The Labor Market for Bankers and Regulators

Philip Bond
University of Washington

Vincent Glode
University of Pennsylvania

We propose a labor market model in which agents with heterogenous ability levels choose to work as bankers or as financial regulators. When workers extract intrinsic benefits from working in regulation (such as public-sector motivation or human capital accumulation), our model jointly predicts that bankers are, on average, more skilled than regulators and their compensation is more sensitive to performance. During financial booms, banks draw the best workers away from the regulatory sector and misbehavior increases. In a dynamic extension of our model, young regulators accumulate human capital and the best ones switch to banking in mid-career. (*JEL* G28, J24, J45)

> "*Does it really matter who is in charge of the regulators? The grunt work of supervision depends on more junior staff, who will always struggle to keep tabs on smarter, better-paid types in the firms they regulate.*"
>
> *The Economist*, September 30 2010

The financial industry is heavily regulated. Whether it is in terms of spending or number of employees, financial regulation represents more than a third of all business- and industry-related regulation in the United States (De Rugy and Warren 2009), even though the financial sector contributes to less than 10% of the country's GDP. Moreover, in many countries including the U.S., regulatory resources devoted to the financial sector look set to increase (e.g., Acharya et al. 2010; SEC 2012). However, many commentators express grave doubts about the current efficacy of financial regulation (e.g., Barth, Caprio, and

Levine 2012). One strand of criticism, exemplified by the quote above, is that, bluntly-put, financial regulators are not as smart as the bankers and traders they are charged with overseeing. Although optimal financial regulation has justifiably received a lot of academic attention (more on this later), very little has been done to understand the allocation of the dominant input needed for regulation, that is, human capital.

The widely-held perception that financial regulators are less skilled than bankers is the central motivating observation of our paper. In addition, two related observations are worth stressing. First, the discrepancy in ability between regulators and bankers is believed to widen significantly when the financial sector booms, or when regulatory resources shrink. Second, jobs in financial regulatory agencies offer compensation that is low and insensitive to performance, relative to jobs in the firms being supervised (Henderson and Tung 2012; Philippon and Reshef 2012). Together, these observations raise a number of questions. Why is the regulatory sector less prepared to pay for skill relative to the private sector? Why does this discrepancy worsen when the financial sector booms and how does this affect the efficacy of regulation? Is this allocation of workers socially inefficient? And why do regulatory agencies make comparatively little use of performance pay?

This paper provides a very parsimonious but perhaps surprising answer to these questions. We show that if workers derive a utility benefit from working in regulation—due, for example, to public-sector motivation or to human capital benefits—then the labor-market outcomes described above emerge naturally: in equilibrium, financial-sector regulators are less skilled, are paid less, and receive less performance pay. Put succinctly, the job that people intrinsically enjoy the *most* ends up with the *worst* workers.

The notion that public-sector motivation represents an intrinsic benefit of working for regulatory agencies can be illustrated by the following comments made by financial regulators in the U.K. and U.S., respectively:

> *"The work we do, aiming to make the financial sector more stable – consumer protection – has a higher purpose than chasing a profit margin. (...) Some are motivated to work for a higher purpose and job satisfaction."*[1]

> *" 'These are all people who could be making a lot more money doing something else,' Ms. Corsell said. Working at the SEC 'is an opportunity to make policy and participate in the way in which the financial system works and, at this point in time, is rebuilt. That's a pretty powerful draw to a lot of people.' "*[2]

---

[1] See "FSA: Regulator: 'No, I don't like being called an idiot'" by Joris Luyendijk in *The Guardian* newspaper of June 22, 2012.

[2] See "Budget battles could crimp SEC's plans" by Mark Schoeff in *Investment News* of August 29, 2010. Ms. Corsell is a former attorney in the Securities and Exchange Commission (SEC) investment management division.

Consistent with these sentiments, regulatory agencies appeal explicitly to public-sector motivation in their recruitment efforts.[3] Moreover, a number of outside observers have commented on the significance of public-sector motivation in financial regulation. Shiller (2012, p. 98) discusses the importance to financial-sector regulators of holding a job with a "broader mission" and a "social purpose." We are not aware of more systematic evidence on public-sector motivation in the specific context of financial regulation, but an extensive empirical literature documents the existence of public-sector motivation in a variety of public-sector jobs [see, e.g., Perry and Hondeghem (2008) for a survey, or alternatively, the many sources cited by the growing economics literature on public-sector motivation that includes Dewatripont, Jewitt, and Tirole (1999), Besley and Ghatak (2005), Francois (2007), Delfgaauw and Dur (2008, 2010), Macchiavello (2008), and Jaimovich and Rud (2011)].

Although the public-sector motivation we refer to resembles altruism (Becker 1974), the intrinsic benefit workers extract from being regulators may also stem entirely from a desire for power or any other non-pecuniary benefit; for our purposes, the distinction is unimportant. We analyze in Section 4 an alternative example of intrinsic benefit stemming from working in regulation: human capital accumulation. In particular, we show that low-skilled workers may start in regulation because it offers the opportunity to build human capital; and that those workers who successfully acquire human capital move to banking later in their careers. This corresponds to the notion that working at the SEC, for example, may enhance an individual's future career prospects, consistent with deHaan et al. (2012).

Naturally, other explanations for the labor-market patterns described in the opening paragraph are possible. In particular, one might be tempted to ascribe these patterns to one of the following informal arguments: (A) political constraints determine pay in the public sector; or (B) the private sector is significantly wealthier than the public sector.[4] Our model speaks to both of these alternatives. With respect to (A), we show that the labor-market patterns described are constrained Pareto efficient, implying that any political constraints on compensation may be non-binding. With respect to (B), our model shows this is not a necessary condition by delivering the same predictions even when regulatory budgets are large relative to private-sector profitability.

We use our model of the financial-sector labor market to analyze how equilibrium misbehavior responds to financial-sector booms and to reductions in regulatory resources. In both cases, and as one would expect, the regulatory sector struggles to hire workers, and loses workers to the private sector, consistent with journalistic accounts such as Masters (2010) who

---

[3] See, e.g., the Office of the Comptroller of the Currency's career webpage at: http://http://www.occ.treas.gov/about/who-we-are/careers/index-careers.html.

[4] Note that this second argument does not fully explain why the private sector is disproportionately attractive to highly-skilled workers, nor why it makes more use of performance pay.

reports that: "Staff resignations doubled at the Financial Services Authority in the second quarter as the government announced plans to split up the embattled regulator and as revived private sector recruitment lured away managers and frontline supervisors." Perhaps less obvious, we show that it is the highest-ability workers that the regulatory sector loses. Both effects make regulation less effective: there are fewer regulators, supervising more bankers, and the average regulator is now less skilled. Consequently, equilibrium misbehavior by bankers increases during financial-sector booms. Moreover, when the financial sector booms, larger bonuses are paid there.

Relative to the literature on optimal regulation in financial markets, the main innovation of this paper is to focus on the labor market for regulators. Accordingly, we model the regulatory process in the simplest way possible that allows us to endogenize the allocation of talent across regulated and regulating bodies. While we do not examine topics such as deposit insurance (e.g., Giammarino, Lewis, and Sappington 1993), capital requirements (e.g., Morrison and White 2005), or the enforcement of financial contracts (e.g., Carlin and Gervais 2012), our paper still contributes to the literature on financial regulation by analyzing the social efficiency of a decentralized labor market equilibrium in which the allocation of talent is tilted away from the regulatory sector, consistent with the widely-held view that financial regulators are less skilled than the bankers they are in charge of monitoring. Since human capital is arguably the most important input needed for regulation and banking, we believe that understanding (and potentially influencing) the economic forces at work in this competition for talent could contribute to better regulation.

A burgeoning literature examines financial-sector labor markets; we add to this literature by analyzing which workers become regulators. For example, Axelson and Bond (2013) and Glode and Lowery (2013) rationalize the high compensation offered to investment bankers and traders, respectively, through the channels of moral hazard and fixed-sum trading (neither of which we examine in this paper). In our model, we take the marginal product of financial-sector workers (e.g., bankers or traders) as given, and focus on how the regulatory sector can compete with private financial institutions to hire workers of different ability levels. The allocation of talent in finance is also studied by Murphy, Shleifer, and Vishny (1991), Philippon (2010), and Bolton, Santos, and Scheinkman (2013). None of these papers, however, model the choice between working in finance and in regulation. In contrast to these models where talent is inefficiently allocated, the equilibrium allocation of workers in our model—namely, higher skilled workers in finance and lower skilled workers in regulation—is (constrained) Pareto efficient.

The dynamic extension of our model in Section 4, in which we study the "revolving door" between regulation and the private sector, is related to Che (1995) and Bar-Isaac and Shapiro (2011), who study how employment opportunities in the private sector (i.e., at monitored firms) impact the incentives faced by employees of monitoring agencies. Relative to these papers, our focus

is on which type of worker starts in regulation and which type switches to the private sector in mid-career.

More generally, our paper contributes to the study of non-pecuniary incentives and public-sector employment.[5] Our paper examines the combination of *job-specific* intrinsic motivation in a labor market with heterogeneously-skilled workers. Specifically, we model the employment of workers with different abilities in the public and private sectors, where public-sector employment delivers a utility benefit. Delfgaauw and Dur (2008, 2010) study a related setting, but with some important differences.[6] First, the economic mechanism we identify is different (see detailed discussion in Section 2). Second, the two sectors in our model are linked, while the sectors in these previous papers function independently from each other. Third, these previous papers are silent on incentive pay and human capital formation.[7] In contrast, we use our model with risk-averse workers to make predictions that are consistent with findings by Burgess and Metcalfe (1999) that incentive pay systems are far more widespread in the private sector than in the public sector.

The paper is organized as follows. In Section 1, we introduce the general environment for our model and in Section 2 we develop its main implications in a risk-neutral setting. In Section 3, we extend our analysis to the case where workers are risk-averse and derive predictions about the use of performance pay in both sectors. We develop a dynamic version of our model and interpret the intrinsic benefit of working in regulation as an improvement in human capital in Section 4. In Section 5, we discuss the robustness of our analysis. We conclude and highlight the policy implications resulting from our analysis in the last section.

1. Model

A continuum of workers can be employed by two types of risk-neutral employers: banks and regulatory agencies. There are two types of workers: a mass 1 of low-skill workers and a mass η of high-skill workers. What differentiates these two types of workers is the probability of succeeding in their work-related tasks. To avoid hard-wiring any particular allocation of

---

[5] In addition to the papers on public-sector motivation cited earlier, see also Prendergast (2003, 2007) for other issues related to public sector employment. For papers on non-pecuniary incentives in the specific context of corporate governance, see, for example, Brennan (1994) and Carlin and Gervais (2009).

[6] Although Jaimovich and Rud (2011) study an economy with heterogeneously-skilled agents, they assume that only highly-skilled agents are able to choose among occupations—bureaucracy and entrepreneurship—and so cannot say anything about the skill composition of these sectors. Instead, they focus on the existence of multiple equilibria, and in particular on the possibility that an inefficient public sector is self-reinforcing because inefficiency makes the return from entrepreneurship low, and hence entrepreneurship unattractive. See also Macchiavello (2008) for a related observation.

[7] Delfgaauw and Dur (2008) briefly consider a case in which effort is unverifiable. Since output is deterministic, the contracts in this case are simple forcing contracts, which pay a worker only if output reaches some critical level.

workers into our model, we assume that the probability of success for each worker type is the same in both jobs: q_L for the low-skill worker and q_H for the high-skill worker, where $q_L < q_H$. Equivalently, we could allow these success probabilities to change with the sector as long as the ratio of productivity for the high type over the low type remains constant across sectors.

A banker's job is to oversee investments in projects. Each banker deals with one project, and there are at least $1 + \eta$ projects in the economy (so there are sufficiently many projects even if all workers become bankers). A project's outcome depends on how effectively the banker monitors it. For simplicity, we assume that when a project is successful, it generates a net profit to the bank of p (> 0) and when it fails the net profit is 0. (It would be straightforward to generalize our model to one in which the payoff p from a successful project is replaced by $P(n)$, a decreasing function of the number of projects financed.) A banker's skill affects his monitoring ability, which in turn affects the probability that the project is successful: projects monitored by high-skill bankers succeed with probability q_H, while projects monitored by low-skill bankers succeed with probability q_L.

A worker's skill is only known by the worker himself. Hence, when approached by a bank, workers are offered a menu of performance-contingent compensation contracts. Each menu item is denoted $w_B = (w_{BS}, w_{BF})$, where w_{BS} is the payment if the project succeeds and w_{BF} is the payment if the project fails. By standard arguments, we can assume the menu contains just two contracts: one intended for high-skill workers, w_B^H, and one intended for low-skill workers, w_B^L. The unobservability of skill is important for our results on performance pay in Section 3. However, it plays no role in our results for risk-neutral workers, since employers can perfectly separate high-skill workers from low-skill workers by offering contracts that only pay in the case of success. Under risk neutrality, this separation is achieved without any utility cost for either the worker or employer, thus yielding an equilibrium outcome for which the unobservability of skill is inconsequential (see Lemma 3).

We assume there are at least two banks; Lemma 1 shows that this implies the standard result that banks earn zero profits in equilibrium.

After becoming a banker, and also after learning whether his project has succeeded or failed, a worker encounters an opportunity to misbehave for personal gain. This opportunity represents anything that regulators are responsible for monitoring and preventing, such as defrauding small entrepreneurs, a government agency, or the general public. This misbehavior imposes a deadweight cost on the economy: formally, if the aggregate quantity of banker misbehavior is Q, the deadweight social cost is $\kappa(Q)$.

Let z denote a banker's private gain from misbehavior. Workers do not know the exact value of z when they choose a career, since the gains from misbehavior are determined by factors such as the naivety of a banker's clients and the efficacy of his supervisors. Accordingly, we assume that z is distributed according to some continuous distribution function.

After learning how much he will gain from misbehavior, a banker chooses whether or not to misbehave. In doing so, he compares the gain z with the cost of being caught and penalized by regulators. Specifically, when effectively monitored by a regulator, misbehavior results in a (possibly non-monetary) fine K for the banker, which may depend on z (if, for example, the fine entails repayment of fraudulent gains). We use r to denote the probability of being effectively investigated, which is endogenously determined in equilibrium based on the numbers of regulators and bankers, and the average skill of regulators.

It is worth noting that the details of how we model bankers' misbehavior have little impact on our main results about worker allocation. What really matters is how much the opportunity to misbehave is worth to workers, compared to the intrinsic benefit of working in regulation, when they decide on a career. Our primary objective is to study how workers are allocated between sectors and the current model of misbehavior allows us to characterize the feedback between workers' allocation and the quality of regulation, as measured by the equilibrium quantity r.

Our key assumption is that workers who become regulators receive an intrinsic benefit Δ, due for example to the social recognition from acting as public servants, or as we illustrate in Section 4, stemming from the acquisition of human capital useful in later stages of their careers. We assume for now that such intrinsic benefit is outcome independent, or in other words, that it does not depend on a worker's skill level. We show in Section 5 that this assumption can be relaxed without significantly affecting our results. Regulators investigate bankers to check if they misbehaved. With probability q_i a regulator of skill level $i \in \{H, L\}$ determines the truth (i.e., whether or not a banker misbehaved). We describe this outcome as a *useful report*, since the information generated can be used to penalize the banker. With probability $1 - q_i$, the regulator learns nothing.

Parallel to banks, a regulatory agency offers workers a menu of two performance-contingent compensation contracts $\{w_R^H, w_R^L\}$: for $i \in \{H, L\}$, $w_R^i = (w_{RS}^i, w_{RF}^i)$, where w_{RS}^i is the payment for a useful report and w_{RF}^i is the payment otherwise. A regulatory agency aims to learn as much as it can about the actions of bankers, so it aims to maximize the number of useful reports it can generate, taking its budget as given. We assume there are at least two regulatory agencies, and that the total budget of regulatory agencies, denoted by M, is equally divided among them.

Remark 1. A reader might wonder why we have assumed that regulatory agencies maximize the number of useful reports, rather than some measure of social welfare. The main reason is that maximization of social welfare would introduce an equilibrium effect into the regulatory agency's objective that we find unrealistic. To be more specific, if a regulatory agency aimed to maximize social welfare, one possible way to do so would be to hire

more workers, so that in equilibrium there are fewer bankers, and hence less banker misbehavior. Essentially, this is regulatory employment as preemptive incarceration.[8] Although this effect is present in our model, we believe its importance in the real world is limited. Modeling the regulatory agency's objective as the maximization of useful reports eliminates this problem. Moreover, in Subsection 2.2 we show that equilibrium outcomes satisfy at least two different notions of social efficiency. Consequently, our analysis implies social welfare may be maximized even if regulatory agencies do not have social welfare maximization as their objective.

Remark 2. A reader might also wonder why we have assumed that there are multiple regulatory agencies. The reason is that if we instead assumed there is only one regulatory agency, this agency would then enjoy monopsonist power in the labor market for regulators, pushing down regulator compensation. Because we want to highlight that our predictions about low regulator compensation, and relatively unskilled regulators, are not driven by monopsonist power in the regulator labor market, we prefer to assume that there are at least two competing regulatory agencies. However, all our results would be qualitatively unchanged if there was only one regulatory agency.

Remark 3. Finally, we take the total regulatory budget M as exogenous. It would be straightforward to solve for the optimal M in a setting where the central planner, say the federal government, attempts to maximize the total value created by bankers, net of penalty functions for the incidence of misbehavior and the use of public funds. However, our main results do not depend on the level of M, which has the advantage of making them positive rather than normative.

To simplify the presentation of our results, we make the very mild assumption that the total regulatory budget M does not allow the regulatory sector to employ all workers:

Assumption 1. $M < (\eta q_H + q_L)\left(p - \frac{\Delta}{q_H}\right)$.

If $\Delta = 0$, Assumption 1 states that the budget M is less than the aggregate banking output even when all workers become bankers. If $\Delta > 0$, a regulator's cost of employing a worker is reduced; see Section 2.

A worker's utility from being a regulator is $u(w + \Delta)$. A worker's utility from being a banker is $u(w + z - K(z))$ if he misbehaves and is caught; $u(w + z)$ if he misbehaves and is not caught; and $u(w)$ if he abstains from misbehaving. To eliminate wealth effects, which are tangential to our main analysis, we assume that workers are either risk-neutral, or have constant absolute risk

---

[8] Somewhat related, Glode and Lowery (2013) study how a trader's compensation is partly determined by a bank's desire to prevent the trader from joining another bank and trading against the first bank.

aversion (CARA), i.e., $u(c) \equiv -e^{-\gamma c}$, where γ is the coefficient of absolute risk aversion.

Define $U^i\left(w_B^j\right)$ as the expected utility for a worker of type i from accepting the banking contract intended for a worker of type j. Likewise, define $U^i\left(w_R^j\right)$ as the utility for a worker of type i from accepting the regulator contract intended for type j. Since we assume the misbehavior decision takes place after the banker observes whether he has succeeded or failed,

$$U^i\left(w_B^j\right) = q_i E_z\left[\max\left\{(1-r)u\left(w_{BS}^j+z\right)+ru\left(w_{BS}^j+z-K(z)\right), u\left(w_{BS}^j\right)\right\}\right]$$

$$+(1-q_i)E_z\left[\max\left\{(1-r)u\left(w_{BF}^j+z\right)+ru\left(w_{BF}^j+z-K(z)\right), u\left(w_{BF}^j\right)\right\}\right], \quad (1)$$

$$U^i\left(w_R^j\right) = q_i u(w_{RS}^j+\Delta)+(1-q_i)u(w_{RF}^j+\Delta). \quad (2)$$

We focus on symmetric equilibria in which all regulatory agencies offer the same contracts, and likewise, all banks do too. When multiple employers offer the same contract, we assume that workers randomize among them with equal probability.

Labor market outcomes are summarized by the fraction of workers of each skill level who enter each of the two sectors. For $i \in \{H, L\}$, let α^i denote the fraction of workers with skill level i who become bankers; hence a fraction $1-\alpha^i$ become regulators.

To close the model, we need to relate labor-market outcomes to the efficacy of regulators, that is, to the equilibrium probability r of misbehavior detection. A parsimonious way to achieve this is by first assuming that each regulator can monitor a measure $\lambda > 0$ of bankers and that monitoring occurs successively, so that two useful reports are never produced on the same banker (unless the number of regulators is so large that a useful report is produced on *every* banker). Write $N = \alpha^L + \eta\alpha^H$ for the number of workers hired as bankers, and $\lambda R = \lambda\left(1-\alpha^L\right)q_L + \lambda\eta\left(1-\alpha^H\right)q_H$ for the number of useful reports produced by regulators. Since regulators do not know which bankers misbehave until they have monitored them, the mass λ of bankers each regulator monitors is randomly selected among the bankers with no useful reports. Hence, the regulatory sector collects useful information about a mass $\min\{\lambda R, N\}$ of the N bankers. The probability that a given misbehaving banker will be penalized is then:

$$r = G(R, N) \equiv \frac{\min\{\lambda R, N\}}{N}. \quad (3)$$

Remark 4. It is worth stressing that our results hold for many other parameterizations of the misbehavior-detection function G; all we require is that G is continuous in its two arguments, weakly increasing in the skill-adjusted mass of regulators R, and weakly decreasing in the total

number of bankers N. In particular, we show in Section 5 that these mild restrictions allow "congestion" or "attention" effects to be incorporated into the misbehavior-detection process.

Define $\Pi^i(w_B)$ as a bank's per-worker profits from employing a type-i worker using contract w_B. Define $\rho^i(w_R) = \frac{q_i}{q_i w_{RS} + (1-q_i) w_{RF}}$ as a regulatory agency's productivity (i.e., the ratio of the number of useful reports to expected compensation paid) from employing a type-i worker using contract w_R (and set $\rho^i(w_R) = \infty$ if the denominator is zero or negative). For a regulatory agency that employs both types of worker, specifically, $k^i > 0$ workers of type i using contract w_R^i, define $\mu^i = k^i \left(q_i w_{RS}^i + (1-q_i) w_{RF}^i \right) / \sum_{j \in \{L,H\}} k^j \left(q_j w_{RS}^j + (1-q_j) w_{RF}^j \right)$ as the fraction of the compensation paid to workers of type i; the regulatory agency's overall productivity is then $\sum_{i \in \{L,H\}} \mu^i \rho^i (w_R^i)$.

An equilibrium in our economy is defined as follows:

Definition 1. An equilibrium is a vector $(w_B^H, w_B^L, w_R^H, w_R^L, \alpha^H, \alpha^L, r)$ satisfying:

- Labor market: utility maximization by workers among contracts.
  - If $\alpha^i > 0$ (i.e., some workers of type i become bankers), then:

$$U^i\left(w_B^i\right) \geq \max\left\{U^i\left(w_B^j\right), U^i\left(w_R^i\right), U^i\left(w_R^j\right)\right\}. \qquad (4)$$

  - If $\alpha^i < 1$ (i.e., some workers of type i become regulators), then:

$$U^i\left(w_R^i\right) \geq \max\left\{U^i\left(w_R^j\right), U^i\left(w_B^i\right), U^i\left(w_B^j\right)\right\}. \qquad (5)$$

- For banks: There is no deviation $\left\{\tilde{w}_B^H, \tilde{w}_B^L\right\}$ such that, taking all other contracts as fixed, the bank strictly increases its profits.
- For regulatory agencies: There is no deviation $\left\{\tilde{w}_R^H, \tilde{w}_R^L\right\}$ such that, taking all other contracts as fixed, the regulatory agency strictly increases its productivity.
- Total regulatory expenditure equals the budget, $M = \left(1-\alpha^L\right)\left(q_L w_{RS}^L + (1-q_L) w_{RF}^L\right) + \left(1-\alpha^H\right)\eta\left(q_H w_{RS}^H + (1-q_H) w_{RF}^H\right)$; and the probability r that misbehavior is detected is consistent with the labor market outcome, $r = G\left((1-\alpha^L)q_L + \eta(1-\alpha^H)q_H; \alpha^L + \eta\alpha^H\right)$.

The following result helps simplify the analysis. Unless otherwise stated, proofs are relegated to the Appendix.

Lemma 1. In equilibrium, banks extract zero profits from each type of worker they employ and regulatory agencies extract the same productivity from each type of worker they employ. Consequently, the expected compensation of a banker of type i is $q_i p$; and there exists an s such that the expected compensation of a regulator of type i is $q_i s$.

It is important to note that these properties hold regardless of whether workers are risk-neutral or risk-averse; the reason is that the result is driven by the objectives of risk-neutral employers.

2. Equilibrium Allocation of Workers

In this section, we assume all workers are risk-neutral. Consequently, a banker chooses to misbehave whenever his payoff z exceeds the expected penalty $rK(z)$, where, as introduced earlier, r is the equilibrium probability of being caught when misbehaving. The aggregate incidence of misbehavior in the economy is then $Q = (\alpha^L + \eta\alpha^H) Pr(z > rK(z))$, since $\alpha^L + \eta\alpha^H$ represents the total number of bankers in equilibrium. To ease notation, we define $\phi(r) \equiv E_z[\max(z - rK(z), 0)]$, representing a banker's expected payoff from the opportunity to misbehave.

How are workers allocated between the two sectors? A worker of type i is paid his marginal product in banking (see Lemma 1). Given risk neutrality and the possibility of fraudulent gains, his total expected utility from becoming a banker is $q_i p + \phi(r)$. Consequently, a regulatory agency must offer a worker of type i an expected compensation of at least $q_i p - (\Delta - \phi(r))$ in order to attract that worker.

Before proceeding to our main result, it is worth pausing to consider the allocation of workers in the benchmark version of our economy in which both intrinsic benefits and fraud are absent, i.e., $\Delta = 0$ and $\phi(r) = 0$ for any level of r.

Lemma 2. In the benchmark case with $\Delta = 0$ and $\phi(r) = 0$, the allocation of workers is indeterminate: any α^L, α^H such that $(1 - \alpha^L)q_L p + (1 - \alpha^H)\eta q_H p = M$ is an equilibrium outcome.[9]

However, when Δ and $\phi(r)$ take different values, our model has something to say about the allocation of workers across sectors. Our main result is that, whenever the benefit of regulation, Δ, is larger than the net gain from misbehavior, $\phi(r)$, regulatory agencies hire high-skill workers only after they have completely exhausted the supply of low-skill workers and some regulatory budget remains. More formally, low-skill bankers and high-skill regulators cannot coexist.

To see this, suppose to the contrary that low-skill bankers and high-skill regulators coexist in equilibrium. Write $X_B^i = pq_i$ for the expected compensation of type i in banking. Note that (by above) a high-skill regulator must receive expected compensation of at least $X_B^H - (\Delta - \phi(r))$, and so the regulatory agency's productivity from this worker is at most $\frac{q_H}{X_B^H - (\Delta - \phi(r))}$. Instead, a regulatory agency could poach low-skill bankers by offering a contract paying

---

[9] An analogous result can be shown to hold for the case of risk-averse workers, considered in Section 3 below.

just above $\frac{X_B^L - (\Delta - \phi(r))}{q_L}$ in the case of success, and nothing after failure. Low-skill bankers would certainly accept this contract, and the regulatory agency's productivity from any poached worker would be $\frac{q_L}{X_B^L - (\Delta - \phi(r))}$ (regardless of skill). Whenever $\Delta > \phi(r)$, this productivity level exceeds the upper-bound on the productivity of existing high-skill regulators,[10] implying that regulatory agencies would benefit from poaching low-skill bankers (and firing some of their existing high-skill workers). This contradicts the equilibrium assumption and establishes:

Proposition 1. In any equilibrium with $\Delta > \phi(r)$, bankers are more skilled than regulators. Formally, there is no equilibrium in which some high-skill workers are regulators ($\alpha^H < 1$) and some low-skill workers are bankers ($\alpha^L > 0$).

The intuition for Proposition 1 can be expressed as follows. Each worker who enters banking pays a fixed utility cost of $\Delta - \phi(r)$ relative to entering regulation. Net of this fixed utility cost, the ratio of the productivity of low- and high-skill workers in banking is $\frac{q_L - \frac{\Delta - \phi(r)}{p}}{q_H - \frac{\Delta - \phi(r)}{p}}$, compared to simply $\frac{q_L}{q_H}$ in regulation. The latter expression is the larger one when $\Delta > \phi(r)$, and so low-skill workers have a *comparative* advantage in regulation. This comparative advantage is a consequence of the intrinsic benefit; if instead $\Delta = \phi(r) = 0$, low-skill workers do not have a comparative advantage, since the ratio of productivities equals $\frac{q_L}{q_H}$ in both sectors.[11]

A simple numerical example may also help to illustrate Proposition 1. Suppose high-skill workers are twice as productive as low-skill workers, with $q_H = 2/3$ and $q_L = 1/3$; the payoff from a successful project is $p = 300$; and the net utility gain from regulatory work, $\Delta - \phi(r)$, is 50. In this case,

---

[10] Note that in any equilibrium with low-skill bankers, $X_B^L - (\Delta - \phi(r)) \geq 0$, since if instead $X_B^L - (\Delta - \phi(r)) < 0$, a regulatory agency could poach these workers and become infinitely productive.

[11] Delfgaauw and Dur (2010) study an economy with multiple worker types and observe that public-sector motivation essentially lowers the marginal cost of the inputs for the public sector. It then follows that at the social optimum, the marginal product in the public sector should be lower. In their model, this in turn implies that the return to skill is lower in the public sector, and hence the most talented workers should work in the private sector. Our paper complements Delfgaauw and Dur (2010) by describing a different mechanism that pushes the most talented workers into the private sector. In contrast to their paper, our mechanism does not rely on the marginal product being higher in the private sector. So in particular, even if regulatory agencies are underfunded, and the marginal product of regulatory resources is consequently high, our results still apply, and regulatory agencies are still best off using their limited resources to employ lower-skilled workers.

In a related paper, Delfgaauw and Dur (2008) study a model with three types of worker, which are private information to the worker: a benchmark type, a dedicated type who has a lower cost of effort in the public sector, and a lazy type who has a higher cost. Dedicated workers display a form of public-sector motivation. As in our model, and others, this implies that they can be paid less. If the public sector needs many workers, it hires a mix of dedicated and lazy workers, since the contract offered to lazy workers is not very tempting for dedicated workers, and so is not too distorting. This result has some overlap with Proposition 1; however, it does not predict that the best workers in the economy end up in the private sector, which is an important component of Proposition 1.

In addition, both papers are silent on incentive pay and human capital formation, two topics we explore in detail below.

expected compensation for the two types in banking is 200 and 100 respectively. In particular, the high-skill worker receives twice as much, reflecting his higher productivity. In contrast, a regulatory agency needs to pay expected compensation of at least 150 and 50 to attract each of the two types. Since high-skill workers must be paid three times as much as low-skill workers, but are only twice as productive, high-skill workers become regulators in equilibrium only when regulatory agencies exhaust the entire supply of low-skill workers and some budget remains. In equilibrium, the most intrinsically attractive job—here, regulation—ends up with the worst workers.

If some regulatory budget remains unused after the supply of low-skill workers is exhausted, regulatory agencies then hire high-skill workers. In this case, the compensation of high-skill regulators is determined by competition with the banking sector, so that high-skill workers are indifferent between the two jobs. In contrast, regulatory agencies bid up the compensation of low-skill workers until they have the same productivity per dollar of expected compensation as high-skill workers, but low-skill workers strictly prefer working in regulation to banking.

It is worth highlighting that although large intrinsic benefits (i.e., $\Delta > \phi(r)$) lead to an equilibrium allocation of less-skilled workers to regulation, it does *not* follow that regulatory agencies would wish to reduce the attractiveness of regulatory jobs by reducing Δ. Doing so would simply increase the compensation they have to offer workers, and reduce their productivity, as measured by the number of successful investigations per dollar of expected compensation. This observation generates a couple of immediate implications. First, to the extent that the outsourcing of regulatory tasks to private agencies reduces Δ, such outsourcing is a bad idea.[12] Second, a straightforward application of our results to purely private settings implies that private firms would gain from taking steps to cultivate some form of *esprit de corps*, corporate identity or sense of mission; indeed, many firms spend considerable resources on just such efforts. Our results imply that, to the extent to which such efforts succeed, the result is that firms employ less talented workers; but again, firms benefit from this, because such workers are cheaper.

In words, Proposition 1 states that the better job gets the worse workers. Here "better job" corresponds to the condition that $\Delta > \phi(r)$. A parallel statement holds for the opposite case: in any equilibrium in which banking is the better job, i.e., $\phi(r) > \Delta$, regulators are instead more skilled than bankers. Although it is not usually regarded as a "conventional" labor market, the allocation of talent between police forces and criminal organizations strikes us as a potential example of this situation. In this case, criminals produce no output other than

---

[12] Besley and Ghatak (2001) show that when investments are non-contractible, projects that the government cares more about than private parties should be left in the hands of the government. Our observation—that if outsourcing tasks away from the public sector reduces the extent to which workers care about these tasks, then such outsourcing is a bad idea—thus complements their analysis.

"misbehavior," and so $p = 0$. To the extent to which $\phi(r) > \Delta$ in this setting, our analysis then predicts that police officers are more skilled than the criminals they "oversee." More generally, although we focus on the regulation of financial markets, which has received a lot of attention in recent years, our model also applies to other enforcement situations. Thus, our paper should have implications for many other sectors of the economy, as long as monitoring and monitored organizations require somewhat similar aptitudes from their employees.

In equilibrium, the allocation of skilled workers is tilted towards the banking sector and, contrary to the popular view, a high-value banking sector and a resource-scarce regulatory sector are neither sufficient nor necessary conditions for this outcome. It is not necessary because in our model, bankers are more skilled than regulators even when regulatory budgets are large compared to profits in the banking sector (i.e., the public sector is wealthier than the private sector). It is not sufficient because—and as noted above—if instead the expected gain from misbehavior is larger than the intrinsic benefit Δ, then in equilibrium the most skilled workers become regulators.

For the remainder of the section we make the following assumption, which generates what we believe is the empirically relevant case for financial regulation.

Assumption 2. The intrinsic benefit of regulation exceeds the expected gain from misbehavior even with zero probability of punishment: $\Delta > \phi(0)$.

Assumption 2 ensures that $\Delta > \phi(r)$ and so any equilibrium is of the form of Proposition 1. Note that this assumption is stronger than we really need, since for most parameter configurations the equilibrium detection probability r is strictly positive in any equilibrium and the average gain from misbehavior is smaller than $\phi(0)$. Assumption 2 implies that, given the ex ante information available to workers *when they choose a career*, the value they expect to derive intrinsically from becoming regulators is greater than the expected utility they will derive from misbehaving as bankers. It is important to stress that Assumption 2 is completely consistent with a worker ex post encountering fraud opportunities with payoffs in excess of Δ. Next, we prove the existence of an equilibrium along the lines described in Proposition 1.

Proposition 2. At least one equilibrium exists.

The proof of equilibrium existence consists of conjecturing a number of bankers n, and then using Proposition 1 to construct a candidate equilibrium satisfying all equilibrium conditions except for budget-balancing for regulatory agencies. This gives a mapping, W, from a candidate number of bankers to a compensation bill for regulatory agencies. Any number of bankers n such that $W(n)$ matches the regulatory budget M constitutes an equilibrium. Recall that regulatory agencies hire high-skill workers only if some regulatory budget

remains unused after the supply of low-skill workers is exhausted. Clearly $W(1+\eta)=0$, since in this case all workers are bankers and so the regulator compensation bill is zero. At the opposite extreme, Assumption 1 guarantees that regulatory agencies do not have the resources to hire all workers, i.e., $W(n)>M$ as $n\to 0$. By the intermediate-value theorem, there exists at least one level of n such that the regulatory compensation bill $W(n)$ matches the budget M, and hence an equilibrium exists.[13]

Multiple equilibria are possible in our environment. When they exist, they can be ordered by the size of the banking sector. The small banking sector equilibrium has a relatively large number of regulators. Consequently, enforcement is effective, and bankers are largely deterred from misbehaving for private gain. This in turn reduces the attractiveness of banking employment, which in turn reduces the compensation that regulatory agencies must offer to attract workers, which is how the regulatory sector is able to afford to hire a relatively large number of workers. Conversely, the large banking sector equilibrium has a small number of regulators; consequently, enforcement is ineffective, and so many bankers misbehave and the attractiveness of banking sector employment is relatively high; in turn, regulatory agencies must offer generous compensation, and their budgets are quickly exhausted.[14]

The possibility of multiple equilibria implies that, when comparing different regulatory jurisdictions, one may observe very different levels of misbehavior even when fundamentals such as regulatory resources are similar. The possibility of equilibrium multiplicity also implies that small changes in regulatory resources or banking sector profitability may generate large changes in outcomes, since small changes can lead to the disappearance of equilibria.

It is worth noting that the source of multiplicity in our model is different from the congestion effects in enforcement that generate multiple equilibria in many enforcement papers (see related discussion at the end of Section 5). Moreover, multiple equilibria arise even though Assumption 2 closes down an additional source of potential multiplicity. In particular, if this assumption is weakened so that $\phi(0)>\Delta>\phi(1)$, then there is the possibility of multiple equilibria arising in which one equilibrium has many low-skill regulators who collectively produce reasonably effective regulatory outcomes, so that $\Delta>\phi(r)$; another equilibrium may also exist in which regulators are more skilled but so few in number that regulation is ineffective, and so $\phi(r)>\Delta$, which explains both why high-skill

---

[13] In a little more detail, W is a correspondence, but is single-valued everywhere except for $n=\eta$ (i.e., all high-skill workers are bankers and all low-skill workers are regulators). We handle this complication by making use of a result in Milgrom and Roberts (1994).

[14] Mathematically, the source of equilibrium multiplicity is that the correspondence W discussed above may be non-monotonic. The source of this non-monotonicity is that an increase in the number of bankers n, or equivalently a decrease in the number of regulators, has two offsetting effects. On the one hand, employing fewer regulators reduces regulatory agency expenditure. But on the other hand, employing fewer regulators means a lower probability r of a misbehaving banker being penalized, and this increases the required compensation of regulators.

workers are regulators, and why they are so expensive that a regulatory agency is only able to hire a small number of them.

2.1 Comparative statics
Comparative statics follow from the proof of equilibrium existence.

Corollary 1. As either the banking payoff p increases, or the total regulatory budget M decreases:

    (a) some workers switch from regulation to banking and it is the most skilled regulators who switch,

    (b) the probability that a given banker who misbehaves gets caught by regulators falls,

    (c) the aggregate amount of misbehavior increases.

If there are multiple equilibria, these statements are all true for the equilibria with the smallest and largest banking sectors. If there is complete segregation of types (i.e., the number of bankers exactly equals η) both before and after the change, all statements hold only weakly. In addition, (b) holds only weakly if the detection probability is 1.

When the regulatory budget shrinks, fewer workers can be employed by regulatory agencies. Alternatively, an improvement in the payoffs of banking projects leads to an increase in banker compensation for any conjectured number of bankers, and thus an increase in regulator compensation, resulting again in fewer regulators hired in equilibrium. Since in both cases the workers transferring from regulation to banking are either less skilled than the average initial bankers and/or more skilled than the average remaining regulators, the average skill of workers in both jobs weakly falls.

The equilibrium probability $r = G(R, N)$ that a misbehaving banker gets caught by regulators decreases for two reasons. First, the number of bankers N, who need to be monitored, increases. Second, workers are moving from the regulatory sector to the banking sector and these workers are weakly more skilled than the remaining regulators, leading to a decrease in the number of useful reports R. And unless the remaining regulators are still numerous enough to successfully monitor all bankers, an act of misbehavior is less likely to be detected than before, implying that the equilibrium level of misbehavior increases with the overall profitability of banking. Financial-sector booms, when p increases, or regulatory budget cuts, when M decreases, are then associated with periods of increased misbehavior.[15]

---

[15] These results are related to those in Povel, Singh, and Winton (2007) on the link between equilibrium misbehavior and business conditions. Their model focuses on firms soliciting capital from investors who can monitor the information that firm managers disclose. The overall profitability of the sector affects investors' beliefs about

2.2 Welfare analysis

Recall that we assumed that regulatory agencies maximize the number of useful reports, rather than some measure of social welfare. Nonetheless, and as we show in this subsection, equilibrium outcomes satisfy at least two different notions of social efficiency.

First, all equilibria lie on the feasible frontier of misbehavior-banking output combinations. This is readily established. Consider perturbing an equilibrium allocation of workers by switching a mass ε of high-skill bankers with a mass $\frac{q_H}{q_L}\varepsilon$ of low-skill regulators so that the aggregate output of the banking sector remains unchanged. (By Proposition 1, the opposite change of swapping low-skill bankers for high-skill regulators is impossible.) This switch also leaves the skill-adjusted mass of regulators, R, unchanged. However, the number of bankers, N, increases, resulting in a weakly lower probability of misbehavior detection, $G(R, N)$, and a strictly higher incidence of misbehavior in the economy.

Second, all equilibria also satisfy what we think is the relevant notion of Pareto efficiency. To show this, we start by observing that, under risk neutrality, asymmetric information has no effect on equilibrium outcomes. Indeed, note that asymmetric information played no role in the proof of Proposition 1. In contrast, asymmetric information will have an effect when we consider risk-averse workers in the next section. The reason asymmetric information has no equilibrium impact under risk neutrality is that it is always possible for an employer to offer a contract that only one type $i \in \{L, H\}$ accepts, without imposing any inefficiency. Formally:

Lemma 3. $\left(w_B^H, w_B^L, w_R^H, w_R^L, \alpha^H, \alpha^L, r\right)$ is an equilibrium if and only if there is an equilibrium of the full-information economy with the same allocation of workers and the same utility levels.

Our main result of this subsection resembles the first welfare theorem (i.e., that any decentralized equilibrium of our economy is Pareto efficient). Recall that, in establishing our results, we have imposed no restrictions on the total budget M of regulatory agencies (beyond the mild Assumption 1). Consequently, our equilibrium characterization holds regardless of whether society spends too much, or too little, on regulation. Accordingly, the appropriate notion of Pareto efficiency is *constrained* Pareto efficiency, where the planner is constrained to allocations in which payments to regulators sum to exactly M. Otherwise, the planner is able to freely allocate workers to be either bankers or regulators, after observing worker types,

---

the quantity of (bad) firms that might want to produce fraudulent information in hopes of being financed. The endogenous monitoring of firms by investors then affects whether or not firm managers commit fraud. Our results are instead driven by the labor market for financial workers. In our model, business conditions in the banking sector dictate the compensation that banks offer to potential employees. The better compensation banks offer, the harder it is for regulatory agencies to prevent skilled workers from leaving for the banking sector. As the number and average skill of regulators decrease, the quality of the monitoring also decreases, making the expected cost of misbehaving lower and misbehavior more prevalent in the banking sector.

and to stipulate any transfers to and from both workers and consumers (who are the victims of banker misbehavior).[16] Here, the planner cannot directly stipulate a level of banker misbehavior: instead, this is determined exactly as described above, and in particular, by the detection probability function G.

Finally, we make the following assumption about the social value of banking:

Assumption 3. The banking sector appropriates all surplus from successful investments (which equals p).

This assumption ensures that the size of the banking sector is not hardwired to be too large, or too small, and that any inefficiency we may uncover in the decentralized equilibrium results from the allocation of workers, the focus of this paper, rather than from the more obvious channel of distorted investment choices by banks. The main result of this subsection is then:

Proposition 3. Any decentralized equilibrium is constrained Pareto efficient.

Note that Proposition 3 is not an immediate consequence of the first welfare theorem because regulatory agencies have a fixed budget and do not maximize profits. Indeed, it holds even though the decentralized equilibrium entails banks imposing a negative externality on the ultimate victims of banker misbehavior, who do not participate in setting labor-market contracts.

In brief, the argument behind Proposition 3 is the following. Consider a decentralized equilibrium. Because, by Proposition 1, regulatory agencies employ the cheapest (i.e., low-skill) workers, a social planner's only option, given the fixed budget M, is to decrease the size of the regulatory sector and increase the size of the banking sector. But we know that, in equilibrium, banks cannot profitably expand, even when they do not internalize the social cost of banker misbehavior. Internalizing the cost of misbehavior only reinforces this observation, and implies that no increase in total social welfare is possible. Any allocation of workers that differs from the decentralized equilibrium either makes some workers worse off or implies more misbehavior by bankers.[17]

---

[16] We do not allow the social planner to stipulate ex ante lotteries in which a worker has some probability of being a banker and some probability of being a regulator. The reason is that lotteries would allow a planner to pay regulators in the lottery realization in which they become bankers, without these payments showing up in the regulatory budget.

[17] To highlight the fact that Proposition 3 is not an immediate consequence of the first welfare theorem, it is worth noting that it would *not* necessarily hold under the alternate parameter assumption that $\Delta < \phi(r)$. As discussed, under this alternate assumption, any decentralized equilibrium features low-skill workers as bankers and high-skill workers as regulators. Because regulatory agencies now employ the most expensive workers, a social planner could shrink the banking sector by replacing many low-skill bankers with a few of the high-skill workers currently in regulation. This switch is potentially socially beneficial because it reduces the number of bankers, and hence may reduce the amount of banker misbehavior.

3. Performance Pay

In this section, we analyze performance pay by relaxing the assumption that workers are risk-neutral. In particular, when workers are instead risk-averse, our model implies that regulators receive less performance pay than bankers, consistent with Henderson and Tung (2012). Moreover, we show that when banking payoffs increase, bonuses paid in the financial sector increase as well. In other words, financial-sector booms do not simply increase base pay, they also affect performance pay.

Given the absence of wealth effects (CARA preferences) and the fact that a banker decides whether to misbehave for gain z after learning that his project succeeded or failed, a banker misbehaves if and only if the gain z more than offsets the expected cost of the penalty $K(z)$, i.e.,

$$(1-r)u(z)+ru(z-K(z))>u(0). \tag{6}$$

By defining

$$\Phi(r)\equiv E_z\left[\min\left\{1,e^{-\gamma z}\left(1-r+re^{\gamma K(z)}\right)\right\}\right], \tag{7}$$

we can write a worker's utility from banking, $U^i\left(w_B^j\right)$, as:

$$U^i\left(w_B^j\right)=\left(q_i u\left(w_{BS}^j\right)+(1-q_i)u\left(w_{BF}^j\right)\right)\Phi(r). \tag{8}$$

Likewise, a worker's utility from regulation, $U^i\left(w_R^j\right)$, is:

$$U^i\left(w_R^j\right)=\left(q_i u\left(w_{RS}^j\right)+(1-q_i)u\left(w_{RF}^j\right)\right)e^{-\gamma\Delta}. \tag{9}$$

Because of the CARA utility assumption, the utility the worker extracts from his job can be written as the expected utility from consuming the chosen compensation contract times a multiplier that either adjusts for the extra benefits from misbehaving as a banker or from working as a regulator.

Just as in the risk-neutral setting, whenever the intrinsic benefit of working in regulation Δ is sufficiently large compared to the net payoff from the opportunity to misbehave, it is the least skilled workers who become regulators.

Proposition 4. In any equilibrium with $\Delta>-\frac{1}{\gamma}\ln\Phi(r)$, bankers are more skilled than regulators. Formally, there is no equilibrium in which $\Delta>-\frac{1}{\gamma}\ln\Phi(r)$, some high-skill workers are regulators ($\alpha^H<1$), and some low-skill workers are bankers ($\alpha^L>0$).

Proposition 4 is identical to Proposition 1, but for the risk-averse setting. As before, it would be straightforward to adapt the proof to establish the parallel result; if instead the average gain from misbehavior is larger, then in

equilibrium the most skilled workers become regulators. But for the remainder of the section, we assume:

Assumption 4. The intrinsic benefit of regulation exceeds the expected gain from misbehavior even with zero probability of punishment: $-e^{-\gamma\Delta} > E_z\left[-e^{-\gamma z}\right]$.

Assumption 4 is equivalent to $\Delta > -\frac{1}{\gamma}\ln\Phi(0)$, and hence ensures that $\Delta > -\frac{1}{\gamma}\ln\Phi(r)$ and so any equilibrium is of the form of Proposition 4. The reader should note, again, that Assumption 4 is stronger than what we really need, since for most parameter configurations the equilibrium detection probability r is strictly positive in any equilibrium.

We now derive a result that is specific to the risk-averse setting, namely that the unobservability of skill forces banks to offer compensation that is more sensitive to performance than that offered by regulatory agencies. Because workers are strictly risk-averse, by a standard argument any equilibrium must entail full-insurance for low-skill workers. Focusing on regulation contracts, suppose to the contrary that in equilibrium a low-skill worker is not fully insured (i.e., $w_{RS}^L \neq w_{RF}^L$). Then a regulatory agency could offer a new full-insurance contract, $\tilde{w}_{RS} = \tilde{w}_{RF} = q_L w_{RS}^L + (1-q_L)w_{RF}^L - \varepsilon$, where $\varepsilon > 0$. Provided ε is chosen sufficiently small, a low-skill worker strictly prefers this new contract to the equilibrium contract. Moreover, the contract strictly improves the regulatory agency's productivity when accepted by low-skill workers; and productivity is even higher if it is accepted by high-skill workers. But this contradicts the supposition that the original contract is part of an equilibrium. A parallel proof applies to banking contracts.

Given that low-skill workers are completely insured in equilibrium, high-skill workers cannot be—that is, high-skill workers must receive some degree of performance pay. For the case in which both high- and low-skill workers are bankers, this is again a standard argument, and is easy to see (other cases are dealt with in the Appendix): if high-skill workers were fully insured, they would receive exactly the same contract as low-skill workers working in the same sector, since otherwise all workers would opt for the more attractive of the two fixed-compensation contracts. But then profits would not be zero for both types of workers in banking.[18] Given the allocation of high-skill workers to banks, this implies:

Proposition 5. In any equilibrium, compensation for regulation jobs is safer than for banking jobs: either all regulators receive riskless compensation while some bankers do not, or all bankers receive performance-based compensation while some regulators do not.

---

[18] Moreover, performance pay in the high-skill banking contract w_B^H must take the form of more pay after success than failure. The opposite (and counterintuitive) case $w_{BS}^H < w_{BF}^H$ would violate the equilibrium condition, since combined with $U^H\left(w_B^H\right) \geq U^H\left(w_B^L\right)$ it would imply $U^L\left(w_B^H\right) > U^L\left(w_B^L\right)$.

Here, the safer compensation contracts for regulation jobs are a direct consequence of the equilibrium allocation of workers. When the intrinsic benefit of working in regulation exceeds the expected misbehavior gain, regulatory agencies employ workers who are not as skilled as those that banks employ. We also know that workers' risk aversion coupled with adverse selection ensures that low-skill workers receive safer compensation contracts. Consequently, compensation in regulation is, on average, safer than compensation in banking as regulators are, on average, less skilled than bankers, consistent with the description by Henderson and Tung (2012). Moreover, one could interpret this result more broadly and conclude that the safe compensation that arises endogenously in our model for the regulatory sector could take the form of superior long-run job security, also consistent with Henderson and Tung (2012).

This result is different from the mechanism suggested by Dixit (2002). In his case, some workers derive utility from exerting effort, and so need less performance pay. In our model, workers derive utility from being regulators, not from exerting effort, per se. Yet, regulators receive compensation that is less sensitive to performance than bankers because of a job selection mechanism. On average, regulators are less skilled than bankers. This result originates from the incentive compatibility condition for high-skill workers (bankers) and the risk aversion of low-skill workers (regulators).

An alternative explanation for the greater use of performance pay in banking could be that output in regulation is less observable (or more generally, less contractible) than output in banking. However, this ranking of output-observability across the two sectors is not at all obvious to us. Nonetheless, if regulatory output really was more difficult than banking output to accurately measure, then this would only reinforce our result.

Both Propositions 4 and 5 are predicated on an equilibrium actually existing. We show that this is indeed the case, and at the same time, derive comparative statics. We relegate most of the details to the Appendix. However, one point that is worth describing in more detail is the determination of the level of compensation for regulatory workers.

The level of a banker compensation is easy to describe—by Lemma 1, expected compensation simply equals the profit a banker is expected to generate for his employer. For the case in which the banking sector is relatively large, regulator compensation follows easily: only low-skill workers are employed by regulatory agencies, and their expected compensation is determined by the indifference condition with the contract for low-skill bankers, which is a simple contract offering guaranteed pay.

The case in which the banking sector is small, relative to the supply of high-skill workers, is a little more complicated. As before, the expected compensation of high-skill bankers is determined by the profits these workers produce. High-skill regulators must then earn an amount that makes them indifferent between working in regulation and banking. Finally, regulatory agencies bid up the

compensation of low-skill regulators to the point where regulatory agencies are equally satisfied hiring the two different skill levels (see the proof of Proposition 6 in the Appendix for full details).

Our formal result is that an equilibrium exists whenever the number of high-skill workers η is sufficiently low (as in Rothschild and Stiglitz 1976).[19]

Proposition 6.   Provided the ratio of high-skill to low-skill workers η is not too large, at least one equilibrium exists.

Moreover:

Corollary 2.   The comparative statics identified in Corollary 1 for the risk-neutral setting also hold in the risk-averse setting.

As before, an improvement in banking payoffs leads to an increase in banker compensation for any conjectured number of bankers, and hence to an increase in regulator compensation also. Moreover, because of the performance-pay implication of risk aversion, we are also able to analyze, as part of the proposition that follows, how performance pay responds to a financial boom.

Proposition 7.   As the banking payoff p increases, the bonus compensation, $w_{BS}^H - w_{BF}^H$, that high-skill bankers receive when their project is successful also increases in equilibrium.

When banking becomes more profitable and p increases, the zero-profit condition from Lemma 1 implies that bankers' expected compensation must also increase. In order to keep high-skill bankers' contracts unattractive to low-skill workers, the extra compensation high-skill bankers receive for having selected and monitored a successful project has to increase as well. Otherwise, the increase in expected compensation would all come from the base compensation w_{BF}^H and low-skill workers would then prefer a contract that targets high-skill workers, violating one of the incentive-compatibility restrictions from the equilibrium definition. Consistent with the earlier discussion, the relatively harder half of establishing Proposition 7 relates to the case in which the marginal worker has high skill, and the employment contracts in the two sectors interact in a more complicated way.

---

[19] The requirement that there are not too many high-skill workers is standard to the literature on competition under adverse selection: see, for example, Rothschild and Stiglitz (1976). In brief, the issue is that any candidate equilibrium entails different contracts for high- and low-skill workers, and the contracts for high-skill workers offer less than full insurance. So if most workers have high skill, the following deviation is profitable: offer a contract that reduces the expected compensation of high-skill workers, but in return, features full insurance. All workers accept this contract, and provided that there are enough high-skill workers, the increase in profits from these workers more than offsets the losses from low-skill workers. As discussed by, for example, Bolton and Dewatripont (2005), there is some dissatisfaction with this equilibrium non-existence result that arises when the high-skill type is numerous, and a number of authors have offered possible solutions; see Guerrieri, Shimer, and Wright (2010) for a recent example.

4. Human Capital Formation

So far we have assumed that workers enjoy an exogenous gain from working in regulation. In this section, we impose more structure and analyze a two-period overlapping generation (OLG) model in which the gains Δ from working in regulation stem from the accumulation of human capital. This corresponds to the notion that working at the SEC, for example, may enhance an individual's future career prospects, consistent with deHaan et al. (2012). It also relates to the broader idea in Che (1995, p. 379) that "[r]egulated firms need regulators' unique expertise to minimize the cost of complying with regulations." The human capital interpretation of Δ also has the added benefit of making our model applicable to non-regulatory contexts, such as credit-rating agencies, where one might be skeptical about the existence of direct utility benefits but where workers acquire human capital that later makes them attractive to rated firms (as argued by Cornaggia, Cornaggia, and Xia 2013). More generally, this extension highlights how our model can be extended to allow for time variations in the non-pecuniary benefits of occupying a given job, even if those variations are not due to the accumulation of human capital (e.g., Δ would decrease if young workers are more idealistic about public service than are old workers).

The dynamic model below generates low-skill young workers entering regulation, while high-skill young workers immediately become bankers. Some of the workers starting in regulation acquire human capital, and then move to banking when old. Our model thus predicts the existence of a "revolving door" leading from government to the private sector, consistent with empirical evidence from deHaan et al. (2012) that approximately a third of SEC lawyers leave to join the private sector; and moreover, that it is the relatively "tough" lawyers who leave.

As in Section 2, we assume that workers are risk-neutral. This greatly simplifies the algebra and allows us to focus on worker allocation issues at the cost of losing predictions about the sensitivity of pay to performance.

There are many ways in which working in regulation may add to a worker's human capital. For example, a worker might develop political connections, learn about regulators' practices, or acquire knowledge useful for later stages of his career. To capture human capital accumulation while preserving our convenient two-type model, we assume that all workers have some probability of being high-skill when old, and some probability of being low-skill when old. Working in regulation when young increases by θ (> 0) the probability of being high-skill when old. For now, we assume that a worker's skill levels when young and old are uncorrelated: all workers who start as bankers have a probability α of being high-skill when old, while all workers who start in regulation have a probability $\alpha + \theta$ of being high-skill when old. We return to this point in detail after we state our main result.

Switching occupations in mid-career (i.e., moving from regulation to banking, or vice versa) is costly. For example, the worker's productivity may be negatively impacted; some human capital may be lost; or the worker may

simply suffer some direct disutility from moving. The exact form of the cost is unimportant for our analysis, and so we assume simply that the worker bears a cost $c \geq 0$ from switching occupations in mid-career.

The gain from working in regulation when young, which we denote Δ_y, can thus be expressed as follows. Write V_i^R and V_i^B for the expected utility of an old worker with skill $i \in \{H, L\}$ who, *when young*, worked in regulation and banking respectively. (A worker's occupation when young has a direct effect on utility when old because of the switching cost c.) Hence:

$$\Delta_y = \theta \left(V_H^R - V_L^R \right) + \alpha \left(V_H^R - V_H^B \right) + (1 - \alpha) \left(V_L^R - V_L^B \right). \qquad (10)$$

That is, the effect of starting work as a regulator is a combination of the increased probability θ of being high-skill when old (the first term of (10)), capturing human capital accumulation; and the consequences of switching costs on a worker's occupation when old (the last two terms of (10)). Note that because old workers are at the end of their careers and do not benefit from human capital accumulation, they do not benefit from working in regulation, i.e., $\Delta_o = 0$.

Given our focus on human capital accumulation, our main purpose in this section is to show how an equilibrium with $\Delta_y > 0$ and with young workers entering both sectors (consistent with reality) easily emerges. We first conjecture that a banker's expected gain from misbehavior is dominated by human capital accumulation, i.e., $\Delta_y > \phi(r)$. Of course, this is an equilibrium relation; we show below how it arises.

By Lemma 1, competition among employers implies that there exists an s such that a worker of skill i earns $q_i s$ per period when employed in regulation, and $q_i p$ when employed in banking. The conjecture $\Delta_y > \phi(r)$ then has two immediate but significant implications. First, young regulators are less skilled than young bankers: this is just Proposition 1. Second, conditional on some young workers being bankers, it must be the case that $s < p$.

All old workers would therefore earn more as bankers: the gain, including the additional benefits from misbehavior as a banker, is $pq_i + \phi(r) - sq_i$ for a worker of skill i. Hence, no old worker would switch from banking to regulation, even if $c = 0$. With a positive switching cost c, some workers who started in regulation may prefer to remain there rather than switch to banking to earn a higher wage. For example, if c is high, no worker would ever switch jobs in mid-career, which contradicts the evidence on the existence of a revolving door. With a low c instead, old workers, who do not extract the non-pecuniary benefit Δ_y of working in regulation, would all work as bankers to collect p rather than s. This scenario would thus give rise to an extreme version of a revolving door with *all* workers who start in regulation switching to higher-paying banking jobs in mid-career. But the fact that high-skill old workers have a larger incentive to switch to banking than do low-skill workers also allows our model to yield a third, potentially more realistic scenario with:

$$pq_H + \phi(r) - sq_H \geq c \geq pq_L + \phi(r) - sq_L, \qquad (11)$$

in which old workers who started as regulators switch if they are high-skilled, but not if they are low-skilled.

Proposition 8. There exist parameter values such that there is an equilibrium in which some young workers start as regulators; and the subset of these workers who become high-skilled when old switch to banking.

The proposition shows that our dynamic model can generate a revolving door between regulation and banking, but it is only used by a fraction of the workers, that is, by the old high-skill workers who started their career in regulation. From the proof of this result, one can see that the key parameter conditions are that switching costs c are intermediate, and the benefits from banking misbehavior $\phi(\cdot)$ are small.

Recall that we assumed that a worker's skill level is uncorrelated over time: all workers who start as bankers have a probability α of being high-skill when old, while all workers who start in regulation have a probability $\alpha + \theta$ of being high-skill when old. It is however worth noting that a positive correlation of skill over time would actually reinforce our results relating to the allocation of low-skill workers to regulation, though at the cost of moving us away from the baseline model in which the benefit of working in regulation is independent of type.[20]

The analysis in this section highlights how the option to switch to banking later in one's career lowers the cost of hiring young regulators. Part of the intrinsic benefit Δ_y comes from the fact that workers who start their career in regulation can later switch to banking if offered more money. Recently, regulatory agencies and policy makers have discussed the idea of closing, at least partially, the revolving door between the regulatory sector and the financial industry. Our model suggests that closing the revolving door might have the unintended consequence of raising the cost of hiring young regulators, which could potentially lower the overall productivity for the regulatory sector.

In common with the existing economics literature, our discussion of the revolving door between public and private service is focused on movements from the public to the private sector (Che 1995; Bar-Isaac and Shapiro 2011; Blanes i Vidal, Draca, and Fons-Rosen 2012; deHaan et al. 2012; Cornaggia, Cornaggia, and Xia 2013). However, it is worth noting that our central assumption of public-sector motivation can also provide a very natural explanation of the other half of the revolving door, namely the movement from the private sector to the public sector. Although a full exploration of this idea is beyond the scope of the current paper, we briefly sketch the main idea.

---

[20] Assume now that workers who are high-skill when young have a higher probability, α_H say, of being high-skill when old. From expression (10), one can see that this assumption would result in Δ_y varying with the worker's type when young. The assumption that $\alpha_H > \alpha$ implies that high-skill young workers would benefit *less* from working in regulation than before. To see this, observe that (10) is decreasing in α by inequality (11).

In our earlier analysis, we deliberately abstracted from wealth effects in occupation choice, by using a combination of CARA preferences and specifying utility as $u(c+\Delta)$, so that public-sector motivation generates the same dollar-equivalent increase in utility for all workers. However, a natural extension of our model would be to allow for wealth effects, by, for example, specifying utility as $u(c)+\Delta$. Under this specification, the utility gain from public-sector employment has a higher dollar-value for wealthier workers. Consequently, workers who are successful and grow rich in the private sector may end their careers by moving to the public sector. This effect is related to the effect noted in dynamic contracting papers such Spear and Wang (2005) and Sannikov (2008), when an agent with utility that is additively separable in consumption and leisure may eventually grow too wealthy to incentivize effectively, and so "retirement" is optimal. Here, "retirement" takes the form of public-sector employment.[21]

5. Robustness

For transparency and analytical tractability, we have made the simplifying assumptions that there are just two skill levels and that workers are homogeneous with respect to the intrinsic benefit of working in regulation. The assumption of two skill levels is easily relaxed under either risk neutrality or full-observability of skill, and our results generalize exactly as one would expect, but generate no significant new insights: there is a cutoff skill-level above which workers are bankers, and below which they work for regulatory agencies. Our results admittedly rely on some substitutability between workers of different skill levels. Clearly if no such substitution is possible, then the skill mix in the two occupations is essentially technologically determined. For analytical convenience, we have assumed perfect substitutability, but this is not essential for our results.

The assumption of homogeneity of the intrinsic benefit is easily relaxed in the cases of risk neutrality or full-observability of skill. What matters then is the intrinsic benefit of the worker who is indifferent between the two occupations, and provided this "marginal-type" intrinsic benefit is positive, our results are qualitatively unchanged.[22] Economically, the intrinsic benefit of the marginal worker is positive whenever the number of workers in the economy who derive an intrinsic benefit from regulation exceeds the equilibrium number

---

[21] A multi-period model with risk-averse workers and observable worker skill would be relatively straightforward to analyze. (As noted in Lemma 3, the observability of skill does not affect outcomes when workers are risk-neutral.) However, a multi-period model with risk-averse workers and *unobservable* worker skill might generate the following countervailing effect: starting in regulation would be a negative signal, making promotion to banking more difficult. We leave a fuller exploration of this effect for future research.

[22] Generalizing our model in the case of risk aversion and asymmetric information about skill is considerably harder. In particular, establishing equilibrium existence for more than two skill levels becomes significantly harder; while dealing with two dimensions of unobserved type, i.e., both skill and intrinsic benefit, would introduce substantial extra complexity.

of regulators. When this condition is met, regulators have relatively low skill, as in the homogenous benefit case. Moreover, heterogeneity implies that, in equilibrium, most regulators strictly prefer their job to working in banking, since their intrinsic benefit exceeds that of the marginal type. A final point worth making in this regard is that a worker's intrinsic utility from regulation is likely to be negatively correlated with the same worker's net benefit from misbehaving as a banker. For example, a worker who values public service may well suffer disutility from misbehaving as a banker. Negative correlation of this type makes Assumption 2 more likely to hold.

One special but important case of heterogeneity in the intrinsic benefit is that in which regulators care about how many useful reports they produce. In other words, the intrinsic benefit may be partially output-dependent, instead of completely output-independent as we have previously assumed. If regulators place a value d on useful reports, the total intrinsic benefit of a worker of skill $i \in \{H, L\}$ is $\overline{\Delta} + q_i d$, where $\overline{\Delta}$ is the output-independent component. The next proposition shows that the addition of the output-dependent component $q_i d$ to the intrinsic benefit does not change the logic behind the model's central prediction. As long as $\overline{\Delta} > \phi(r)$ and $d \leq p$, regulatory agencies hire high-skill workers only after they have completely exhausted the supply of low-skill workers and some regulatory budget remains.

Proposition 9. Suppose $d \leq p$. Then in any equilibrium with $\overline{\Delta} > \phi(r)$, bankers are more skilled than regulators. Formally, there is no equilibrium in which some high-skill workers are regulators ($\alpha^H < 1$) and some low-skill workers are bankers ($\alpha^L > 0$).

Moreover, a similar argument implies that this result is also robust to the gains from misbehavior $\phi(r)$ being linearly dependant of a worker's skill q_i. Specifically, when the fixed benefit of regulation, $\overline{\Delta}$, is larger than the fixed component of gains from misbehavior, say $\overline{\phi(r)}$, regulators hire high-skill workers only after they have completely exhausted the supply of low-skill workers and some regulatory budget remains.

Our central result on the allocation of workers to occupations also holds when bankers do not extract the full surplus p in equilibrium. The proof of Proposition 1 makes use only of the property that the expected compensation in banking of a worker of skill i (i.e., X_B^i), net of the utility loss of being a banker satisfies:

$$\frac{X_B^H - (\Delta - \phi(r))}{X_B^L - (\Delta - \phi(r))} \geq \frac{q_H}{q_L}. \tag{12}$$

In particular, under Assumption 2 a sufficient condition for this inequality is that:

$$\frac{X_B^H}{X_B^L} \geq \frac{q_H}{q_L}. \tag{13}$$

In the case with full banking competition, where bankers receive all the surplus, $X_B^i = p q_i$, inequality (13) holds with equality. At the same time, inequality (12)

also holds under other labor market assumptions. For example, the sufficient condition (13) holds strictly if banks incur a fixed cost $a > 0$ from employing each banker, so that $X_B^i = pq_i - a$. It also holds if banker compensation is determined in a standard bargaining game, where the outside option of workers is proportional to their skill. In this case, $X_B^i + \phi(r) = \beta(pq_i + \phi(r)) + (1-\beta)O_i$, where $\beta \in [0,1]$ is a bargaining-power weight and O_i is the worker's non-banking outside option, and by assumption $O_H/O_L = q_H/q_L$. A potentially important determinant of banker compensation here could be the outside option to work as a regulator, which is however not proportional to skill. If both skill types are employed as regulators, then from Lemma 1, O_i takes the form $O_i = q_i s + \Delta$, for some s. Hence $X_B^i = (\beta p + (1-\beta)s)q_i + (1-\beta)(\Delta - \phi(r))$, so that (12) is satisfied, although (13) is not. Of course, there are also situations in which inequality (12) does not hold, and in these cases, the conclusion of Proposition 1 may no longer hold. A simple example is if banking compensation is determined by bargaining, and a worker's outside option $\bar{O}$ is independent of skill and is large enough, i.e., $X_B^i + \phi(r) = \beta(pq_i + \phi(r)) + (1-\beta)\bar{O}$, with $\bar{O} > (\Delta - \beta\phi(r))/(1-\beta)$.

Finally, in the benchmark specification of the misbehavior-detection function G, an individual banker's probability of being penalized for misbehavior is independent of how many other bankers are misbehaving. This property may not hold in practice. For example, an increase in aggregate misbehavior may attract regulator attention, increasing an individual banker's probability of being penalized. Alternatively, there may be "congestion" effects in the punishment of banker misbehavior, generating the opposite effect. However, it is possible to allow for effects of this type while satisfying the restrictions on G, as we next show.

Write ν for the fraction of the N bankers who misbehave. The probability of a penalty being imposed can be expressed as:

$$r = F(R, \nu N), \tag{14}$$

where we assume that F is continuous, and increasing in the skill-weighted number of regulators R. The sign of the derivative of F with respect to νN could be either positive (the "attention" effect), or negative (the "congestion" effect).

Given risk-neutral or CARA preferences, the probability that an individual banker misbehaves is determined solely by the penalty probability r, and we denote this probability by the (decreasing function) $f(r)$. The penalty probability is thus given by the solution to the fixed point problem:

$$r = F(R, f(r)N). \tag{15}$$

Note that N and R are effectively parameters of the fixed-point problem (15); hence one can write the solution to (15) as

$$r = G(R, N), \tag{16}$$

which coincides with our main specification of the model. Provided that the derivative of F with respect to νN is either positive or not too negative

(i.e., allowing either for "attention" or for mild "congestion" effects), then $r - F(R, Nf(r))$ is strictly increasing in r, and the equilibrium in the misbehavior game, where $r - F(R, Nf(r)) = 0$, is unique and the G function behaves as needed.[23]

6. Conclusion

We propose a labor market model in which workers with heterogenous ability levels can choose to work as bankers, investing in projects with risky payoffs, or as regulators, monitoring the behavior of bankers. The model allows us to shed light on the interactions between the financial labor market, the profitability of the financial sector, and its degree of misbehavior. Our model jointly endogenizes the occupational choice of workers and the compensation contracts offered in the two sectors. When the intrinsic benefit from working as a regulator (e.g., recognition for being a public servant) is greater than the ex ante benefit a banker can expect to extract through fraud or other types of misbehavior, bankers are, on average, more skilled than regulators and their compensation is more sensitive to performance. We show that when the financial sector booms, banks draw the best workers away from the regulatory sector and equilibrium misbehavior by bankers increases. In a dynamic extension of our model, young regulators accumulate human capital and the best ones switch to banking mid-career.

Our analysis provides insights for policy makers in the government and in financial regulatory agencies about competitive labor market forces at play. Our model shows that increasing the budget of regulatory agencies would not prevent a situation where bankers are, on average, more skilled than regulators. Allocating more resources to these regulatory agencies would allow them to increase the quantity of supervision they provide as they would hire away from banks some of their less skilled workers. These workers, when considering the compensation regulatory agencies need to pay them, would be the most productive workers to hire away from the banking sector and consequently the skill inequality between the regulatory sector and the banking sector would persist despite the larger regulatory budgets. Our model shows that regulatory agencies prioritizing the hiring of low-skill workers is socially efficient when the intrinsic benefits from working in regulation are large. It is, however, important to highlight that the intrinsic benefits that trigger this skill inequality improve the productivity of the regulatory sector, thanks to the resulting savings in labor costs, and regulatory agencies should not try to eliminate them. In that

---

[23] The complication that arises with severe congestion effects in the penalty probability is that there may be multiple equilibria in misbehavior, even taking as given a distribution of workers across occupations; that is, (15) may have multiple solutions. (Hence this is a different form of multiplicity from the one discussed in Section 2.) This equilibrium multiplicity is standard in the crime literature [see, e.g., Bond and Hagerty (2010) and the references therein]: a banker may misbehave if and only if many other bankers are misbehaving and his probability of being penalized is consequently low. With severe congestion effects, G could become discontinuous.

sense, our model also highlights that preventing regulators from switching to banking (i.e., closing the "revolving door") during their career would reduce the human capital benefits of starting a career in regulation, increase the cost of hiring young regulators, and potentially make the regulatory sector less productive.

The appropriate regulation of financial markets has long been a topic of considerable importance, in academia and in practice. This paper adds to the existing literature by analyzing which workers are best suited to work in financial regulation, both positively and normatively. It is worth noting that even though we have focused on financial regulation, our results on the allocation of talent and on the efficacy of enforcement potentially apply to other sectors of the economy where regulation and the primary activity being regulated require broadly similar knowledge and training. Regulation of offshore oil production is one obvious and important example. Our results that deal specifically with the allocation of talent across sectors can also be applied to non-regulatory settings; for example, they provide a simple and novel explanation of the popular wisdom: "He who can, does; he who cannot, teaches" (Shaw 1903).

Appendix

Proof of Lemma 1: To prove the statement about banker compensation, suppose to the contrary that an equilibrium exists in which banks extract strictly positive expected profits from a worker of type i. Let w_B^L and w_B^H be the equilibrium banking contracts.

There cannot be an equilibrium in which a bank expects strictly positive profits from both types, i.e., $\Pi^L\left(w_B^L\right) > 0$ and $\Pi^H\left(w_B^H\right) > 0$, since in this case a bank can profitably deviate by making both contracts slightly more attractive for workers and capturing the whole market. So the bank must make weakly negative profits from type $j \neq i$. (This includes the case in which all workers of type j are in regulation.)

Next, let $\tilde{w}_B^i$ be a single contract that strictly improves the utility of type i relative to w_B^i, but strictly worsens the utility of type j relative to w_B^i. Because the success probabilities differ, one can always construct such a contract, and moreover, can ensure that the profits $\Pi^i\left(\tilde{w}_B^i\right)$ are arbitrarily close to the profits $\Pi^i\left(w_B^i\right) > 0$. It is then a strictly profitable deviation for a bank to offer a single contract, $\tilde{w}_B^i$, in place of the menu of contracts, $\left\{w_B^H, w_B^L\right\}$, as follows. By construction, type i accepts the contract, and $\Pi^i\left(\tilde{w}_B^i\right) > 0$. Moreover, type j does not accept the contract, since in the conjectured equilibrium he is at most indifferent between selecting w_B^i and some other contract, which remains available; and $U^j\left(\tilde{w}_B^i\right) < U^j\left(w_B^i\right)$. The existence of a strictly profitable deviation contradicts the equilibrium definition, and establishes that banks extract zero profits from each type of worker employed in equilibrium.

The proof of the statement about regulator compensation is similar. Suppose an equilibrium exists in which regulatory agencies hire both types of workers but extract strictly higher productivity from type-i workers than type-j workers. Let w_R^H and w_R^L be the equilibrium regulator contracts. Let $\tilde{w}_R^i$ be a single contract that strictly improves the utility of type i relative to w_R^i, but strictly worsens the utility of type j relative to w_R^i; as above, because the success probabilities differ, one can always construct such a contract, and moreover, can do so such that $\rho^i(\tilde{w}_R^i)$ is arbitrarily close to $\rho^i(w_R^i)$. A regulatory agency could then strictly improve its productivity by deviating and offering the single contract, $\tilde{w}_R^i$, in place of the menu of contracts, $\left\{w_R^H, w_R^L\right\}$. This contradicts the equilibrium condition, and so establishes that in any equilibrium in which regulatory agencies employ both worker types, they extract the same productivity from both types, i.e., there exists s

such that:

$$\frac{1}{s} = \frac{q_H}{q_H w_{RS}^H + (1-q_H) w_{RF}^H} = \frac{q_L}{q_L w_{RS}^L + (1-q_L) w_{RF}^L}. \tag{A1}$$

This completes the proof. ∎

Proof of Lemma 2: Let α^L and α^H satisfy the condition stated in the lemma. For types $i \in \{H, L\}$ and occupations $j = \{B, R\}$, let w_j^i be the contract paying p after success and 0 after failure. It is straightforward to check that all the equilibrium conditions from Definition 1 are satisfied. ∎

Proof of Proposition 1: See paragraph that precedes proposition. ∎

Proof of Proposition 2: For each possible number of bankers $n \in (0, 1+\eta)$, we construct a candidate equilibrium that satisfies all the equilibrium conditions other than the regulatory budget constraint. We then calculate the regulatory sector's total compensation bill in each candidate equilibrium. Finally, we use a version of the intermediate-value theorem to show that at least one candidate equilibrium satisfies the regulatory budget constraint.

For each candidate number of bankers n, Proposition 1 determines the skill levels of all bankers and regulators (i.e., all bankers are high-skilled if $n \leq \eta$, all regulators are low-skilled if $n \geq \eta$). Given the allocation of workers, it is straightforward to compute the misbehavior detection probability r.

Candidate equilibrium for $n \in (0, \eta)$, when marginal worker has high skill. From Lemma 1, high-skill bankers receive expected compensation of $q_H p$. Since some high-skill workers are employed by regulatory agencies, the expected compensation of high-skill regulators is $q_H s$, where $s = p - \frac{\Delta - \phi(r)}{q_H}$, and hence (by Lemma 1) the expected compensation of low-skill regulators is $q_L s$. The bank and regulatory agency equilibrium conditions are satisfied since if either employer reduces compensation for workers of type i, it will lose type-i workers (for regulatory agencies this is a bad outcome since productivity is the same across the two worker types); and banks cannot profitably poach low-skill workers, since they would have to pay them an expected compensation of $q_L s + \Delta - \phi(r) > q_L p$. Finally, if the above expected compensations are delivered by the simple contracts $(w_{BS}^i, w_{BF}^i) = (p, 0)$ and $(w_{RS}^i, w_{RF}^i) = (s, 0)$ for types $i \in \{H, L\}$, the self-selection equilibrium condition is satisfied since, by construction, high-skill workers are indifferent, i.e., $q_H s + \Delta = q_H p + \phi(r)$, and low-skill workers strictly prefer the regulation contract given that $p > s$ by Assumption 2.

Candidate equilibrium for $n \in (\eta, 1+\eta)$, when marginal worker has low skill. From Lemma 1, high- and low-skill bankers receive expected compensation of $q_H p$ and $q_L p$ respectively. Since some low-skill workers are employed by regulatory agencies, the expected compensation of low-skill regulators is $q_L s$, where $s = p - \frac{\Delta - \phi(r)}{q_L}$. The bank and regulatory agency equilibrium conditions are satisfied since if either employer reduces compensation for workers of type i, it will lose type-i workers; and regulatory agencies cannot profitably poach high-skill workers, since they would have to pay them an expected compensation of $q_H p - (\Delta - \phi(r)) > q_H s$, meaning productivity is lower than that of existing regulators. Finally, if the above expected compensations are delivered by the simple contracts $(w_{BS}^i, w_{BF}^i) = (p, 0)$ and $(w_{RS}^i, w_{RF}^i) = (s, 0)$ for types $i \in \{H, L\}$, the self-selection equilibrium condition is satisfied since, by construction, low-skill workers are indifferent, $q_L s + \Delta = q_L p + \phi(r)$, and high-skill workers strictly prefer the banking contract given that $p > s$ by Assumption 2.

Candidate equilibrium for $n = \eta$, with complete separation of types. From Lemma 1, high-skill bankers receive expected compensation of $q_H p$. For low-skill regulators, any expected compensation:

$$q_L s \in \left[q_L \left(p - \frac{\Delta - \phi(r)}{q_L} \right), q_L \left(p - \frac{\Delta - \phi(r)}{q_H} \right) \right], \tag{A2}$$

is a candidate equilibrium outcome, as follows. The lower end of this interval is exactly the expected compensation that makes it impossible for banks to profitably poach low-skill regulators. Likewise, the upper end of the interval is exactly the expected compensation that prevents regulatory agencies to gain from replacing their low-skill workers with high-skill workers poached from banks. Finally, if the above expected compensations are delivered by the simple contracts $(w_{BS}^i, w_{BF}^i) = (p, 0)$ and $(w_{RS}^i, w_{RF}^i) = (s, 0)$ for types $i \in \{H, L\}$, the self-selection equilibrium condition is satisfied since high-skill workers do not become regulators and low-skill workers do not become bankers: $q_H p + \phi(r) \geq q_H s + \Delta$ and $q_L p + \phi(r) \leq q_L s + \Delta$.

Equilibrium existence. We next define functions $\bar{W}$ and $\underline{W}$ as follows. For any $n \in (0, \eta) \cup (\eta, 1 + \eta)$, define $\bar{W}(n) = \underline{W}(n)$ as the total regulatory compensation bill associated with the candidate equilibrium characterized above, i.e.,

$$\bar{W}(n) = \underline{W}(n) = \begin{cases} \left\{ ((\eta - n)q_H + q_L)\left(p - \frac{\Delta - \phi(r)}{q_H} \right) \right\} & \text{if } n \in (0, \eta) \\ \left\{ (1 + \eta - n)q_L \left(p - \frac{\Delta - \phi(r)}{q_L} \right) \right\} & \text{if } n \in (\eta, 1 + \eta) \end{cases} \tag{A3}$$

Define $\bar{W}(0) = \underline{W}(0) = \lim_{n \to 0} \bar{W}(n)$ and $\bar{W}(1+\eta) = \underline{W}(1+\eta) = \lim_{n \to 1+\eta} \bar{W}(n)$. Finally, define $\bar{W}$ and $\underline{W}$ at η by:

$$\bar{W}(\eta) = \lim_{n \nearrow \eta} \bar{W}(n), \tag{A4}$$

$$\underline{W}(\eta) = \lim_{n \searrow \eta} \underline{W}(n). \tag{A5}$$

Observe that, by Assumption 2, $\bar{W}(\eta) \geq \underline{W}(\eta)$.

For any constant $C > 0$, define the functions $\bar{\psi}$ and $\underline{\psi}$ by:

$$\bar{\psi}(n) = C\left(\bar{W}(n) - M \right) + n, \tag{A6}$$

$$\underline{\psi}(n) = C\left(\underline{W}(n) - M \right) + n. \tag{A7}$$

By Assumption 1, $\bar{W}(0) = \underline{W}(0) > M$. Moreover, $\bar{W}(1+\eta) = \underline{W}(1+\eta) = 0$. Consequently, it is possible to choose the constant $C > 0$ sufficiently small such that both $\underline{\psi}$ and $\bar{\psi}$ map the closed interval $[0, 1+\eta]$ into itself. Note that $\bar{\psi}(n) \geq \underline{\psi}(n)$ for all n. Define the correspondence $\psi(n) = \left[\underline{\psi}(n), \bar{\psi}(n) \right]$. By construction, ψ is continuous but for upward jumps in the sense of Milgrom and Roberts (1994). Hence by Corollary 2 of Milgrom and Roberts (1994), ψ has at least one fixed point.

Any fixed point of ψ is an equilibrium, as follows. Since $\bar{W}(0) = \underline{W}(0) > M$, and $\bar{W}(1+\eta) = \underline{W}(1+\eta) = 0$, all fixed points lie in the interior of $[0, 1+\eta]$. If a fixed point n lies strictly below (respectively, above) n, then $\bar{W}(n) = M$, and corresponds to an equilibrium in which the marginal worker has high (respectively, low) skill. If the $n = \eta$ is a fixed point, then $n \in [C(\underline{W}(n) - M) + n, C(\bar{W}(n) - M)]$, which is equivalent to $M \in \left[\underline{W}(n), \bar{W}(n) \right]$, which is equivalent to condition (A2) above. In this case, the fixed point corresponds to an equilibrium with complete separation of types. ∎

Proof of Corollary 1: The proof uses the machinery already in the proof of Proposition 2. The functions $\underline{\psi}(\cdot)$ and $\bar{\psi}(\cdot)$ defined there are strictly increasing in p and strictly decreasing in M. Hence by Corollary 2 of Milgrom and Roberts (1994), the size of the banking sector in the equilibria with the smallest and largest banking sectors are weakly increasing in p and weakly decreasing in M, establishing the first half of part (a).

The second half of part (a) is immediate from equilibrium characterization result Proposition 1. Part (b) follows from part (a): the number of bankers is larger, and the skill-weighted number of regulators is smaller. Part (c) then follows immediately from parts (a) and (b).

Finally, the statement that these relations are all strict for equilibria $n \neq \eta$ follows from the fact that both $\underline{\psi}(\cdot)$ and $\bar{\psi}(\cdot)$ are strictly increasing in p and strictly decreasing in M. ∎

Proof of Lemma 3: "Only if" is immediate from the fact that, given risk neutrality, both banks and regulatory agencies are able to offer contracts that are accepted by only one type, and deliver arbitrary utility to a worker without entailing any inefficiency. For the "if" part, note that Lemma 1 and Proposition 1 hold for full-information economies also. The fact that any equilibrium outcome of the full-information economy can also be supported as the equilibrium outcome of the asymmetric information economy then follows from the proof of Proposition 2. ∎

Proof of Proposition 3: Fix a decentralized equilibrium. Write r for the equilibrium detection probability, and n for the equilibrium number of bankers. By Lemma 1, there is an s such that worker type i gets $pq_i + \phi(r)$ as a banker and $sq_i + \Delta$ as a regulator. Observe that $s > 0$, since otherwise regulatory agencies could hire all workers without exhausting their budget M, which cannot be an equilibrium.

Suppose that, contrary to the claimed result, there exists a Pareto superior alternative allocation. Relative to the decentralized equilibrium, in the new allocation, ε_L and ε_H low- and high-skill workers are moved from banking to regulation; and δ_L and δ_H low- and high-skill workers are moved from regulation to banking. Arbitrary payments are allowed in the new allocation, subject to the constraint that total payments to regulators equal M.

Write A for the increase in utility experienced by the subset of workers who are regulators in the *new* allocation. By the supposition that the new allocation is Pareto superior, $A \geq 0$. In the new allocation, the combined utility of these workers is simply:

$$M + \left(1 + \eta - n - \sum_i \delta_i + \sum_i \varepsilon_i\right)\Delta. \tag{A8}$$

In the decentralized equilibrium, the ε_i workers of type i who were switched, for the alternative allocation, from banking to regulation received $pq_i + \phi(r)$, while the $1 + \eta - n - \sum_i \delta_i$ who are regulators in both the new and old allocations received a combined utility of:

$$M - \sum_i \delta_i s q_i + \left(1 + \eta - n - \sum_i \delta_i\right)\Delta. \tag{A9}$$

So:

$$A = M + \left(1 + \eta - n - \sum_i \delta_i + \sum_i \varepsilon_i\right)\Delta - \sum_i \varepsilon_i (pq_i + \phi(r))$$

$$- \left(M - \sum_i \delta_i s q_i + \left(1 + \eta - n - \sum_i \delta_i\right)\Delta\right), \tag{A10}$$

which simplifies to:

$$A = \sum_i \delta_i s q_i - \sum_i \varepsilon_i (pq_i + \phi(r) - \Delta). \tag{A11}$$

Observe that $\varepsilon_i > 0$ is possible only if the decentralized equilibrium featured type-i workers in banking; but in this case, $pq_i + \phi(r) \geq \Delta + sq_i$, since otherwise a regulatory agency could strictly increase its number of useful reports by deviating and offering a contract that would attract these workers away from banking. Consequently, $\sum_i \delta_i s q_i - \sum_i \varepsilon_i s q_i \geq A \geq 0$, and since $s > 0$, this implies that the number of useful reports must be lower in the new allocation, i.e.,

$$(\varepsilon_H - \delta_H)q_H + (\varepsilon_L - \delta_L)q_L \leq 0. \tag{A12}$$

In the decentralized equilibrium, either all low-skill workers are in regulation, or all high-skill workers are in banking. Consequently, either $\varepsilon_L = 0$ or $\delta_H = 0$, and so inequality (A12) implies that the new allocation has more bankers, $\sum_i \varepsilon_i - \sum_i \delta_i \leq 0$.

Write $n' = n - \sum_i (\varepsilon_i - \delta_i)$ for the number of bankers in the new allocation, and r' for the misbehavior detection probability in the new allocation. As noted, the new allocation has more bankers, $n' \geq n$; and since there are more bankers and fewer useful reports, the new detection rate is lower, $r' \leq r$, given the properties of G.

Recall that $\kappa(Q)$ is the net total social cost of misbehavior (i.e., the social harm of misbehavior and the social cost of penalties imposed on bankers net of the gains experienced by bankers) given the aggregate quantity of banker misbehavior Q. We use $Q(n,r)$ to emphasize that aggregate misbehavior depends on the number of bankers, n, and the misbehavior detection probability, r; and in particular, aggregate misbehavior and its social cost are higher in the new allocation: $\kappa(Q(n',r')) \geq \kappa(Q(n,r))$.

Consider the sum of all utilities in the economy. In the decentralized equilibrium this is:

$$\left(\eta \alpha^H q_H + \alpha^L q_L \right) p + M + (1 + \eta - n) \Delta - \kappa(Q(n,r)), \tag{A13}$$

where the first term is monetary payments to bankers, the second term is monetary payments to regulators, the third term is the total intrinsic utility received by regulators, and the fourth term is the deadweight cost of banker misbehavior. (This expression is written under the assumption that the punishment $K(z)$ consists of a transfer payment like a fine. Assuming instead that the punishment has a deadweight cost would only strengthen our result.) So the sum of utilities in the new allocation is:

$$\left(\eta \alpha^H q_H + \alpha^L q_L + \sum_i (\delta_i - \varepsilon_i) q_i \right) p + M + \left(1 + \eta - n' \right) \Delta - \kappa(Q(n',r'))$$

$$= \left(\eta \alpha^H q_H + \alpha^L q_L \right) p + M + (1 + \eta - n) \Delta + \sum_i (\delta_i - \varepsilon_i)(p q_i - \Delta) - \kappa(Q(n',r')). \tag{A14}$$

Hence the change in the sum of utilities is:

$$\sum_i (\delta_i - \varepsilon_i)(p q_i - \Delta) - \left(\kappa(Q(n',r')) - \kappa(Q(n,r)) \right)$$

$$= A + \sum_i \delta_i (p q_i - \Delta - s q_i) + \sum_i \varepsilon_i \phi(r) - \left(\kappa(Q(n',r')) - \kappa(Q(n,r)) \right), \tag{A15}$$

where the equality follows from (A11).

Observe that $\delta_i > 0$ is possible only if the decentralized equilibrium featured type-i workers in regulation, but in this case, $p q_i + \phi(r) \leq \Delta + s q_i$, since otherwise a bank could make strictly positive profits by deviating and offering a contract that would attract these workers away from regulation. So the change in the sum of utilities is bounded above by:

$$A + \sum_i (\varepsilon_i - \delta_i) \phi(r) - \left(\kappa(Q(n',r')) - \kappa(Q(n,r)) \right). \tag{A16}$$

From above, $\sum_i (\varepsilon_i - \delta_i) \leq 0$ and $\kappa(Q(n',r')) \geq \kappa(Q(n,r))$. Consequently, the change in the sum of utilities is smaller than the utility gain experienced by regulators in the *new* allocation, A. Therefore, the sum of utilities for workers who are not regulators in the new allocation is lower than in the decentralized equilibrium, and is strictly so whenever the (new allocation) regulators are strictly better off (i.e., $A > 0$) in the new allocation. But this contradicts the supposition that the new allocation is a Pareto improvement, completing the proof. ∎

Proof of Proposition 4: Suppose to the contrary that such an equilibrium exists. Consider first the deviation in which a bank offers the contract $(\tilde{w}_{BS}, \tilde{w}_{BF}) = \left(w_{RS}^H + \tau + \varepsilon_S, w_{RF}^H + \tau - \varepsilon_F \right)$, where τ is such that, if $\varepsilon_S = \varepsilon_F = 0$, the new contract gives *any* worker exactly the same utility as the

regulator contract $\left(w_{RS}^{H}, w_{RF}^{H}\right)$ gives, i.e., $u(w+\tau)\Phi(r)=u(w+\Delta)$ for all w. (The existence of such a contract follows from CARA preferences.) Hence τ satisfies:

$$\Delta - \tau = -\frac{1}{\gamma}\ln\Phi(r). \tag{A17}$$

For use below, note that, from the condition stated in the proposition, $\tau > 0$: in words, if offered the same compensation, workers prefer regulation to banking, and so a bank must raise compensation by τ above that of a regulatory agency if it is to offer the same utility. Choose ε_S and ε_F such that the new contract offers strictly more utility to high-skill workers but strictly less utility to low-skill workers than the regulator contract $\left(w_{RS}^{H}, w_{RF}^{H}\right)$. Consequently, high-skill workers in regulation will accept this contract, while no low-skill workers will accept this contract since it is strictly worse than a contract they already reject.

By supposition, the original set of contracts is an equilibrium, and so any deviation of the type just described must deliver weakly negative profits for the bank offering it, i.e., $q_H \tilde{w}_{BS} + (1-q_H)\tilde{w}_{BF} \geq q_H p$. If that was not the case, the original set of contracts could not be part of an equilibrium. It follows that:

$$q_H w_{RS}^{H} + (1-q_H)w_{RF}^{H} + \tau \geq q_H p. \tag{A18}$$

Next, consider a deviation by a regulatory agency to $(\tilde{w}_{RS}, \tilde{w}_{RF}) = \left(w_{BS}^{L} - \tau - \varepsilon_S', w_{BF}^{L} - \tau + \varepsilon_F'\right)$, where τ is defined in equation (A17) above. Given CARA utility, $u(w)\Phi(r) = u(w - \tau + \Delta)$ for all w. Consequently, when $\varepsilon_S' = \varepsilon_F' = 0$, the new contract offers exactly the same utility as the bank contract $\left(w_{BS}^{L}, w_{BF}^{L}\right)$. Let ε_S' and ε_F' be such that the new contract offers strictly more utility to low-skill workers but strictly less utility to high-skill workers than the banker contract $\left(w_{BS}^{L}, w_{BF}^{L}\right)$. Consequently, low-skill workers working in banking will accept this contract, while no high-skill worker will accept this contract, since it is strictly worse than a contract they already reject.

The productivity per dollar of this deviation contract is $\frac{q_L}{q_L \tilde{w}_{RS} + (1-q_L)\tilde{w}_{RF}}$. By setting ε_S' and ε_F' small, this can be made arbitrarily close to:

$$\frac{q_L}{q_L w_{BS}^{L} + (1-q_L)w_{BF}^{L} - \tau}. \tag{A19}$$

By supposition $\left(w_{BS}^{L}, w_{BF}^{L}\right)$ is an equilibrium contract, and since $\alpha^L > 0$, is accepted by some low-skill workers. So the zero-profit condition for banks implies that the ratio (A19) equals $\frac{q_L}{q_L p - \tau}$, which since $\tau > 0$ is strictly greater than $\frac{q_H}{q_H p - \tau}$, which by (A18) is weakly greater than $\frac{q_H}{q_H w_{RS}^{H} + (1-q_H)w_{RF}^{H}}$, the productivity of the equilibrium contract for high-skill regulators, $\left(w_{RS}^{H}, w_{RF}^{H}\right)$. Hence there exists a deviation that strictly raises the regulatory agency's productivity, contradicting the supposition that the original set of contracts was an equilibrium, and completing the proof. ∎

Proof of Proposition 5: The main text deals with the cases in which both types of worker are employed by banks. Here, we consider the case in which only high-skill workers are employed by banks. From the main text, low-skill regulators have fixed compensation, i.e., $w_{RS}^{L} = w_{RF}^{L} = w_{R}^{L}$, and high-skill regulators (if they exist) receive performance pay. Here, we show that high-skill bankers receive performance pay, i.e., $w_{BS}^{H} > w_{BF}^{H}$.

First, observe that if $w_{BS}^{H} < w_{BF}^{H}$, then the equilibrium condition $U^H\left(w_B^H\right) \geq U^H\left(w_R^L\right)$ implies that low-skill workers strictly prefer w_B^H to w_R^L, a contradiction.

Second, $w_{BS}^{H} = w_{BF}^{H}$ is also impossible, as follows. Suppose to the contrary that $w_{BS}^{H} = w_{BF}^{H} = w_B^H$. So for both worker types $i \in \{H, L\}$, $U^i\left(w_B^H\right) = u\left(w_B^H\right)\Phi(r)$ and $U^i\left(w_R^L\right) = u\left(w_R^L\right)e^{-\gamma\Delta}$. Since these utilities are independent of a worker's type, they must equal one another, because otherwise the contracts w_B^H and w_R^L cannot coexist in equilibrium. But then a regulatory agency could strictly

increase its productivity by offering fixed compensation just above w_R^L and attracting both types of worker. ∎

Proof of Proposition 6: The structure of the proof is similar to that of Proposition 2. For each $n \in (0, 1+\eta)$, we construct a candidate equilibrium. We also show that, for any $n \neq \eta$, the candidate equilibrium is unique; this matters for comparative statics, though not for equilibrium existence. We then calculate the regulatory sector's total compensation bill for each possible number of bankers n. Finally, we use a version of the intermediate-value theorem to show that at least one candidate equilibrium exists. The only equilibrium condition we then need to check is that there is no "pooling" deviation in which an employer offers an alternate contract that attracts *both* types of workers, as in Rothschild and Stiglitz (1976). We start by considering, in turn, the cases $n \in (0, \eta)$ and $n \in (\eta, 1+\eta)$.

Candidate equilibrium for $n \in (0, \eta)$, when marginal worker has high skill. When the number of bankers $n < \eta$, all bankers have high skill. So the contracts accepted in equilibrium are w_R^L, w_R^H, and w_B^H. From Proposition 5, $w_{RS}^L = w_{RF}^L$, $w_{RS}^H > w_{RF}^H$, and $w_{BS}^H > w_{BF}^H$. From Lemma 1, $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$ and $\Pi^H\left(w_B^H\right) = 0$. Any equilibrium must have $U^H\left(w_B^H\right) = U^H\left(w_R^H\right)$, since the marginal worker has high skill. Moreover, $U^L\left(w_B^H\right) = U^L\left(w_R^H\right) = U^L\left(w_R^L\right)$, as follows. Suppose instead that $U^L\left(w_j^H\right) > U^L\left(w_R^L\right)$ for either $j = B$ or $j = R$. Then an employer of type j could deviate and offer a contract that is slightly less performance sensitive than w_j^H but that promises the same expected utility to high-skill workers. Such contract would still be accepted by high-skill workers, while still separating them from the low-skill workers, and it would cost the employer strictly less than the existing contract w_j^H.

We next explicitly solve for the fixed wage w_R^L. Note that $U^i\left(w_B^H\right) = U^i\left(w_R^H\right)$ for both worker types $i \in \{H, L\}$. Expanding, for $i \in \{H, L\}$

$$q_i\left(u\left(w_{RS}^H\right)e^{-\gamma\Delta} - u\left(w_{BS}^H\right)\Phi(r)\right) + (1-q_i)\left(u\left(w_{RF}^H\right)e^{-\gamma\Delta} - u\left(w_{BF}^H\right)\Phi(r)\right) = 0. \quad \text{(A20)}$$

Since $q_H \neq q_L$, it follows that for outcomes $\chi \in \{S, F\}$, $u\left(w_{R\chi}^H\right)e^{-\gamma\Delta} = u\left(w_{B\chi}^H\right)\Phi(r)$, or equivalently (given CARA preferences), $w_{R\chi}^H + \Delta = w_{B\chi}^H - \frac{1}{\gamma}\ln\Phi(r)$. Given $\Pi^H\left(w_B^H\right) = 0$, we then have:

$$q_H w_{RS}^H + (1-q_H)w_{RF}^H = q_H w_{BS}^H + (1-q_H)w_{BF}^H - \left(\Delta + \frac{1}{\gamma}\ln\Phi(r)\right) = q_H p - \left(\Delta + \frac{1}{\gamma}\ln\Phi(r)\right). \quad \text{(A21)}$$

The constraint $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$ can then be rewritten as:

$$\frac{q_L}{w_R^L} = \frac{q_H}{q_H p - \left(\Delta + \frac{1}{\gamma}\ln\Phi(r)\right)}, \quad \text{(A22)}$$

and so

$$w_R^L = q_L p - \frac{q_L}{q_H}\left(\Delta + \frac{1}{\gamma}\ln\Phi(r)\right). \quad \text{(A23)}$$

The contract w_B^H is then determined by the (unique) solution to $\Pi^H\left(w_B^H\right) = 0$ and $U^L\left(w_R^L\right) = U^L\left(w_B^H\right)$ such that $w_{BS}^H > w_{BF}^H$. The contract w_R^H is then given by $w_{R\chi}^H = w_{B\chi}^H - \left(\Delta + \frac{1}{\gamma}\ln\Phi(r)\right)$ for $\chi \in \{S, F\}$.

Note that a bank would have to pay at least $w_R^L + \Delta + \frac{1}{\gamma}\ln\Phi(r)$ to poach a low-skill worker from a regulatory agency, which is unprofitable, since this amount exceeds $q_L p$. Consequently, we have satisfied all the equilibrium conditions except budget balancing for the regulatory agency and deviations designed to attract both worker types; we check these conditions

below. But note for now that the total compensation bill of the regulatory sector is given by $(\eta - n)\left(q_H w_{RS}^H + (1 - q_H) w_{RF}^H\right) + w_R^L$.

Candidate equilibrium for $n \in (\eta, 1 + \eta)$, when marginal worker has low skill. When the number of bankers $n > \eta$, all regulators have low skill. So the contracts accepted in equilibrium are w_R^L, w_B^L, and w_B^H. From Proposition 5, $w_{RS}^L = w_{RF}^L$, $w_{BS}^L = w_{BF}^L$, and $w_{BS}^H > w_{BF}^H$. From Lemma 1, $\Pi^H\left(w_B^H\right) = \Pi^L\left(w_B^L\right) = 0$, and so in particular $w_B^L = q_L p$. Any equilibrium must have $U^L\left(w_R^L\right) = U^L\left(w_B^L\right)$, which implies $w_R^L = w_B^L - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)$. By the same argument as in the case $n \in (0, \eta)$, $U^L\left(w_B^H\right) = U^L\left(w_B^L\right)$.

Note that a regulatory agency would have to pay at least $q_H w_{BS}^H + (1 - q_H) w_{BF}^H - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right) = q_H p - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)$ to poach a high-skill worker from a bank. This would give a productivity of $\dfrac{q_H}{q_H p - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)} < \dfrac{q_L}{q_L p - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)}$, which is the productivity the regulatory agency obtains from its existing low-skill workers. Consequently, we have satisfied all the equilibrium conditions except budget balancing for the regulatory agency and deviations designed to attract both worker types; we check these conditions below. The total compensation bill of the regulatory sector is given by $(1 + \eta - n) w_{RS}^L$.

Candidate equilibrium for $n = \eta$, with complete separation of types. When the number of bankers is $n = \eta$, all bankers have high skill and all regulators have low skill. So the contracts accepted in equilibrium are w_R^L and w_B^H. Any equilibrium must have $w_{RS}^L = w_{RF}^L$ and $\Pi^H\left(w_B^H\right) = 0$. From Proposition 5, $w_{BS}^H > w_{BF}^H$, and by the same argument as in the case $n \in (0, \eta)$, $U^L\left(w_B^H\right) = U^L\left(w_R^L\right)$. The main complication in this case is that we have just three equations to determine four contract terms. Consequently, there is indeterminancy in the candidate equilibrium.

Define $\bar{w}_R^L = q_L p - \frac{q_L}{q_H}\left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)$ and $\underline{w}_R^L = q_L p - \left(\Delta + \frac{1}{\gamma} \ln \Phi(r)\right)$. (Note that $\bar{w}_R^L$ and $\underline{w}_R^L$ are the limiting values of w_R^L as n approaches η from below and above, respectively.)

Observe that a bank can profitably poach a low-skill regulator if and only if $w_R^L < \underline{w}_R^L$. Similarly, the expected compensation necessary for a regulatory agency to poach a high-skill banker is $\frac{q_H}{q_L} \bar{w}_R^L$, and so a regulatory agency can increase productivity by poaching a high-skill banker if and only if $w_R^L > \bar{w}_R^L$.

It follows that when $n = \eta$, the set of candidate equilibria is given by any $w_R^L \in \left[\underline{w}_R^L, \bar{w}_R^L\right]$, together with $\Pi^H\left(w_B^H\right) = 0$, $U^L\left(w_R^L\right) = U^L\left(w_B^H\right)$, and $w_{BS}^H > w_{BF}^H$. The regulatory agency compensation bill lies in the interval $\left[\underline{w}_R^L, \bar{w}_R^L\right]$.

Equilibrium existence. By exactly the same arguments as in the proof of Proposition 2, there exists n such that the candidate equilibrium constructed above for that n has a total regulatory compensation bill of M. The associated contracts constitute a candidate equilibrium in which no bank or regulatory agency can profitably deviate by offering a contract that is accepted by just one type. It remains to check that there is no profitable deviation involving a contract that is accepted by both types. The most profitable deviation of this type entails a full-insurance contract, since workers are strictly risk-averse. It is straightforward to show that high-skill workers strictly prefer their contracts to the low-skill worker contracts in the candidate equilibrium. So the deviation must entail a discrete increase in the utility of low-skill workers. So the deviation results in losses from the low-skill workers who accept it. Provided the fraction of high-skill workers η is sufficiently small, it follows that the deviation is unprofitable. ∎

Proof of Corollary 2: Identical to the proof of Corollary 1. ∎

Proof of Proposition 7: We use $B \equiv w_{BS}^H - w_{BF}^H > 0$ to denote the high-skill banker's performance bonus. The high-skill banker is paid w_{BF}^H with probability $1 - q_H$ and $w_{BF}^H + B$ with probability q_H. We know expected compensation must equal expected profits, and so $w_{BF}^H + q_H B = q_H p$, or equivalently,

$$w_{BF}^H = q_H(p - B). \tag{A24}$$

Now, consider an improvement in the success payoff of banking projects (i.e., $dp > 0$). From Corollary 2, the equilibrium misbehavior detection probability falls, i.e., $dr < 0$. We will establish $dB > 0$.

If $n \in (0, \eta)$ and the marginal worker has high skill, w_{BF}^H and B are determined by (A24) together with the low-skill worker indifference condition:

$$(1 - q_L) u\left(w_{BF}^H\right) + q_L u\left(w_{BF}^H + B\right) = u\left(w_R^L\right) \frac{e^{-\gamma \Delta}}{\Phi(r)}, \tag{A25}$$

where w_R^L is given by equation (A23) in the proof of Proposition 6. Substituting in (A24) and rewriting the righthand side yields:

$$(1 - q_L) u(q_H(p - B)) + q_L u(q_H p + (1 - q_H)B) = u\left(w_R^L + \Delta + \frac{1}{\gamma} \ln \Phi(r)\right). \tag{A26}$$

Substituting in for w_R^L, the change dp and associated changes dB and dr must satisfy:

$$q_H (1 - q_L) u'\left(w_{BF}^H\right)(dp - dB) + q_L u'\left(w_{BF}^H + B\right)(q_H dp + (1 - q_H) dB)$$

$$= u'\left(w_R^L + \Delta + \frac{1}{\gamma} \ln \Phi(r)\right)\left(q_L dp + \left(1 - \frac{q_L}{q_H}\right) \frac{1}{\gamma} \frac{\Phi'(r)}{\Phi(r)} dr\right). \tag{A27}$$

Given CARA preferences, we know $(1 - q_L) u'\left(w_{BF}^H\right) + q_L u'\left(w_{BF}^H + B\right) = u'\left(w_R^L + \Delta + \frac{1}{\gamma} \ln \Phi(r)\right)$. Given $q_H > q_L$, $\Phi'(r) \geq 0$, $dp > 0$ and $dr < 0$, it follows that:

$$\left(-q_H(1 - q_L) u'\left(w_{BF}^H\right) + q_L(1 - q_H) u'\left(w_{BF}^H + B\right)\right) dB < 0. \tag{A28}$$

Finally, since $q_L(1 - q_H) < q_H(1 - q_L)$ and $u'\left(w_{BF}^H + B\right) < u'\left(w_{BF}^H\right)$, we obtain $dB > 0$.

If instead $n \in (\eta, 1 + \eta)$ and the marginal worker has low skill, w_{BF}^H and B are determined by (A24), together with the low-skill worker indifference condition:

$$(1 - q_L) u\left(w_{BF}^H\right) + q_L u\left(w_{BF}^H + B\right) = u(q_L p). \tag{A29}$$

The implication $dB > 0$ then follows by essentially the same argument as before (in fact, the argument is slightly simpler, since the indifference condition is simpler).

Finally, if $n = \eta$, we know from the proof of Proposition 6 that w_{BF}^H and B are determined by (A24) together with the low-skill worker indifference condition:

$$(1 - q_L) u\left(w_{BF}^H\right) + q_L u\left(w_{BF}^H + B\right) = u\left(w_R^L\right) \frac{e^{-\gamma \Delta}}{\Phi(r)}$$

$$= u\left(w_R^L + \Delta + \frac{1}{\gamma} \ln \Phi(r)\right), \tag{A30}$$

where $w_R^L = M$. The implication $dB > 0$ again follows by essentially the same argument as before (again, the argument is actually simpler than in the case $n < \eta$, since w_R^L remains unchanged as it still needs to equal M). ∎

Proof of Proposition 8: Fix all parameters other than c, the distribution function of z, and the penalty function K. Choose c such that $\frac{\theta p(q_H - q_L) - (\alpha + \theta)c}{1 + \frac{q_L}{q_H}(1 - \alpha - \theta)} > c$ and $c > \frac{\theta p(q_H - q_L) - (\alpha + \theta)c}{1 + (1 - \alpha - \theta)}$. Given any $\tilde{q} \in [q_L, q_H]$, let:

$$\Delta_y = \frac{\theta p(q_H - q_L) - (\alpha + \theta)c - (1 - \alpha - \theta)\left(1 - \frac{q_L}{\tilde{q}}\right)\phi(r)}{1 + \frac{q_L}{\tilde{q}}(1 - \alpha - \theta)}, \tag{A31}$$

and

$$s = p - \frac{\Delta_y - \phi(r)}{\tilde{q}}. \tag{A32}$$

Consider first the case in which bankers cannot profit from misbehavior, i.e., $\phi \equiv 0$. Given the choice of c, condition (11) is satisfied, regardless of the value of $\tilde{q} \in [q_L, q_H]$. Since (11) is satisfied, and

$s < p$, we have $V_H^R = pq_H + \phi(r) - c$, $V_L^R = sq_L$, $V_H^B = pq_H + \phi(r)$, and $V_L^B = pq_L + \phi(r)$. Substituting into (10) delivers (A31). Hence for these parameter values, there is an equilibrium in which some young workers become regulators when young; the subset of these workers who are highly skilled when old switch to banking; and workers who start as bankers remain as bankers when old. In this equilibrium, the expected one-period compensation of a regulator with skill q_i is sq_i, where s is as in (A32).

By continuity, a qualitatively identical equilibrium exists when banker gains from misbehavior are strictly positive but small. ∎

Proof of Proposition 9: This proof closely follows the logic of the proof for Proposition 1. Suppose that low-skill bankers and high-skill regulators coexist in equilibrium. The regulatory agency's productivity from a high-skill worker is now at most $\frac{q_H}{q_H(p-d)-(\overline{\Delta}-\phi(r))}$ and the regulatory agency could instead poach low-skill bankers who would give a productivity of $\frac{q_L}{q_L(p-d)-(\overline{\Delta}-\phi(r))}$. Whenever $\overline{\Delta} > \phi(r)$, then using the fact that $q_L(p-d)-(\overline{\Delta}-\phi(r)) \geq 0$ in any equilibrium with low-skill bankers (see footnote 10), together with $q_H(p-d) \geq q_L(p-d)$, this productivity level exceeds the upper-bound on the productivity of existing high-skill regulators, implying that regulatory agencies would benefit from poaching low-skill bankers (and firing some of their existing high-skill workers). ∎

References

Acharya, V. V., T. F. Cooley, M. P. Richardson, and I. Walter. 2010. *Regulating Wall Street: The Dodd-Frank act and the new architecture of global finance.* Hoboken, NJ: John Wiley & Sons.

Axelson, U., and P. Bond. 2013. Wall Street occupations: An equilibrium theory of overpaid jobs. Working Paper, University of Washington.

Bar-Isaac, H., and J. Shapiro. 2011. Credit ratings accuracy and analyst incentives. *American Economic Review* 101:120–4.

Barth, J.R., G. Caprio Jr., and R. Levine. 2012. *Guardians of finance: Making regulators work for us.* Cambridge, MA: MIT Press.

Becker, G. 1974. A theory of social interactions. *Journal of Political Economy* 82:1063–93.

Besley, T., and M. Ghatak. 2001. Government versus private ownership of public goods. *Quarterly Journal of Economics* 116:1343–72.

Besley, T., and M. Ghatak. 2005. Competition and incentives with motivated agents. *American Economic Review* 95:616–36.

Blanes i Vidal, J., M. Draca, and C. Fons-Rosen. 2012. Revolving door lobbyists. *American Economic Review* 102:3731–48.

Bolton, P., and M. Dewatripont. 2005. *Contract theory.* Cambridge, MA: MIT Press.

Bolton, P., T. Santos, and J. A. Scheinkman. 2013. Cream skimming in financial markets. Working Paper, Columbia University.

Bond, P., and K. Hagerty. 2010. Preventing crime waves. *American Economic Journal: Microeconomics* 2:138–59.

Brennan, M. 1994. Incentives, rationality, and society. *Journal of Applied Corporate Finance* 7:31–9.

Burgess, S., and P. Metcalfe. 1999. The use of incentive schemes in the public and private sectors: Evidence from British establishments. Working Paper, University of Bristol.

Carlin, B., and S. Gervais. 2009. Work ethic, employment contracts, and firm value. *Journal of Finance* 64:785–821.

Carlin, B., and S. Gervais. 2012. Legal protection in retail financial markets. *Review of Corporate Finance Studies* 1:68–108.

Che, Y. K. 1995. Revolving doors and the optimal tolerance for agency collusion. *RAND Journal of Economics* 26:378–97.

Cornaggia, J., K. Cornaggia, and H. Xia. 2013. Revolving doors on Wall Street. Working Paper, Indiana University.

deHaan, E., S. Kedia, K. Koh, and S. Rajgopal. 2012. Does the revolving door affect the SEC's enforcement outcomes. Working Paper, University of Washington.

Delfgaauw, J., and R. Dur. 2008. Incentives and workers' motivation in the public sector. *Economic Journal* 118:171–91.

Delfgaauw, J., and R. Dur. 2010. Managerial talent, motivation, and self-selection into public management. *Journal of Public Economics* 94:654–60.

De Rugy, V., and M. Warren. 2009. Expansion of regulatory budgets and staffing continues in the new administration: An analysis of the U.S. budget for fiscal years 2009 and 2010. Regulators' budget report 31 by the Mercatus Center at George Mason University and the Murray Weidenbaum Center at Washington University in St. Louis.

Dewatripont, M., I. Jewitt, and J. Tirole. 1999. The economics of career concerns, part II: Application to missions and accountability of government agencies. *Review of Economic Studies* 66:199–217.

Dixit, A. 2002. Incentives and organizations in the public sector: An interpretative review. *Journal of Human Resources* 37:696–727.

Francois, P. 2007. Making a difference. *RAND Journal of Economics* 38:714–32.

Giammarino, R., T. Lewis, and D. Sappington. 1993. An incentive approach to banking regulation. *Journal of Finance* 48:1523–42.

Glode, V., and R. Lowery. 2013. Informed trading and high compensation in finance. Working Paper, University of Pennsylvania.

Guerrieri, V., R. Shimer, and R. Wright. 2010. Adverse selection in competitive search equilibrium. *Econometrica* 78:1823–62.

Henderson, M. T., and F. Tung, 2012. Paying bank examiners for performance: Should regulators receive bonuses for effectively guarding the public interest? *Regulation*, Spring 2012: 32–8.

Jaimovich, E., and J. P. Rud. 2011. Excessive public employment and rent-seeking traps. Working Paper, University of London.

Macchiavello, R. 2008. Public sector motivation and development failures. *Journal of Development Economics* 86:201–13.

Masters, B. FSA exodus adds to concern over regulation. *Financial Times*. August 8, 2010.

Milgrom, P. and J. Roberts. Comparing equilibria. *American Economic Review* 84:441–59.

Morrison, A., and L. White. 2005. Crises and capital requirements in banking. *American Economic Review* 95:1548–72.

Murphy, K. M., A. Schleifer, and R. W. Vishny. 1991. The allocation of talent: Implications for growth. *Quarterly Journal of Economics* 106:503–30.

Perry, J., and A. Hondeghem. 2008. *Motivation in public management: The call of public service.* Oxford: Oxford University Press.

Philippon, T. 2010. Engineers vs. financiers: Should the financial sector be taxed or subsidized? *American Economic Journal: Macro* 2:158–82.

Philippon, T., and A. Reshef. 2012. Wages and human capital in the U.S. financial industry: 1909-2006. *Quarterly Journal of Economics* 127:1551–1609.

Prendergast, C. 2003. The limits of bureaucratic efficiency. *Journal of Political Economy* 111:929–58.

Prendergast, C. 2007. The motivation and bias of bureaucrats. *American Economic Review* 97:180–96.

Povel, P., R. Singh, and A. Winton. 2007. Booms, busts, and fraud. *Review of Financial Studies* 20:1219–54.

Rosen, S. 1974. Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy* 82:34–55.

Rothschild, M., and J. Stiglitz. 1976. Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. *Quarterly Journal of Economics* 90:629–50.

Sannikov, Y. 2008. A continuous-time version of the principal-agent problem. *Review of Economic Studies* 75:957–84.

Shiller, R. 2012. *Finance and the good society*. Princeton, NJ: Princeton University Press.

Shaw, B. 1903. *Man and superman: A comedy and a philosophy*. Cambridge, MA: The University Press.

Spear, S., and C. Wang. 2005. When to fire a CEO: Optimal termination in dynamic contracts. *Journal of Economic Theory* 120:239–56.

U.S. Securities and Exchanges Commission (SEC). 2012. *In brief - FY 2013 congressional justification*. Washington, DC.