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Why Do Central Banks Go Weak?

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Abstract

Determinants of central banks' profitability are studied using a statistical analysis of their balance sheets, country characteristics, and the macroeconomic and institutional environments in which they operate. Central banks at both tails of the distribution of profits generally operate in poorer countries with more troubled macroeconomic and institutional environments. For these central banks, profitability is strongly influenced by fiscal dominance and, to a lesser extent, by how actively central banks used their balance sheet for monetary policy purposes.

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[1] This paper greatly benefited from extensive comments by Daniel Hardy and Kenneth Sullivan.

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I. INTRODUCTION

The literature on central banks' financial health is sparse and mostly focuses on the implications of financial strength for policy performance and credibility. Ize (2005) explores within a debt sustainability framework the linkages between a central bank's ability to conduct monetary policy (i.e., to maintain low inflation) and its financial conditions measured on the basis of its "structural profits" (total profits excluding temporary valuation gains and one-time incomes or expenditures). Stella (2006) illustrates these linkages through a simple empirical study of correlations between central banks' capital and inflation. Based on a more complete econometric analysis, Stella and Klueh (2008) detect a strong positive relation between financial strength and inflation.

But what is behind a central bank's weak financial condition? Dalton and Dziobek (2005) lay out the possible sources of central bank losses, and illustrate their analysis with six country case studies. Based on an empirical analysis of the sources and uses of seigniorage for a sample of 100 central banks, Ize (2007) finds that weak central banks typically (although not exclusively) operate in smaller and less wealthy countries, and are burdened by large nonperforming assets, compulsory transfers and low capital. Notwithstanding their weak finances, these central banks tend to overspend as regards their operating expenditures.

Using the same database, this paper explores more directly the roots of central banks' financial conditions as determined by their structural profits. Based on a profitability benchmark obtained by normalizing structural profits for cross-country differences in size and per capita income, central banks are divided into three groups of broadly equal size, dubbed the "strong central banks" (SCB), the "weak central banks" (WCB), and the "middle group central banks" (MCB). The middle group corresponds for the most part to central banks of wealthier countries operating in more stable macroeconomic and institutional environments. It is surrounded on both sides by central banks of poorer countries operating in more troubled waters.

The main difference between the strong and the weak reflects their relationship with their government. While the strong benefit from well-paying claims on their government, the weak are heavily burdened with interest-paying liabilities, including to their own shareholder. In other words, while the strong have a profitable relationship with their shareholder, the weak seem to have been hard pressed to transfer funds to their owner in any way possible. However, we also find that balance sheet volatility is a good predictor of profitability, suggesting that the more active central banks—or central banks operating in more turbulent macroeconomic environments—become more exposed to extraordinary gains or losses.

As a by-product of our analysis, we also find that central banks in the smallest and poorest countries are more likely to encounter financial difficulties, suggesting that there are important fixed costs to central banking. As countries grow and develop, central banks seem to go through roughly three stages of development. In the first stage, they act as simple depositories of funds for their shareholder: they hold public deposits and place assets abroad. In the second stage, they act as domestic funding agents: they collect deposits from banks and pass them on to their government. In the third stage, central banks operate as bankers to domestic banks: they issue securities and on-lend funds to banks.

The rest of the paper is organized as follows. Section II presents the dataset and discusses the results of the control regressions carried out to normalize the data. Section III describes the three profitability groups, based on their normalized financial statements, as well as their countries' structural, macroeconomic, and institutional environments. Section IV conducts a simple econometric analysis to identify the most influential determinants of central banks' profitability. Section V concludes.

II. CONTROLLING FOR COUNTRY INCOME AND SIZE: CENTRAL BANKING FROM A MILE HIGH

We use the 2003 income statements of 95 central banks to obtain interest income, interest expense, operating expenditures, and all other *recurrent* net operating income. We then obtain from IFS the balance sheet data for the same year, organized as currency and claims on (or liabilities to) the external sector, government, and banks. The latter includes deposits and loans as well as securities. As time series are readily available for all the balance sheet data (unlike in the case of the income statement), we were also able to derive from that data an index of average balance sheet volatility over the period 1993–2003. To make the data comparable across countries, we convert it into dollars at the current exchange rate and control for countries' two key structural characteristics, size and per capita income (all the data is expressed in logs). Results are summarized in Tables 1 and 2.

Table 1. Regression Results for the Income Statement Components

	Interest income	Interest expense	Operating expenditures	Other net income
C	-2.13**	-3.31	0.51	-5.44**
	(1.05)	(2.56)	(0.79)	(1.81)
Population	0.86**	0.93**	0.80**	0.96**
	(0.05)	(0.13)	(0.04)	(0.10)
GDP per Capita	0.89**	0.77**	0.60**	0.73**
	(0.06)	(0.14)	(0.04)	(0.10)
R-squared	0.83	0.44	0.84	0.67
Adjusted R-squared	0.82	0.43	0.84	0.66
S.E. of regression	0.84	2.00	0.64	1.31
Sum squared residuals	64.72	346.65	37.17	124.14
Log likelihood	-115.84	-188.39	-90.22	-125.32
DW statistic	1.82	2.17	1.94	1.43

Source: Central banks' financial statements, World economic outlook.
*** Significant at 5 percent level.*

Table 2. Regression Results for the Balance Sheet Components

	Foreign assets	Claims on government	Claims on banks	Foreign liabilities	Bank deposits	Government deposits	Securities	Currency
C	2.48**	-6.78**	12.84**	2.28	-0.34	3.23	-4.45	-3.25**
	(0.96)	(3.41)	(2.27)	(2.63)	(1.26)	(3.02)	(5.16)	(0.97)
Population	0.82**	1.23**	1.24**	1.01**	0.87**	0.62**	0.98**	1.05**
	(0.05)	(0.17)	(0.11)	(0.14)	(0.06)	(0.15)	(0.26)	(0.05)
GDP per Capita	0.79**	0.86**	1.51**	0.09	0.93**	0.79**	1.14**	0.95**
	(0.05)	(0.19)	(0.12)	(0.14)	(0.07)	(0.16)	(0.28)	(0.05)
R-squared	0.84	0.44	0.76	0.41	0.79	0.30	0.51	0.89
Adjusted R-squared	0.84	0.42	0.76	0.40	0.79	0.28	0.47	0.89
S.E. of regression	0.75	2.63	1.59	1.87	0.96	2.25	1.81	0.75
Sum squared residuals	46.62	558.91	181.66	266.36	75.90	405.49	78.44	47.18
Log likelihood	-96.31	-198.79	-139.60	-160.11	-115.80	-183.60	-52.71	-96.83
DW statistic	1.93	2.23	2.03	2.29	1.77	1.92	2.19	2.09

Source: International Financial Statistics, World economic outlook
** *Significant at 5 percent level.*

Most regressions have a good fit, suggesting that there are strong underlying regularities in the way central banks operate across the world. Interestingly, the balance sheet items that have more residual variability are the claims on (and liabilities to) government. This suggests that the extent (and modalities) of the relationship between central banks and their shareholders is the one aspect of central banking that is subject to the most discretion. Not surprisingly, as we will see below, this is also the aspect that is responsible for most of the variability in central banks' profits.

The comparison of the income and size elasticities provides a rough, yet revealing "positive" theory of central banking. Starting with the income statement, notice first that operating expenditures have the lowest income elasticity while the income elasticity of interest expense is lower than that of interest income. Therefore, as income declines, expenditures (both gross expenditures and operating expenditures) grow faster than income, which suggests that central banks in poorer countries are likely to have a harder time getting their financial conditions in shape. The fact that operating expenditures also have the lowest size elasticity further supports the view that there are important fixed costs to central banking.

The ordering of the income elasticities of assets and liabilities suggests a similarly revealing sequence of stages as countries get wealthier. As indicated by those items with the lowest income elasticities (around 0.8), the most "basic" central banks function as "external bankers to

their government." They collect government deposits and mainly accumulate assets abroad, probably because they do not have much investment alternatives.[2] As can be seen from the items with somewhat higher income elasticities (around 0.9), slightly more evolved central banks become "local bankers to their governments." They collect deposits from local banks and on-lend part of that funding to their government. As inferred from the items with income elasticities above 1.0, the most evolved central banks become "bankers to banks." They borrow by issuing securities and on-lend part of their funding back to their banks, reflecting the development of market operations in the more advanced economies.

The ordering of size elasticities is also interesting. As indicated by the items with the smallest size elasticities (from 0.6 to 0.9), the smaller central banks collect deposits—first from their governments and then from their banks—and accumulate assets abroad. This is roughly the same story as above, except that it extends to the smallest—not only the poorest—countries. Bigger central banks issue securities and on-lend to local banks (the items with size elasticities around or above 1.0), which is again broadly consistent with the income side story. Interestingly, however, the size elasticity of claims on government is much higher than the income elasticity, suggesting that larger central banks are more prone to accumulate claims on their government. Such returns to scale effects are consistent with the issuance (and accumulation by the central bank) of market-based government securities, where market size clearly matters.

III. THE WHO IS WHO OF CENTRAL BANK PROFITABILITY: A SIMPLE PARTITION ANALYSIS

The residuals of the regressions above can be used to "benchmark" each of the main items of the income statement, with a positive residual meaning "excess" income or "excess" spending, a negative residual implying a corresponding shortfall or underperformance. From these item-by-item benchmarks, simply adding up the log values of incomes minus expenditures to obtain a profitability benchmark would be problematic since it would amount to computing profits based on a geometric mean of its components. Instead, we derived the profitability benchmark through the following steps. First, we transformed the log values back into natural values. Second, to smooth out the resulting scale differences (that come back after the conversion), we took their ratios to GDP. Third, we calculated the structural profitability benchmark as the sum of the income ratios minus the expenditure ratios. We then sorted the sample based on this benchmark and divided it into three groups of roughly equal size, the countries with the highest profitability being classified as "strong central banks," the ones with the lowest profitability as "weak central banks", and the ones in the middle as the "middle group central banks."

Table 3 presents a summary of the main country characteristics in which the three groups of central banks operate, divided up into structural characteristics (size and income), macroeconomic characteristics (volatilities of: inflation, fiscal deficit, and central banks'

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[2] Notice also that the income coefficient of external borrowing is close to zero (i.e., foreign borrowing by central banks is independent of the countries' income level). Borrowing abroad seems to be the first thing central banks do.

balance sheet[3], the flexibility of the exchange rate regime,[4] and the frequency of financial crises[5]), and institutional characteristics (the KKM governance index[6] and a country risk index.[7])

Table 3. Country Characteristics by Group

	Full Sample	SCB	MCB	WCB
1. Structural:				
GDP per Capita	11,221	8,493	14,715	9,592
Population	39.66	85.34	20.20	23.03
2. Macro				
Inflation Volatility	4.62	3.88	2.27	7.81
Fiscal Deficit Volatility	2.32	2.63	1.86	2.57
Exchange Rate Regime **	5.14	5.67	4.94	4.91
Banking Crisis (% of total)	28.00	25.00	39.29	35.71
Central Bank Balance Sheet Volatility	5.92	5.01	4.89	7.85
3. Institutional				
KKM*	0.37	0.13	0.67	0.23
Country Risk	3.66	4.35	2.71	4.13
Number of observations	95	27	36	32

Source: International Financial Statistics, World economic outlook, OECD, AREAER database, Leaven and Valencia (2008).
* lower KKM reflects lower governance

** Higher exchange rate index denotes of higher flexibility.

The middle group is wealthier and surrounded by two groups of central banks operating in countries with much lower but roughly equivalent average GDPs per capita. Central banks in the two tails are also more exposed to macroeconomic volatility (inflation and fiscal deficits) and operate within a more fractured institutional environment (as reflected by the lower governance index and higher country risk). The main differences between the strong and the

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[3] This is measured as the average standard deviation over the period 1993–2003 of all the main items of central banks' balance sheets, defined in the same way as that described above (i.e., claims and liabilities on the external, public and private sectors).

[4] The data is drawn from the IMF AREAER database.

[5] We check whether the country has experienced a financial crisis during the period 1993 to 2003. The data comes from Luc Leaven and Fabien Valencia (2008).

[6] The KKM index, developed by Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi, measures six dimensions of governance including voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. It ranges in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes.

[7] The data comes from the OECD's country risk classification.

weak lie in their size (the strong group has much larger countries), the volatility of central banks' balance sheets (the weak central banks experienced a much higher volatility, suggesting that they have assumed a more active monetary, exchange rate, or financial management, or been exposed to more financial turbulence), their exchange rate regimes (the strong group has more flexible regimes), and the occurrence of banking crises (the strong group experienced less banking crises). Hence, while both tail groups tend to operate in more problematic environments, the WCB seem to have used their balance sheet more actively, reflecting more restrictive policy regimes and/or more unstable financial systems. The differences in the choice of policy regimes may in part have reflected differences in country size, with larger countries more likely to adopt more flexible exchange rate regimes.

Tables 4 and 5 present a birds' eye view of the income and balance sheet profiles for the three groups. For these tables, we use the log residuals straight from the regressions in Tables 1 and 2. Because these residuals sum up to zero for the sample as a whole, the sum of the three sub-sample averages also approximates zero.[8] Thus, the positive or negative averages for each of the sub-samples highlight how each of the groups differentiates itself from the others. Notwithstanding the difficulties flagged above as regards the derivation of profits or capital from the summation of log values, we nonetheless report these simple implied values in the tables below because, with the proper caveats, they help to illustrate the key group-by-group differences.

Notice first from Table 4 that the differences in "profitability" arise mostly from net financial income, particularly from the spending side (interest expenses). The WCB overspend, the SCB underspend. Indeed, Table 5 shows that the WCB have large excess liabilities. Instead, the SCB have very low liabilities (much below benchmark). Notice also that the WCB have exceptionally large government deposits while the SCB have exceptionally low levels of foreign borrowing. This suggests that WCBs' financial conditions are undermined in a large part by the interest transfers they make to (or on behalf of) their shareholders. Instead, the SCB benefit from the fact that, unlike the WCB, they were not requested to borrow abroad on account of their government.

Table 4. Income Profiles by Group

	SCB	MCB	WCB
Net Financial Income	**1.12**	**-0.10**	**-0.84**
Interest Income	0.36	-0.21	-0.07
Interest Expenditures	-0.76	-0.11	0.77
Net Operational Income	**-0.17**	**0.31**	**-0.20**
Operational Income	-0.27	0.10	0.12
Operational Expenditures	-0.10	-0.21	0.32
Profits	**0.95**	**0.21**	**-1.04**

Source: Central banks' financial statements.

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[8] The sum of the sub-sample averages does not exactly sum up to zero because of differences in sample sizes.

There are also important differences on the income side. The SCB benefit from exceptionally high interest earnings (see Table 4), which appear to be mostly related to claims on their shareholder (Table 5). While the WCB also have large claims on government, they under-perform as regards their interest income. Hence, a key difference between the two groups seems to be that the SCBs' claims perform, while the WCBs' do not.

Table 5. Balance Sheet Profiles by Group

	SCB	MCB	WCB
Assets	**0.62**	**-0.68**	**0.24**
Foreign	0.05	-0.10	0.07
Banks	0.02	0.15	-0.19
Government	0.55	-0.73	0.36
Liabilities	**-0.75**	**-0.47**	**1.15**
Foreign	-0.50	0.17	0.23
Banks	-0.08	-0.25	0.34
Government	-0.22	-0.27	0.49
Securities	0.05	-0.12	0.09
Currency	**0.19**	**-0.15**	**0.01**
Capital	**1.18**	**-0.06**	**-0.92**

Source: International Financial Statistics.

Three additional features are worth noticing from these tables:

- Profitability seems to correlate with capitalization: the SCB are "overcapitalized", the WCB are "undercapitalized". It would be tempting to infer from this that the profitability of central banks mostly reflects their capitalization. However, as we will see in the next section based on econometric tests, this interpretation is overly simplistic and mostly incorrect. Without major valuation adjustments to the main items of the balance sheets, central banks' capital only explains a very small fraction of their profitability.

- The WCB overspend as regards their operating expenditures, while the other two groups underspend. This suggests that differences in profitability may be in part also associated with differences in governance.

- The SCB and WCB accumulate slightly more foreign assets than warranted by their benchmark, the MCB slightly less. This could reflect the more turbulent macroeconomic environment in which both groups operate (which may call for a higher buffer of international reserves).

IV. LINKING PROFITABILITY BACK TO THE FINANCIAL ACCOUNTS: A STATISTICAL ANALYSIS

These preliminary clues from simple data tabulations are corroborated by a statistical analysis based on pair-wise correlations between structural profits and the various components of the income statement (Table 6) and a variance decomposition of profits (Table 7). For this analysis,

Table 6. Pairwise Correlations Between Profits and its Components[1]

	Full Sample	SCB	MCB	WCB
Operating expenditures	**-0.27**	-0.01	**0.29**	-0.18
Interest expense	0.15	**0.78**	-0.05	**-0.71**
Interest Income	**0.38**	**0.83**	0.13	**-0.38**
Other Net Income	-0.16	-0.08	0.13	**-0.49**

Source: Central banks' financial statements.
[1] Significant correlations (at the 5 percent level) are in bold.

Table 7. Variance Decomposition of Profits[1]

	Interest Expense	Interest Income	Operating Expenditures	Other Net Income
Full Sample	0.52	**1.46**	**-0.10**	-0.03
SCB	**5.33**	**6.34**	0.00	-0.02
MCB	-0.39	1.05	**0.58**	0.15
WCB	**-1.88**	**-0.88**	-0.11	**-0.11**

Source: Central banks' financial statements.
[1] Significant coefficients (at the 5 percent level) are in bold.

for the reasons already discussed in the previous section (i.e., the need to have a more sensible profitability benchmark), we revert to natural values.[9]

It is immediately apparent from both tables that the profits of the weak and strong central banks mostly originate from their interest income and expenses. The most important variables are interest income in the case of the SCB and interest expense in the case of the WCB. Furthermore, while the correlations are positive for the SCB, they are negative for the WCB. Thus, the SCB are profitable because they benefit from large interest earning assets that are meant to pay for their interest paying liabilities. The more liabilities they have, the more assets they get, and the more profitable they become. In the case of the WCB, the picture is just the opposite. The more interest paying liabilities they have, the greater the losses as the interest earning assets they are given are insufficient to offset the interest costs.

For the MCB, the correlations between profitability and interest income and expenses are much weaker. Instead, profitability is more largely explained by operating expenditures. Remarkably, notwithstanding the fact that one would expect a negative correlation on accounting grounds (operating expenses reduce profits), the correlation is positive: more profitable central banks spend more. As noticed in Ize (2007), the fact that the most profitable central banks seek to

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[9] To avoid introducing a possible scaling bias, the regressions of profits versus balance sheet items are done in full natural values, rather than ratios to GDP. This however tends to raise the regressions' R-squares somewhat artificially (differences in GDP levels show up on both sides of the regressions).

retain some of the windfall "in-house," rather than distribute it to their shareholder, suggests that there may be some governance issues even for this group. Central banks may not have sufficient incentives to squeeze every penny out of their operations and match their expenditures with broader social objectives.[10]

The strong negative correlation for the WCB group between profits and other income (the higher the losses, the higher the other income), which again runs counter to what one would expect on pure accounting grounds, is similarly noteworthy. As pointed out by Ize (2007), this may reflect attempts by WCB to fill up the profit gap through the mobilization of extraordinary resources, whether real or fictional (i.e., through creative accounting).

The linkages between profits and the main items of the balance sheet are further highlighted by the set of regressions shown in Table 8. Consider first the results for the sample as a whole (column 1). All items have the expected sign and are significant (assets increase profits, liabilities reduce them), except for liabilities to the private sector (essentially bank deposits), which have the wrong sign but are only mildly significant. This is consistent with the fact that many (or perhaps most) central banks do not pay interest (or at least not at the market rate) on deposits from banks. Hence, as noted in Ize (2007), bank deposits constitute by far the principal source of seigniorage.

Notice also that currency has a negative sign (the higher the currency stock, the lower the profits) which, at first sight, would seem to be inconsistent with the traditional view of currency as providing an important (if not the most important) source of seigniorage. However, this apparent contradiction is quickly resolved once one realizes that profits must accrue from the asset side of the balance sheet. Hence, seigniorage (including on currency) must be reflected in the positive and significant coefficients that are associated with the central bank's claims. Instead, the negative sign of the currency coefficient reflects printing and handling costs, which, as we will see below, are particularly important for central banks at either tail of the profit distribution.

Remarkably, when an attempt is made to explain central bank profits solely on the basis of their capital (column 2), the fit is extremely poor. However, once we add back the components of the balance sheet that are most likely to be non-interest bearing, nonperforming, or bear a below market interest rate (currency, bank deposits and claims on government), the fit improves noticeably (column 3). This highlights the fact that unless one fully adjusts all central bank balance sheet accounts in accordance with fair value accounting (and, clearly, much more would be needed to achieve this), reported capital has very limited value for economic analysis.

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[10] While it could well be socially optimal for a central bank to raise its operational expenditures to the point where it brings its profits to zero (this could be necessary to improve the quality of its monetary or prudential management), this should produce a *negative* correlation between profits and operating expenses, not a positive correlation.

Table 8. Regression of Profits on the Main Balance Sheet Components

	Full Sample			SCB	MCB	WCB
	(1)	(2)	(3)			
Constant	-25,334**	-10,118	-30,214**	6,550	-10,455**	-8,199
	(7662.50)	(14632.33)	(9975.10)	(5436.80)	(4144.32)	(5436.80)
Banks Deposits	0.02*		0.06**	0.01	0.01	0.02**
	(0.01)		(0.01)	(0.02)	(0.01)	(0.01)
Claims on Government	0.07**		0.03**	0.07*	0.01	0.01
	(0.02)		(0.00)	(0.04)	(0.01)	(0.01)
Claims on Banks	0.03**			-0.06**	-0.01	-0.02**
	(0.01)			(0.03)	(0.02)	(0.01)
Currency	-0.11**		-0.07**	-0.09**	0.00	-0.10**
	(0.03)		(0.01)	(0.04)	(0.02)	(0.01)
Foreign Assets	0.04**			0.06**	0.03**	0.04**
	(0.01)			(0.03)	(0.00)	(0.01)
Foreign Liabilities	-0.06			0.07	-0.03**	-0.09**
	(0.06)			(0.08)	(0.02)	(0.01)
Government Deposits	-0.01			-0.03	-0.03	-0.12**
	(0.05)			(0.08)	(0.02)	(0.02)
Securities	-0.07**			-0.04**	-0.04**	-0.05**
	(0.02)			(0.02)	(0.01)	(0.02)
Capital		0.00	0.03**			
		(0.01)	(0.00)			
R-squared	0.62	0.00	0.57	0.99	0.93	0.96
Adjusted R-squared	0.59	-0.01	0.55	0.98	0.90	0.95
Log likelihood	-1,214.44	-1,260.84	-1,220.86	-310.29	-402.16	-360.24
Durbin-Watson stat	2.12	1.95	2.13	2.08	1.75	2.2
Mean dependent var	-9,448.89	-9,448.89	-9,448.89	70,072.48	-402.16	-53,051.10
Akaike info criterion	25.76	26.59	25.81	23.65	22.84	23.08
F-statistic	17.88	0.25	29.85	172.39	42.51	76.79
Prob(F-statistic)	0.00	0.62	0.00	0.00	0.00	0.00

Source: Central banks' financial statements and International Financial Statistics.
*Significant at 90 percent.
** significant at 95 percent.

Consider now the results for the three sub-samples. Although they are constrained by the small sample sizes (resulting in some coefficients, such as claims on banks, having the wrong sign), they are nonetheless quite consistent overall. To provide a better feel for the relative importance of each of the variables in explaining profitability, a variance decomposition, based on the regressions in Table 8, is also shown (see Table 9). Take first the SCB. The clear dominant story is that of claims on government which explains the lion's share of their profitability. Instead, these central banks did not borrow heavily from abroad and their deposits from government are not a burden (neither of these coefficients is significant in Table 8). But notice also the importance of currency issuing costs.

Table 9. Variance Decomposition of Profits[1]

	SCB	MCB	WCB
Banks Deposits	0.07	0.05	**0.07**
Claims on Government	**2.19**	0.04	-0.06
Claims on Banks	**-0.13**	0.07	**0.04**
Currency	**-1.24**	0.01	**0.38**
Foreign Assets	**-0.39**	**0.48**	**0.16**
Foreign Liabilities	0.21	**0.11**	**0.22**
Government Deposits	-0.22	0.05	**0.12**
Securities	**-0.00**	**0.12**	**0.00**

Source: International Financial Statistics.
[1] Significant coefficients (at the 5 percent level) are in bold.

For the WCB, setting aside currency issuing costs which also play an extremely important role (more on this below), the other key items in Table 9 are foreign liabilities (as well as foreign assets) and government deposits. Instead, the coefficient of claims on government is not significant. This is consistent with a story in which the profitability gap for these central banks has for the most part a fiscal root. They were induced to borrow (mostly abroad) and on-lend (mostly for free) at least part of these funds to their shareholder. At the same time, they were requested to pay interest on the funds that the owner re-deposited at the central bank. After the fact, the owner has been of course reluctant to clean up the central bank's accounts because its own (fiscal) accounts benefit from the status quo. The profitability of these central banks is further worsened by the need to assume their own operational costs, including currency issue costs.[11]

Finally, consider the middle group. The only clear story coming up from Table 9 relates to their foreign assets. The most profitable central banks have the highest foreign reserves, with a

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[11] Notice that profits in this paper are defined prior to any dividend transfer to the shareholder. Hence, weak profitability can only arise from the structure of the balance sheet and the interest rates paid on the various assets and liabilities. A further weakening of central banks' financial conditions could result from unwarranted profit distributions (for example, compulsory minimum distributions even when there are no profits, which amount to programmed decapitalizations).

causality that could flow in either direction: reserves increase profits and profits raise the capacity to accumulate reserves.

Finally, we also regressed central bank profits on the main macroeconomic and institutional country characteristics of Table 3. The results (not shown) were disappointing in that the only variable that showed a significant statistical impact was the balance sheet volatility. Rather remarkably, however, this effect is negative for the WCB, positive for the SCB (see Table 10). The fact that the financial conditions of central banks at either tail of the distribution is related to how heavily they used their balance sheet for monetary or financial management, or how exposed their balance sheet was to macroeconomic or financial turmoil, is not overly surprising.

Table 10. Regression of Profits on Balance Sheet Volatility[1/]

| | Coefficients/S.D. | | | |
Variable	Full Sample	SCB	MCB	WCB
Constant	-0.06	0.03	-0.09	-0.34
	0.06	(0.06)	(0.01**)	(0.06**)
Balance sheet volatility	-0.01	0.06	0.00	-0.03
	(0.00**)	(0.01**)	(0.00)	(0.00**)
R-squared	0.05	0.72	0.05	0.58
Adjusted R-squared	0.04	0.71	0.03	0.56
Log likelihood	-65.05	1.73	52.94	-3.44
Durbin-Watson statistic	2.11	1.90	0.15	0.88
Mean dependent var	-0.13	0.35	-0.10	-0.57
Akaike info criterion	1.41	0.02	-2.83	0.34
Schwarz criterion	1.47	0.12	-2.74	0.43
F-statistic	5.18	64.20	1.91	40.79
Prob(F-statistic)	0.03	0.00	0.18	0.00

Source:
[1/] Significant at 90 percent.
** significant at 95 percent.

The switch in signs between the two groups is more surprising and could have a number of interpretations: (i) it could reflect pure luck (the lucky ones benefited from the turmoil, the unlucky ones were hurt); (ii) alternatively, it could reflect more "skillful" handling (the central banks that did well "earned" their profits); or else (iii) it could reflect ex-post interventions by the owner (the profitable central banks were "bailed out," cleaned up and recapitalized, the unprofitable ones were not). Indeed, the fact that the SCB are more profitable (and better capitalized) than the average central bank (as represented by the MCB group) would be consistent with this last interpretation. "Well-cared-for" central banks operating in a more volatile environment would be expected to have a higher built-in defense (a profitability buffer) against volatility. The more volatile the environment, the larger the buffer. More research is clearly needed to sort out these alternative interpretations.

V. Conclusions

The main conclusion of this paper is that fiscal dominance (i.e., the way central banks are treated by their owner, which in turn is likely to reflect fiscal concerns) seems to largely explain the financial health of central banks at both tails of the profits distribution. Central banks that are in the poorest health are those that were asked to borrow abroad but were not adequately remunerated on the claims they then held on their government; instead they were required to pay interest on their holdings of government deposits. Those that have the highest profits are the mirror image of the former group. They have little or no external liabilities, have highly performing claims on their government, and pay little or no interest on government deposits. Remarkably, both groups belong to poorer countries with relatively turbulent macroeconomic environments and poorer institutions. In between the two groups sits a middle group of central banks from more affluent and stable countries with more evolved institutions for which profitability is not a function of their relationship with their owner. Instead, as one would expect, it mostly reflects how much foreign assets they have.

That central banks' financial health is only as good as their owner wants it to be (or is able to support it) is of course not too surprising. Nonetheless, it is useful reminder that the credibility of monetary policy is largely dependent on the fiscal environment under which central banks operate and the commitment of their owner to protect and promote their strength.

We also found indications that the monetary and financial system oversight responsibilities of central banks have a bearing on their profitability. The loss-making central banks as a group have more rigid exchange rate regimes—which may expose them to higher sterilization costs— and have experienced a higher frequency of banking crises—which may have exposed them to more frequent bouts of onerous liquidity support. Although neither effect was found to be statistically significant at a bank-by-bank level, perhaps in part because of the limited sample sizes, we did find central banks' profitability to be strongly related to how actively they used their balance sheets in the recent past or how exposed their balance sheets were to turbulent macroeconomic or financial conditions.

Remarkably, we found that central banks' profitability and central banks' capital bear no direct relation, i.e., how well capitalized a central bank has no relationship to its actual financial strength, a result already emphasized by Stella (1997). This seemingly disturbing finding largely appears to reflect accounting issues. A much stronger relationship between capital and profits emerges once the non-interest bearing or under-performing components of the balance are factored in. In part, this reflects inherent accounting difficulties, for example how to account for demandable liabilities such as currency and bank deposits, as well as their matching assets. But it may also reflect remaining discrepancies between international accounting standards as applied to central banks and actual accounting practices, for example as regards the valuation of non-performing claims on government. Unless these gaps can be bridged (and they may well never be), accounting capital will fail to provide much insight as to the real underlying strength of a central bank.

We also found firm statistical evidence showing that the profitability of central banks also reflects their operating expenses and currency issuing costs, in addition to the quality of their balance sheets. As already flagged in Ize (2007), the evidence on operating expenditures raises

important governance concerns. On the other hand, the importance of currency issuance costs for the profitability of the smaller and poorer central banks seems to deserve a careful second look. One generally finds in the literature an unmitigated presumption that having its own currency is always a source of profits for central banks. However, this presumption may need to be revisited for the smaller central banks. Once one adjusts for issuing costs, maintaining a currency may not be that profitable, particularly for those central banks that commit to low inflation.

More generally, we do find that central banks in the poorer and smaller countries have a harder time paying the end-month bills, probably in part because of fixed cost effects. Integrating a currency area, when feasible, could thus have some pecuniary benefits. We also find some indications that central banks grow in stages as their country develops. In this process, they gradually mature from being essentially "treasuries" to their owner to being "bankers" to banks.

This paper is to our knowledge the first to conduct a comprehensive statistical analysis of central banks' financial strength. In doing so, it makes some steps, even if modest, towards a "positive" theory of central banking: how are central banks' balance sheets affected by the environment and policy regime in which they operate? Important caveats need to be flagged. First, the small sample sizes (which are particularly restrictive in view of the fact that strong heterogeneity calls for sub-dividing the overall sample into more homogeneous sub-samples) are clearly a constraining factor. Second, the one year coverage of the sample could also limit the statistical significance of the results. The research would therefore greatly benefit from being expanded to a larger data set and a dynamic panel analysis. In addition to uncovering better the historical roots of central banks' financial difficulties, this would also throw more light on causality effects, including the links—in both directions—between central banks' profitability and macroeconomic performance.

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