

The Architecture and Governance of Financial Supervision: Sources and Implications^{*}

N. Nergiz Dincer[†] and Barry Eichengreen[‡]

[†]*TED University, Ankara, Turkey* and [‡]*University of California, Berkeley, California, USA*

Abstract

We compare the architecture and governance of financial supervision across countries. We find that countries where the supervisor is the central bank, or where it is independent of government, have more conservatively regulated financial systems. Nonperforming loans are lower in countries where the supervisor is independent, while capital ratios are higher where the central bank, rather than another agency of government, is the lead supervisor. At the same time, some measures of bank credit to the economy are significantly lower both where the supervisor is independent and where the lead supervisor is the central bank. Insofar as the same institutional arrangements that confer greater stability, such as higher capital ratios and lower nonperforming loans, also limit the provision of credit to the economy, countries face a tradeoff. That different countries have been moving in different directions in restructuring their supervisory arrangements should not be surprising insofar as they have different objectives for their financial sector.

I. Introduction

In 1997–98 the British government transferred responsibility for supervising commercial banks from the Bank of England to a newly created independent supervisory agency, the Financial Services Authority (FSA). In 2010–11 it transferred that authority back, creating a Financial Policy Committee within the Bank and establishing a Prudential Regulatory Authority as a Bank of England subsidiary while refocusing the FSA on consumer protection.¹

This reversal reflected distinctive aspects of the UK's experience, notably the failure to head off problems in a prominent building society, Northern Rock.² It reflected the first bank run in the United Kingdom in more than a century, an event attributed by some to imperfect coordination and

^{*}The first author gratefully acknowledges the financial support of TUBITAK (The Scientific and Technological Research Council of Turkey) under the TUBITAK-BIDEP fellowship.

¹See Ferran (2011) for the relevant history.

²Technically, a cooperative bank specializing in mortgage lending.

inadequate information sharing between the FSA and the Bank of England. More generally it was indicative of uncertainty about the appropriate locus of responsibility for bank supervision (an uncertainty by no means limited to the UK) and of a dearth of evidence about what works best.³

Before the crisis, the argument for assigning prudential supervision to an agency separate from the central bank had been gaining adherents.⁴ Removing supervision from the central bank would avoid conflicts, it was said, between its price-stability mandate and concern for the condition of the financial system.⁵ A central bank whose remit was limited to the pursuit of low inflation would be less likely to follow inflationary monetary policies in order to paper over banking-system weaknesses inadequately addressed by its own prior supervision. The perceived need to accommodate banking-sector problems, which might distort the conduct of monetary policy, would be less.⁶

Moreover, whereas the supervisory competence of central banks centred on commercial banks, it was increasingly difficult to draw a line in practice between bank and nonbank financial firms.⁷ As bank assets were increasingly securitized, the line between banks and securities markets similarly grew fuzzier. As the case for consolidated supervision of these different classes of markets and institutions became more compelling, the dilemma was whether to force the central bank out of its comfort zone by also giving it responsibility for oversight of nonbank institutions and markets with which it had little familiarity, or to transfer responsibility for supervision to a separate self-standing agency. Increasingly one heard arguments favouring the latter.

A worry about transferring supervisory authority to a self-standing governmental agency was that the new agency would be subject to political influence – in contrast to the central bank, it was said, which in many if not all countries enjoys a relatively high level of independence from politics. Hence the argument for giving the new self-standing supervisor statutory and budgetary independence in order to insulate it from lobbying and rent seeking and to allow it to go about its business without undue political influence. Statutory and budgetary independence would be politically palatable, moreover, because the responsibilities of the self-standing supervisor were limited and well defined, making it easier to hold the new authority accountable for its actions.⁸

In principle, insulation from political influence could also be assured by vesting supervisory responsibility with a strongly independent central bank. But an expanded mandate and strengthened independence can be difficult to reconcile; the more complex the central bank's mandate, the more difficult it becomes to hold it accountable for its actions in the court of public opinion. Indeed, in the UK case the decision to hive off supervisory responsibilities from the central bank and create an independent self-standing FSA in the late 1990s was part of the same political process resulting in the decision to make the Bank of England independent.

The global financial crisis then cast new doubt on this emerging consensus. It served as a reminder that the central bank is the source of emergency liquidity to the banking system.⁹ But the central bank

³There were other similar contemporaneous debates of whether and how much the central bank should be involved in prudential regulation, in South Korea for example.

⁴As we show more systematically below.

⁵See Schoenmaker (1992). Gerlach et al. (2009) provide a post-crisis reiteration of the point.

⁶In addition, the drive to make central banks independent would be more palatable politically if the responsibilities of the institution were limited to targeting inflation. With this limited mandate, it would become easier to hold independent central banks politically accountable for their actions.

⁷Between commercial banks and so-called shadow banks, for example.

⁸On this, see for example Quintyn and Taylor (2003).

⁹An alternative would be for the independent supervisor to have a line of credit with the finance ministry or central bank so that it can undertake lender-of-last-resort interventions, but such arrangements have been rare in practice, presumably because the central bank is concerned about what such a facility would imply for its own ability to achieve its other objectives.

cannot be expected to provide emergency liquidity efficiently without up-to-date information on the condition of the banks, and it is unlikely to possess such information unless it is intimately involved in their supervision. The central bank is the ultimate guarantor of financial stability, and it cannot make good on that guarantee in the absence of the kind of information that can only be obtained through hands-on supervision.¹⁰

Coordination and information sharing between a self-standing supervisor and central bank can in principle assure the monetary authority of timely access to this information. But what is possible in principle may not always be possible in practice. When supervision takes place outside the central bank, monetary policy makers may not be able to compel other supervisors to share. Retaining information is one way for bureaucracies to increase their leverage. Skeptics of this view (e.g. Goodhart 2000) counter that cooperation between central banks, other supervisors, and treasuries cum finance ministries has occurred for years and that a considerable amount of effort has been invested in making such cooperation work.

As with many things economic, there are thus theoretical arguments pointing both ways. Unfortunately evidence on their empirical relevance is limited.¹¹ In this paper we therefore provide new evidence on the structure of supervision and its impact on financial structure and outcomes. In doing so we distinguish two aspects of arrangements at the country level: supervisory architecture (meaning where primary responsibility for supervision was located, in the central bank or another government agency); and supervisory governance (meaning whether or not the supervisor in question is independent). This is the first attempt, to our knowledge, to consider supervisory architecture and governance together in a unified empirical framework.

By distinguishing central banks from other supervisors and cases where the lead supervisor is independent, from cases where it is not, we effectively have four categories of supervisors: independent central banks, other (non-independent) central banks, independent non-central-bank supervisors, and other non-central-bank supervisors. Our first step, in Section II, is to document their changing prevalence since the late 1990s. Our new measures cover as many as 140 countries from 1998 through 2010. This is more extensive and representative country coverage than in previous studies. Considering a longer period enables us further to provide a clear sense of developments over time, while including data through 2010 brings the story up to date.

We then analyze the determinants of supervisory architecture and governance and their effects on financial variables, again in a unified empirical framework. We consider a range of financial outcomes potentially subject to strong supervisory influence, such as credit by the banking sector, banks' capital-to-asset ratios, the level of deposit rates, nonperforming loans, and M2 as a share of GDP.

Our new measures document that there has been steady movement since 1998 toward greater statutory and financial independence for the lead supervisor, and in addition toward vesting primary responsibility for supervision with a government agency other than the central bank – the UK's recent movement in the opposite direction notwithstanding to the contrary. Though such movement is far from universal, there has nonetheless been a discernible shift toward the independent self-standing supervisor model overall.

In terms of consequences, our results suggest that countries where the supervisor is independent and where that supervisor is the central bank tend to have more conservatively regulated financial systems. We find that nonperforming loans are significantly lower in countries where the supervisor has independence from politics, regardless of whether that supervisor is an independent central bank

¹⁰A forceful statement of these arguments is DeGrauwe (2007). Moreover, information on the condition of the banking and financial system of the sort that only a supervisor possesses is important for the conduct of monetary policy not just in crisis times (Ferguson 2000). Whether for example UK monetary policy would have been different in the period prior to the 2007 crisis had the Bank of England possessed supervisory authority is debatable, but it is a question worth pondering. Peek et al. (1999) provide evidence that supervisory authority is a source of information useful for forecasting.

¹¹We review the earlier literature below.

or another independent government agency. This is clear evidence that supervisory governance (whether or not the lead supervisor, whomever this might be, is independent) matters importantly for outcomes. In addition, capital ratios tend to be higher where the central bank rather than another agency of government is the lead supervisor, regardless of whether or not the central bank or separate self-standing supervisor in question is independent of politics. This confirms that supervisory architecture (where primary responsibility for supervision is located) also matters for financial-market outcomes. At the same time, some measures of bank credit to the economy are significantly lower both where the supervisor is independent and where the lead supervisor is the central bank.

Thus, the same institutional arrangements likely to confer greater stability (higher capital ratios, lower nonperforming loans) also tend to limit the provision of credit to the economy, other things equal, conceivably translating into less investment for financially constrained firms and lower economic growth. Different countries presumably have preferences for different positions along this stability/provision-of-liquidity tradeoff. That different countries have been moving in different directions in restructuring their supervisory arrangements is not surprising, in other words, insofar as they care about different things.

II. Literature

Early contributions to this literature, inaugurated by Goodhart and Schoenmaker (1995), focused mainly on supervisory architecture, asking whether making the central bank the lead supervisor of banks and markets had implications for inflation. While Goodhart and Schoenmaker found little evidence that inflation was higher or more volatile in countries where the central bank had responsibility for bank supervision, subsequent work by Di Giorgio and Di Ni (1999) disputed their findings.

A study by Barth et al. (2002) then used data for 133 countries in 1996–99 to examine the impact of a related aspect of supervisory architecture, the number of supervisory authorities, on various aspects of the financial system but found no significant effects. Arnone and Gambini (2007) found that unified supervision and supervision by the central bank were both positively associated with good supervisory practice, as measured by the Basel Core Principles for Effective Banking Supervision. They did not account for the potential endogeneity of these aspects of supervisory architecture, however, nor did they ask whether adherence to the Basel Core Principles is in turn associated with superior financial outcomes. Cihak and Podpiera (2007) similarly considered compliance with the Basel Core Principles and similarly concluded that unified supervision is positively associated with compliance. However, in contrast to Arnone and Gambini they did not find an effect of whether the unified supervisor was inside or outside the central bank.

More recently, Masciandaro et al. (2011) examined the impact of whether supervisory authority is consolidated in a single entity and whether that authority is delegated to the central bank. They linked these variables circa 2007 to the depth of the output decline in 2008–09. They find that consolidated supervision is negatively associated with economic resilience, so measured, and that the degree of involvement of the central bank in supervision does not appear to have any significant impact. Though these are useful results, the circumstances of 2008–09 were special. Moreover, the depth of recession is, arguably, relatively remote from the structure of supervision; more informative might be to focus on financial outcomes. Nor do these authors attempt to control for the potential endogeneity of supervisory arrangements.¹²

¹²A related study by Caprio et al. (2011) examines the determinants of the likelihood of suffering a financial crisis in 2007–09 using data for 83 countries. Their key dependent variable is whether a country's bank supervisors have the authority to take specific action. They do not consider whether crisis likelihood was associated with the decision of whether to place supervisory responsibility inside or outside the central bank or ask whether supervisory governance (the independence of the supervisor) displays such an association.

III. The Evolution of National Practice

We start by constructing a measure of supervisory architecture, focusing on whether supervisory responsibility rests principally with the central bank or another agency of government. Where responsibility is shared, this requires making a decision about who is the lead or principal supervisor (based on sources described below).

We then ask whether the supervisory agency in question is independent of the government. In the case of supervisors other than the central bank, we ask first whether the supervisory agency has its own revenue sources and guaranteed budget or must rely on the parliament or government for its operating funds. We ask next whether the agency in question is part of another government agency like the ministry of finance or central bank, or whether it is independent of these other entities. We define the agency as independent if it satisfies both criteria.

For central banks, we build on the previous literature and specifically on the criteria developed by Cukierman et al. (1992). First, we categorize a central bank as more independent if its head (the chief executive) is appointed by the board of the central bank and not by the prime minister or minister of finance, is not subject to dismissal, and has a long term in office. Second, independence is taken as greater when policy decisions are taken without direct government involvement. Third, a central bank is classified as more independent if its charter states that price stability is the sole or primary goal of monetary policy. Fourth, independence is greater when there are limits on the ability of the government to borrow from the central bank. Finally, we added measures of limits on the reappointment of the CEO and limits on his/her holding other offices in government, measures of provisions affecting (re)appointment of other board members similar to those affecting the CEO, restrictions on government representation on the board, and intervention of the government in exchange rate policy formulation.¹³ These different dimensions are then combined into a single index of independence.¹⁴

Our indices cover the period 1998–2010. Where there was a change in some aspect of independence over the course of a calendar year, we take the value that prevailed for the largest portion of the year. We were able to assemble information on central bank independence for 89 central banks. We then code as independent those central banks with indices whose values are above the mean for the sample.

In coding supervisory arrangements, we examined central bank websites, which indicate whether or not the central bank is charged with such responsibilities. Where a central bank website or related sources indicate that supervisory responsibility lies with another government agency, we cross-checked the website of the agency in question. The resulting information was then further verified by checking the statutes in question and using independent descriptions on the website of the Bank for International Settlements and in Courtis (1999), Keay (2008) and Masciandaro et al. (2008). For evidence on central bank independence, we again draw information from central bank websites and also from their statutes, annual reports, and other published documents.

Changes in the prevalence of the four cases are shown in Figure 1. It will be evident that there has been a shift since 1998 in the share of countries where supervision is by a government agency other than the central bank. Most of the additional such agencies enjoyed a relatively high degree of independence (the share of countries where supervision is by entities other than the central bank that possess a low level of independence did not rise at all over the period). There is also evidence of an increase in the share of central banks with supervisory authority and also relatively high levels of

¹³The importance of rules governing the appointment and dismissal of entire central bank board, as opposed to just the governor, and restrictions on government representation on the board were suggested by Bade and Parkin (1985), Grilli et al. (1991), Eijffinger and Schaling (1992) and Jacome and Vazquez (2005). Government intervention in the formulation and conduct of foreign exchange policy is emphasized by Jacome and Vazquez (2008).

¹⁴For details on the procedures followed in constructing this index see Dincer and Eichengreen (2012).

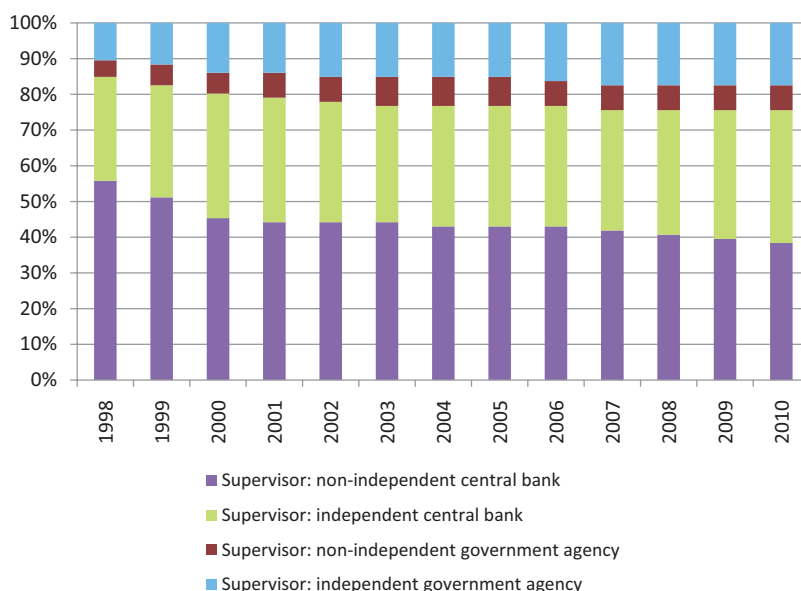


Figure 1: Share of Independent Bank Supervisors and Central Bank Supervisors

independence. The results here thus support and document the two trends noted above: the shift in supervisory architecture from central banks to separate nonbank government agencies, and the shift in supervisory governance toward independent agencies.

Overall, the percentage of the total observations where the supervisor is independent (whether central bank or other) has risen from 39.5% in 1998 to 54.7% in 2010. The percentage of total observations where the central bank is the lead supervisor (whether independent or not) has, meanwhile, fallen from 84.9% to 75.6% over the period.

IV. Determinants of Supervisory Arrangements

We now explore the determinants of the architecture and governance of supervision, taking as the dependent variable in Tables 1 and 2 binary indicators for whether supervisory responsibility is situated inside or outside the central bank and whether or not the responsible entity possesses a high level of independence, respectively. While exploring the determinants of supervisory architecture and governance is interesting in its own right, it is also useful for identifying potential instruments for institutional arrangements that might be employed when we consider their impact on financial structure and stability.

As explanatory variables we consider dummies for legal origin, indicators of political and institutional development, and financial and macroeconomic conditions. Dummy variables for the origin of the legal code are from LaPorta et al. (1998). We distinguish German, British and other legal traditions (other, which in our sample almost always means French, being the omitted alternative). Political stability, rule of law, voice and accountability, government effectiveness and regulatory quality are from Kaufmann et al. (2010). Macroeconomic indicators are log real GDP per capita (in international prices) and CPI inflation, from *World Development Indicators*. The earlier literature points to both macroeconomic/developmental and institutional/political characteristics of countries as

Table 1: Determinants of Supervisory Architecture, Multinomial Logit

	Coef.	SE	Z	$P > Z $	[95% CI]	
Central bank with supervisory responsibility coded as one						
Constant	−12.05	1.60	−7.52	0.00	−15.19	−8.91
GDP per capita	1.13	0.17	6.55	0.00	0.79	1.47
Past inflation	0.33	0.67	0.49	0.62	−0.99	1.65
Rule of law	−1.95	0.35	−5.59	0.00	−2.63	−1.27
Political stability	−0.92	0.18	−5.22	0.00	−1.27	−0.58
Accountability	0.79	0.18	4.29	0.00	0.43	1.14
Gov. effectiveness	1.04	0.38	2.77	0.01	0.30	1.78
Regulatory quality	1.17	0.28	4.14	0.00	0.62	1.73
German law	0.52	0.19	2.79	0.01	0.15	0.88
UK law	−1.77	0.22	−7.95	0.00	−2.21	−1.33

Number of obs = 1407; LR $\chi^2(9) = 436.93$; Prob > $\chi^2 = 0.00$; Pseudo $R^2 = 0.29$; Log likelihood = -540.77.

Table 2: Determinants of Supervisory Governance, Multinomial Logit

	Coef.	SE	Z	$P > Z $	[95% CI]	
Independent supervisor coded as one						
Constant	−1.20	0.97	−1.24	0.22	−3.11	0.70
GDP per capita	0.11	0.11	0.95	0.34	−0.11	0.32
Past inflation	−1.04	0.69	−1.51	0.13	−2.40	0.31
Rule of law	0.78	0.27	2.90	0.00	0.25	1.31
Political stability	0.44	0.14	3.14	0.00	0.16	0.71
Accountability	−0.92	0.15	−6.20	0.00	−1.21	−0.63
Gov. effectiveness	−0.08	0.32	−0.25	0.81	−0.70	0.54
Regulatory quality	−0.66	0.23	−2.85	0.00	−1.12	−0.21
German law	−0.32	0.21	−1.55	0.12	−0.72	0.08
UK law	1.27	0.17	7.68	0.00	0.95	1.60

Number of obs = 975; LR $\chi^2(9) = 176.28$; Prob > $\chi^2 = 0.00$; Pseudo $R^2 = 0.13$; Log likelihood = -585.64.

important for their decisions regarding supervisory architecture and governance, which leads us to consider both types of characteristics here.

We start in Table 1 with the determinants of supervisory architecture, estimating them by multinomial logit over the period 1998–2009, using annual data and panel data methods.¹⁵ We find that supervisory authority is more likely to be vested with the central bank in countries with relatively high levels of per capita GDP that compare unfavourably in terms of rule of law and political stability. That central banks are more likely to possess supervisory responsibility in countries where rule of law and political stability are problems is consistent with the presumption that the central bank is one of the few strong public agencies in such countries. But we also find that the central bank is more likely to possess primary supervisory responsibility in countries where regulatory quality is high. Finally, German and British legal traditions are positively and negatively associated, respectively, with the likelihood that the central bank possesses significant regulatory responsibility.

¹⁵While we also have data on the dependent variable for 2010 (see Figure 1), we lack information on some of the independent variables (the political/institutional measures) for that year.

In Table 2 we consider the determinants of supervisory governance (whether or not the primary supervisor is independent, regardless of whether it is the central bank or another agency of government). Here, in contrast to Table 1, there is no association with the level of per capita income. Again there is no impact of past inflation. Rule of law and political stability are both positively associated with the independence of the supervisor as intuition would suggest. Regulatory quality enters with a significant negative coefficient. Evidently, where regulatory quality is high, concerns about the susceptibility of the supervisor to political influence are less. Finally, countries with a British legal tradition are significantly more likely to have an independent supervisor.

So far we have been considering the two dimensions of supervisory structure (architecture and governance) one at a time in isolation. In Table 3 we consider supervisory architecture and

Table 3: Determinants of Structure of Bank Supervision, Multinomial Logit

	Coef.	SE	Z	$P > Z $	[95% CI]	
Independent self-standing government agency coded as one						
Constant	-23.25	3.57	-6.52	0.00	-30.23	-16.26
GDP per capita	2.39	0.38	6.26	0.00	1.64	3.14
Past inflation	1.14	0.83	1.37	0.17	-0.49	2.77
Rule of law	-2.19	0.57	-3.84	0.00	-3.31	-1.07
Political stability	-1.61	0.30	-5.34	0.00	-2.20	-1.02
Accountability	2.45	0.46	5.37	0.00	1.55	3.34
Gov. effectiveness	0.21	0.65	0.32	0.75	-1.06	1.48
Regulatory quality	1.62	0.47	3.46	0.00	0.70	2.54
German law	0.10	0.36	0.27	0.78	-0.60	0.80
UK law	-3.31	0.39	-8.44	0.00	-4.08	-2.54
Non-independent self-standing government agency coded as one						
Constant	-18.49	3.88	-4.76	0.00	-26.10	-10.88
GDP per capita	1.85	0.42	4.39	0.00	1.03	2.68
Past inflation	-11.64	3.71	-3.14	0.00	-18.91	-4.36
Rule of law	-3.90	0.79	-4.95	0.00	-5.45	-2.36
Political stability	-1.98	0.40	-4.91	0.00	-2.77	-1.19
Accountability	0.15	0.34	0.45	0.66	-0.52	0.82
Gov. effectiveness	1.64	0.85	1.93	0.05	-0.03	3.30
Regulatory quality	2.78	0.65	4.27	0.00	1.50	4.05
German law	1.87	0.43	4.34	0.00	1.03	2.71
UK law	-17.40	377.10	-0.05	0.96	-756.50	721.69
Independent central bank coded as one						
Constant	2.83	1.25	2.26	0.02	0.38	5.27
GDP per capita	-0.35	0.14	-2.47	0.01	-0.63	-0.07
Past inflation	-0.51	0.67	-0.76	0.45	-1.83	0.81
Rule of law	-1.92	0.34	-5.59	0.00	-2.59	-1.25
Political stability	-0.56	0.18	-3.05	0.00	-0.91	-0.20
Accountability	0.53	0.19	2.80	0.01	0.16	0.90
Gov. effectiveness	0.03	0.41	0.08	0.94	-0.77	0.84
Regulatory quality	1.17	0.31	3.78	0.00	0.56	1.77
German law	1.86	0.32	5.87	0.00	1.24	2.47
UK law	-1.34	0.23	-5.85	0.00	-1.79	-0.89

Note: Number of obs = 963; LR $\chi^2(27) = 975.76$; Prob > $\chi^2 = 0.00$; Pseudo $R^2 = 0.40$; Log likelihood = -720.06.

governance simultaneously. Here as in Figure 1 the dependent variable takes on four values: non-independent central bank as lead supervisor, independent central bank as lead supervisor, other non-independent government agency as lead supervisor, and other independent government agency as lead supervisor (where the first category is the omitted alternative).¹⁶

The results again suggest that governmental agencies other than the central bank are more likely to be the lead supervisor in more advanced, high income countries. Supervision by an independent entity (either an independent central bank or a separate agency of government) is more likely in countries where government agencies are held to high accountability, consistent with the presumption that accountability is important for making regulatory independence politically acceptable.¹⁷ Where regulatory quality is high, a central bank that lacks independence is less likely to possess primary responsibility for supervision. Supervision by either an independent central bank or a non-independent governmental agency is more likely in countries with a German legal tradition, while British-style law makes it less likely that supervision will be by an independent self-standing government agency or a politically dependent central bank.¹⁸ Rule of law and political stability enter with negative and significant coefficients in all three panels, indicating that both factors make supervision by a central bank characterized by low levels of independence more likely.

V. Impact on Financial Outcomes

Given that government efficiency, accountability and regulatory quality are predetermined or slow to change – and that they are not readily affected by current financial conditions – we now use them as instruments in second-stage regressions relating the structure of supervision to financial outcomes. We show the second-stage regressions in Tables 4–6. The dependent variables are credit by the banking sector and M2 relative to GDP (as measures of the provision of credit to the economy), nonperforming loans as a percent of GDP (as a measure of the performance of lending), the capital-to-asset ratio (as a measure of bank capitalization), and the deposit rate (as a measure of returns to savers). Each row reports a regression for a different dependent variable. GDP per capita as a measure of economic development and lagged inflation as a measure of the stability of the economic and financial environment are included as controls. The vector of legal-origin variables is included on the grounds that legal tradition is well known to influence financial structure and development.¹⁹ Year fixed effects to control for, *inter alia*, global business cycle conditions are included throughout.

Table 4 shows that countries with independent supervisors (whether the central bank or another government agency) have fewer nonperforming loans as a percentage of GDP, other things being equal. Their banks are able to hold less capital as a share of assets. It is tempting to link this to the previous result – that where nonperforming loans are fewer, banks need less capital as a buffer for provisioning for them – although we present some grounds for questioning this causal interpretation below. Bank credit and M2 as shares of GDP, considered here as measures of the provision of credit to the economy by the banking system, enter with positive coefficients (significantly greater than zero in the case of credit). Deposit rates are no different in countries with independent supervisors. Insofar as a causal interpretation is justified, these results for nonperforming loans and bank capital point to positive effects of supervision by an independent entity.

¹⁶We collapse French and other legal traditions because including French law as an independent variable makes it impossible to estimate this more complex nonlinear model.

¹⁷For arguments to this effect see *inter alia* Plosser (2010). Masciandaro et al. (2008) report similar findings.

¹⁸Making the decision to move primary responsibility to the independent FSA, since reversed, seemingly an aberration.

¹⁹This having been the key point of LaPorta et al. (1998) when developing these measures.

Table 4: Impact of an Independent Supervisor on Financial Outcomes (GMM with Period Fixed Effects)

Dependent variables	Const.	ISICBS	PCPI	GDPPC	UK law	GR law	J-stat	#obs
Credit (% GDP)	-0.27*** (-9.52)	0.95*** (3.94)	-0.72*** (-3.50)	0.31*** (12.84)	0.44 (5.90)	0.09 (1.01)	0.00	841
Capital/asset (%)	0.27*** (13.63)	-0.07*** (-5.04)	0.17*** (5.85)	-0.02*** (-6.78)	-0.03*** (-4.48)	-0.00*** (-0.36)	0.00	841
Deposit rate	0.06 (0.42)	0.17 (0.96)	0.18*** (4.86)	-0.01* (-2.12)	0.02 (0.40)	-0.04*** (-2.21)	0.00	764
Nonperf. L. (% GDP)	0.38*** (12.49)	-0.10*** (-4.16)	0.02 (0.68)	-0.03*** (-7.94)	-0.04*** (-3.19)	-0.01 (-0.94)	0.00	504
M2 (% GDP)	-0.97*** (-3.38)	0.21 (0.87)	-0.53*** (-5.29)	0.16*** (10.13)	0.13 (1.25)	-0.05 (-0.94)	0.00	824

Note: Dependent variables are in rows. Instruments in the regressions are rule of law, political stability, accountability, government efficiency and regulatory quality. *t*-Statistics in parentheses.
ISICBS is a dummy variable which takes value 1 when the supervisor is either an independent central bank or an independent non-central bank supervisory agency, and 0 otherwise.
**Significant at 5%.
***Significant at 1%.

Table 5: Impact of Central Bank Supervision on Financial Outcomes (GMM with Period Fixed Effects)

Dependent variables	Constant	CBS	PCPI	GDPPC	UK law	GR law	J-stat	#obs
Credit (% GDP)	16.82 (1.39)	-18.49 (-1.40)	-9.38 (-1.19)	0.24 (0.53)	-0.53 (-0.42)	-5.69 (1.17)	0.00	1175
Capital/asset (%)	-0.10 (-1.10)	0.16*** (3.51)	0.15*** (3.82)	0.00 (1.38)	-0.04*** (-3.64)	0.00 (0.37)	0.00	673
Deposit rate	0.56*** (3.29)	-0.24** (-2.21)	0.22*** (8.32)	-0.04*** (-3.47)	0.01 (0.75)	-0.03*** (-2.94)	0.00	1080
Nonperf. L. (% GDP)	0.09 (0.85)	0.17*** (3.18)	0.01 (0.21)	-0.01 (-1.62)	-0.04*** (-3.04)	0.00 (0.10)	0.00	688
M2 (% GDP)	-0.12 (-0.50)	-0.59*** (-3.96)	-0.54*** (-5.33)	0.12*** (7.03)	0.28*** (7.33)	0.04 (1.24)	0.00	1147

Note: Dependent variables are in rows. Instruments are rule of law, political stability, accountability, government efficiency and regulatory quality. *t*-Statistics in parentheses.
CBS is a dummy variable which takes value 1 when the supervisor is central bank, and 0 otherwise.
**Significant at 5%.
***Significant at 1%.

Table 6: Impact of an Independent Bank Supervisor or Independent Central Bank as a Supervisor on Banking Sector Development (GMM with Period Fixed Effects)

Dependent variables	Cons.	ISICBS	CBS	PCPI	GDPPC	UK law	GR law	<i>J</i> -stat	#obs
Credit (% GDP)	-2.10 (-0.43)	-0.53 (-0.53)	-0.47 (-0.28)	0.11 (0.70)	0.32* (0.70)	1.38 (1.82)	0.07 (0.21)	0.84	841
Capital/asset (%)	-0.06 (-0.47)	0.03 (0.79)	0.13*** (2.65)	0.09** (2.01)	0.01 (0.82)	-0.04*** (-4.07)	-0.00 (-0.16)	1.91	482
Deposit rate	0.02 (0.20)	0.03 (1.24)	0.07* (1.90)	0.20*** (11.47)	-0.00 (-0.20)	-0.03*** (-4.13)	0.02*** (3.82)	0.01	764
Nonperf. L. (% GDP)	0.35*** (3.76)	-0.08*** (-2.60)	0.01 (0.37)	0.02 (0.58)	-0.02*** (-3.70)	-0.03*** (-3.36)	-0.01 (-0.89)	0.52	504
M2 (% GDP)	3.26*** (2.45)	-1.43*** (-3.69)	-1.53** (-2.82)	-0.16 (-0.68)	-0.11 (-1.19)	0.08 (0.89)	0.20*** (2.38)	0.84	824

Note: Dependent variables are in rows. Instruments in the regressions are rule of law, political stability, accountability, government efficiency and regulatory quality. *t*-Statistics in parentheses.

ISICBS is a dummy variable which takes value 1 when the supervisor is either an independent central bank or an independent non-central bank supervisory agency, and 0 otherwise. CBS is a dummy variable which takes value 1 when the supervisor is a central bank and 0 otherwise.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

Table 5 looks next at the effects of supervisory governance, where the key explanatory variable is whether supervisory responsibility resides inside or outside the central bank (not distinguishing for the moment whether or not that lead supervisor has political and financial independence). These results suggest nonperforming loans are higher and banks are required to hold more capital as a share of assets when the central bank is the principal supervisor. Deposit rates are significantly lower (although we will revisit the association of central bank supervision with the level of nonperforming loans below). Both measures of bank credit to the economy enter with negative coefficients, one of which (M2 as a percentage of GDP) is significantly different from zero at standard confidence levels. Evidently, supervisory architecture (where primary responsibility for supervision is placed) matters for financial outcomes. It would appear that situating responsibility for supervision inside the central bank produces less desirable results.

In Table 6 we include our measures of supervisory architecture and governance simultaneously. Both continue to matter for financial outcomes, although including both eliminates some of what appeared previously to be significant effects. We continue to find that nonperforming loans as a share of GDP are significantly lower in countries with independent supervisors (although no longer are they significantly higher when the central bank is the supervisor). Capital-to-asset ratios are significantly higher where the central bank is the lead supervisor. Strikingly, the results now suggest that M2 as a share of GDP is lower not just where the lead supervisor is the central bank but also where the supervisor is independent (central bank or not).

We also asked whether supervisory architecture and governance have had implications for financial stability by considering their association with banking crises. We used the World Bank-IMF indicator of systemic banking crises from Leuven and Valencia (2010). We estimate linear probability models with the binary banking-crisis indicator as the dependent variable, since we are not concerned with fitting predicted values on the basis of the equation.²⁰ The other independent variables are the same as above. There was no evidence, across a wide variety of specifications and subperiods, of an impact of these characteristics of national supervisory practice on financial-crisis incidence.

Our results thus suggest that there are some advantages of supervisory independence, in that banks in countries with this form of supervisory governance tend to have lower levels of nonperforming loans. If political interference in supervision makes for problems with oversight of lending practice, then independence for the supervisor would appear to be the solution. Our results also suggest that banks in countries where the central bank is the primary supervisor are better capitalized, which is presumably a positive from the point of view of stability outcomes and resolution costs. But there may be tradeoffs: both independence for the supervising agency and situating supervision in the central bank are associated with less provision of credit by the banking system to the economy, as measured by M2 relative to GDP. Evidently, supervisory architecture and governance both matter. Both affect financial outcomes. But neither offers a free lunch.

VI. Alternative Methodology

An alternative approach to analyzing these questions is propensity score matching (PSM). This involves matching the observations for the treatment group with those for a control group with similar characteristics. In the present context, countries where the central bank is the principal supervisor or, alternatively, where the supervisor is independent are the treatment group. The remaining observations then constitute the control group.

²⁰Were we concerned with predicted values a logit or probit model would be appropriate.

Table 7: Propensity Score Matching Using Nearest Neighbour Matching for the Case where the Supervisor (Either a Central Bank or a Supervisory Agency) is Independent

Variable	Sample	Treated	Controls	Difference	SE	t-Stat
Credit by banks (% of GDP)	Unmatched	57.72	89.32	−31.60	7.61	−4.15
	ATT	57.72	72.43	−14.71	13.42	−1.10
Capital to asset ratio	Unmatched	10.55	9.24	1.32	0.47	2.80
	ATT	10.55	9.93	0.63	0.53	1.19
Deposit rate	Unmatched	7.77	5.45	2.33	0.74	3.13
	ATT	7.77	7.11	0.66	0.82	0.80
Nonperforming L. (% of GDP)	Unmatched	6.92	6.93	−0.01	0.76	−0.02
	ATT	6.92	9.19	−2.27	0.95	−2.38
M2 (% of GDP)	Unmatched	45.83	70.86	−25.03	4.36	−5.74
	ATT	45.83	53.43	−7.60	7.14	−1.07
Untreated	155					
Treated	221					
Total	376					

Note: Nearest neighbourhood matching is used where the independent variables are regulatory quality, GDP per capita, legal origin dummies, past inflation and fixed effects.

Table 8: Propensity Score Matching Using Nearest Neighbour Matching for the Case where Central Bank is the Supervisor

Variable	Sample	Treated	Controls	Difference	SE	t-Stat
Credit by banks (% of GDP)	Unmatched	53.72	103.21	−49.49	6.30	−7.86
	ATT	53.74	94.39	−40.66	17.14	−2.37
Capital to asset ratio	Unmatched	10.62	8.01	2.61	0.40	6.50
	ATT	10.59	7.73	2.86	0.55	5.22
Deposit rate	Unmatched	7.30	6.91	0.39	0.69	0.56
	ATT	7.30	6.56	0.74	1.76	0.42
Nonperforming L. (% of GDP)	Unmatched	9.67	3.85	5.81	0.75	7.73
	ATT	9.61	6.98	2.63	0.88	3.00
M2 (% of GDP)	Unmatched	53.42	65.67	−12.25	4.56	−2.68
	ATT	53.53	80.85	−27.32	9.68	−2.82
Untreated	150					
Treated	330					
Total	480					

Note: Nearest neighbourhood matching is used where the independent variables are regulatory quality, GDP per capita, legal origin dummies, past inflation and fixed effects.

Conditional on a vector of covariates X , we assume that the expected value of our financial market development indicators would be the same for treatment and control-group observations that are paired together. Subject to this, we can take the control observations as twins of the treated observations had the latter not received treatment. Thus, the difference between the treated and control observations will be an estimate of the effect of employing an independent bank supervisor.

The vector of covariates X should include variables that are determinants of both financial market conditions and the likelihood of employing an independent supervisor.

The vector X consists of country characteristics such as the macroeconomic variables, legal origin dummies and political variables considered above. Matching based on X must still confront the problem of multidimensionality. Rosenbaum and Rubin (1983) suggest matching on the probability of employing an independent bank supervisor conditional on the vector X . When two observations have a similar propensity score, they are paired according to either nearest neighbour matching or kernel matching. In the nearest neighbour approach, the individual from the comparison group is chosen as a matching partner for a treated individual that is closest in terms of the propensity score. Kernel matching (KM) is a nonparametric matching estimator that uses weighted averages of nearly all individuals in the control group to construct the counterfactual outcome. All treated units are matched with a weighted average of all controls, with weights inversely proportional to the distance between the propensity scores of the treated and control groups. Because all control units contribute to the weights, lower variance is achieved.

As the first stage, we again estimate a probit model explaining the likelihood of a country employing an independent bank supervisor, following the specification used in Tables 1 and 2. We then use two different propensity matching methods for the purpose of robustness: nearest neighbour matching (Tables 7 and 8) and kernel matching (Tables 9 and 10). Country-year fixed effects are included throughout.

The results are consistent with what we found above. Banks in countries where the central bank is the lead supervisor tend to have higher nonperforming loans and to hold more capital relative to assets. There is again some evidence that they provide less credit to the economy (as measured by the M2/GDP ratio). In contrast, banks in countries where the supervisor is independent have lower nonperforming loans. Here, in contrast to some of the regression analysis, we no longer find that they are able to hold significantly less capital. That said, these results are broadly consistent with our previous findings.

Table 9: Propensity Score Matching Using Kernel Matching for the Case where the Supervisor (Either a Central Bank or a Supervisory Agency) is Independent

Variable	Sample	Treated	Controls	Difference	SE	<i>t</i> -Stat
Credit by banks (% of GDP)	Unmatched	57.72	89.32	-31.60	7.61	-4.15
	ATT	58.49	74.19	-15.70	11.92	-1.32
Capital to asset ratio	Unmatched	10.55	9.24	1.32	0.47	2.80
	ATT	10.40	9.84	0.55	0.52	1.07
Deposit rate	Unmatched	7.77	5.45	2.33	0.74	3.13
	ATT	6.68	6.92	-0.24	0.65	-0.37
Nonperforming L. (% of GDP)	Unmatched	6.92	6.93	-0.01	0.76	-0.02
	ATT	6.66	8.97	-2.31	0.91	-2.55
M2 (% of GDP)	Unmatched	45.83	70.86	-25.03	4.36	-5.74
	ATT	46.77	54.74	-7.97	6.71	-1.19
Untreated	155					
Treated	221					
Total	376					

Note: Kernel matching is used where the independent variables are regulatory quality, GDP per capita, legal origin dummies, past inflation and fixed effects.

Table 10: Propensity Score Matching Using Kernel Matching for the Case where Central Bank is the Supervisor

Variable	Sample	Treated	Controls	Difference	SE	t-Stat
Credit by banks (% of GDP)	Unmatched	53.72	103.21	-49.49	6.30	-7.86
	ATT	54.17	83.70	-29.53	13.46	-2.19
Capital to asset ratio	Unmatched	10.62	8.01	2.61	0.40	6.50
	ATT	10.54	8.16	2.39	0.46	5.16
Deposit rate	Unmatched	7.30	6.91	0.39	0.69	0.56
	ATT	7.28	7.00	0.28	1.37	0.21
Nonperforming L. (% of GDP)	Unmatched	9.67	3.85	5.81	0.75	7.73
	ATT	9.55	6.52	3.03	0.75	4.06
M2 (% of GDP)	Unmatched	53.42	65.67	-12.25	4.56	-2.68
	ATT	54.11	69.07	-14.96	7.79	-1.92
Untreated	150					
Treated	330					
Total	480					

Note: Kernel matching is used where the independent variables are regulatory quality, GDP per capita, legal origin dummies, past inflation and fixed effects.

VII. Conclusion

We have related the structure of bank supervision to economic and financial outcomes, distinguishing countries according to their supervisory architecture – whether the lead supervisor is the central bank or another nonbank agency of government – and their supervisory governance – whether or not the lead supervisor is politically, economically and financially independent of other branches of government (regardless of whether or not the lead supervisor in question is the central bank). Recent events have raised questions about the efficacy of prevailing arrangements. Even where the question of who should supervise was seemingly settled, these events would appear to have thrown it open again.

On the basis of new measures of the locus of primary responsibility of the supervision and regulation of banking systems in a panel of advanced and developing countries, we are able to document trends in supervisory architecture and governance in recent years. We show that there has been an increase in the share of countries where primary responsibility for supervision resides with an agency other than the central bank, with most of this shift concentrated in the first half of the period (prior to the middle of the last decade). There has also been a tendency toward greater political independence for the lead supervisor, be it the central bank or another agency of government. This trend would appear to be ongoing; that is, it is not obviously concentrated in a particular portion of the period. We find that supervisory responsibility is more likely to be assigned to governmental agencies other than the central bank in more advanced, high income countries, although those countries differ in the independence that they accord to the agency in question. Supervision by an independent entity, either the central bank or a separate agency of government, is more likely in countries where government agencies have a relatively high level of accountability, consistent with the notion that adequate accountability is a political precondition for regulatory independence.

Turning to consequences, our results suggest that both supervisory architecture and supervisory governance matter for outcomes. Nonperforming loans are lower in countries where the supervisor has independence from politics, while capital ratios tend to be higher where the central bank is the lead supervisor. At the same time, bank credit to the economy is significantly lower both where the supervisor is independent and where the lead supervisor is the central bank.

That the same institutional arrangements that confer greater stability (that result in higher capital ratios and lower nonperforming loans) also tend to limit the provision of credit to the economy, conceivably translating into less investment for financially constrained firms and lower economic growth, means that there are tradeoffs. That different countries have been moving in different directions in restructuring their supervisory arrangements is not surprising, in this light, given that they tend to have different objectives for their financial sectors.

Barry Eichengreen
University of California
Berkeley, CA
USA
eichengr@econ.berkeley.edu

References

- Arnone, M., and A. Gambini (2007), 'Architecture of Supervisory Authorities and Banking Supervision', in D. Masciandaro and M. Quintyn (eds), *Designing Financial Supervision: Institutions, Independence, Accountability and Governance*. Cheltenham: Edward Elgar, pp. 262–308.
- Bade, R., and M. Parkin (1985), 'Central Bank Laws and Monetary Policy', Unpublished, University of Western Ontario.
- Barth, J., D. E. Dolle, T. Phumiswasana and G. Yago (2002), 'A Cross Country Analysis of the Bank Supervisory Framework and Bank Performance', *Financial Markets, Institutions and Instruments*, 12, 67–120.
- Caprio, G., V. D'Apice, G. Ferri and G. W. Puopolo (2011), 'Macro-Financial Determinants of the Great Financial Crisis: Implications for Financial Regulation', IStEin Working Paper No. 12.
- Cihak, M., and R. Podpiera (2007), 'Experience with Integrated supervisors: Governance and the Quality of Supervision', in D. Masciandaro and M. Quintyn (eds), *Designing Financial Supervision Institutions: Independence, Accountability and Governance*. Cheltenham: Edward Elgar, pp. 309–41.
- Courtis, N. (1999), *How Countries Supervise Their Banks, Insurers and Securities Markets*. London: Central Banking Publications.
- Cukierman, A., S. B. Webb and B. Neyapti (1992), 'Measuring the Independence of Central Banks and its Effects on Policy Outcomes', *World Bank Economic Review*, 6, 353–98.
- DeGrauwe, P. (2007), 'There is More to Central Banking than Inflation Targeting', *VoxEU* (14 November).
- Di Giorgio, G., and C. Di Ni (1999), 'Should Banking Supervision and Monetary Policy Tasks be Given to Different Agencies?' *International Finance*, 2, 361–78.
- Dincer, N. N., and B. Eichengreen (2012), 'Central Bank Transparency and Independence: Updates and New Measures', Unpublished, University of California, Berkeley (April).
- Eijffinger, S., and E. Schaling (1992), 'Central Bank Independence: Criteria and Indices', Research Memorandum 548, Faculty of Economics and Business Administration, Tilburg University.
- Ferguson, R. (2000), 'Alternative Approaches to Prudential Supervision and Regulation', *Journal of Financial Services Research*, 17, 297–303.
- Ferran, E. (2011), 'The Breakup of the Financial Services Authority', *Oxford Journal of Legal Studies*, 1, 1–26.
- Gerlach, S., A. Giovannini, C. Tille and J. Viñals (2009), 'Are the Golden Days of Banking Over? The Crisis and the Challenges', *Geneva Reports on the World Economy*, 10.
- Goodhart, C. (2000), 'The Organisational Structure of Bank Supervision', Financial Stability Board Occasional Paper No. 1, Basel: Bank for International Settlements.
- Goodhart, C., and D. Schoenmaker (1995), 'Institutional Separation between Supervisory and Monetary Agencies', in C. Goodhart (ed), *The Central Bank and the Financial System*. London: Macmillan.

- Grilli, V., D. Masciandaro and G. Tabellini (1991), 'Political and Monetary Institutions and Public Financial Policies in the Industrial Countries', *Economic Policy*, 13, 341–92.
- Jacome, L., and F. Vazquez (2005), 'Any Link Between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean', Working Paper No. 05/75, Washington, DC: IMF.
- Kaufmann, D., A. Kraay and M. Mastruzzi (2010), *Worldwide Governance Indicators*, Washington, DC: World Bank.
- Keay, J. (2008), *How Countries Supervise Their Banks, Insurers and Securities Markets*. London: Central Banking Publications.
- LaPorta, R., F. Lopez-de-Silanes, A. Shleifer and R. Vishney (1998), 'Law and Finance', *Journal of Political Economy*, 106, 1133–55.
- Leuven, L., and F. Valencia (2010), 'Systemic Banking Crises: A New Data Set', Unpublished, IMF.
- Masciandaro, D., M. Quintyn and M. Taylor (2008), 'Inside and Outside the Central Bank: Independence and Accountability in Financial Supervision: Trends and Determinants', *European Journal of Political Economy*, 24, 833–48.
- Masciandaro, D., R. V. Pansini and M. Quintyn (2011), 'The Economic Crisis: Did Financial Supervision Matter?', Unpublished, IMF (October).
- Peek, J., E. Rosengarten and G. Toottel (1999), 'Is Bank Supervision Central to Central Banking?', *Quarterly Journal of Economics*, 114, 629–53.
- Plosser, C. (2010), 'The Federal Reserve System: Balancing Independence and Accountability', Speech to the World Affairs Council of Philadelphia (17 February).
- Quintyn, M., and M. Taylor (2003), 'Regulatory and Supervisory Independence and Financial Stability', *CES-Ifo Economic Studies*, 49, 259–94.
- Rosenbaum, P. R., and D. B. Rubin (1983), 'The Central Role of the Propensity Score in Observational Studies for Causal Effects', *Biometrika*, 70, 41–55.
- Schoenmaker, D. (1992), 'Institutional Separation between Supervisory and Monetary Agencies', FMG Special Papers No. 52, Financial Markets Group, London School of Economics.