significant at 10%.

The discontinuity is also significantly larger when central banks face a more extreme populist leader of either left or right orientation. We find that small profits are 19 times more likely than small losses when the country leader is affiliated with an extreme right- or left-wing party, while it is only

[20] There is an alternative way to interpret this proxy: the metric 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 therefore puts pressure on the government's budget, particularly when such expenses are a large fraction of their government's budget.

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

[22] We find similar results if we instead scale operating expenses with GDP (i.e., the size of the country's economy). For central banks with above median values of operating expenses to GDP, the incidence of small profits is 9.88 times larger than the incidence of small losses as opposed to only 3.03 for central banks with below median values. The difference between the groups is statistically significant at 1%. Sample splits with respect to the country's debt to GDP or government deficit (surplus) to GDP do not reveal any systematic differences in the size of the discontinuity.

4.89 times more likely when the country leader is affiliated with a centrist party.[23] The difference between the two values is statistically significant at 5%.

Publicly traded central banks also exhibit an economical and statistically larger discontinuity. However, this last result should be viewed with caution as only four central banks (Belgium, Greece, Japan, and Switzerland) are publicly traded, and obviously many other variables can potentially be used to describe the particular features of these central banks.

Consistent with the idea that pressures from governments, politicians or the public may give rise to agency problems and career concerns to central bank governors, we find that the discontinuity is significantly (both economically and statistically) larger 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 at 1%.

Perhaps surprisingly, central banks that enjoy less de jure independence do *not* exhibit larger discontinuities. This result highlights the distinction between de jure independence and de facto independence. It may also be due to the endogeneity of central bank independence: positive profits may help the central bank justify and maintain its independence.

We also find no significant differences with respect to the broader quality of institutions. With respect to central banks, we find no significant differences in the discontinuity across central banks with varying levels of transparency. Central banks that are more open about their policy objectives and decision-making have similar discontinuities as less transparent central banks. The same holds for the country's broader quality of institutions and respect for the law as captured by World Bank measures of government effectiveness, corruption, and rule of law.

[23] In robustness tests, we also distinguish between extreme left and extreme right. We find that the discontinuity is present for both. It is slightly more pronounced for extreme right than extreme left but the difference between them is not significant.

Accounting standards, foreign assets, and exchange rates

The ability of central banks to manage earnings and avoid reporting losses may be also influenced by accounting standards as well as the composition of their assets and the exchange rate system.[24] Central banks under IFRS, for example, may have less room for discretion as IFRS does not allow general purpose provisions and a greater share of assets and liabilities are mark-to-market.[25] One may thus expect that central banks under IFRS have a lower ability to manage earnings and a smaller discontinuity.[26] Central banks with large foreign assets (e.g., foreign currency reserves, gold, and other foreign securities) may also have lower ability to manage earnings, because foreign assets are reported on their balance sheet in the local currency, and changes in the exchange rate thus imply changes in the central bank's asset value. The associated gains and losses in the value of foreign assets have to be reported in the income statement under IFRS, creating volatility in central banks' profits. Hence, to the extent that central banks do not perfectly control the exchange rate, they cannot precisely control their profits, suggesting that central banks with large foreign assets have a smaller discontinuity. The opposite should hold for central banks with exchange rate pegs.

Results in Figure 7 provide support for these hypotheses. The discontinuity is present under both IFRS and local accounting standards—consistent with ability to manage earnings under both sets of accounting standards—but it is statistically and economically smaller under IFRS.[27] Central banks with above median foreign assets to total assets ratios have a smaller discontinuity. Central banks with a fixed exchange rate peg have instead a more pronounced discontinuity. Additional

[24] As the debate about the Fed's solvency began heating up—following the announcement of QE2—the Fed made a subtle change to its accounting rules making it almost impossible to ever have to report capital losses. While this change makes it unlikely to ever have "to go cap-in-hand" to the US Treasury for a capital top-up, protecting its independence, it may undermine its credibility and the credibility of the US government who provides ultimate back-up. Bank of America Merrill Lynch's Ralph Axel states: "such 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 accounting change, 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).

[25] General purpose provisions whose values are arguably subjective may afford central banks a greater ability to reduce volatility in reported earnings and dividends that may arise from "paper" gains and losses on revaluation of foreign assets and liabilities or assets and liabilities that are mark-to-market.

[26] This is not meant to say that IFRS leaves no room for discretion or that discretion under IFRS is uniform.

[27] In unreported robustness tests, we also find that central banks under IFRS exhibit a larger discontinuity when the greater share of total assets is measured at historical cost.

results reported in Figure A1 in the Appendix further suggest that the ability to control and manage earnings may be even more pronounced when the central bank is introducing a peg.

(Insert Figure 7 about here)

Is the effect mechanical, or simply due to the business model of central banks in general?

The cross-sectional systematic differences in the magnitude and significance of the discontinuity are more difficult to reconcile with the notion that a profit discontinuity is simply a mechanical feature of central banks' business model. However, we can also more directly test for that hypothesis by "switching off" the factors hypothesized to give rise to profit concerns. Under the null hypothesis that the discontinuity is mechanical, the discontinuity should persist no matter which factors are present. Under the alternative hypothesis that the discontinuity is due to frictions, the discontinuity should disappear when no frictions are present.

Which minimum combination of factors (frictions) can "switch off" the effect? We find that there is no economically and statistically significant discontinuity when a combination of factors is switched off: 1) when dividend distribution rules do not impose a "hard" budget constraint *and* central bank governors are not re-appointable or 2) when central bank's operating expenses are not a large fraction of the government's tax revenues *and* central bank governors are not re-appointable. Figure 8 presents results for these combinations. Overall, these findings suggest that incentives to avoid losses are much reduced or eliminated if the financial linkages between central banks and their governments do not impose significant pressures on their respective budgets and when private interest considerations do not make central bank governors susceptible to external pressures.[28]

(Insert Figure 8 about here)

Multivariate analysis

Table 2 transfers the above analyses to a multivariate framework to account for correlations between the various factors, and to explore the marginal explanatory power of each.[29] Before we start,

[28] Weak power due to smaller samples is an alternative reason why the discontinuity may become insignificant. However, this explanation is less likely to be the cause for our findings, because many other combinations of factors with equally small samples do yield significant discontinuities.

[29] Table A2 in the appendix reports a correlation matrix.

we should note that the sample significantly changes with the inclusion or exclusion of particular factors, which makes the interpretation of this approach less straightforward than would be desirable. Indeed, a key reason to show the discontinuity plots before is to provide the greatest possible level of transparency to the reader; the regression analysis presented now should be seen as a complement. That said, the results are qualitatively similar to those obtained in the bivariate analysis above; we point out exceptions in what follows.

(Insert Table 2 about here)

Using the sub-sample of observations around the discontinuity (i.e., observations in the first bin to the right and to the left of zero), we examine how the incidence of small profits, as opposed to small losses, varies with the factors studied in Figures 5, 6 and 7. We estimate an econometric model where the dependent variable equals one if a central bank falls in the small profit region, [0, 0.003], and equals zero if it falls in the small loss region, [-0.003, 0). (109 central banks in our sample fall in the small profit or small loss region at least once during the sample period.) All explanatory variables are expressed as dummy variables using the same cut-off points as in the figures and are coded so that they all predict positive coefficients when associated with higher incentives to avoid losses. We add each variable sequentially, unless it correlates with other variables measuring a related concept. The model is estimated with OLS, and standard errors are clustered at the central bank account level.[30]

Despite the significantly reduced sample, results in Table 2 are remarkably similar to those found in Figures 5, 6, and 7. We find that dividend distribution rules, political pressures, and career concerns of central bank governors are the three most important factors, both in terms of the size of their coefficient and their marginal R-square. Consistent with unconditional results, right-wing party affiliation and extreme party affiliation 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

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

than losses. Also similar to unconditional results, we find no significant evidence that central bank transparency or the overall quality of country institutions and respect for the law matter for loss avoidance behavior. Central bank legal independence and IFRS are not found to matter once we control for other factors. (This is due to the presence of other factors and not the smaller sample.)[31] Finally, in unreported robustness checks we also add the growth of GDP in the model. This leaves all other coefficients unchanged (both in terms of magnitude and statistical significance) and the coefficient of GDP itself is statistically insignificant, consistent with idea that narrow-interval regressions compare counties with similar business cycle conditions.

In sum, the multivariate analysis corroborates the findings illustrated by the profit distribution plots.

5. Is there evidence for a relationship between loss avoidance and distorted policy choices?

To examine whether central banks' tendency to avoid losses distorts policy choices, we examine both Taylor rule coefficients (as a proxy for policy inputs) and inflation rates (both in levels and relative to target, as a proxy for policy outputs) for central banks just to the left and just to the right of the zero-profit threshold. Absent a policy distortion, policy should not be significantly different just to the right and left of zero, because zero is not a meaningful number in a frictionless model of central banking. By contrast, if loss avoidance distorts policy, we should observe that in a regression of short-term (policy) rates on various explanatory variables, the coefficient on deviations of inflation from its target is systematically smaller for central banks that report small profits relative to central banks that report small losses.

Similarly, if central banks' loss avoidance matters for policy outcomes, we should observe a discontinuity in inflation rates at the zero-profit threshold: inflation rates (or inflation gaps, relative

[31] For example, keeping the sample the same as in column (8) and dropping the other variables from the model, yields a negative and statistically significant coefficient for central bank independence equal to -0.167 (p-value = 0.087). Similarly, we find that including other variables into the model turns the effect of IFRS insignificant. We do not include exposure to foreign assets because our sample size is significantly reduced when we combine data on foreign assets with other determinants of loss avoidance.

to target) should be systematically higher for central banks that report small profits relative to central banks that report small losses. By contrast, under the null hypothesis, we expect a smooth distribution and no discontinuity in policy inputs or outputs across central banks that are just to the left or right of any given profit threshold, including zero.

Lastly, note that even under our alternative hypothesis, a discontinuity should only be observed at zero profits; we have no reason to assume (under either the statistical null or the alternative hypothesis) that inflation would be a discontinuous function of central bank profits for any profit level *other than* zero. Tests for discontinuous changes of coefficients at non-zero profit levels thus serve as placebos.

Inflation outcomes

Given greater data availability and a more straightforward econometric approach, we start with the "policy outcomes" analysis using polynomial regressions and narrow interval regressions with inflation rates and inflation gaps as outcome variables. Polynomial regressions use a large sample from both inside and outside the small profit and small loss region. They control for a possible underlying relationship between inflation rates and central bank profitability using polynomials of profitability, along with other controls, and investigate whether the polynomial "wants" to jump around zero and various other (placebo) thresholds. Narrow interval regressions focus instead on the region around the zero (i.e., [-0.003, +0.003] in our case) and compare the inflation rates of central banks that are just below the zero profit-threshold to those that are just above. Formally, we estimate

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

where $\pi_{i,t}$ indicates the inflation rate (or inflation gap) in country i at year t. $d_{i,t}$ is dummy variable that equals 1 if the central bank in country i at year t reported a profit, $x \geq 0$ at year t, and it equals 0 otherwise. The term $\sum_{s=1}^{n}\left[\beta_s x_{i,t}^{s} + \gamma_s x_{i,t}^{s} * d_{i,t}\right]$ indicates polynomials of profitability, $x_{i,t}$. 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.[32] The terms $z_{i,t}$ and α_i indicate time-varying country characteristics and country-fixed effects, respectively. $\varepsilon_{i,t}$ is the idiosyncratic error tem. A positive and statistically significant β indicates that the conditional expectation of inflation rates, $E(\pi/x)$, is systematically higher as one moves from just below the zero-profit threshold to just above.

The narrow-interval regressions estimate similar specifications without the polynomials and using only observations around the threshold:

$$\pi_{i,t} = \beta d_{i,t} + \delta z_{i,t} + \alpha_i + \varepsilon_{i,t} \quad (2)$$

Similar to eqn. (1), a positive and statistically significant β indicates that inflation rates are systematically higher as one moves from just below to just above zero.

Table 3 reports results for polynomial regressions. In columns (1) to (5) we report results for eqn. (1) with inflation rate as the dependent variable. Column (1) reports results for a baseline specification without any controls apart from the six-order polynomials. We find a positive and statistically significant coefficient for $d_{i,t}$ equal to 2.927. This indicates that there is a positive and significant jump in the conditional expectation of inflation rates at the zero-profit threshold: inflation rates are nearly 3 percentage points higher. This result seems surprisingly large at first, but is economically plausible considering that the sample mean and standard deviation of inflation rates are 6.73 and 8.26, respectively.[33]

(Insert Table 3 about here)

Figure 9 offers an illustration of the same analysis, based on specification (1) of Table 3. The plot shows predicted inflation rates from the model for different levels of profitability. The horizontal axis divides x into bins that contain a small range of x-values. The bins are constructed so that each bin falls on either side of the threshold (i.e., no bin contains the threshold in its interior). The vertical

[32] There is no a priori reason to expect this relationship to be the same on both sides of 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.

[33] Also, the magnitudes appear plausible compared to the estimates by Adler et al. (2012) on the impact of central bank *capital* levels (as opposed to *marginal profit* levels in our study) on monetary policy and inflation outcomes; see also Stella (2008), Klüh and Stella (2008) and Benecká et al. (2012) for a critical evaluation of these findings.

line indicates the zero-profit threshold. Each circle in the plot corresponds to the average inflation rate for a particular bin. The solid line indicates the average predicted values for each bin. The dashed lines indicate the 95% confidence interval. There is a clear and significant discontinuity in inflation rates at zero. This result is consistent with the hypothesis that balance sheet concerns compromise inflation rates, and inconsistent with the null hypothesis of a smooth relation between inflation and central bank profits.

(Insert Figure 9 about here)

As a placebo test, we examine whether inflation rates exhibit similar discontinuities at various ex ante not meaningful thresholds of x such as 0.024, 0.012, 0.006, -0.006, -0.012, and -0.024. We find no evidence of a discontinuity in any of these cases; Figure 10 illustrates results for two of these thresholds, 0.012 and -0.012.

(Insert Figure 10 about here)

Subsequent specifications in Table 3 present similar specifications to column (1) with additional controls. In column (2), we additionally control for broad economic conditions that may correlate with both inflation rates and central bank profitability such as GDP growth, income levels, and rule of law. Rule of law has a negative and statistically significant coefficient, indicating that countries with higher respect for the law have on average lower inflation rates. In column (3) and (4), we additionally control for factors that drive central banks incentives to avoid losses that may also correlate with inflation rates directly. This includes political party affiliation, whether the central bank governor is re-appointable, and central bank independence.

We find a more pronounced discontinuity when we add these controls, indicating that omitted variable bias may have attenuated, rather than upward-biased the coefficient in column (1). For example, controlling for broad economic conditions in column (2) increases the estimated coefficient from 2.927 to 3.787. This is not surprising, given that 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 may

influence central bank policies has a similar effect, raising the profit coefficient from 3.787 to 4.595 and 4.881 as they tend of be associated with lower inflation rates.[34] In column (5), we also introduce country fixed effects, thus retaining only countries with significant within-variation of both profits and inflation. Doing so helps control for a broader set of time-invariant country and central bank characteristics that our controls up to column (4) may fail to capture. We find again a positive and statistically coefficient for $d_{i,t}$ of similar magnitude. In unreported robustness checks, we also confirm the jump in both high- and low-income countries. The estimated coefficient is larger in low-income countries (4.303 as opposed to 2.452 for high-income countries).[35]

Column (6) presents a similar specification using inflation gap (inflation minus the inflation target) as the dependent variable, estimated for central banks with explicit inflation targets. Results are similar to those reported earlier for inflation rates: central banks with small positive profits have systematically larger inflation gaps than central banks with small losses by around 2 percentage point. This finding may suggest that central banks with greater incentives to avoid losses adjust their policy rates less aggressively to inflation gaps. We will test this hypothesis shortly with regressions approximating a Taylor rule.

It is important to ensure that the particular functional form chosen for the polynomials does not drive the results above. Aside from ensuring robustness to different orders of polynomials, we therefore also report results for narrow interval regressions in Table 4. Identification in this case is obtained using only observations of central banks with very similar levels of profitability, with ROA ranging between -0.003 and 0.003. Results are similar to those reported in Table 3, with the estimated size of the discontinuity ranging between 1.357 and 3.590. Our most conservative specification with country fixed effects and time-varying controls points to an estimated jump of 2.245. Identification in this case is obtained by comparing the inflation rates in the same country when the central bank's

[34] To be able to compare our estimates, we keep our sample constant across the various specifications using for all specifications the sub-sample of observations for which all control variables up to column (3) are available.
[35] In our sample, the average inflation rate for low income countries is 8.660 with a standard deviation of 10.306. The corresponding figures for high income countries are 2.748 and 2.528, respectively.

ROA is just below or just above zero. Results using deviations from inflation targets are also qualitatively similar.

(Insert Table 4 about here)

We conclude that there indeed exists an association between a propensity to avoid losses and inflation outcomes. In what follows, we provide suggestive evidence supporting the idea that a more accommodative policy stance on monetary policy is partially responsible for these results.

Policy inputs (Taylor rule regressions)

The most consequential question that our results thus far raise is whether central banks' propensity to avoid losses impacts monetary policy choices. Needless to say, policy rules and their parameters are impossible to observe and difficult to infer. To nevertheless try and approach this question, we study whether the responsiveness of short-term nominal interest rates to changes in inflation gaps and the output gap is associated with being in the small-profit region as opposed to the small-loss region of the profit distribution.

Specifically, a Taylor rule assumes that a central bank's policy instrument—the short-term nominal interest rate—responds to deviations of inflation and output fundamentals from targets. Since its inception in the early 1990s, estimation techniques have undergone various modifications. Although many issues remain unresolved and the literature has yet to settle on an empirical benchmark, the following is a popular specification:

$$r_t = \alpha + \rho r_{t-1} + \gamma_\pi(\pi_{t-1} - \pi_t^*) + \gamma_y(y_{t-1} - y_{t-1}^*) + \varepsilon_{i,t}, \qquad (3)$$

where r_t denotes the short-term nominal interest rate at time t, $(\pi_{t-1} - \pi_t^*)$ denotes the "inflation gap" as the difference between the actual inflation rate, π_{t-1}, and the desired level, π_t^*, $(y_{t-1} - y_{t-1}^*)$ denotes the output gap as the difference between the actual output and its long-term equilibrium level, known as potential output. Lagged inflation and output values are motivated by the lack of contemporaneous data on inflation and output gap when the central bank sets the interest rate

(McCallum 1999).[36] The inclusion of the lagged short-term interest rates among the fundamentals accounts for policy responses to other factors such as interest rate smoothing (Clarida et al. 2000) and serially correlated policy shocks (Rudebusch 2002).[37] Simulations in Carare and Tchaidze (2005) show that Taylor rules with lagged interest rates among the explanatory variables yield small biases in estimates of the inflation and output coefficients (γ_π and γ_y) when the timing of fundamentals is misspecified.[38]

The coefficient γ_π measures how strongly the central bank responds to changes in deviations of inflation from its target. We are interested in whether γ_π is systematically and *discontinuously* different for central banks that report small profits versus small losses. (Short-term rates may correlate with profit levels for various reasons, but we are not aware of a theoretical reason why short-term rates would discontinuously change as a function of central bank profits, other than because short-term rates and profits are co-determined by policy and are a function of the various factors we have shown to correlate with the discontinuity in profits.) Notwithstanding the conceptual and practical difficulties of such reduced-form parametrizations of policy functions,[39] we estimate an augmented version of eqn. (3) around the discontinuity, allowing for interactions of inflation gaps with the profit indicator, $d_{i,t}$:

$$r_{i,t} = \alpha_i + \rho r_{i,t-1} + \gamma_{\pi_1}\left(\pi_{i,t-1} - \pi^*_{i,t}\right) + \gamma_{\pi_2}\left(\pi_{i,t-1} - \pi^*_{i,t}\right) * d_{i,t} + \gamma_y\left(y_{i,t-1} - y^*_{i,t-1}\right) + \gamma_s d_{i,t} + \varepsilon_{i,t}, \quad (4)$$

and test whether the γ_{π_2} interaction coefficient is significantly different from zero. The null hypothesis is that whether the central bank makes a small profit or a small loss is irrelevant for its policy, so γ_{π_2} should be indistinguishable from zero. The alternative hypothesis is that small profits are, at least in part, due to manipulations of the policy rate, as suggested by theory (e.g., Berriel and

[36] Lagged-based rules are not necessarily backward looking as lags serve as predictors of future values (see Tchaidze 2004).
[37] Reasons mentioned in the literature behind interest rate smoothing include model uncertainty, the fear of disrupting capital markets, loss of credibility from sudden large policy reversals, need for consensus building for a policy change. Serially correlated policy shocks account for policy responses to serially correlated disturbances not captured by inflation and output gap. These may include credit crunches, oil and commodity price shocks, exchange rate movements, and stock market developments. These could also represent measurement errors between what policymakers thought about the state of the economy in real-time and what they know ex-post. Such errors could arise because changes in productivity trends.
[38] As shown in Orphanides (2001) misspecifying the timing of the fundamentals may bias the estimated coefficients.
[39] See http://johnhcochrane.blogspot.com/2014/06/taylor-rules.html for a discussion.

Bhattarai 2009). Under that hypothesis, one would expect a negative γ_{π_2} coefficient, indicating a more lenient or less aggressive monetary policy. Given the probable role of exchange rates in emerging economies' interest rate setting, we also estimate augmented specifications of eqn. (4), where we add the changes in the exchange rate, $\Delta s_{i,t}$, among the explanatory variables.

Table 5 presents our findings. In column (1) we present results for a full set of countries, assuming that inflation targets are 2% and 4.5% for high and low income countries, respectively. In column (3) we present results for a smaller sample of countries with explicit inflation targets from Siklos (2017). Columns (2) and (4) present corresponding specifications after including changes in the currency exchange rate among the explanatory variables. Measures of the output gap are obtained using the Hondrik-Prescott (HP) filter. We estimate the model in the [-0.003, 0.003] region using the Arellano-Bond estimator, which controls for country-fixed effects, and robust standard errors.[40]

(Insert Table 5 about here)

In column (1), we find that central banks in the small loss region have positive and statistically significant inflation coefficient of 0.466, similar to what is found in the literature.[41] However, the interaction coefficient is significantly negative and of a similar magnitude. As a result, central banks in the small profit region have an inflation coefficient (γ_{π_1} plus γ_{π_2}) that is statistically indistinguishable from zero. This result is consistent with the hypothesis that central banks with balance sheet concerns are less likely to aggressively raise interest rates as inflation increases. Similar results are obtained in column (2) when we also include the change in the exchange rate among the explanatory variables. Results in columns (3) and (4) for inflation targeting countries, are qualitatively similar, though the γ_{π_1} coefficient seems to lack power due to the small sample used to estimate these

[40] The Arellano-Bond estimator offers a number of advantages in estimating Taylor rules because it controls for the endogeneity of regressors using lagged realizations of regressors as instruments. Furthermore, it controls for time-invariant unobservable country characteristics, and mitigates the autocorrelation due to the lead-lag structure of the equation. Previous studies that use a GMM estimator for Taylor rules include Clarida et al. (2000) and Jondeau et al. (2004).

[41] Clarida et al. (2000), Orphanides (2001), and Orphanides and Williams (2002) report inflation coefficients of 0.45, 0.56, and 0.35, respectively. See Carare and Tchaidze (2005) for a review.

specifications. In unreported robustness tests, we also confirm that results are qualitatively similar for both high and low-income countries.[42]

In sum, subject to the limitations inherent to the methodologies we employ, the data appears consistent with the hypothesis that central bank's policies and profits are co-determined and affected by various political and agency frictions. That data is inconsistent with the hypothesis that profitability considerations are entirely irrelevant to central banks' behavior.

6. Conclusions

This paper provides a set of novel empirical facts that informs the premise of a theoretical debate on central bank design and monetary policy. In particular, we devise a test of whether central banks care about the sign of their profits. Specifically, the key idea is that a discontinuity in the profit distribution appears to be 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 smaller Taylor rule coefficients and higher inflation levels and inflation gaps. These findings suggest that a preference for positive profits is a friction that may be important for future theoretical modeling to consider.

If one interpreted the facts we provide literally within the framework of existing models, one might conclude that risks to monetary stability may be greater than is often assumed due to the existence of various factors that appear to be linked to central bank profit concerns. An extreme interpretation would be that especially amid large-scale asset repurchases and increased political

[42] Re-estimating column (4) separately for high and low income countries yields point estimates γ_{π_1} and γ_{π_2} equal to 0.193 and -0.309 for low income countries and 0.212 and -0.512 for high income countries. Similar results are also obtained if we drop observations with low or negative inflation rates (below 0.5 percent).

pressure,[43] the risks to runaway inflation may be more pronounced than generally assumed, even in the United States.

This interpretation should be put in some perspective, however. Many central banks (such as the Bank of Japan) have long conducted monetary policy with large-scale asset purchases, and the apparent risks to monetary stability have not materialized (at least so far). Similarly, the central banks of Chile, Israel, and Slovakia have successfully operated with negative equity for a sustained period of time.

To some, these data points are more difficult to reconcile with the notion that balance sheet considerations are likely to lead to monetary instability, because more specifically, negative equity does not seem to jeopardize a central bank's independence. However, also this perspective benefits from nuance. Indeed, the opposite argument can be made. Suppose that the level of the central bank's equity is deeply negative and that the payout rule is such that profits must not be distributed to the Treasury until all past cumulative losses are replenished. In such cases, it is virtually impossible for the Treasury to receive dividends from a central bank with deeply negative equity in the foreseeable future, no matter the realization of period-profits. The impossibility to pay dividends effectively isolates the central bank from political pressure in such a situation.[44]

These considerations illustrate that 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 of communicating losses to the public and other constituents. Moreover, many central banks seeem to be exposed to sufficient political pressure, career concerns, and an institutional ability such that incentives for profit considerations enter decision-making. De jure independence and a buffer account do not seem to be sufficient to entirely shield central bankers from these pressures.

[43] 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 US.
[44] This insight is due to Luboš Pástor, to whom we are grateful for mentioning it to us.

One might conclude that accounting rules that allow central banks to avoid disclosing losses enables them to steer clear of the political pressures that may otherwise influence their decision-making. However, this notion would assume that only the sign but not the level of profits (and the associated dividend) matters to decision makers. Whether this assumption is warranted depends on the external validity of our estimates, which are obtained from the margin around zero profit levels. Such a claim to external validity is difficult to substantiate in our setting. We thus leave this question to future research.

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Appendix

Table A1: Variable definitions and sources

Variable name	Definitions and data sources
ROA	Net income of a central bank divided by its average total assets. The data is from Bankscope.
Profit $d_{i,t}$	An indicator variable that equals 1 if ROA of central bank *i* in year $t \geq 0$, and 0 otherwise.
"Hard" budget constraint	An indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greter tha 90% (third tertile of the entral bank dividend payout distribution) or when a central bank pays dividends despite incurring a loss. The indicator vaible equals 0 if the central banlk dividend payout ratio is less than 50% (first tertile of the central bank divididend payout distrribution) or when a central banks receives dividends from the government. The data is from Bankscope.
Operating expenses	The ratio of central bank personnel expenses from Bankscope to the country's total tax revenues from World Bank.
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 is from Beck et al. (2001) and is 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 is from Beck et al. (2001) and is 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 is from Beck et al. (2001) and is available for years 1992-2012.
Extreme party affiliation	An indicator variable that equals 1 if a country's chief executive has affiliation with the nationalist party, and 0 otherwise. The data is from Beck et al. (2001) and is 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 is from Bankscope.
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 is from Dreher et al. (2008).

Central bank legal independence	An index of central bank independence (CBIW) based on 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 to 2010. We use the value of the index in 1998 for the time period between 1998 and 2010. We assign values of the index from 2010 for years 2011-2014. All central banks in Euro Zone countries receive the same score.
Central bank transparency	An index of central bank policy transparency based on 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 to 2010. We use the value of the index in 1998 for the time period between 1998 and 2010. 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 is 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 is 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 is 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 is 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 is from Klein and Shambaugh (2008) and is available for all the years in our sample period.

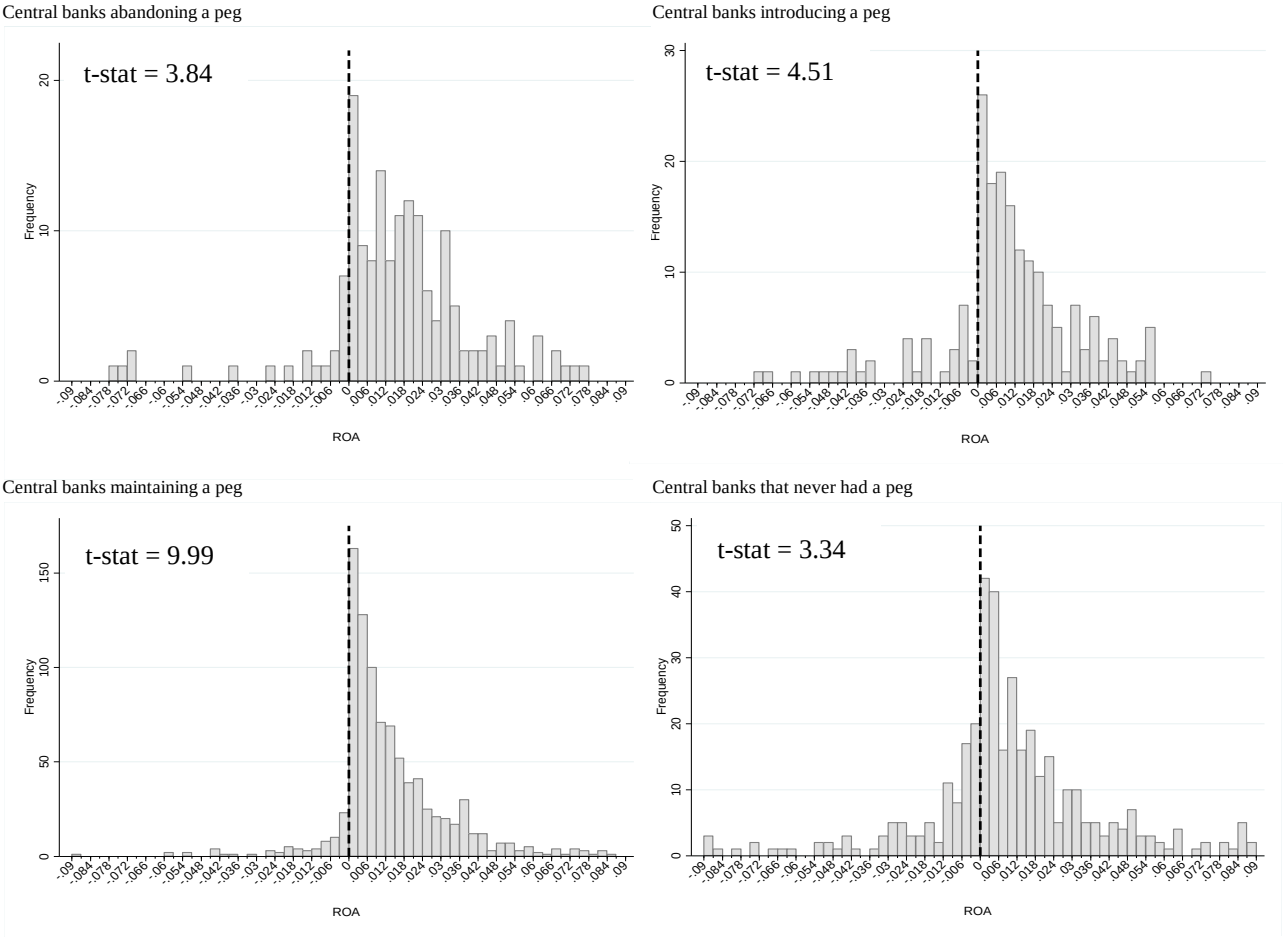
Introduce exchange rate peg	An indicator variable that equals 1 if a country introduces an exchange rate peg in a given year based on classification of Klein and Shambaugh (2008), and 0 otherwise. The data is from Klein and Shambaugh (2008).
Abandon exchange rate peg	An indicator variable that equals 1 if a country abandons an exchange rate peg in a given year based on classification of Klein and Shambaugh (2008), and 0 otherwise. The data is from Klein and Shambaugh (2008).
Foreign assets	The ratio of central bank foreign assets to total assets. The data on central bank foreign assets is from IMF.
Inflation	The country rate of consumer price inflation in a given year. The data is from World Bank.
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 $r_{i,t}$ or $r_{i,t-1}$	The short-term treasury bill interest rate in country *i* and year *t* or *t-1*. The data is from International Financial Statistics (IFS), IMF.
(Inflation – target) $(\pi_{i,t-1} - \pi^*_{i,t})$	The country rate of consumer price inflation of country *i* in year *t-1* less the central bank target inflation in year *t*. The data on inflation rates is from World Bank, the data on inflation targets is from Siklos (2017). The median inflation target for low (4.5%) or high (2%) income economies is used when a central bank does not use an explicit inflation target.
Output gap $(y_{i,t-1} - y^*_{i,t-1})$	The difference between the actual GDP and the expected GDP for country *i* and year *t-1*. The expected GDP is the smoothed value of GDP in a given year obtained using the Hodrick and Prescott (1997) filter and the timeseries of available GDP data for country *i* during our sample period.
Δ Exchange rate $\Delta s_{i,t}$	The difference in the exchange rate of local currency to USD from *t-1* to *t* for country *i*. The data is form Bankscope.

Table A2: Correlation between the test variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) "Hard" budget constraint	1.000												
(2) High operating expenses	-0.092	1.000											
	0.395												
(3) Right-wing party affiliation	-0.060	0.133	1.000										
	0.541	0.128											
(4) Extreme party affiliation	0.096	0.020	-0.010	1.000									
	0.241	0.776	0.882										
(5) Publicly traded central banks	0.205	0.048	0.111	0.073	1.000								
	0.007	0.494	0.099	0.172									
(6) Governor re-appointable	-0.034	0.017	0.103	0.110	0.097	1.000							
	0.665	0.812	0.132	0.044	0.057								
(7) Low central bank legal independence	0.114	-0.496	-0.260	0.025	-0.068	0.159	1.000						
	0.161	0.000	0.000	0.676	0.224	0.004							
(8) Low central bank transparency	-0.004	-0.162	-0.111	0.099	-0.236	0.096	0.388	1.000					
	0.959	0.025	0.120	0.083	0.000	0.073	0.000						
(9) Low rule of law	-0.348	-0.283	-0.179	0.111	-0.190	-0.006	0.128	0.572	1.000				
	0.000	0.000	0.008	0.038	0.000	0.907	0.021	0.000					
(10) Low government effectiveness	-0.371	-0.272	-0.166	0.014	-0.140	-0.005	0.169	0.512	0.808	1.000			
	0.000	0.000	0.014	0.790	0.005	0.929	0.002	0.000	0.000				
(11) Low control of corruption	-0.396	-0.339	-0.138	0.067	-0.180	-0.036	0.049	0.527	0.836	0.816	1.000		
	0.000	0.000	0.040	0.207	0.000	0.474	0.375	0.000	0.000	0.000			
(12) Do not follow IFRS	-0.117	-0.189	-0.065	0.033	-0.131	0.123	0.352	0.281	0.092	0.086	0.131	1.000	
	0.126	0.007	0.334	0.536	0.007	0.015	0.000	0.000	0.063	0.082	0.007		
(13) Exchange rate peg	0.155	0.665	0.106	0.082	-0.027	0.170	-0.208	0.080	-0.111	-0.171	-0.197	-0.034	1.000
	0.044	0.000	0.116	0.128	0.592	0.001	0.000	0.140	0.027	0.001	0.000	0.498	

The table reports Pearson correlation coefficients for the variables used in Table 2. The p-values are reported below the correlation coefficients. All variables are expressed as dummy variables using the same cut-off points as in Figure 6. “Hard” budget constraint is an indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greter than 90% (third tertile of the entral bank dividend payout distribution) or when a central bank pays dividends despite incurring a loss. The indicator vaible equals 0 if the central banlk dividend payout ratio is less than 50% (first tertile of the central bank divididend payout distrribution) or when a central banks receives dividends from the government. Operating expenses is the ratio of central bank personnel expenses to the country’s total tax revenues. Right-wing party affiliation is 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). Extreme party affiliation is an indicator variable that equals 1 if a country’s chief executive has affiliation with the nationalist party, and 0 otherwise. Publicly traded central banks is an indicator variable that equals 1 if the shares of a central bank are quoted on a public exchange, 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. Central bank policy transparency is an index of central bank policy transparency. Rule of law captures the extent to which economic agents have trust in and abide by legal institutions. Government effectiveness is the government effectiveness index. Control of corruption captures perceptions of the use of power by political elites for private gain. IFRS is an indicator variable that equals 1 if a central bank prepares financial statements in accordance with IFRS, and 0 otherwise. Exchange rate peg is an indicator variable that equals 1 if a country has an exchange rate peg, and 0 otherwise.

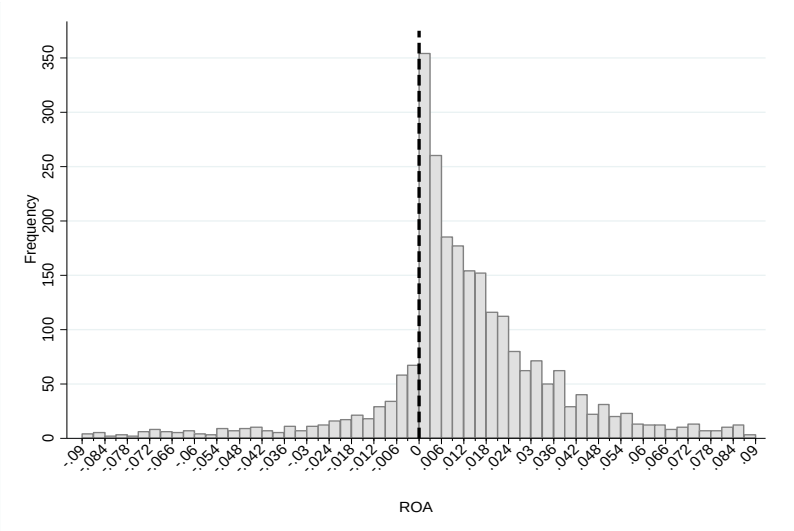
Figure A1: Distribution of central bank profits and exchange rate peg



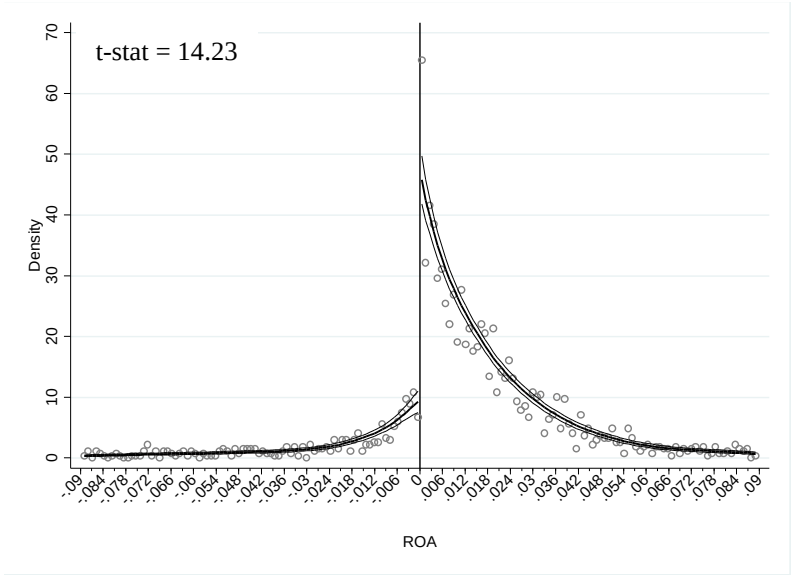
Notes: This figure plots the histogram of central bank profits for countries with different exchange rate regulations. The classification of countries based on the exchange rate peg is from Klein and Shambaugh (2008). ROA is defined as central bank net income divided by average total assets. The distribution 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. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant.

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

I. Distribution of central bank profits

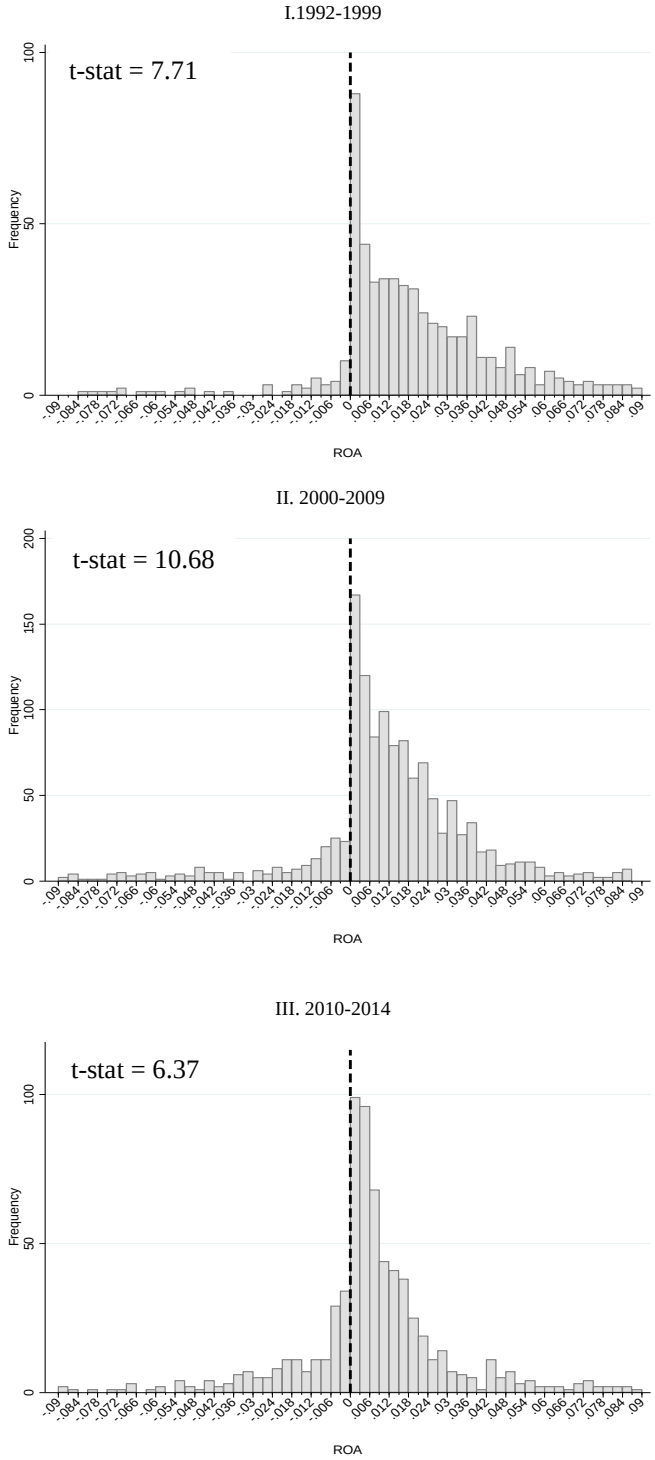


II. McCrary (2008) test for the discontinuity at zero



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 test, reported in the upper left corner, examines whether the discontinuity at zero is significant.

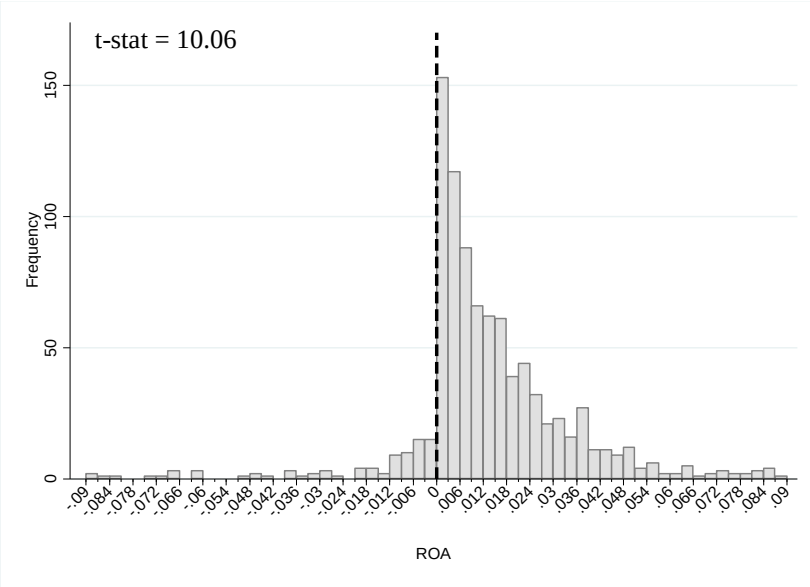
Figure 2: Distribution of central bank profits for each of the three decades in the sample



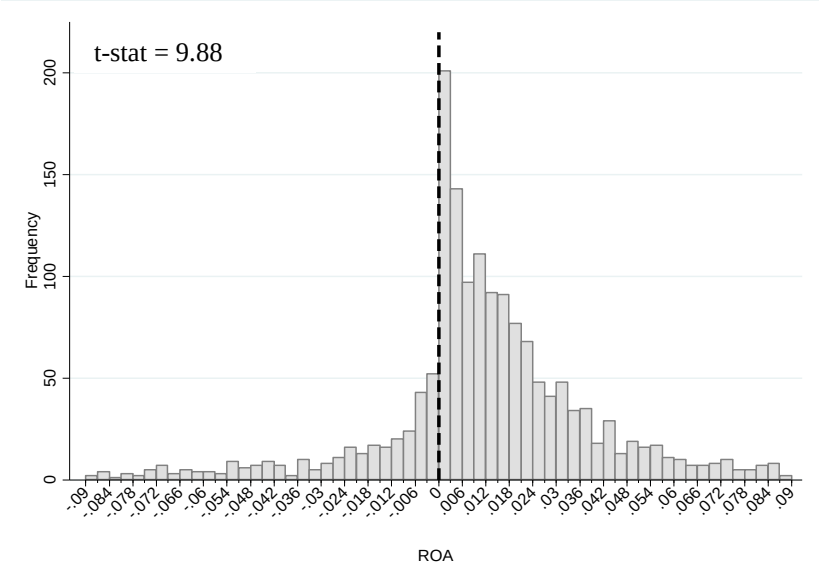
Notes: This figure plots the histogram of central bank profits for 3 sub-periods: 1992-1999, 2000-2010 and 2010-2014. ROA is defined as central bank net income divided by average total assets. The distribution of ROA in both graphs is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant.

Figure 3: Distribution of central bank profits in high vs. low income countries

I. High income countries

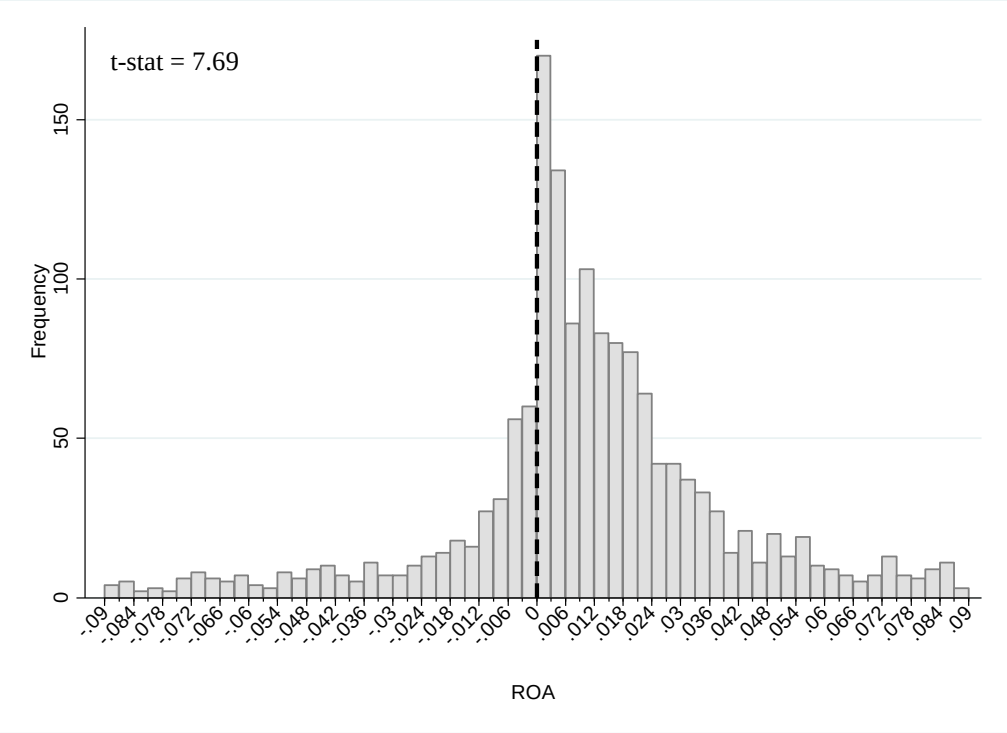


II. Low income countries



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. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant.

Figure 4: Distribution of central bank profits for central banks that can incur losses

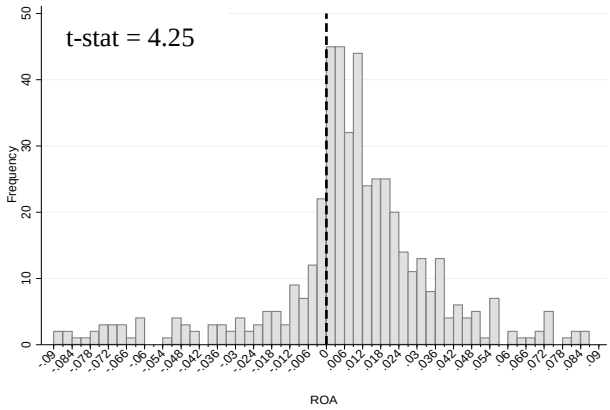


Notes: This figure plots the histogram of central bank profits for central banks that report a loss at least once during the sample period and for which we have at least 10 observations. ROA is defined as central bank net income divided by average total assets. The distribution of ROA in both graphs 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. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant.

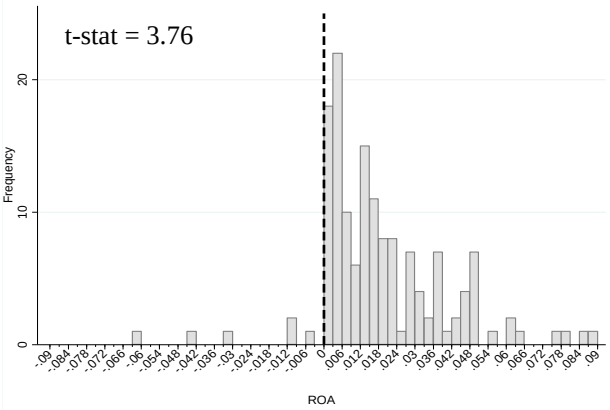
Figure 5: Distribution of central bank profits and dividends to government

I. Dividend distribution rules

"Soft" budget constraint



"Hard" budget constraint

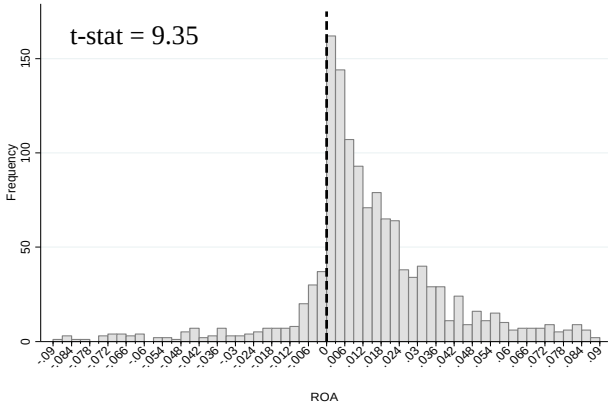


Contingency tables

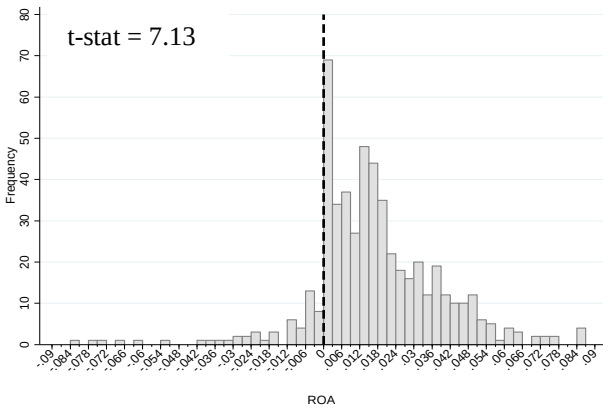
	"Soft" budget constraint	"Hard" budget constraint	Total	
Small profit	45	18	63	
Small loss	22	0	22	**χ^2-test 7.97**
Total	67	18	85	**p = 0.005**
Small profit/small loss	2.05	infinity		

II. Dividend payments – high vs. low split

Payout < 90%



Payout ≥ 90%

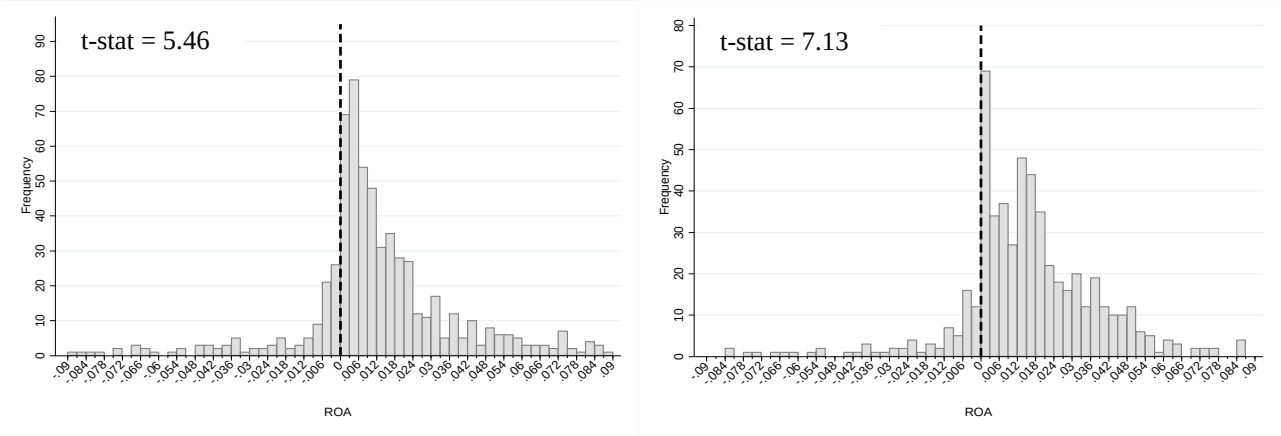


Contingency tables

	Payout < 50%	Payout > 90%	Total	
Small profit	162	69	231	
Small loss	37	8	45	**χ^2-test 2.74**
Total	199	77	276	**p = 0.098**
Small profit/small loss	4.38	8.63		

III. Dividend payment – tertile split

Payout < 50% | Payout ≥ 90%



Contingency tables

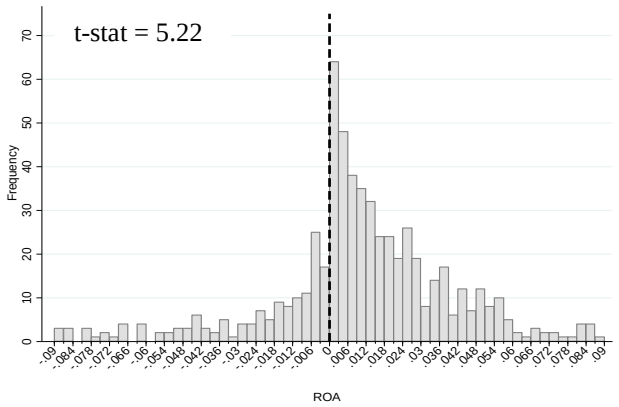
	Payout < 50%	Payout > 90%	Total	
Small profit	69	69	138	
Small loss	26	8	34	**χ^2-test 7.73**
Total	95	77	172	**p = 0.005**
Small profit/small loss	2.65	8.63		

Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on prevailing incentives for loss avoidance. The distribution of ROA is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant. The table below each set of 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 two adjacent histograms. The assignment into "hard" and "soft" budget coinstraints is based on the classification of central bank dividend rules for 30 countries in Archer and Moser-Boehm (2013, Annex 2). "Soft" budget constraint central banks can draw on external resources to cover losses or if they 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 US) . "Hard" budget constraints face central banks that 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 United Kingdom). The sample splits focussing on dividend payments split the sample based on central bank's dividend payout ratio. The third tertile of the dividend payout ratio is 90%. The central banks that pay dividends in the presence of losses have high payout ratios. Central banks that receive dividends from the government (i.e. report negative dividends) have low payout ratios.

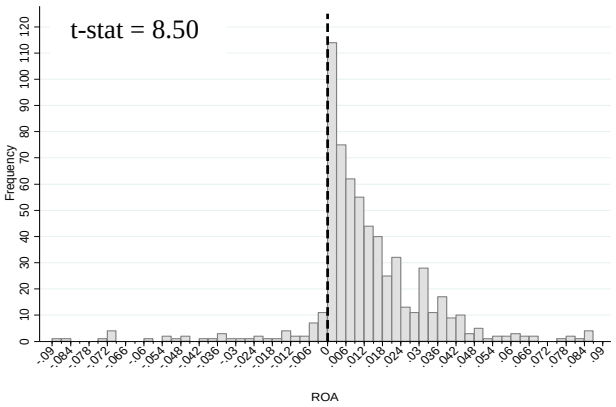
Figure 6: Distribution of central bank profits and other political, behavioral, or economic frictions

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

Below median



Above median

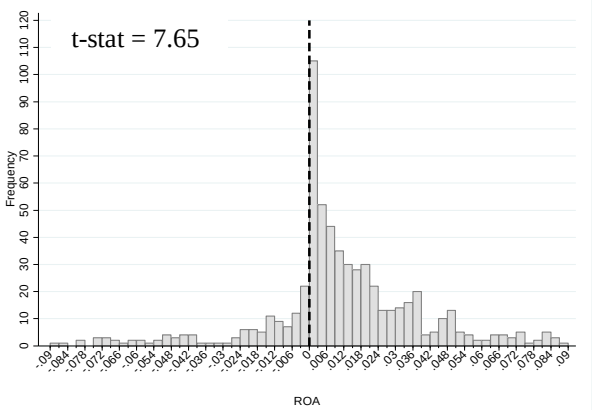


	Below median	Above median	Total
Small profit	64	114	178
Small loss	17	11	28
Total	81	125	206
Small profit/small loss	3.76	10.36	

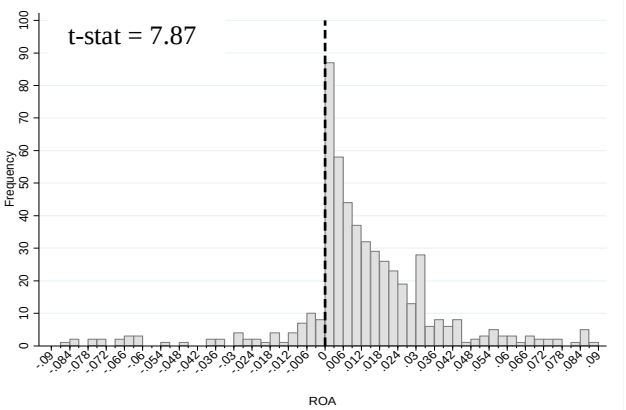
χ^2-test 6.22
p = 0.013

II. Country leader affiliated with left vs. right-wing parties

Left-wing parties



Right-wing parties

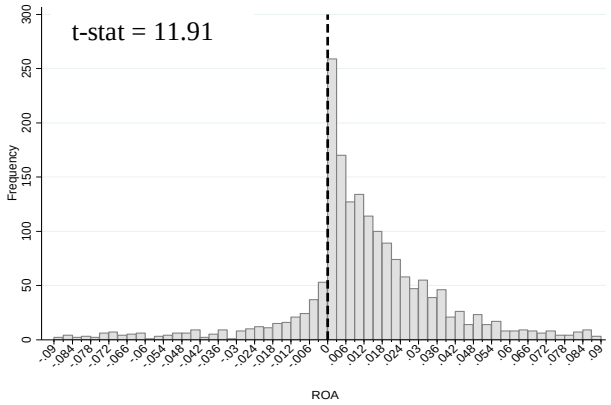


	Left-wing parties	Right-wing parties	Total
Small profit	105	87	192
Small loss	22	8	30
Total	127	95	222
Small profit/small loss	4.77	10.88	

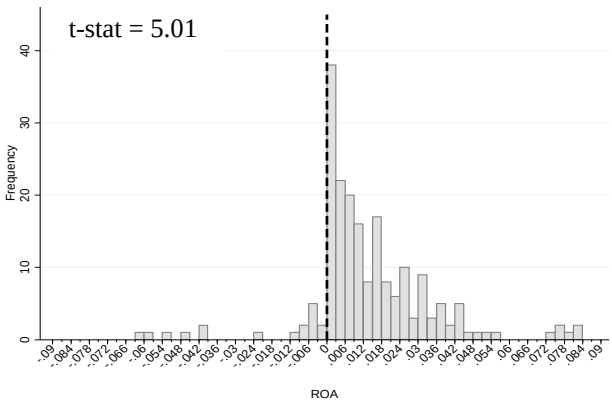
χ^2-test 3.68
p = 0.055

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

Centrist parties



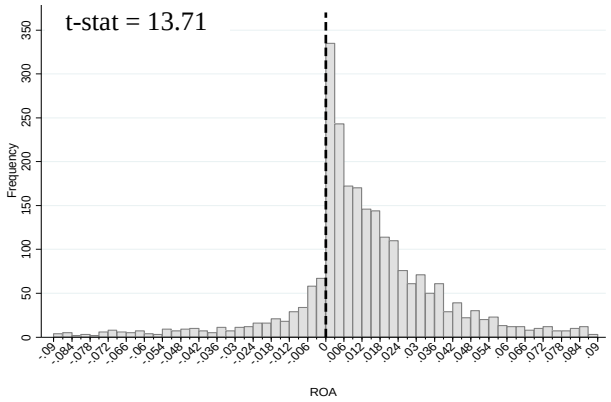
Extreme parties



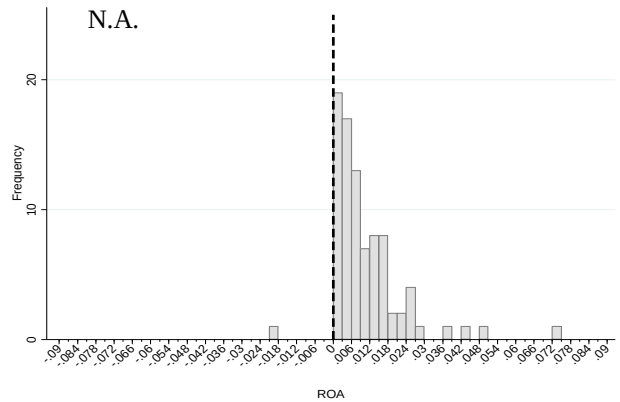
	Centrist parties	Nationalist parties	Total	
Small profit	259	38	297	
Small loss	53	2	55	χ^2-test 3.86
Total	312	40	352	p = 0.049
Small profit/small loss	4.89	19.00		

IV. Central bank is publicly traded vs. not

Not publicly traded



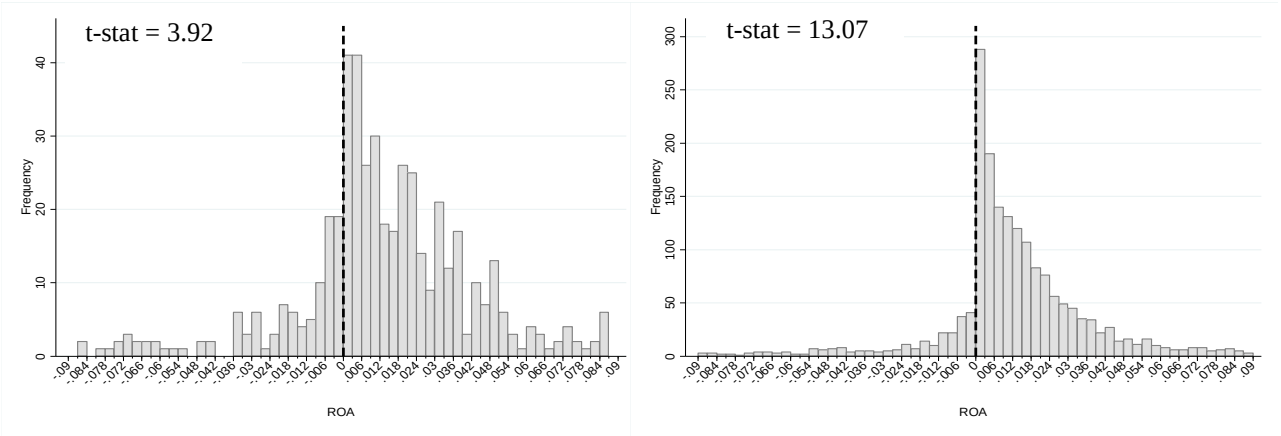
Publicly traded



	Non-publicly quoted	Publicly quoted	Total	
Small profit	335	19	354	
Small loss	67	0	67	χ^2-test 3.77
Total	402	19	421	p = 0.052
Small profit/small loss	5.00	infinity		

V. Central bank governor re-appointable vs. not

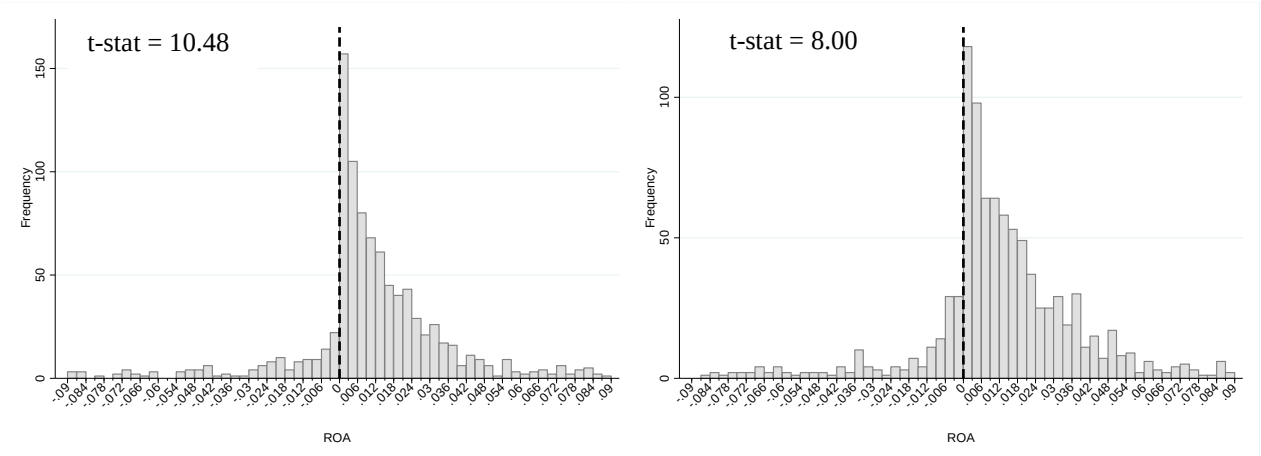
Not re-appointable | Re-appointable



	Not re-appointable	Re-appointable	Total	
Small profit	41	288	329	
Small loss	19	41	60	χ^2-test 14.35
Total	60	329	389	p < 0.001
Small profit/small loss	2.16	7.02		

VI. Central bank legal independence

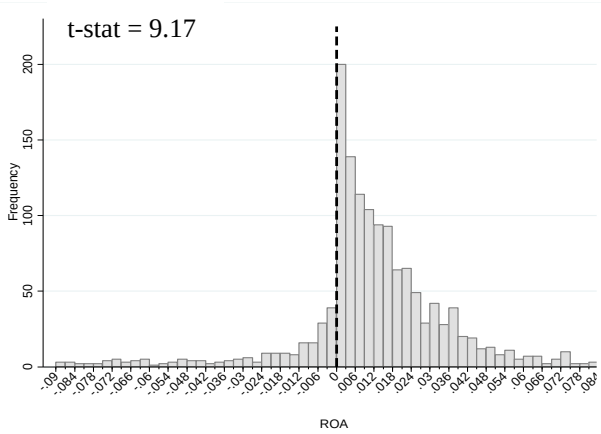
Above median | Below median



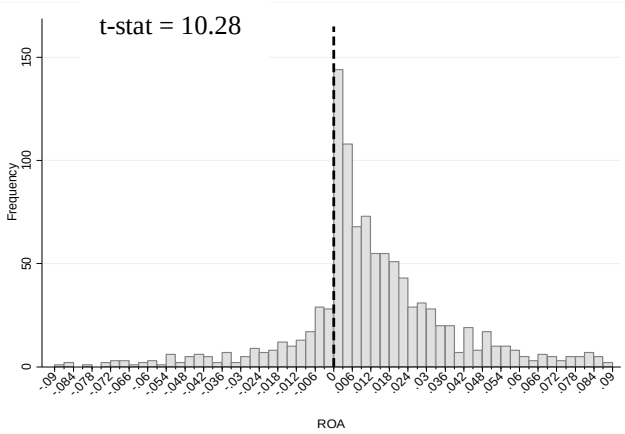
	Above median	Below median	Total	
Small profit	157	118	275	
Small loss	22	29	51	χ^2-test 3.38
Total	179	147	326	p = 0.066
Small profit/small loss	7.14	4.07		

VII. Central bank policy transparency

Above median



Below median

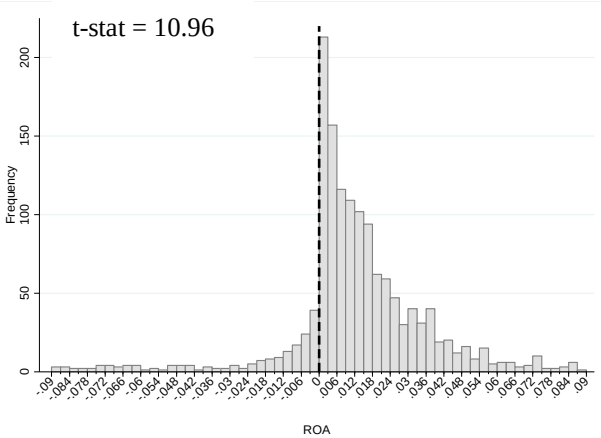


	Above median	Below median	Total
Small profit	151	156	307
Small loss	29	23	52
Total	180	179	359
Small profit/small loss	5.21	6.78	

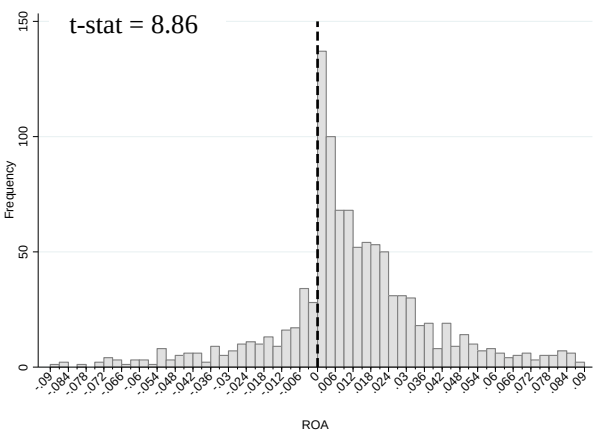
χ^2-test 0.77
p = 0.380

VIII. Country institutions – rule of law

Above median



Below median

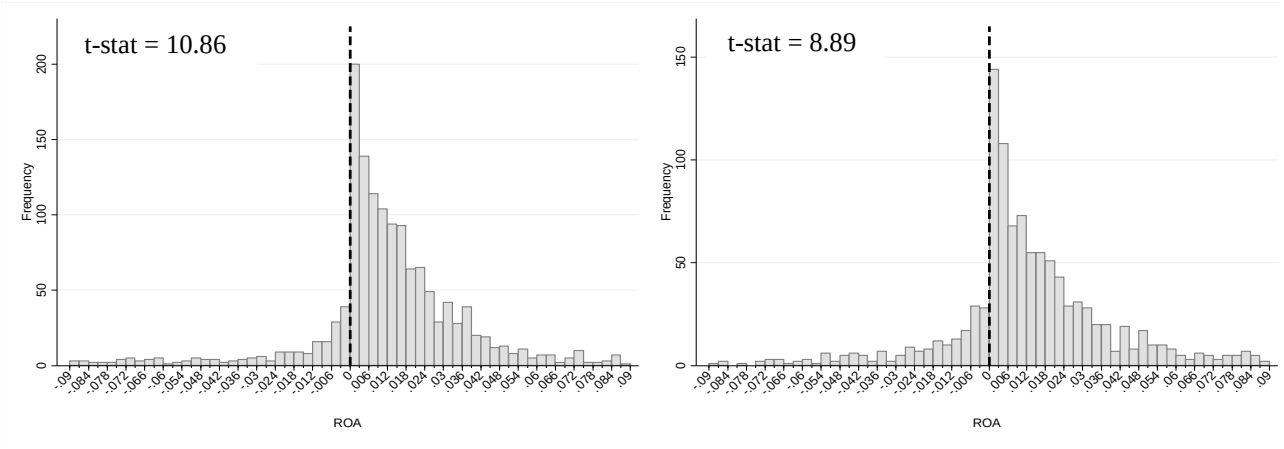


	Above median	Below median	Total
Small profit	210	140	350
Small loss	39	28	67
Total	249	168	417
Small profit/small loss	5.38	5.00	

χ^2-test 0.08
p = 0.784

IX. Country institutions – government effectiveness

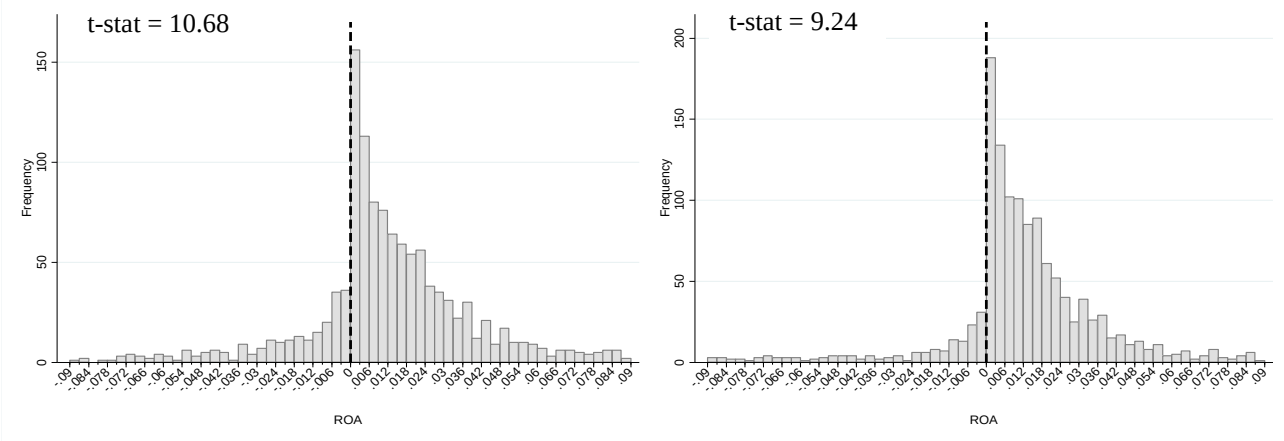
Above median | Below median



	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		

X. Country institutions – corruption

Below median | Above Median



	Above median	Below median	Total	
Small profit	159	185	344	
Small loss	36	31	67	χ^2-test 1.27
Total	195	216	411	p = 0.260
Small profit/small loss	4.42	5.97		

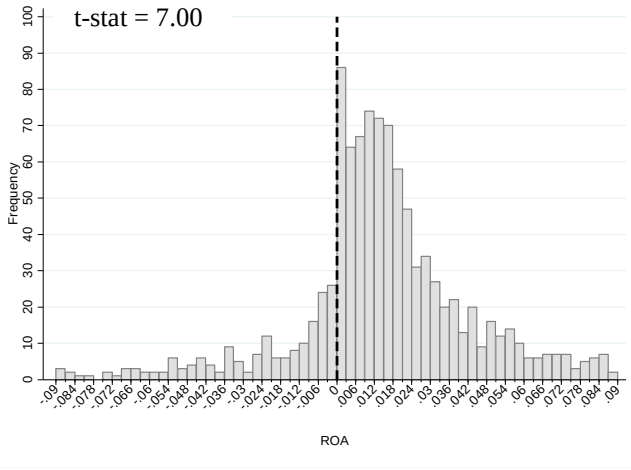
Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on prevailing incentives for loss avoidance. The variables that are used to split the sample based on prevailing incentives are described in Table A1 of the Appendix. The distribution of ROA is trimmed at [-0.09; 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 McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant. The McCrary test in panel IV (histogram on the right) is not available because there are no loss observations that are close to zero profit threshold. (The confidence interval of the estimated density to the right of zero can be estimated and is consistent with the existence of the discontinuity at zero.) The table

below each set of 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 two adjacent histograms.

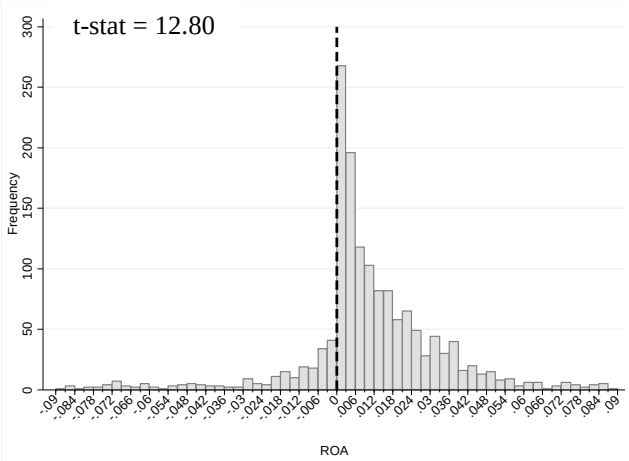
Figure 7: Distribution of central bank profits and ability to avoid losses

I. Accounting standards

IFRS



Local standards

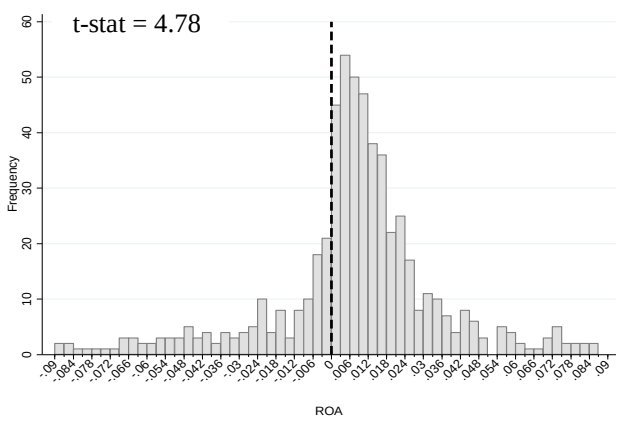


	IAS/IFRS	Local standards	Total
Small profit	86	268	354
Small loss	26	41	67
Total	112	309	421
Small profit/small loss	3.31	6.54	

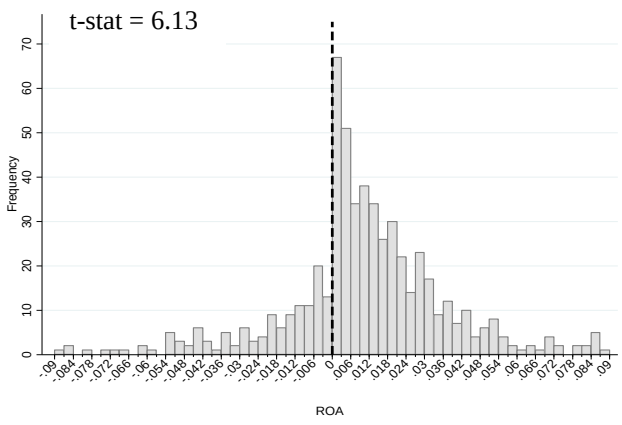
χ^2-test **6.08**
p = 0.014

II. Central bank foreign assets to total assets ratio

Above median



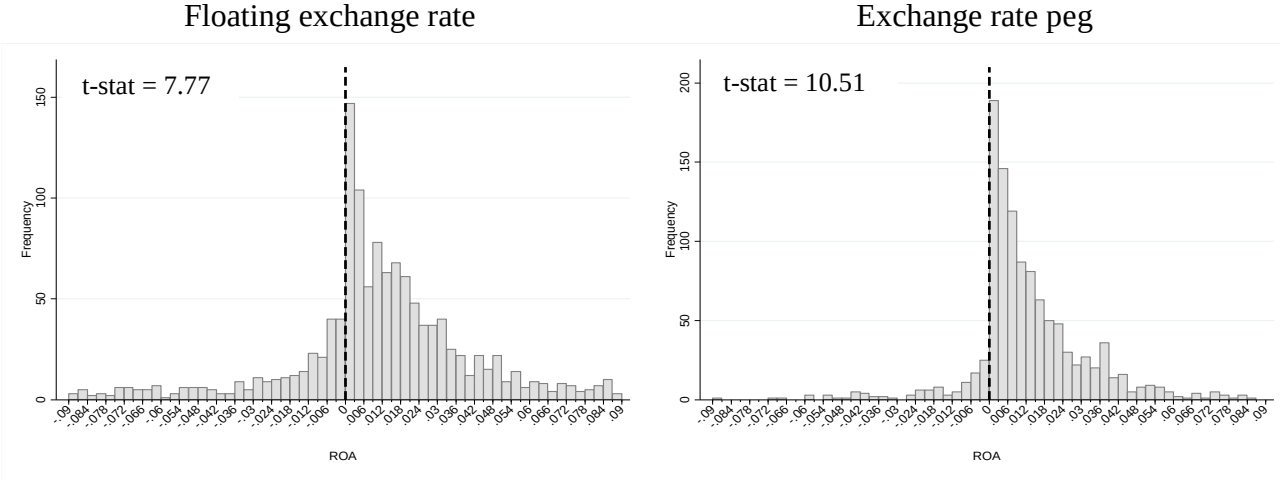
Below median



	Above median	Below median	Total
Small profit	45	67	112
Small loss	21	13	34
Total	66	80	146
Small profit/small loss	2.14	5.15	

χ^2-test **4.91**
p = 0.027

III. Exchange rate regime

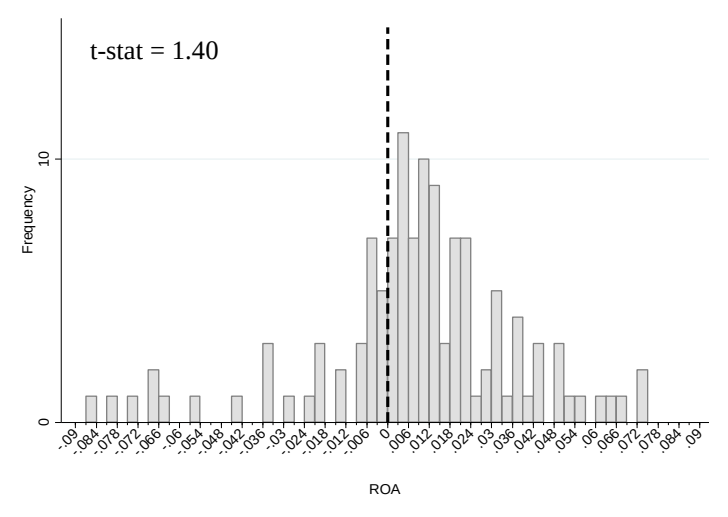


	Floating rate	Exchange rate peg	Total	
Small profit	147	189	336	
Small loss	40	25	65	**χ^2-test 6.93**
Total	187	214	401	**p = 0.009**
Small profit/small loss	3.68	7.56		

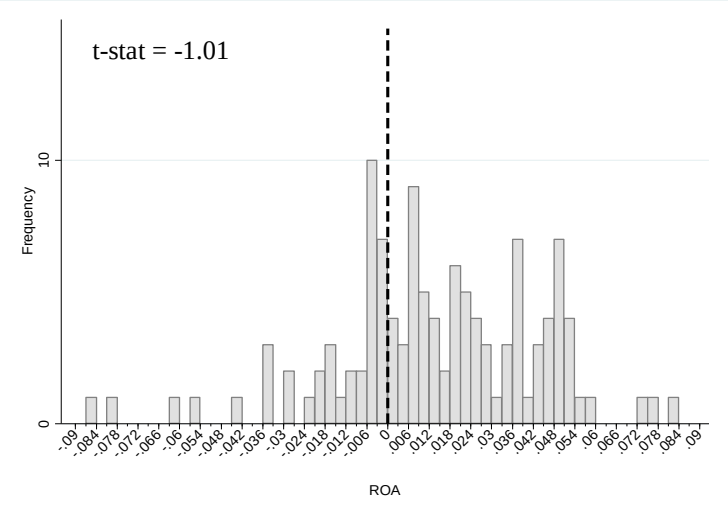
Notes: This figure plots the histogram of central bank profits (ROA) for sample splits based on ability to avoid losses. The variables that are used to split the sample based on prevailing incentives are described in Table A1 of the Appendix. The distribution of ROA is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant. The table below each set of 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 two adjacent histograms.

Figure 8: Minimum combination of factors that can "switch off" the effect

I. Dividend distribution allows contemporaneous or intertemporal smoothing
Central bank governor not re-appointable

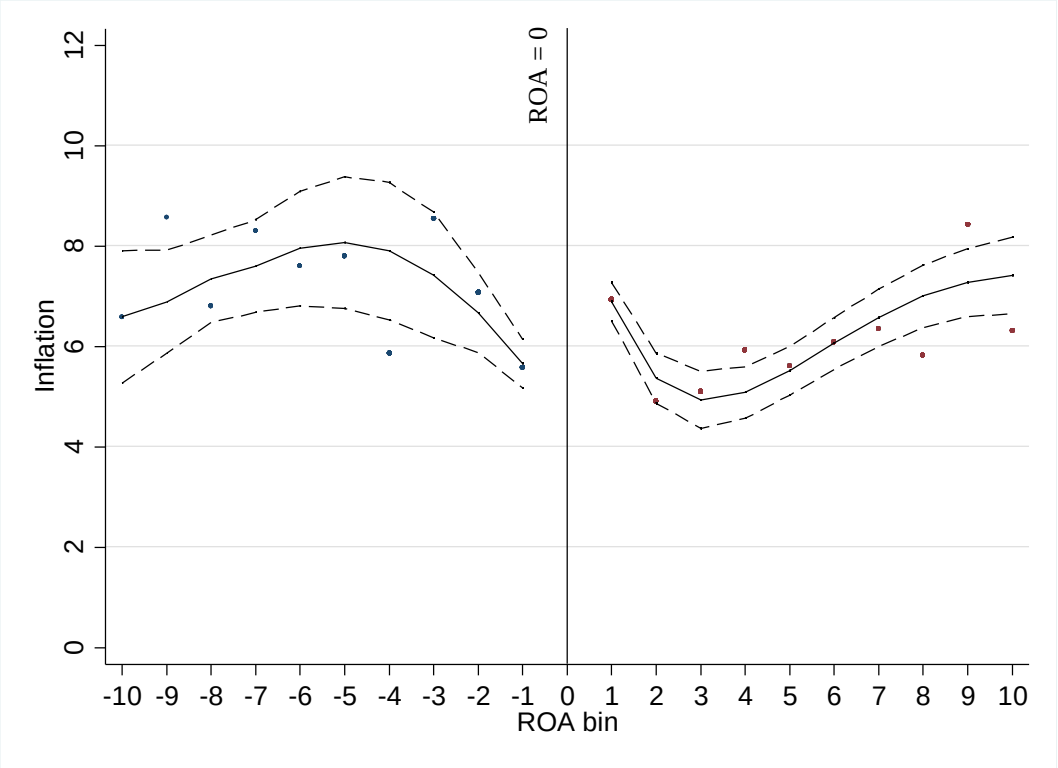


II. Central bank operating expenses to total government income from taxes
Central bank governor not re-appointable



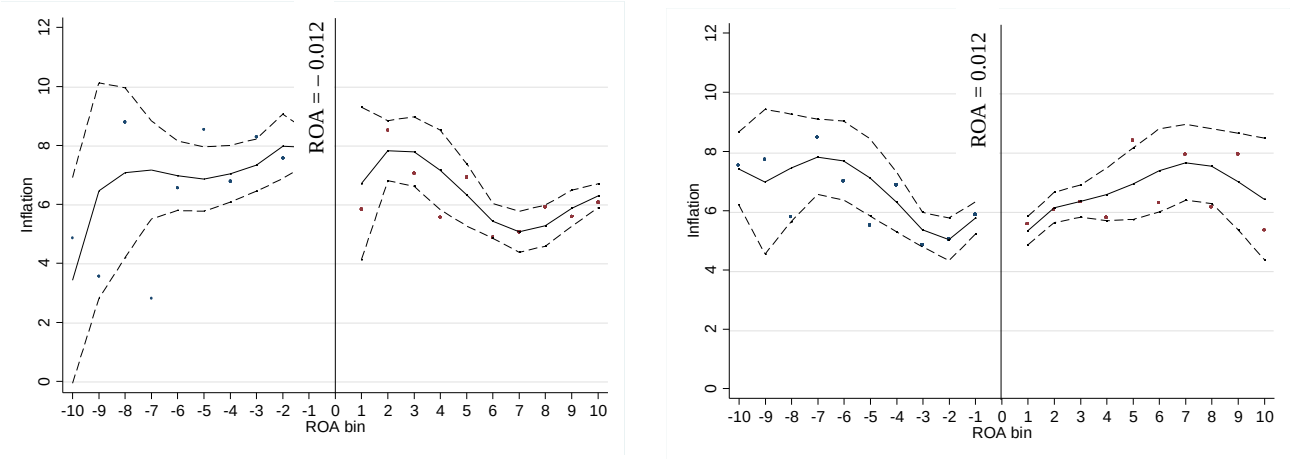
Notes: This figure plots the histogram of central bank profits (ROA) based on the combination of factors reported in Figure 5 and Figure 6. The first plot uses the intersection of sub-samples used in Figure 5.III (left histogram) and Figure 6.V (left histogram). The second plot uses the intersection of sub-samples used in Figure 6.I (left histogram) and Figure 6.V (left histogram). The distribution of ROA is trimmed at [-0.09; 0.09]. The dotted vertical line shows when ROA equals zero. The number of observations falling into each bin is reported on the vertical axis. The McCrary test, reported in the upper left corner of each histogram, examines whether the discontinuity at zero is significant.

Figure 9: Predicted inflation rates from polynomial regression



The figure plots predicted inflation rates from the polynomial regression reported in column (1) of Table 3. The vertical axis shows inflation rates. The horizontal axis shows the intervals of the ROA distribution. 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). The dots show the mean inflation rates. The solid line shows the mean predicted inflation rates, and the dotted lines show the 95% confidence interval for predicted values.

Figure 10: Predicted inflation rates from polynomial regression at placebo thresholds



The figures plot predicted inflation rates from the polynomial regression similar to the one reported in column (1) of Table 3. The vertical axis shows inflation rates. The horizontal axis shows the intervals of the ROA distribution. The vertical line in the middle of each plot shows the ROA threshold (left plot ROA threshold = –0.012; right plot ROA threshold = 0.012). 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. The dots show the mean inflation rates. The solid line shows the mean predicted inflation rates, and the dotted lines show the 95% confidence interval for predicted values.

Table 1: Sample composition by country

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

Table 2: 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	(12) Profit	(13) Profit
"Hard" budget constraint	0.170**	0.195**	0.166**	0.166**	0.166**	0.146**	0.176***	0.189***	0.172***	0.189***	0.169**	0.176**	0.174**
	(0.068)	(0.076)	(0.066)	(0.070)	(0.065)	(0.063)	(0.061)	(0.059)	(0.059)	(0.061)	(0.064)	(0.066)	(0.061)
High operating expenses		0.154*	0.198***	0.213***	0.197***	0.166**	0.145**	0.121*	0.144**	0.121*	0.132*	0.130*	0.163**
		(0.078)	(0.061)	(0.070)	(0.063)	(0.059)	(0.057)	(0.067)	(0.057)	(0.067)	(0.069)	(0.072)	(0.074)
Right-wing party affiliation			0.201***		0.199**	0.195**	0.213**	0.203**	0.217***	0.203**	0.184**	0.153	0.189**
			(0.067)		(0.079)	(0.071)	(0.075)	(0.079)	(0.075)	(0.084)	(0.086)	(0.098)	(0.079)
Extreme party affiliation				0.116**	0.005	0.015	0.003	-0.025	-0.002	-0.025	-0.026	-0.017	0.005
				(0.055)	(0.063)	(0.049)	(0.046)	(0.053)	(0.044)	(0.055)	(0.059)	(0.065)	(0.055)
Publicly traded central banks						0.102***	0.095***	0.090***	0.105***	0.090**	0.077**	0.088**	0.101**
						(0.032)	(0.032)	(0.031)	(0.037)	(0.033)	(0.035)	(0.038)	(0.038)
Governor re-appointable							0.322***	0.378***	0.313***	0.378***	0.379***	0.403***	0.338***
							(0.052)	(0.084)	(0.045)	(0.078)	(0.085)	(0.089)	(0.058)
Low central bank legal independence								-0.085		-0.085	-0.081	-0.095	
								(0.083)		(0.079)	(0.085)	(0.085)	
Low central bank transparency									0.033				
									(0.094)				
Low rule of law										-0.001			
										(0.088)			
Low government effectiveness											-0.113		
											(0.119)		
Low control of corruption												-0.126	
												(0.109)	
Do not follow IFRS													-0.009
													(0.099)
Exchange rate peg													-0.053
													(0.050)
Introduce exchange rate peg													0.196**
													(0.092)
Adandon exchange rate peg													-0.221
													(0.216)
Constant	0.726***	0.657***	0.540***	0.541***	0.541***	0.543***	0.218**	0.209**	0.220***	0.209**	0.239**	0.248**	0.232***
	(0.054)	(0.085)	(0.081)	(0.084)	(0.084)	(0.085)	(0.076)	(0.076)	(0.076)	(0.082)	(0.084)	(0.089)	(0.077)
R^2	0.045	0.094	0.210	0.210	0.210	0.220	0.240	0.250	0.250	0.250	0.260	0.270	0.290
Observations	172	88	65	65	65	65	63	63	63	63	63	63	63

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 is an indicator for small profits and equals 1 if the central bank reports a small profit in year t. All explanatory variables are expressed as dummy variables using the same cut-off points as in Figure 6

and are coded so that they all predict positive coefficients when associated with higher incentives to avoid losses. “Hard” budget constraint is an indicator variable that equals 1 if the central bank dividend payout ratio (dividends divided by net income) is greter than 90% (third tertile of the entral bank dividend payout distribution) or when a central bank pays dividends despite incurring a loss. The indicator vaible equals 0 if the central banlk dividend payout ratio is less than 50% (first tertile of the central bank dididend payout distrribution) or when a central banks receives dividends from the government. Operating expenses is the ratio of central bank personnel expenses to the country’s total tax revenues. Right-wing party affiliation is 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). Extreme party affiliation is an indicator variable that equals 1 if a country’s chief executive has affiliation with the nationalist party, and 0 otherwise. Publicly traded central banks is an indicator variable that equals 1 if the shares of a central bank are quoted on a public exchange, 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. Central bank policy transparency is an index of central bank policy transparency. Rule of law captures the extent to which economic agents have trust in and abide by legal institutions. Government effectiveness is the government effectiveness index. Control of corruption captures perceptions of the use of power by political elites for private gain. Do not follow IFRS is an indicator variable that equals 1 if a central bank prepares financial statements in accordance with local standards, and 0 if it follows IFRS. Exchange rate peg is an indicator variable that equals 1 if a country has an exchange rate peg, and 0 otherwise. Introduce (Abandon) exchange rate peg is an indicator variable that equals 1 if a country introduces (abandons) an exchange rate peg in a given year, and 0 otherwise. Robust standard errors are clustered by central bank and are reported in parentheses. ***, **, * represent significance at 1%, 5% and 10% levels for the two-tailed tests.

Table 3: Loss avoidance and inflation rates – polynomial regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation less target
Profit	2.927**	3.787***	4.595***	4.881**	3.800**	2.018*
	(1.471)	(1.333)	(1.683)	(2.257)	(1.720)	(0.991)
Growth rate of nominal GDP		-1.409	-1.134	-1.845	-3.303	-1.415
		(2.177)	(2.154)	(2.641)	(2.237)	(1.641)
Low income countries		1.583	1.541	0.916	-0.311	-0.972**
		(1.055)	(1.081)	(1.199)	(0.883)	(0.408)
Rule of law		-2.754***	-2.998***	-3.398***		
		(0.553)	(0.577)	(0.771)		
Right-leaning party affiliation			1.695	1.348		
			(1.367)	(1.644)		
Left-leaning party affiliation			1.176	1.130		
			(0.774)	(0.905)		
Extreme party affiliation			-1.684*	-1.923*		
			(0.897)	(1.055)		
Governor re-appointable			-2.605	-3.466		
			(1.846)	(2.465)		
Central bank legal independence				-0.799		
				(1.583)		
Polynomials	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	Yes	Yes
R^2	0.020	0.150	0.170	0.190	0.025	0.110
Observations	1,775	1,775	1,775	1,417	1,775	350

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 bank that target inflation. 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 has affiliation with the nationalist party, and 0 otherwise. Governor re-appointable is an indicator variable that equals 1 if a central bank governor is re-appointable, and 0 otherwise. Central bank legal independence is an index of central bank independence. Polynomials include a vector of polynomials of ROA up to the factor of 6. We trim ROA at the 1st and the 99th percentiles to control for outliers. Standard errors are reported in parentheses and are based on robust standard errors clustered by central bank. ***, **, * represent significance at 1%, 5% and 10% levels for the two-tailed tests.

Table 4: Loss avoidance and inflation rates – Narrow interval regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation less target
Profit	1.357	2.511**	3.590**	3.291*	2.245**	1.553**
	(0.976)	(0.967)	(1.364)	(1.731)	(0.954)	(0.585)
Growth rate of nominal GDP		6.566	8.745	9.257	1.331	-7.434**
		(7.359)	(7.107)	(7.856)	(3.842)	(3.219)
Low income countries		3.953**	3.370**	1.958	2.112	0.586***
		(1.694)	(1.345)	(1.179)	(2.220)	(0.073)
Rule of law		-1.972**	-2.418***	-2.943***		
		(0.875)	(0.842)	(1.026)		
Right-leaning party affiliation			2.149	2.377		
			(1.667)	(2.041)		
Left-leaning party affiliation			2.287	2.952		
			(1.577)	(1.811)		
Extreme party affiliation			-3.006**	-2.863*		
			(1.431)	(1.688)		
Governor re-appointable			-4.497	-6.281*		
			(2.756)	(3.453)		
Central bank independence				-3.325		
				(2.536)		
Country fixed effects	No	No	No	No	Yes	Yes
R^2	0.003	0.210	0.270	0.290	0.029	0.310
Observations	319	319	319	272	319	57

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 bank that target inflation. 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 has affiliation with the nationalist party, and 0 otherwise. Governor re-appointable is an indicator variable that equals 1 if a central bank governor is re-appointable, and 0 otherwise. Central bank 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. ***, **, * represent significance at 1%, 5% and 10% levels for the two-tailed tests.

Table 5: Taylor rule (policy input) – narrow interval regressions

		All countries		Inflation targeting countries	
		(1)	(2)	(3)	(4)
(Inflation - Target)	$(\pi_{i,t-1} - \pi^*_{i,t})$	0.466***	0.441***	0.101	0.089
		(0.159)	(0.149)	(0.155)	(0.144)
(Inflation - Target) × Profit	$(\pi_{i,t-1} - \pi^*_{i,t}) * d_{i,t}$	-0.498***	-0.469***	-0.414**	-0.410**
		(0.145)	(0.132)	(0.193)	(0.189)
Output gap	$(y_{i,t-1} - y^*_{i,t-1})$	4.279	3.479	-0.238	0.501
		(5.380)	(5.194)	(7.530)	(7.872)
Profit	$d_{i,t}$	2.225***	2.079***	0.954**	0.991**
		(0.790)	(0.758)	(0.477)	(0.473)
Interest rate at t-1	$r_{i,t-1}$	-0.433***	-0.383***	0.301**	0.311**
		(0.132)	(0.128)	(0.142)	(0.138)
Δ Exchange rate	$\Delta s_{i,t}$		-4.116***		1.790***
			(0.953)		(0.664)
Constant		11.789***	11.413***	4.220***	4.098***
		(3.043)	(2.947)	(1.244)	(1.230)
Wald χ^2		26.21	58.96	26.92	32.62
Observations		118	118	42	42

Notes: The table reports results of the 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 is the interest rate on short-term treasury bills of country *i* in year *t* ($r_{i,t}$). All models are estimated using the Arellano-Bond GMM estimator. Columns (1) and (2) use observations with all available data on test variables and sets inflation target at 2% (4.5%) in high income (low income) economies if a central bank does not target inflation. Columns (3) and (4) use only central banks that target inflation and that have an actual inflation target. Profit is an indicator for whether a central bank reports a profit or a loss. (Inflation – target) is the country rate of consumer price inflation of country *i* in year *t-1* less the central bank target inflation in year *t*. Interest rate at *t-1* is the short-term treasury bill interest rate in country *i* and year *t-1*. Output gap is the difference between the actual GDP and the predicted GDP using the Hodrick and Prescott (1997) filter for country *i* and year *t-1*. Δ Exchange rate is the difference in the exchange rate of local currency to USD from *t-1* to *t* for country *i*. Robust standard errors are reported in parentheses. ***, **, * represent significance at 1%, 5% and 10% levels for the two-tailed tests.