Regulatory Capture by Sophistication*

Hendrik Hakenes†
University of Bonn and MPI Bonn

Isabel Schnabel‡
Johannes Gutenberg University Mainz, CEPR, and MPI Bonn

April 30, 2013

Abstract

One explanation for the poor performance of regulation in the recent financial crisis is that regulators had been captured by the financial sector. We present a micro-founded model with rational agents in which banks may capture regulators due to their high degree of sophistication. Banks can search for arguments of differing complexity against regulation. Finding such arguments is more difficult for a bad bank, which the regulator wants to regulate more strictly. However, the more sophisticated a bank is, the more easily it can produce an argument that a regulator may not understand. Career concerns prevent the regulator from admitting this, hence he rubber-stamps even bad banks, which leads to inefficiently low levels of regulation. Bank sophistication leads to capture, and thus to worse regulatory decisions.

Keywords: Regulatory capture, special interests, banking regulation, sophistication, career concerns, financial stability.

JEL-Classification: G21, G28, L51, P16.

---

*The term "regulatory capture by sophistication" is borrowed from Martin Hellwig who inspired us to work on this topic. We are grateful for his encouragement and advice. We also thank Philippe Aghion, John Boyd, Charles Goodhart, Rainer Haselmann, Thomas Hartmann-Wendels, Matthias Kräkel, Roland Strausz, Hal Varian, seminar participants in Tilburg, Bonn, Munich, Aachen, Mainz, Heidelberg, Madrid, and the Max Planck Institute (Public Goods)in Bonn, as well as conference participants at the Campus for Finance in Vallendar and at the GEABA in Graz for useful comments and suggestions.

†Institute for Financial Economics and Statistics, University of Bonn, Adenauerallee 24-42, 53113 Bonn, Germany, hakenes@uni-bonn.de.

‡Gutenberg School of Management and Economics, Johannes Gutenberg University Mainz, 55099 Mainz, Germany, isabel.schnabel@uni-mainz.de.

1 Introduction

When the model-based approach to capital regulation was introduced [...] the regulatory community was so impressed with the sophistication of recently developed techniques of risk assessment and risk management of banks that they lost sight of the fact that the sophistication of risk modeling does not eliminate the governance problem which results from the discrepancy between the private interests of the bank's managers and the public interest in financial stability.

Martin Hellwig, 2010

One of the most disturbing features of the recent financial crisis was the inability of regulation, especially capital regulation, to prevent the crisis or at least mitigate its consequences. This is all the more surprising as, in recent decades, we have seen an increasing sophistication of regulatory approaches, moving from rigid capital ratios under Basel I to highly sophisticated methods based on banks' internal models, first with regard to market risk under the 1996 Amendment of the Basel Accord, and then with regard to credit risk under Basel II (Hellwig, 2010). But rather than making the system more resilient, these approaches allowed banks to reduce their unweighted capital ratios to levels as low as 2 percent (Basel Committee on Banking Supervision, 2009). So why did the regulators not prevent this development? Why did they approve an approach that made the system less rather than more stable?

The quote by Hellwig (2010) suggests that regulators did not sufficiently appreciate that there was a conflict of interest between banks and the public. In particular, regulators may not have realized that banks do not internalize the effects of their failure on the remaining financial system and the real economy. In this paper, we propose an alternative explanation of the phenomenon that Martin Hellwig has called *regulatory capture by sophistication*. In our model setup, banks try to persuade the regulator to abstain from regulation. We show that unsophisticated regulators may "rubber-stamp" banks even though regulation would be desirable from a social perspective. The reason is that the regulators are not willing to admit that they do not understand the bank's arguments because they are afraid of harming their own reputation, and thus their future career. This may leave bad banks under-regulated, endangering the stability of the financial system. While regulatory capture may occur at the level of the entire banking sector, regulators become even more vulnerable to capture at the bank-individual level when banks and regulators enter into a dialogue about appropriate regulation, as intended in Pillar 2 of the Basel Accord ("Supervisory Review Process"). In such interactions between regulators and banks, regulators are most susceptible to persuasion, and career concerns are most pressing.

Our model has three important ingredients. First, we need a persuasion technology. Second, we allow for differing complexities of arguments and for varying degrees of sophistication of agents. Third, we propose career concerns as a reason for why a regulator may not admit that an argument is too complex for him. In our model economy, there is a regulator and a bank. The bank may be good or bad, which cannot be observed by the regulator. A bad bank should be regulated, whereas a good bank should not. Regulation comes at a cost for the bank, so the bank wants to persuade the regulator to abstain from regulation. It can do so by presenting an argument. We treat arguments as balls from an urn. A bank is represented by an urn filled with red and green balls, the fraction of red balls being equal to the probability of financial distress. At a cost, the bank can draw a ball at random, look at it and decide whether to show it to the regulator. The bank can repeat this process as often as it likes, until it has found a ball that it wants to show to the regulator. The regulator will then update his beliefs about the bank's type, and possibly refrain from regulation.

We assume that the complexity of arguments differs. More precisely, each ball has a "complexity" represented by a number between 0 and 1. Moreover, the bank and the regulator each have a certain degree of sophistication, again lying between 0 and 1. If the bank's (or the regulator's) sophistication exceeds the ball's complexity, it can observe the color; otherwise it cannot. The regulator comes in two types; type H understands all arguments, whereas type L is less sophisticated than the bank. The regulator's future salary is assumed to depend on his perceived type. He thus wants to keep his *reputation* as high as possible.

In some equilibria, the bank is always (or never) regulated, hence argumentation is unnecessary and does not occur in equilibrium. In the interesting parameter range, however, the equilibrium induces *regulatory capture by sophistication*. The type H regulator sets the standard for arguments so high that he is just convinced. If the bank is relatively sophisticated, it is easy for the bank to make arguments, and the standard for arguments is set high in order to keep the argument's informativeness. This entails negative consequences for a type L regulator. He does not understand a large portion of arguments. Yet if he admitted that he did not understand, his reputation would be lost; he thus nods the argument through. The more sophisticated the bank, the easier it becomes to fool the regulator (if he is of type L), and the worse the regulatory decision becomes. The less sophisticated regulator is captured by the bank's sophistication.

Our model nicely captures the discussions surrounding the introduction of risk-based models, as described by Hellwig (2010). The banking lobby argued in the 1990s that capital regulation at the time fell well behind the current standard of banks' risk management. While there was some truth to this, rigid capital ratios were much easier to understand and hence to be controlled by regulators than banks' internal models. Given the discrepancy in salaries and hence presumably also expertise in risk management between the financial sector and regulatory bodies, regulators could not easily be on par with the banks to be regulated. It is well possible that regulators were not willing to admit this discrepancy due to reputational concerns.

The observed shift towards more discretionary powers of regulators involves the risk of exacerbating regulatory capture, especially in combination with an increasing discrepancy between regulators' and bankers' sophistication. In the light of our model, there are three type of responses to this danger: switching to a less sophisticated regulatory regime (e. g., non-risk-weighted capital requirements), closing the sophistication (and wage) gap between bankers and regulators, and immunizing regulators against pressure from career concerns. Given that the banking lobby belongs to the most influential interest groups, any regulatory reform should also take the political economy of regulation into account.

Literature. While there exists a broad literature on the governance of financial institutions, the governance of regulatory bodies and the incentive structures of regulators are still poorly understood. The idea to our paper was strongly influenced by a paper by Hellwig (2010), which includes an entire chapter on regulatory capture by sophistication, in which he describes how the regulator tried to piggyback on the sophistication of banks, not bearing in mind that a bank has very different objectives than a regulator (otherwise, it would not have to be regulated at all).

Our paper is also related to several strands of literature not directly related to banking. A bank trying to persuade the regulator that regulation is unnecessary is a special case of lobbying. The literature on regulatory capture dates back to Laffont and Tirole (1991, 1993) and Giammarino, Lewis, and Sappington (1993).[1] An excellent survey and introduction to the theory of lobbying is given in Grossman and Helpman (2001, chapter 4), and the literature is still very active (see, e. g., Armstrong and Sappington, 2004, 2007; Feldmann and Bennedsen, 2006).

In our model, the bank presents verifiable information to the regulator, the decision maker. It thus influences the regulator's beliefs, but the regulator anticipates the bank's objectives. The paper is hence related to the theoretical literature on games of persuasion (see Milgrom and Roberts, 1986; Shin, 1994; Glazer and Rubinstein, 2001, 2004, 2006; Turkay, 2011; Sher, 2010). Our paper introduces the sophistication of players and the complexity of arguments into these games.[2]

There are different kinds of regulatory capture that we do not address in the model. The first is social capture, which occurs when former bank managers start to work

[1] The theory of regulation is much older, including Huntington (1952); Bernstein (1955); Stigler (1971); Levine and Forrence (1990), to name a few prominent articles.

[2] Other papers on persuasion include Boyer and Ponce (2011), Heinemann and Schüler (2004), Visser and Swank (2007), Strausz (2005), Avery and Meyer (2012), Blume and Board (2009), Kamenica and Gentzkow (2011), Ellison and Wolitzky (2012), Carlin and Manso (2011), Dewatripont and Tirole (2010).

for the regulator, or when bankers and regulators are just too tight.[3] Another kind of capture we do not model is a judicial arms' race, where the regulator has problems to regulate a bank because the bank's lawyers can kill any attempt.[4] Monetary capture, involving side payments and bribes, or the outlook of regulators to get well-paid jobs at banks, is also left aside.

The remainder of the paper is organized as follows. Section 2 defines the basic model ingredients: the behavior of regulators and banks, our urn model of persuasion, and the role of the complexity of arguments. It also discusses the benchmark equilibrium. Section 3 contains our main results. It introduces regulators with differing sophistication. Here, we assume *ad hoc* that a less sophisticated regulator tries to appear more sophisticated. Section 4 explicitly models the career concerns of regulators. The section abandons the *ad hoc* assumption and delivers a closed micro-economic model where all agents behave rationally. Section 5 concludes. Proofs are in the Appendix.

2 The Basic Model

Consider an economy with two agents, a bank and a regulator. There are two potential types of banks, good (G) and bad (B). A good bank has a success probability $p_G \in [0; 1]$. Hence, it gets into financial distress with probability $1 - p_G$. A bad bank has a success probability $p_B \in [0; p_G)$ and a distress probability of $1-p_B$. The *ex-ante* probability that the bank is good is $\varphi_0 \in [0; 1]$. The bank knows its own type (G or B), the regulator knows only the ex-ante probability φ_0. Alternatively, one can also think of a bank in two potential states, good or bad. Then φ_0 is the ex-ante probability that a bank is in the good state.

The Regulator. The regulator considers tightening banking regulation. However, it is unclear ex ante whether tightening is beneficial. The regulator wants to take

[3]For an example of social capture at the top, one can look at the publicly available calendars of Treasury Secretary Timothy F. Geithner and his predecessor, Henry M. Paulson Jr. In the United States, the people regulating the financial industry largely come from that industry, or interact with that industry in their social lives. They play squash with them and dine with them, and these are the peers they look to when they have issues to discuss. Jo Becker and Gretchen Morgenson of The New York Times documented this in their April 2009 article on Mr. Geithner's social interactions during his time as head of the Federal Reserve Bank of New York.

[4]Gylfi Zoega: "You have two lawyers from the regulator, going to a bank to talk about some issue. When they approach the bank, they would see 19, uh, SUVs outside the bank. Right? So you got to the bank, and you have the 19 lawyers sitting in front of you, right? They are very well prepared; ready to kill any argument you make. And then, if you do really well, they offer you a job, right?"

the right decision. Tightening is always costly; the social costs are $C_{\text{regulation}}$. These costs include for example macroeconomic costs from credit tightening, but also the bank's costs κ from regulation.

Without regulation, these costs are avoided. However, when a crisis hits (with probability $1-p_G$ or $1-p_B$, respectively), there are no additional social costs when regulation has been tight, but a cost of C_{crisis} when regulation has been loose. To make the model interesting, the regulator's preferred policy must depend on the state (G or B).

The *ex-ante* probability of bank distress is $\varphi_0\,(1-p_G)+(1-\varphi_0)(1-p_B)$. Assume that, without further information, the regulator would prefer to tighten regulation,

$$\begin{aligned} C_{\text{regulation}} &< \big(\varphi_0\,(1-p_G)+(1-\varphi_0)(1-p_B)\big)\,C_{\text{crisis}}, \quad \text{thus} \\ \varphi_0 &< \bar{\varphi} := \frac{1-p_B}{\Delta p}+\frac{1}{\Delta p}\,\frac{C_{\text{regulation}}}{C_{\text{crisis}}} \end{aligned} \tag{1}$$

with $\Delta p := p_G - p_B$. A fortiori, this implies that the regulator wants to regulate a bank if he knows it is bad. We also assume that the regulator does not want to regulate a good bank,

$$C_{\text{regulation}} > (1-p_G)\,C_{\text{crisis}}. \tag{2}$$

If the bank does not want to be regulated, it needs to *persuade* the regulator. If the bank can bring arguments persuading the regulator that the probability of being of type G is above $\bar{\varphi}$, the regulator will refrain from tightening regulation.

An Urn Model of Persuasion. How can a banker persuade the regulator? We model the situation in the following way. Probabilities are represented by balls in an urn. A good bank is represented by an urn with a fraction p_G of green balls, standing for success, and $1-p_G$ of red balls, indicating distress. A bad bank is represented by an urn with a fraction p_B of green balls and $1-p_B$ of red balls.

After the regulator has taken his decision, nature draws a ball from the urn. If the ball is red, the bank gets into financial distress. Then if the regulator has taken the right decision and has tightened regulation, aggregate costs are only $C_{\text{regulation}}$. Otherwise, he has *ex post* made a mistake, the costs are C_{crisis}. If nature draws a green ball, the bank is successful. Then if the regulator has tightened regulation, the regulation is unnecessary *ex post*, the costs are $C_{\text{regulation}}$. If he has not regulated, the costs are zero.

The balls in the urn are like *arguments* for or against tightening. Red balls are arguments for tighter regulation, green balls are arguments against it. The balls can also be interpreted as academic studies or stress tests. To keep the model tractable, assume that the regulator can only read one study or consider only one argument.

Argumentation. The bank knows its type, and hence the probability $p \in \{p_G, p_B\}$. If the bank is regulated, it incurs a cost of $\kappa > 0$. In order to persuade the regulator, it can present arguments. In the model, the bank can pay c to draw a "test" ball from its urn. The regulator does not know the exact costs. We assume that c is exponentially distributed, with mean χ. This assumption distorts the informative value of an argument.

If the bank shows the ball to the regulator, the regulator observes its color. So the bank will draw an endogenous number of balls, put back the red balls (because those would only encourage the regulator to regulate), and present the green evidence against tighter regulation. The regulator then updates his beliefs about the type of the bank. In doing so, he will take into account the bank's incentive structure.

Complexity of Arguments. Arguments can have different degrees of complexity, $k \in [0, 1]$. Without loss of generality, k is uniformly distributed. The bank has a sophistication S, it can only understand arguments of complexity $k \leq S$. S can be observed by the regulator. In the urn model, one can think of balls with numbers between 0 and 1 on them. A bank can identify the color (red or green) of a ball only if the number does not exceed its ability parameter S. If the number is above its sophistication, it cannot produce the argument, the ball is worthless for the bank. The argument's complexity is publicly observable.

Importantly, the bank's degree of sophistication determines the expected cost of persuading the regulator. For a sophisticated bank, producing an argument is relatively cheap.

The regulator also has some degree of sophistication. In this section, let us assume that he understands all arguments. In Section 3, we introduce regulators that do *not* understand all arguments.

Equilibrium. We solve for perfect Bayesian equilibria. In equilibrium, only a subset $K \subseteq [0, 1]$ of arguments with different complexity will be acceptable for the regulator. Because banks cannot produce arguments more complex than their own sophistication S, we have $K \subseteq [0, S]$. Furthermore, all arguments $k \in [0, S]$ are equivalent. They can be understood by both the bank and the regulator, and they bear the same cost. Thus without loss of generality, assume that $K = [k_0, S]$ for some $k_0 \geq 0$. Arguments of complexity between k_0 and S are acceptable to the regulator.

In equilibrium, k_0 must be such that it is optimal for the regulator to regulate banks that produce arguments $k < k_0$ or no arguments at all, and that it is rational to not regulate banks that produce arguments $k \in [k_0, S]$. Banks, on the other hand, must optimally behave such that the regulator's beliefs are rational. Furthermore, we apply the intuitive criterion (Cho and Kreps, 1987). This has the consequence that k_0 cannot be too large. Otherwise, the bank could potentially produce an argument with $k < k_0$, accompanied with a speech that it would not be rational for a bad bank to produce such an argument, and that the regulator should thus be convinced. In other words, the regulator cannot close his eyes to acceptable arguments.

First, consider the bank's decision to collect arguments against regulation (i. e., green balls). The costs for one argument are c. The probability that the argument is in the right range of complexity is $(S - k_0)$. If the bank is of type G, the probability that that a ball is green and that the bank has actually found an argument against regulation is p_G. If a good bank draws an argument, the probability that it is useable is thus $p_G\,(S - k_0)$. It will then present the argument to the regulator. Otherwise, the bank will continue searching. The expected costs for the search are thus

$$\sum_{i=1}^{\infty} c\, p_G\,(S-k_0)\,\big(1 - p_G\,(S-k_0)\big)^{i-1} = \frac{c}{p_G\,(S-k_0)}. \tag{3}$$

If the regulator is convinced by the argument, he will drop the regulation, entailing a benefit κ for the banker. A good banker is thus indifferent between searching for an argument or not if

$$\kappa = \frac{c}{p_G\,(S-k_0)}, \qquad \text{thus if} \qquad c = \kappa\, p_G\,(S-k_0). \tag{4}$$

Hence if the cost per draw are below $\kappa\, p_G\,(S - k_0)$, the bank will keep drawing arguments from the urn until it has found an acceptable argument. If the cost is above, the bank will not even start searching. Analogous formulas apply for the bad banks. Given that costs are exponentially distributed with mean χ, the mass of good banks producing an acceptable argument from the viewpoint of the regulator is

$$\varphi_0\, F[p_G\,(S-k_0)\,\kappa] = \varphi_0\,\big(1 - e^{-p_G\,(S-k_0)\,\kappa/\chi}\big). \tag{5}$$

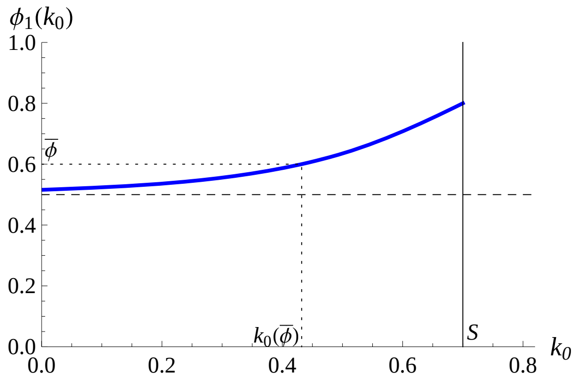
Accordingly, the mass of *bad* banks producing an acceptable argument is

$$(1-\varphi_0)\, F[p_B\,(S-k_0)\,\kappa] = (1-\varphi_0)\,\big(1 - e^{-p_B\,(S-k_0)\,\kappa/\chi}\big). \tag{6}$$

After being presented an acceptable argument, the regulator thus updates his beliefs about the bank's type according to Bayes' law,

$$\begin{aligned} \varphi_1(k_0) &= \frac{\varphi_0\, F[p_G\,(S-k_0)\,\kappa]}{\varphi_0\, F[p_G\,(S-k_0)\,\kappa] + (1-\varphi_0)\, F[p_B\,(S-k_0)\,\kappa]} \\ &= \frac{\varphi_0\,\big(1 - e^{-p_G\,(S-k_0)\,\kappa/\chi}\big)}{\varphi_0\,\big(1 - e^{-p_G\,(S-k_0)\,\kappa/\chi}\big) + (1-\varphi_0)\,\big(1 - e^{-p_B\,(S-k_0)\,\kappa/\chi}\big)}. \end{aligned} \tag{7}$$

Figure 1: Expected Type of the Bank after an Argument



Parameters are $p_G = 0.8$, $p_B = 0.2$, $\varphi_0 = 0.5$, $\chi = 1$, $\kappa = 20$, and $S = 0.7$. This leads to $\bar{\varphi} = 0.6$. The minimum complexity for an admissible argument is $k_0 = 0.432$. These parameters will be used for all following figures and numerical examples.

Figure 1 shows the updated beliefs $\varphi_1(k_0)$ for a set of parameters that will be used as a numerical example throughout this paper (see Appendix A). The initial fraction of good banks is $\varphi_0 = 0.5$. The sophistication of the bank is $S = 0.7$, thus the maximum requirement for the complexity of an acceptable argument is equal to 0.7. Even if the regulator accepts all arguments ($k_0 = 0$), the argument contains some information ($\varphi_1(0) > \varphi_0$), albeit not much. But the higher the minimum complexity k_0, the better the information content. In other words, $\varphi_1(k_0)$ increases in k_0. Now in the example, the minimum φ_1 to convince the regulator to drop the regulation is $\bar{\varphi} = 0.6$. Therefore, the minimum complexity for an admissible argument solves $\varphi_1(k_0) = \bar{\varphi} = 0.6$, which is $k_0 = 0.432$ in the numerical example. Depending on whether the equation $\varphi_1(k_0) = \bar{\varphi}$ has a solution in k_0, there are four cases for different levels of $\bar{\varphi}$. For $\bar{\varphi} < \varphi_0 = 0.5$, the regulator is already persuaded. No further arguments are needed. In the tiny range $\bar{\varphi} \in (\varphi_0, \varphi_1(0)) = (0.5, 0.515)$, the regulator will play a mixed strategy. We describe the exact behavior in the Appendix, together with the proof of Lemma 1. If the bank presents an argument, the regulator will drop the regulation with some positive probability. In the range $\bar{\varphi} \in [\varphi_1(0), \varphi_1(S)] = [0.515, 0.8]$, the minimum complexity k_0 will be chosen such that the regulator is only just persuaded, such that $\varphi_1(k_0) = \bar{\varphi}$, thus defining an implicit function $k_0(\bar{\varphi})$. Finally, in the range $\bar{\varphi} \in (\varphi_1(S), 1] = (0.8, 1]$, the regulator can never be persuaded, hence the bank will not present any arguments. The following lemma sums up some general results (proofs are in the Appendix).

Lemma 1 *If $\bar{\varphi} \leq \varphi_0$, the bank remains unregulated without presenting an argument against regulation. If $\varphi_0 < \bar{\varphi} \leq \varphi_1(0)$, there is a mixed-strategy regime in which all arguments are acceptable, $k_0 = 0$. After having seen an argument, the regulator* *drops the regulation with some positive probability. If $\varphi_1(0) < \bar{\varphi} \leq \varphi_1(S)$, there is a unique equilibrium with $k_0 > 0$. Here, $\varphi_1(S)$ is understood as the limit*

$$\lim_{k_0 \to S} \varphi_1(k_0) = \frac{\varphi_0 \, p_G}{\varphi_0 \, p_G + (1 - \varphi_0) \, p_B}.$$

If $\varphi_1(S) < \bar{\varphi}$, the regulator can never be persuaded. The bank does not present an argument.

From now on, concentrate on the third type of equilibrium, where the bank needs to produce an argument in order to convince the regulator. The implicitly defined function $k_0(\bar{\varphi})$ has the following comparative statics.

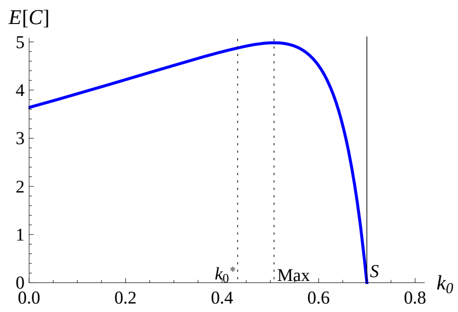
Lemma 2 *The minimum complexity of an acceptable argument $k_0(\bar{\varphi})$ increases in $\bar{\varphi}$. It increases one-to-one in the bank's sophistication S (i. e., $dk_0/dS = 1$), and it decreases in the ex-ante type φ_0. Furthermore, it decreases in the expected cost of producing an argument χ, and it increases in the bank's cost from being regulated κ.*

The proof is again in the Appendix, but let us give some intuition here. If producing an argument is cheap for the bank (low χ), the information content of an argument will decrease just because arguments are cheap to produce. The regulator will have to raise the complexity requirement for acceptable arguments. If the value of staying unregulated is high (high κ), the information content of an argument will also decrease just because banks are so eager to persuade the regulator. Again, the required minimum complexity k_0 will increase. Finally, if φ_0 is already high, the regulator is already halfway convinced. It does not take much more to persuade him to drop regulation, a small k_0 is thus sufficient.

Welfare. Welfare costs consist of the expected C_{crisis} and $C_{\text{regulation}}$, where the bank's costs κ are already included, plus the expected costs for the bank to persuade the regulator. It is important to differentiate between an *ex-ante* perspective (if the regulator could commit to a policy k_0, what would be the optimum?) and an *ex interim* perspective (what is the regulator's optimal decision after he has been presented an argument?). Ex interim, the minimum complexity k_0 of an acceptable argument is just such that the regulator is indifferent between regulating or not. This implies that k_0 indeed maximizes welfare from an interim perspective.

The effect of k_0 on the bank's expected cost of argumentation is twofold. As k_0 increases, the number of banks that decide to argue decreases, but the expected

Figure 2: Expected Argumentation Costs



argumentation cost increases. Figure 2 shows the aggregate expected argumentation costs,

$$E[C] = \varphi_0 \int_0^{p_G\,(S-k_0)\,\kappa} \frac{c}{p_G\,(S-k_0)}\, f(c)\, dc$$
$$+ (1-\varphi_0) \int_0^{p_B\,(S-k_0)\,\kappa} \frac{c}{p_B\,(S-k_0)}\, f(c)\, dc. \tag{8}$$

The aggregate costs converge to zero as $k_0 \to S$, because if argumentation standards are that high, it does not pay off for any bank to search for arguments. There is a cost maximum at $k_0 = 0.508$. The welfare optimum depends on the relative magnitude of κ, χ, $C_{\text{regulation}}$, and C_{crisis}. Potentially, it would be optimal for the regulator to commit not to listen to the bank's arguments at all. However, he cannot close his ears, and once he hears the bank's arguments, he will act upon them. Otherwise, there is an interior optimum k_0^*. In the numerical example, it is lower than the endogenously chosen k_0, implying that the regulation causes excessively high information costs.

3 Reduced Sophistication of the Regulator

We expand the basic model by assuming that a fraction ϑ of regulators (type H) has full sophistication and understands any argument, but a fraction $(1-\vartheta)$ of regulators (type L) only has sophistication $L < S$. This implies that there are arguments that the banker can make, but the regulator may not understand. The regulator's average sophistication is $\vartheta + (1-\vartheta)\,L$, which may be larger or smaller than S. Hence, we do not assume that the regulator is less sophisticated than the bank, but that he *may be* less sophisticated.

We start by assuming that the regulator only wants to minimize aggregate expected costs ($C_{\text{regulation}}$ and C_{crisis}). In this case, we show that an L-type regulator "admits" that he is unsophisticated by reducing the complexity requirements for acceptable arguments. The equilibrium does *not* depend on the degree of sophistication of bank and regulator.

The model becomes interesting if the L-regulator has an incentive to conceal his true type. In this section, we will therefore assume that a regulator has reputational (career) concerns inducing him not to admit to be of type L. The equilibrium outcome then depends crucially on the relative sophistication of bank and regulator. Note that the reputational assumption is not behavioral. We put it on a micro-economic fundament in Section 4.

3.1 No Career Concerns of the Regulator

In the absence of career concerns, the regulator has no reason not to admit that he has reduced sophistication L. He will do so in order to come to the optimal decision. Consequently, if the regulator has type H, the chosen k_0^H will be implicitly defined by $\varphi_1(k_0^H) = \bar{\varphi}$. If the regulator has type L, he will communicate this to the bank. The bank understands that arguments of complexity $k > L$ are not understood by the regulator, they are not acceptable and thus have no value for the bank. The effect is the same as if the bank did not understand the argument itself. Because of Lemma 2, if the maximum acceptable complexity is reduced from S to L, the minimum level k_0 is reduced by an equal amount. Formally,

$$k_0^L = k_0^H - (S - L) \tag{9}$$

if that expression is positive. Otherwise, the L-type regulator will play a mixed strategy.

Hence, the L-type regulator admits to be of type L in equilibrium. This implies that he will only accept arguments of reduced complexity. Interestingly, the decisions of type H and type L are equally good. For an H-type regulator, good banks with $c \leq p_G \left(S - k_0^H\right) \kappa$ make an argument, and bad banks with $c \leq p_B \left(S - k_0^H\right) \kappa$. For an L-type regulator, the conditions are $c \leq p_G \left(L - k_0^L\right) \kappa$ and $c \leq p_B \left(L - k_0^L\right) \kappa$, respectively. Because of (9), the conditions are identical. The set of banks that produce an argument in equilibrium are identical.

3.2 Career Concerns of the Regulator

We now assume that a type L regulator prefers to conceal his type and mimic the behavior of type H. One potential way to endogenize this behavior are career concerns, which will be discussed in the following section. Mimicking means that the

L-regulator must behave in every aspect as if he were H. If an H-regulator chooses to accept only arguments of minimum complexity k_0^H, an L-regulator must do the same in order not to reveal his type, even if he does not understand an argument. We will see that the entire equilibrium is affected. The bank may now choose to present a counter-argument (a red ball) with complexity $k > L$ to the regulator, in the hope that the regulator is of type L and accepts the argument. These cases are easy to detect for the H-type regulator. He will regulate such a bank. As a result, the H-regulator becomes milder when accepting arguments, k_0^H decreases. To concentrate on an interesting case, assume that $L > k_0^H$, i. e., the L-regulator does not understand all arguments by the bank, but some.

Equilibrium. The search for arguments now contains more options. A banker who starts to draw evidence out of the urn may find evidence that cannot be used *at all* (arguments the banker does not understand himself, arguments that are too simple to convince the regulator, or arguments *for* strict regulation that all regulators understand, i. e., red balls). But if he finds a usable argument, there are still two possibilities. Either he has an argument *against* tighter regulation (green ball). Or he has an argument *for* tighter regulation (red ball) that the regulator possibly does not understand, which is the case if the argument has complexity $k \in (L, S]$. Arguments with $k \in (k_0^H(\bar{\varphi}), L]$ are understood by all regulators, no matter which type. If the banker produces a counterargument (red ball) with $k \in (L, S]$, he may either try his luck and present the argument to the regulator, or he may continue and try to find better evidence. Which strategy is preferable depends on the type of the bank, G or B, and the cost of drawing an argument.

Consider a type-G bank that has already found a counterargument (red ball) complex enough to fool an L-regulator ($k \in (L, S]$). If the bank presents this argument, the probability that the regulator has type H is ϑ. The regulator will then observe an argument *for* regulation, and he will comply. The probability that the regulator has type L is $1 - \vartheta$. In this case, regulation will be dropped. If the bank goes on searching for better evidence, the probability of averting tight regulation is 100%, but expected *additional* costs are $\frac{c}{(S-k_0)\,p_G}$. Thus banks with

$$(1-\vartheta)\,\kappa \leq \kappa - \frac{c}{(S-k_0)\,p_G} \qquad \Longrightarrow \qquad c \leq p_G\,(S-k_0)\,\vartheta\,\kappa \tag{10}$$

follow this strategy, leading to a mass of

$$m_{G,\text{honest}} = \varphi\,F\big[p_G\,(S-k_0)\,\vartheta\,\kappa\big] = \varphi\,\big(1 - e^{-p_G\,(S-k_0)\,\vartheta\,\kappa/\chi}\big), \tag{11}$$

where $m_{G,LH}$ is the mass of good banks (G) that collects evidence to convince both L and H types of regulator. The definition for the according $m_{B,\text{honest}}$ is analogous.

But should the bank start to search for evidence in the first place? With other words, what is the critical c above which banks will not search for arguments at all? Every time that a good bank draws a ball, it will be a green ball in the range $k \in [k_0, S]$ with probability $p_G\,(S-k_0)$, and a red ball in the range $k \in (L, S]$ with probability $(1-p_G)\,(S-L)$. The probability that the argument will be shown to the regulator is thus $p_G\,(S-k_0)+(1-p_G)\,(S-L)$. The expected search costs are then

$$E[C] = \frac{c}{p_G\,(S-k_0)+(1-p_G)\,(S-L)}, \tag{12}$$

The conditional probability for a green ball given that the argument is made is

$$q_G = \frac{p_G\,(S-k_0)}{p_G\,(S-k_0)+(1-p_G)\,(S-L)}. \tag{13}$$

With this probability, the argument is accepted by both H and L-regulator. With conditional probability $1-q_G$, the ball is red, and the argument will only be accepted by an L-regulator who does not understand it, hence with probability $1-\vartheta$. The probability that the argument is accepted is thus $q_G+(1-\vartheta)\,(1-q_G)$, in which case the bank's benefit is κ. The condition that a bank prefers to draw balls in the first place is thus

$$\begin{aligned} \frac{c}{p_G\,(S-k_0)+(1-p_G)\,(S-L)} &\leq \frac{p_G\,(S-k_0)+\vartheta\,(1-p_G)\,(S-L)}{p_G\,(S-k_0)+(1-p_G)\,(S-L)}\,\kappa, \\ c &\leq \big(p_G\,(S-k_0)+\vartheta\,(1-p_G)\,(S-L)\big)\,\kappa. \end{aligned} \tag{14}$$

Let $m_{G,L}$ be the mass of good banks that are prepared to cheat if the opportunity arises. Then (14) holds for both $m_{G,\text{honest}}$ and $m_{G,\text{cheat}}$, whereas the stronger (10) holds only for $m_{G,\text{honest}}$. The mass of G-banks that presents some sort of evidence is thus

$$\begin{aligned} m_{G,\text{honest}}+m_{G,\text{cheat}} &= \varphi\,F\big[\big(p_G\,(S-k_0)+\vartheta\,(1-p_G)\,(S-L)\big)\,\kappa\big] \\ &= \varphi\,\big(1-e^{-(p_G\,(S-k_0)+\vartheta\,(1-p_G)\,(S-L))\,\kappa/\chi}\big). \end{aligned} \tag{15}$$

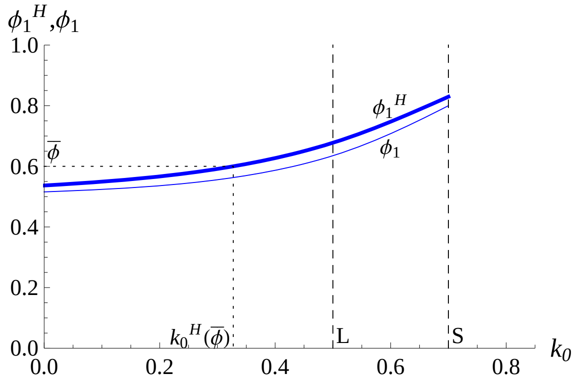
The difference compared to (11) is

$$m_{G,\text{cheat}} = \varphi\Big(F\big[\big(p_G(S-k_0)+\vartheta(1-p_G)(S-L)\big)\kappa\big]-F\big[p_G(S-k_0)\vartheta\kappa\big]\Big). \tag{16}$$

Analogous terms apply for B-type banks, yielding $m_{B,\text{honest}}$ and $m_{B,\text{cheat}}$. A sophisticated regulator will now update his beliefs depending on the argument that he gets. If he gets either no argument or a counter-argument (red ball), he will tighten regulation. But if he sees an acceptable argument (green ball in the range $k \in [k_0, S]$), he uses Bayes' rule to update his beliefs to

$$\varphi_1^H(k_0) = \frac{m_{G,\text{honest}}+\frac{p_G\,(S-k_0)}{p_G\,(S-k_0)+(1-p_G)\,(S-L)}\,m_{G,\text{cheat}}}{\left[\begin{array}{l} \quad m_{G,\text{honest}}+\frac{p_G\,(S-k_0)}{p_G\,(S-k_0)+(1-p_G)\,(S-L)}\,m_{G,\text{cheat}} \\ + \quad m_{B,\text{honest}}+\frac{p_B\,(S-k_0)}{p_B\,(S-k_0)+(1-p_B)\,(S-L)}\,m_{B,\text{cheat}} \end{array}\right]} \tag{17}$$

Figure 3: Expected Type of the Bank after an Argument



Parameters are as before, and $L = 0.5$.

This function is plotted in Figure 3. Importantly, the φ_1^H is above the original φ_1, with the following intuition. The bank has the option to try and persuade only L-regulators. This makes the option to go the whole way and persuade *all* regulators relatively less attractive. As a consequence, only banks with low costs c choose this option, especially if they are the good type G.

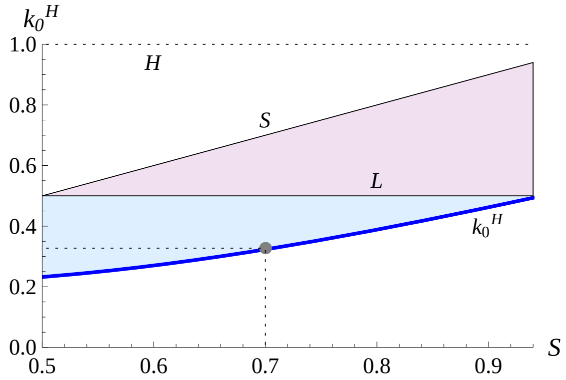
Lemma 3 *For a given complexity standard for arguments k_0, the type H regulator is more convinced after an acceptable argument in the presence of type L regulators. Formally, $\varphi_1^H(k_0) > \varphi_1(k_0)$.*

In equilibrium, the level k_0 will be set such the regulator is convinced only just by an argument if he is of type H. Formally, $\varphi_1^H(k_0) = \bar{\varphi}$. The H-regulator does not take into account how he would interpret the argument if he were type L. Rather, he appreciates only the fact that the bank does not know the regulator's type when deciding upon which arguments to present. The bank, on average, becomes less cautious and presents even false evidence (red balls). These are sorted out immediately by the H-regulator. The task of separating good banks from bad becomes easier for the regulator. He will thus lower complexity standards k_0 in equilibrium.

Lemma 4 *In the presence of type L regulators, the equilibrium minimum complexity k_0 of an acceptable argument is smaller than with type H regulators only. Regulation becomes more lenient.*

In Figure 3, if the minimum degree of conviction for the regulator is $\bar{\varphi} = 0.6$ as before, the minimum complexity of an argument to convince the regulator is now

Figure 4: Complexity Requirements for Arguments



Parameters are as before, $L = 0.5$, $\bar{\varphi} = 0.6$, and S is variable. The light gray dot marks the point for the original $S = 0.7$, leading to $k_0^H = 0.327$ as in Figure 3.

$k_0 = 0.327$, in comparison to the $k_0 = 0.432$ in the absence of L-regulators (Figure 1). This is not a problem for the H-regulator; the expected type of unregulated banks is unchanged. However, it *is* a problem for an L-regulator. Pretending to have high sophistication, he lets pass many banks with fake arguments, leading to inferior average quality of unregulated banks.

Comparative Statics. How does the equilibrium react to changes in exogenous parameters? Especially, how does the degree of sophistication of banks influence the regulator's decision? We show that the quality of the regulatory decision deteriorates. Especially, more bad banks slip through and remain unregulated although this reduces welfare. The regulator is *captured by the banks' sophistication* (justifying the title of the paper), with the following reasoning. The more sophisticated a bank, the higher an H-regulator will set the minimum complexity k_0 of a convincing argument. An L-regulator will have to accept the same range of arguments. Consequently, the fraction of arguments that the L-regulator understands decreases. It becomes relatively cheap for banks to try and fool the L-regulator.

Figure 4 shows the complexity requirements for arguments k_0^H (blue curve). For $S = 0.7$, the parameter we have used before, the required complexity is $k_0^H = 0.327$ (a number we have already seen in Figure 3). For $S = 0.5$, the required complexity is $k_0^H = 0.232$. This is the case where the bank can never fool the regulator, because even the L-regulator is as sophisticated as the bank. This number depends one-to-one on S, as in Figure 1, where $S = 0.7$, we have $k_0 = 0.432 = 0.232 + 0.2$. The slope of k_0^H as a function of S is increasing, implying that a more sophisticated bank is forced to produce more complex arguments.

In Figure 4, there is a colored range above the blue curve $k_0^H(S)$. The upper boundary is S, hence the range marks the arguments that an H-regulator will accept. The light blue range marks arguments that an L-regulator also understands. The pink range marks arguments that type L does not understand. As the bank becomes more sophisticated and S increases, the fraction of arguments that the L-regulator understands becomes smaller, it can even become zero (in this example, for $S = 0.94$).

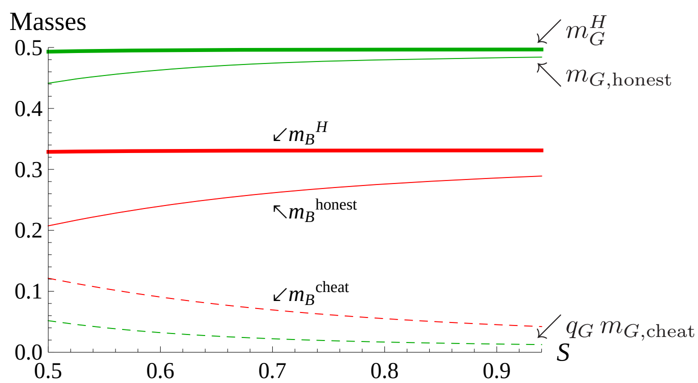
Given that the bank's sophistication increases the probability that an L-regulator follows arguments he does not understand, what are the consequences for the quality of the regulatory decision in the aggregate? Especially, what are the probabilities that each different scenario occurs? We answer the question first from the perspective of an H-regulator, then of an L-regulator. The aggregate will then equal the weighted average of the two.

The mass of good banks that does not cheat, thus searches for an acceptable correct argument to make sure to also convince a sophisticated regulator, is $m_{G,\text{honest}}$ as in (11). Such a bank will go unregulated. The mass is plotted as a thin green curve in Figure 5. The mass of good banks that cheats is $m_{G,\text{cheat}}$ as in (16). Of these banks, a fraction q_G as defined in (12) is lucky and finds an argument that is accepted even by H-regulators. This mass is plotted as a dashed green curve in the figure. The aggregate mass of good banks that goes unregulated is thus

$$m_G^H = m_{G,\text{honest}} + q_G \, m_{G,\text{cheat}}, \tag{18}$$

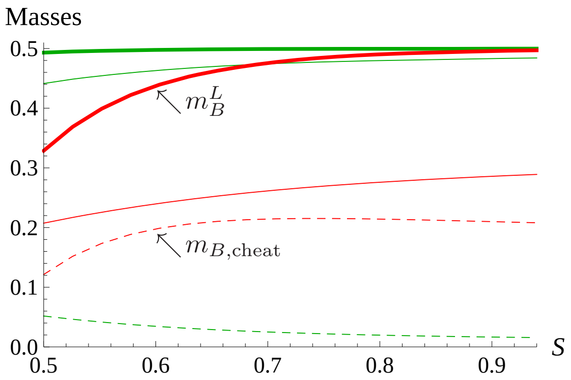
plotted as a thick green curve in the figure. The according curves for bad banks are plotted in red.

Figure 5: Masses of Unregulated Banks, Perspective of H-Regulator



In Figure 5, as the sophistication S of the bank increases, more good banks choose the honest strategy (thin green curve) because k_0 increases less than one-to-one, and searching for arguments becomes cheaper. The same is true for bad banks (thin red

Figure 6: Masses of Unregulated Banks, Perspective of L-Regulator



curve). The cheating strategy becomes more attractive especially for bad banks, but most of them are recognized by an H-regulator, hence both the red and green dashed curves are decreasing. The red and green aggregates are nearly constant. At least their quotient must be constant in equilibrium: because $\bar{\varphi} = 0.6$, the number of good in comparison to bad banks must be 3:2.

From the perspective of an L-regulator, the figure looks differently (Figure 6). L-regulators do not understand some of the arguments, but still do not refute them. Consequently, the mass of cheating good banks that is accepted is not $q_G\, m_{G,\text{cheat}}$, but $m_{G,\text{cheat}}$. In the figure, the difference is negligibly small for good banks, but is immense for bad banks. The red dashed curve $m_{G,\text{cheat}}$ is now predominantly increasing. The aggregate mass of unregulated bad banks is

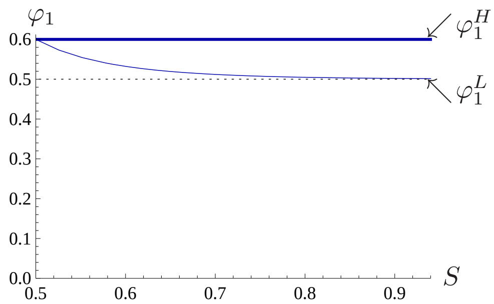
$$m_B^L = m_{B,\text{honest}} + m_{B,\text{cheat}}, \tag{19}$$

where the mass of honest banks is the same as for H-regulators. The aggregate effect is disastrous. With increasing S, more banks try to fool L-regulators. An H-regulator sorts out most of these attempts, but an L-regulator is not able to do so. With increasing sophistication S of banks, the L-regulator's ability to screen out bad banks decreases. For large S, the thick red curve and thick green curve are nearly identical. This means that the L-regulator is no better off than in the absence of any arguments.

Figure 7 shows that expected type φ_1 of a bank that remains unregulated, both from the perspective of an L-regulator who is fooled by many banks (thin curve, φ_1^L), and an H-regulator who cannot be fooled because he is more sophisticated than the bank (thick curve, φ_1^H). The dotted line give the prior in the absence of any argument. The thick curve φ_1^H is constant at 0.6, because the minimum complexity k_0 of an argument is endogenously such that the regulator is only just convinced.

For the L-regulator, the curve also starts at 0.6 for $L = 0.5$. For this level, both the L-regulator and the bank have the same degree of sophistication, and a bank cannot fool the regulator. As S increases, the function $\hat{\varphi}$ decreases. It converges towards $\varphi = 0.5$, the ex-ante expectation. In other word, the fact that the bank presents an argument bears no information for an L-regulator.

Figure 7: Anticipated Types of Unregulated Banks



4 Micro-founded Argument for Career Concerns

Our model is not closed yet. We have assumed that L-regulators rubber-stamp banks that present an argument they do not understand. But why? We endogenize this behavior by assuming that the regulator has career concerns. Ex ante, he is of type H with probability ϑ. Then after having finished this task and after a crisis has occurred or not, beliefs about his type are updated. He is then assigned to another task, where the productivity is proportional to his sophistication, and he gets a salary $\rho\, E[S]$ proportional to his expected sophistication. Hence, a regulator of type L would earn $\rho\, L$, a regulator of type $H = 1$ would earn ρ. In other words, ρ is the value of a regulator's reputation.

We now calculate the minimum $\bar{\rho}$ that supports the equilibrium of Section 3. For a larger ρ, the equilibrium outcome would be the same. For a smaller ρ, the equilibrium would contain mixed strategies. Some (but not all) L-regulators would bluff and rubber-stamp arguments they do not understand.

Assume the bank presents an argument of complexity $k \in [L, k_0]$ to an L-regulator. The L-regulator cannot tell whether it is a B-argument or a G-argument. He can now do one of two things: he can either get cold feet, ignore the argument and regulate the bank. Because an H-regulator would either have accepted the argument or disproved it, it becomes obvious that the regulator must in fact be of type L. The value of his reputation is thus $\rho\, L$.

Otherwise, the L-regulator can rubber-stamp the argument. The effect on the regulator's reputation depends on whether the bank ends up in a crisis. If there is no crisis, the mass of banks admitted by an H-regulator is

$$m_{H,G} = \vartheta\,\big(p_G\,(m_{G,LH} + q_G\,m_{G,L}) + p_B\,(m_{B,LH} + q_B\,m_{B,L})\big), \tag{20}$$

that admitted by an L-regulator is

$$m_{L,G} = (1-\vartheta)\,\big(p_G\,(m_{G,LH} + m_{G,L}) + p_B\,(m_{B,LH} + m_{B,L})\big). \tag{21}$$

The updated belief about the regulator's type is

$$\hat{\vartheta}_G = \frac{m_{H,G}}{m_{H,G} + m_{L,G}}. \tag{22}$$

If there is a crisis, the according masses and updated beliefs are

$$\begin{aligned} m_{H,B} &= \vartheta\,\big((1-p_G)\,(m_{G,LH} + q_G\,m_{G,L}) + (1-p_B)\,(m_{B,LH} + q_B\,m_{B,L})\big), \\ m_{L,B} &= (1-\vartheta)\,\big((1-p_G)\,(m_{G,LH} + m_{G,L}) + (1-p_B)\,(m_{B,LH} + m_{B,L})\big), \quad \text{and} \\ \hat{\vartheta}_B &= \frac{m_{H,B}}{m_{H,B} + m_{L,B}}. \end{aligned} \tag{23}$$

We finally have to compute the probability of ending in a crisis. Because an L-regulator is fooled by banks and admits a higher number of bad banks, the probability of ending in a crisis is relatively large for him,

$$\hat{\varphi}_L\,(1-p_G) + (1-\hat{\varphi}_L)\,(1-p_B). \tag{24}$$

The probability of avoiding a crisis is

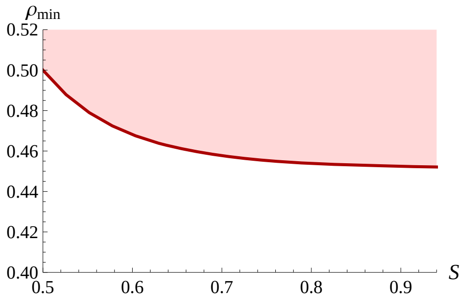
$$\hat{\varphi}_L\,p_G + (1-\hat{\varphi}_L)\,p_B. \tag{25}$$

Hence, the L-regulator's expected reputation from an ex-ante perspective is

$$\big(\hat{\varphi}_L\,p_G + (1-\hat{\varphi}_L)\,p_B\big)\,\hat{\vartheta}_G + \big(\hat{\varphi}_L\,(1-p_G) + (1-\hat{\varphi}_L)\,(1-p_B)\big)\,\hat{\vartheta}_B. \tag{26}$$

This function is plotted in Figure 8.

Figure 8: Ex-ante Reputation of an L-Regulator



5 Conclusion

Our paper has shown that regulators' concerns about their reputation may lead to inefficiently low levels of regulation because regulators may be captured by the financial industry due to a discrepancy in the degree of sophistication between the banks to be regulated and the regulatory bodies. This may help to explain why current regulation was not able to prevent the crisis in spite of its high degree of sophistication.

We have presented a micro-founded model with rational agents: banks and regulators. In order to persuade the regulator to abstain from regulation, banks can present arguments of differing complexity, which the regulator may or may not understand. Finding arguments against regulation is more difficult for a bad bank, which the regulator wants to regulate more strictly. However, the more sophisticated a bank is, the more easily it can produce an argument that a less sophisticated regulator may not understand. If career concerns prevent the regulator from admitting this, he rubber-stamps even bad banks, which leads to inefficiently low levels of regulation. Bank sophistication leads to regulatory capture, and thus to worse regulatory decisions.

Our model implies that a less sophisticated regulation regime (such as the standard approach under the Basel Accord) may be preferable to highly sophisticated regimes (such as an internal models based approach) because this makes regulatory capture by sophistication less likely. However, current policy discussions suggest that regulation is unlikely to move in such a direction – an increasing degree of sophistication is more likely. The same issue will be highly relevant for the implementation of resolution regimes such as livings wills. As with capital regulation, there is a conflict of interest between banks and regulators. Moreover, banks are much better able to understand the details of the living wills' construction than regulators (let alone politicians). Again, the danger of regulatory capture by sophistication is significant.

Another solution suggested by our model is a closing of the sophistication gap between regulators and banks. This would require a sharp increase in regulators' compensation in most countries in order to be able to compete with the financial sector for the brightest experts in risk management and related areas.

If both solutions cannot be implemented, one should think about defining additional minimum standards that require less sophistication on the side of regulators. The regulatory leverage ratio as a complement to risk-weighted capital ratios is a case in point. While not being able to reflect a bank's risk profile, it can provide for a minimum buffer of capital.

Our model suggests that the degree of regulatory capture by sophistication may be an important determinant of regulatory success. This is especially true if regulators have a lot of discretion in their regulatory or supervisory decisions (Pillar 2 of the Basel Accord). Any new regulation should take into account how well the supervisors will actually be able to implement it.

A Definition and Parametrization of Variables

$C_{\text{regulation}}$	4.4	social cost from tighter regulation
C_{crisis}	10.	social cost of a crisis with loose regulation
p_G	0.8	success probabilities of a good bank
p_B	0.2	success probabilities of a bad bank
φ_0	0.5	ex-ante fraction/mass of good banks; prob. that a bank is in state G
$\bar{\varphi}$	0.6	required fraction of good banks to remain unregulated, minimum degree of conviction for the regulator, see (1)
φ_1		expected fraction of good banks after an argument
φ_1^H		fraction of good banks that an H-regulator expects after an argument
χ	1.0	expected costs of collecting one argument/piece of evidence
κ	20.	bank's private cost from strict regulation
S	0.7	sophistication of the bank
L	0.5	sophistication of the L-type regulator
H	1.0	sophistication of the H-type regulator
k_0		minimum complexity of an argument
ϑ	0.5	fraction/mass of H-type regulators
ρ		value of reputation to the regulator
$m_{G,LH}$		mass of good banks (G) that collects evidence to convince both L and H-types of regulator
$m_{G,L}$		mass of good banks (G) that tries to fool L-types of regulator

References

Armstrong, M., and D. E. M. Sappington (2004): "Toward a Synthesis of Models of Regulatory Policy Design with Limited Information," *Journal of Regulatory Economics*, 26(1), 5–21.

——— (2007): "Recent Developments in the Theory of Regulation," in *Handbook of Industrial Organization*. Elsevier.

Avery, C., and M. Meyer (2012): "Reputational Incentives for Biased Evaluators," Working Paper, University of Oxford.

Basel Committee on Banking Supervision (2009): "Strengthening the Resilience of the Banking Sector," Consultative document, bank for international settlements, basel.

Bernstein, M. H. (1955): *Regulating Business by Independent Commission*. Princeton University Press, Princeton.

Blume, A., and O. J. Board (2009): "Intentional Vagueness," Working Paper 381, University of Pittsburgh.

Boyer, P. C., and J. Ponce (2011): "Regulatory Capture and Banking Supervision Reform," *Journal of Financial Stability*, 8(3), 206–217.

Carlin, B. I., and G. Manso (2011): "Obfuscation, Learning, and the Evolution of Investor Sophistication," *Review of Financial Studies*, 24(3), 754–785.

Cho, I.-K., and D. M. Kreps (1987): "Signaling Games and Stable Equilibria," *Quarterly Journal of Economics*, 102(2), 179–221.

Dewatripont, M., and J. Tirole (2010): "Modes of Communication," *Journal of Political Economy*, 113(6), 1217–1238.

Ellison, G., and A. Wolitzky (2012): "A Search Cost Model of Obfuscation," *RAND Journal of Economics*, 43(3), 417–441.

Feldmann, S. E., and M. Bennedsen (2006): "Informational Lobbying and Political Contributions," *Journal of Public Economics*, 90(4-5), 631–656.

Giammarino, R. M., T. R. Lewis, and D. E. M. Sappington (1993): "An Incentive Approach to Banking Regulation," *Journal of Finance*, 48(4), 1523–1542.

Glazer, J., and A. Rubinstein (2001): "Debates and Decisions: On a Rationale of Argumentation Rules," *Games and Economic Behavior*, 36(2), 158–173.

——— (2004): "On the Optimal Rules of Persuasion," *Econometrica*, 72(6), 1715–1736.

——— (2006): "A Study in the Pragmatics of Persuasion: A Game Theoretical Approach," *Theoretical Economics*, 1(4), 395–410.

Grossman, G. M., and E. Helpman (2001): *Special Interest Politics*. MIT Press, Cambridge, MA.

Heinemann, F., and M. Schüler (2004): "A Stiglerian View on Banking Supervision," *Public Choice*, 121(2), 99–130.

Hellwig, M. (2010): "Capital Regulation after the Crisis: Business as Usual?," MPI Preprint 2010/31.

Huntington, S. (1952): "The Marasmus of the ICC: The Commission, the Railroads, and the Public Interest," *Yale Law Journal*, 61(4), 467–509.

Kamenica, E., and M. Gentzkow (2011): "Bayesian Persuasion," *American Economic Review*, 101(6), 2590–2615.

Laffont, J.-J., and J. Tirole (1991): "The Politics of Government Decision-Making: A Theory of Regulatory Capture," *Quarterly Journal of Economics*, 106(4), 1089–1127.

——— (1993): *A Theory of Incentives in Procurement and Regulation*. MIT Press, Cambridge, MA.

Levine, M. E., and J. L. Forrence (1990): "Regulatory Capture, Public Interest, and the Public Agenda. Toward a Synthesis," *Journal of Law, Economics, & Organization*, 6, 167–198.

Milgrom, P., and J. Roberts (1986): "Relying on Information of Interested Parties," *RAND Journal of Economics*, 17(x), 18–32.

Sher, I. (2010): "Credibility and Determinism in a Game of Persuasion," *Games and Economic Behavior*, 71(2), 409–419.

Shin, H. S. (1994): "The Burden of Proof in a Game of Persuasion," *Journal of Economic Theory*, 64(1), 253–264.

Stigler, G. (1971): "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science*, 2(1), 3–21.

Strausz, R. (2005): "Honest Certification and the Threat of Capture," *International Journal of Industrial Organization*, 32(1), 45–62.

Turkay, E. (2011): "Evidence Disclosure and Severity of Punishments," *American Economic Journal*, forthcoming.

Visser, B., and O. H. Swank (2007): "On Committees of Experts," *Quarterly Journal of Economics*, 122(1), 337–372.