Bankers and Regulators

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We propose a career choice 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 improvement), our model jointly predicts that bankers will be, on average, more skilled than regulators and their compensation will be 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.

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" 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 30th 2010

There is a widespread perception that, on average, financial regulators are not as skilled as the bankers and traders they are charged with overseeing — and moreover, that this discrepancy in ability widens significantly when the financial sector booms, or when regulatory resources shrink. In addition, jobs in financial regulatory agencies offer compensation that is low and insensitive to performance, relative to jobs in the financial sector being supervised.[1] 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?

In this paper we use a unified and parsimonious model to address these questions. Workers with heterogenous ability levels can choose to work in the financial sector, as "bankers" investing in risky projects, or as regulators, monitoring the behavior of bankers. Our model jointly endogenizes the occupational choice of workers and the compensation contracts offered in the two sectors. Bankers are, on average, more skilled than regulators and their compensation is more sensitive to performance. Our analysis shows that, contrary to the popular view, a highly profitable banking sector and a resource-scarce regulatory sector are neither sufficient nor necessary conditions to generate relatively low skill levels for regulators.

In our model, we draw on a recent literature in economics that studies the consequences of public-sector motivation: see, for example, Dewatripont, Jewitt, and Tirole (1999), Francois (2007), and Delfgaauw and Dur (2008, 2010). Drawing on extensive empirical evidence (see Perry and Hondeghem (2008) for a survey), this literature posits that many workers derive utility from working

[1] See, for example, Motley Fool's interview of Assistant Treasury Secretary Michael Barr titled "Treasury on Regulatory Failure and 'Too Big to Fail' "where the interviewer, Ilan Moscovitz, mentions related observations. Available at http://www.fool.com/investing/general/2010/08/23/treasury-on-regulatory-failure-and-too-big-to-fail.aspx.

in public service. A former attorney in the SEC investment management division acknowledges the role of public-sector motivation in attracting workers to the SEC as follows:[2]

> *" '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.' "*

When workers' intrinsic benefit from working in regulation is large, it is cheaper for a regulatory agency aiming to achieve a given degree of monitoring to hire a group of low-skill workers than a smaller group of high-skill workers. The intrinsic benefit generates a wage discount for regulators, which makes less skilled workers more productive per dollar of compensation than high-skill workers. Contrary to what one might expect, the most enjoyable job in terms of intrinsic benefits—regulation, in our model—attracts the worst workers in equilibrium. We, however, show that allocating less skilled workers to regulatory tasks than to banking tasks can be a socially efficient response to the existence of intrinsic benefits for regulatory workers. If given the same regulatory budget, a social planner would allocate workers in exactly the same way as in our decentralized equilibrium under risk-neutrality.

As will be clear, we abstract from any institutional failings of either regulatory agencies or banks that may affect labor market outcomes. While such failings doubtless exist, our main argument in this paper is that intrinsic benefits, by themselves, can account for many of the outcomes we observe.

Note that although the intrinsic benefit we assume in our model may resemble altruism (see, e.g., Becker (1974)), it may also stem entirely from a desire for power; for our purposes, the distinction is unimportant. Moreover, and as we show in Section 5, it is possible to reinterpret the intrinsic benefit as an improvement in human capital. We provide an analysis of how human capital considerations affect the allocation of workers between the two sectors when working in regulation improves future career opportunities. In particular, we show that low-skilled workers may start in

[2] See "Budget battles could crimp SEC's plans" by Mark Schoeff, published on August 29, 2010, in Investment News.

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, enhances an individual's future career prospects.

It is worth noting that under the interpretation of the intrinsic benefit as human capital accumulation, our model also applies to employees of organizations such as credit rating agencies. In common with regulatory employees, credit rating agency staff are widely perceived to be less skilled than other financial sector workers, and with employment contracts that make less use of incentives.

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 the following excerpt from a recent Financial Times article:[3]

> *"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 they lose, consistent with Harry Markopolos's memorable description of the Securities and Exchange Commission (SEC) as "a group of 3,500 chickens tasked to chase down and catch foxes which are faster, stronger and smarter than they are."[4] 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 in financial-sector booms.

The paper is organized as follows. In the next section, we compare our paper to closely related papers. Section 2 introduces the general environment and Section 3 develops the model's main implications in a risk-neutral setting. In Section 4, we show that most of these implications are robust when workers are risk averse and derive new predictions about performance-pay in both

[3] See "FSA exodus adds to concern over regulation" by Brooke Masters in the August 8, 2010 issue of the Financial Times.

[4] Harry Markopolos is best known for his (ignored) warnings to the SEC concerning Bernard Madoff. His description of the SEC is from a testimony to the U.S. House of Representatives, available in full at http://www.sec.gov/news/studies/2009/oig-509/exhibit-0269.pdf.

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 5. Section 6 discusses the robustness of our analysis and Section 7 concludes and highlights policy implications that result from our analysis.

1 Literature Review

Our paper is related to Povel, Singh and Winton (2007) who also describe a relationship between equilibrium misbehavior and business conditions. Their model focuses on firms soliciting capital from investors who are able to monitor the information that firm managers disclose. The overall profitability of the sector affects investors' beliefs about 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. We instead focus on 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.

A small literature studies workers' choices between the financial sector and a "real" sector, and emphasizes the possibility that too many workers end up in the financial sector (see Murphy, Shleifer, and Vishny (1991), or, for a recent example, Bolton, Santos and Scheinkman (2011)). Instead, we study the choice between working in finance and in regulation. Moreover, the equilibrium allocation of workers in our model—namely, higher skilled workers in finance and lower skilled workers in regulation—is (constrained) Pareto efficient.

Although our model focuses on the regulation of the financial sector, our paper also contributes to the broader literature about the effect of non-pecuniary incentives on employment. Brennan (1994) highlights that rational agents may derive utility from being virtuous or altruistic. Carlin and Gervais (2009) focus on work ethic and model a firm's hiring decisions when facing a pool

of workers with heterogenous levels of work ethic — some workers are self-interested as in most agency models, while some workers exert effort without the need for extra incentives. Both the type (i.e., egoistic vs. virtuous) and skill (i.e., high vs. low) of workers is unobservable; the authors solve for optimal contracts and show that perfect screening of virtuous agents is never achieved. Carlin and Gervais (2009) assume an exogenously given reservation utility for each worker who considers working for the firm. Our paper instead focuses on the effect of a *job-specific* intrinsic motivation on labor matching, when a worker's reservation utility is endogenously determined based on the allocation of workers among jobs. In that sense, our paper contributes to the labor matching literature on public-sector careers in general. Theoretical papers that focus on issues related to working in the public sector include Dewatripont, Jewitt, and Tirole (1999) who study career concerns in organizations with multiple missions and/or a lack of focus, Besley and Ghatak (2005) who analyze the advantages of matching differentially motivated workers to appropriate organizations, Francois (2007) who studies how a free-rider problem in an organization that produces a good valuable to several, but not all, of its employees could lead some employees to "donate" their time to ensure that the good is produced, and Prendergast (2003, 2007) who studies the inefficiencies of bureaucratic organizations and how exploiting workers' biases can reduce these inefficiencies. Unlike our paper, these papers do not study employment in the public and private sectors simultaneously.

To the best of our knowledge, only two other papers propose career choice models with workers of different ability levels choosing between working in the private sector and in the public sector.[5] Delfgaauw and Dur (2008) study a model with three types of worker: a benchmark type, a dedicated type that has a lower cost of effort in the public sector, and a lazy type that has a higher cost. As in the current paper, a worker's type is private information. Dedicated workers display a form of public-sector motivation. As in our model, and others, this implies that they can be paid less. When the public sector needs only a few workers, it hires only dedicated workers. It also demands

[5] Although Jaimovich and Rud (2011) study an economy with heterogeneously-skilled agents, they assume that only high-skill 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 emerges because inefficiency makes the return from entrepreneurship low, and hence entrepreneurship unattractive. See also Macchiavello (2008) for a related observation.

little work from each of them, since it is cheaper to increase output by hiring more workers than by extracting more effort from existing workers. If instead 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 less distorting. The second case, in which the public sector hires lazy workers, is similar to our result that the public sector hires the worst workers. However, the model is such that it cannot say anything on why the best workers in the economy end up in the private sector, which is a key prediction of our model. Moreover, the model is silent on incentive pay and human capital formation.[6]

In a second paper, Delfgaauw and Dur (2010) again study an economy with multiple worker types, which this time are public information. They 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 addition, this second paper is again silent on incentive pay and human capital formation. In contrast, our model with risk averse workers makes predictions that are consistent with findings by Burgess and Metcalfe (1999) that incentive pay systems are far more widespread in the (British) private sector than in the public sector.

[6]The authors 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.

2 Model

We assume a continuum of workers who can be employed as bankers or as regulators. There are two types of workers: low-skill and high-skill. There is 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 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 is constant across sectors.

A banker's job is to oversee investments in projects. Each banker deals with one project, and there are $1 + \eta$ projects in the economy (so there are sufficient projects even if all workers become bankers). Projects are heterogenous. Additionally, 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 x (> 0), where x varies across projects and is distributed according to the (continuous) distribution function F. When a project fails the net profit to the bank is 0. 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.

We assume a project's success payoff x is publicly observable. Consequently, only the best projects are financed. Specifically, if there are n bankers in total, financing is provided only to the fraction $\frac{n}{1+\eta}$ of the projects with success payoffs above $X(n)$ defined by $1 - F(X(n)) = \frac{n}{1+\eta}$. When a bank hires a worker, it does not know which project the banker will finance. Consequently, the bank anticipates an average project success payment of $P(n) \equiv E[x|x \geq X(n)]$. The average success payoff in equilibrium is denoted p and it will depend on the equilibrium "size" n of the banking sector. To ensure that there are some bankers in equilibrium, we assume that $\lim_{n \to 0} P(n) = +\infty$. It is worth emphasizing that the results we derive in this paper hold for many other parameterizations or interpretations of banking activities. All we need is that a banker's marginal product is decreasing and continuous in the size of the banking sector. Alternative explanations for such rela-

tionship could rely on the competition in the real economy among funded projects or on bankers' bargaining power changing with the search costs faced by borrowers/entrepreneurs.

A worker's skill is only known by the worker himself. Hence, when hired, bankers will be offered a menu of performance-contingent compensation contracts. Given that the realized match between projects and bankers is independent of skill, banks will optimally offer employment contracts that depend only on whether or not a project succeeds, and not on the success payoff x. Each menu item will be denoted $w_B = (w_{BS}, w_{BF})$, where w_{BS} is the payment when the project is successful and w_{BF} is the payment if the project is a failure. 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.

Bankers can also misbehave. This opportunity represents anything that regulators are responsible for monitoring and preventing, such as defrauding small entrepreneurs, a governmental agency, or the general public. To keep things simple, we model misbehavior as being unrelated to the standard banking activities in the economy.

When a banker misbehaves, we assume that he collects a payoff z, which differs across individuals following a continuous cumulative distribution function. Each individual learns about his opportunities for misbehavior only after deciding whether to become a banker.[7] It simplifies considerably the algebra in the risk-averse setting to assume, moreover, that an individual learns z only after finding out whether his investment project is successful.

When effectively monitored by a regulator, misbehavior results in a (possibly non-monetary) fine K, which may depend continuously on z (if, e.g., the fine entails repayment of fraudulent gains). Let r denote the probability of being effectively investigated, which is determined in equilibrium based on the ratio of bankers to regulators, 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 try to decide on a career.

[7]Consequently, we only need to consider two worker-types, low-skill and high-skill, in the analysis of the labor market.

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 5, stemming from the acquisition of human capital useful in later stages of their careers. To simplify the intuition, we assume 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 6 that this simplifying assumption is not necessary to generate our main results. Regulators investigate bankers to check if they misbehaved. With probability q_i a regulator of skill level $i \in \{L, H\}$ 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 a banker. With probability $1 - q_i$ the regulator learns nothing.

Exactly as for bankers, when hired regulators are offered a menu of two performance-contingent compensation contracts $\{w_R^H, w_R^L\}$: for $i \in \{H, L\}$, $w_R^i = \left(w_{RS}^i, w_{RF}^i\right)$, where w_{RS}^i is the payment for a useful report and w_{RF}^i is the payment otherwise. All regulatory agencies aim to learn as much as they can about the actions of bankers, so they maximize the number of useful reports they can generate using an equal share of the total regulatory budget M. This total regulatory budget is exogenously given and regulatory agencies cannot change this amount. We discuss later how a central planner, say the federal government, might choose optimally the total regulatory budget M.

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.

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 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,

$$
\begin{aligned}
U^i\left(w_B^j\right) &= q_i E_z\left[\max\left\{(1-r)\,u\left(w_{BS}^j+z\right)+ru\left(w_{BS}^j+z-K(z)\right),u\left(w_{BS}^j\right)\right\}\right] \\
&\quad +(1-q_i)\,E_z\left[\max\left\{(1-r)\,u\left(w_{BF}^j+z\right)+ru\left(w_{BF}^j+z-K(z)\right),u\left(w_{BF}^j\right)\right\}\right] \\
U^i\left(w_R^j\right) &= q_i u(w_{RS}^j+\Delta)+(1-q_i)\,u(w_{RF}^j+\Delta).
\end{aligned}
$$

We assume that there are at least two regulatory agencies and two banks, and focus on symmetric equilibria in which all regulatory agencies offer the same contracts, and likewise, all banks do also. Having two employers in each sector ensures that if an employer deviates and offers a contract other than the equilibrium contract, the equilibrium contract is still available. When multiple employers offer the same contract, we assume that workers randomize among them with equal probability.

We also assume free-entry into the banking sector, so in equilibrium all banks must make zero profits; other assumptions on the competitive structure of industry would leave our results qualitatively unchanged, though would generally complicate the analysis.

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. Assume 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). So the regulatory sector collects useful information about $\min\left\{\lambda\left[\left(1-\alpha^L\right)q_L+\eta\left(1-\alpha^H\right)q_H\right],\alpha^L+\eta\alpha^H\right\}$ of the $\alpha^L+\eta\alpha^H$ bankers. Hence the probability that a given misbehaving banker will be penalized is

$$
G\left(\left(1-\alpha^L\right)q_L+\eta\left(1-\alpha^H\right)q_H,\alpha^L+\eta\alpha^H\right) \equiv \min\left\{1,\lambda\frac{\left(1-\alpha^L\right)q_L+\eta\left(1-\alpha^H\right)q_H}{\alpha^L+\eta\alpha^H}\right\}.
$$

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 total number of useful reports, and weakly decreasing in the total number of bankers.

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 wage bill) from employing a type i worker using contract w_R. For a regulatory agency that employs both types of worker, specifically, $k^i > 0$ workers of type i using contract w_R^i, define $\mu^i = k^i \left(q_i w_{RS}^i + (1 \quad q_i) w_{RF}^i\right) / \sum_{j=L,H} k^j \left(q_j w_{RS}^j + (1 \quad q_j) w_{RF}^j\right)$ as the fraction of the compensation paid to workers of type i; the regulatory agency's overall productivity is then $\sum_{i=L,H} \mu^i \rho^i \left(w_R^i\right)$.

An equilibrium of our economy is defined as follows:

Definition 1 *An equilibrium is vector* $\left(w_B^H, w_B^L, w_R^H, w_R^L, \alpha^H, \alpha^L, p, r\right)$ *satisfying:*

Labor market: utility maximization by workers among contracts

– *If* $\alpha^i > 0$ *(i.e., some workers of type* i *become bankers), then:*

$$U^i\left(w_B^i\right) \quad \max\left\{U^i\left(w_B^j\right), U^i\left(w_R^i\right), U^i\left(w_R^j\right)\right\}$$

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

$$U^i\left(w_R^i\right) \quad \max\left\{U^i\left(w_R^j\right), U^i\left(w_B^i\right), U^i\left(w_B^j\right)\right\}$$

For banks: There is no deviation $\left\{\tilde{w}_B^H, \tilde{w}_B^L\right\}$ *such that, taking all other contracts as fixed, a fraction* $\tilde{\alpha}^i$ *of skill level* i *accepts contract* $\tilde{w}_B^i$*, and 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, a fraction* $1 \quad \tilde{\alpha}^i$ *of skill level* i *accepts contract* $\tilde{w}_R^i$*, and the regulatory agency strictly increases its productivity.*

Payoffs in the banking sector are consistent with the size of the sector, i.e., $p = P(\alpha^L + \eta\alpha^H)$*; total regulatory expenditure equals the budget,* $M = \left(1 \quad \alpha^L\right)\left(q_L w_{RS}^L + (1 \quad q_L) w_{RF}^L\right) +$

$\left(1-\alpha^H\right)\eta\left(q_H w_{RS}^H+(1-q_H)\, w_{RF}^H\right)$; and the probability r that misbehavior is detected is consistent with the labor market outcome, $r=G\left(\left(1-\alpha^L\right)q_L+\eta\left(1-\alpha^H\right)q_H;\alpha^L+\eta\alpha^H\right).$

The following result, which is standard from models of competition and adverse selection, 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 employed and regulatory agencies extract the same productivity from each type of worker employed. Consequently, the expected compensation of a banker of type i is $q_i p$; and there exists s such that the expected compensation of a regulator of type i is $q_i s$.*

3 Risk-Neutral Workers

In this section, we assume all agents are risk neutral. Under this assumption, the unobservability of skill has no effect on equilibrium outcomes. In particular, bankers can simply be paid their marginal product using a contract that pays the average investment profit p in the case of success, and nothing in the case of failure. Similarly, without loss of generality we can assume that regulators are paid only when their reports are useful. In the next section, we will allow for risk-averse workers and the private information about skill levels will generate sensible predictions about the performance sensitivity of contracts.

In the risk-neutral setting, the workers who misbehave once they become bankers are simply the workers whose payoff z is greater than $rK(z)$, which is the expected penalty (recall, r is the equilibrium probability of being caught when misbehaving). The aggregate incidence of misbehavior in the economy is then $\left(\alpha^L+\eta\alpha^H\right)Pr\left(z>rK(z)\right)$, since $\alpha^L+\eta\alpha^H$ represents the total number of bankers in equilibrium. To ease notation, we define $\phi(r) \equiv E_z\left[\max\left(z-rK(z),0\right)\right]$, 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.

Our main observation is that, whenever the benefit of regulation, Δ, is larger than the net gain from misbehavior, $\phi(r)$, regulators will hire high-skill workers only after they have completely exhausted the supply of low-skill workers and some regulatory budget remains. Slightly 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. Note that (by above) a high-skill regulator must receive expected compensation of at least $q_H p - (\Delta - \phi(r))$, and so the regulatory agency's productivity from this worker is at most $\frac{q_H}{q_H p - (\Delta - \phi(r))}$. Instead, a regulatory agency could poach low-skill bankers by offering a contract paying just above $\frac{q_L p - (\Delta - \phi(r))}{q_L}$ in the case of success, and nothing after failure. Low-skill bankers will accept this contract, and the regulatory agency's productivity from these poached workers is $\frac{q_L}{q_L p - (\Delta - \phi(r))}$.[8] Whenever $\Delta > \phi(r)$, 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). 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 agents are regulators ($\alpha^H < 1$) and some low-skill agents are bankers ($\alpha^L > 0$).*

A simple numerical example may help to illustrate Proposition 1. Suppose high-skill workers are twice as productive per unit of effort as low-skill workers, with $q_H = 2/3$ and $q_L = 1/3$; the average profit from investing in a successful project is $p = 300$ in equilibrium; and net utility gain from regulatory work, $\Delta - \phi(r)$, is 50. In this case, 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 an expected wage of at least 150 and 50 to attract each of the two types. Since high-skill workers must be paid three

[8] Because workers are only rewarded for success, a regulatory agency's productivity from any high-skill workers who accept the contract is exactly the same.

times as much, but are only twice as productive, as low-skill workers, then some high-skill workers can become regulators in equilibrium only if regulatory agencies have exhausted the whole supply of low-skilled workers and some budget remains. In equilibrium, the most enjoyable job—here, regulation—ends up attracting the worst workers.

It is worth highlighting that although intrinsic benefits $\Delta > \phi(r)$ 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 simply increases the compensation they have to offer workers, and reduces their productivity, as measured by the number of successful investigations per dollar of expected wage.

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.

The proposition above formally shows that an equilibrium where the average regulator is at least as skilled as the average banker cannot exist when the intrinsic benefit of being a regulator is greater than the net payoff from misbehavior. This result arises because all agents extract the same intrinsic benefit from working in regulation, but high-skill workers produce more than low-skill workers. Instead of hiring one high-skill worker, it is cheaper for a regulatory agency to hire a mass $\frac{q_H}{q_L}$ of low-skill workers. The cost savings due to the positive net intrinsic benefit from working in regulation are greater when hiring $\frac{q_H}{q_L}$ low-skill workers than one high-skill worker. The precise size of the budget M determines how many low-skill workers, and sometimes high-skill workers, the regulatory sector can employ. Workers who cannot be hired by regulatory agencies because M is too small enter the banking sector, which makes them indifferent.

Here, we take the total regulatory budget M as exogenously given. It would, however, 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.

Although it contributes to making low-skill workers more attractive to regulatory agencies than high-skill workers, a large Δ makes the regulatory sector more productive per dollar spent. As we show later, allocating less skilled workers to regulatory tasks and more skilled workers to banking tasks can be the socially-efficient (as well as the privately-efficient) response to the presence of a positive (net) intrinsic benefit of working in regulation.

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. It is not sufficient because if instead the expected gain from misbehavior is larger than the intrinsic benefit Δ, then in equilibrium the most skilled workers become regulators; this follows from a straightforward adaption of the proof of Proposition 1. (Consequently, a small perturbation in parameter values such that the sign of $\Delta \quad \phi(r)$ is reversed would generate drastic changes in the allocation of workers.)

For the remainder of the section we make the following assumption, which we believe is the empirically relevant case:

Assumption 1 *The intrinsic benefit of regulation exceeds the expected gain from misbehavior (even with zero probability of punishment),* $\Delta > \phi(0)$.

Assumption 1 ensures that $\Delta > \phi(r)$ and so any equilibrium is of the form of Proposition 1. The reader should note that this assumption is stronger than what 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 $\phi(0)$.

Next, we prove the existence of an equilibrium along the lines described prior to Proposition 1.

Proposition 2 *At least one equilibrium exists.*

The proof of equilibrium existence consists 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 wage bill for regulatory agencies. Any number of bankers n such that $W(n)$ matches the regulatory budget M constitutes an equilibrium. Clearly $W(1+\eta) = 0$, since in this case all workers are bankers and so the regulator wage bill is 0. At the opposite extreme, $W(n) \to \infty$ as $n \to 0$, since in this case the NPV of bank projects explodes, leading both banker and regulator wages to explode as well. By the mean-value theorem, there exists at least one level of n such that the regulatory wage bill $W(n)$ matches the budget M, and hence an equilibrium exists.[9]

Given this proof of equilibrium existence, comparative statics follow easily. An improvement in the distribution of banking projects leads to an increase in banker compensation for any conjectured number of bankers, and hence to an increase in regulator compensation also. So the function W increases everywhere, giving the following corollary:

Corollary 1 *As either the underlying distribution of banking projects F improves (in the sense of first-order stochastic dominance), or the regulatory budget M available decreases:*

(a) the banking sector grows and the regulatory sector shrinks,

(b) the average skill of either bankers or regulators falls while the average skill in the other sector remains unchanged,

(c) the probability that misbehavior is detected (weakly) falls,

(d) the incidence of misbehavior (weakly) increases.[10]

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. If there are multiple equilibria,[11] *these statements*

[9] In a little more detail, W is a correspondence, but is single-valued everywhere except for $n = \eta$ (i.e., all high-skilled workers are bankers and all low-skilled workers are regulators). We use a straightforward extension of the mean-value theorem: see John (1999).

[10] An improvement in the underlying distribution of banking projects F leads to pointwise increase in the function $P(\cdot)$, as follows. By definition, $P(n) = \int_{x \geq X(n)} x dF(x) / \int_{x \geq X(n)} dF(x)$, where recall that $1 - F(X(n)) = \frac{n}{1+\eta}$. Under the change of variables $F(x) = t$, we obtain $P(n) = \int_{1-\frac{n}{1+\eta}}^{1} F^{-1}(t)\, dt / \int_{1-\frac{n}{1+\eta}}^{1} dt$. First-order stochastic dominance leads to a pointwise increase in F^{-1}, giving the result.

[11] Multiple equilibria may arise as follows. The labor market equilibrium is determined by the regulatory agencies' budget constraint. Fix an equilibrium, and consider an exogenous increase in the number of regulators. This has three effects on a regulatory agency's expenditure. First, the regulatory agency must spend more to employ the extra workers. Second, because the extra workers come from the banking sector, the equilibrium profits from investing in a successful project rises, which feeds through to an increase in the equilibrium wage that must be offered to regulators. This second effect also increases the regulatory agency's total expenditure. The third effect, however, operates in the opposite direction: the increase in the number of regulators decreases a banker's potential

are all true for at least the equilibria with the smallest and largest banking sectors.

When banking becomes more profitable or the regulatory budget decreases, a smaller number of workers can be attracted away from the banking sector by the regulatory sector. Since 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.

Also, the equilibrium probability of misbehavior being detected falls for two reasons. First, the number of bankers increases while the number of regulators decreases. Second, the workers moving from the regulatory sector to the banking sector are weakly more skilled than the remaining regulators, hence the average skill of regulators decreases. And unless the remaining regulators are still numerous enough to successfully monitor all bankers, misbehavior is then detected less often than before, implying that the equilibrium level of misbehavior increases with the overall profitability of banking tasks. Banking booms are then associated with periods of increased misbehavior.

We conclude this section with a discussion of the efficiency of equilibrium outcomes. We start by observing that, because of worker risk-neutrality, asymmetric information has no effect on equilibrium outcomes. The reason is that it is always possible for an employer to offer a contract that only type $i \in \{L, H\}$ accepts, without imposing any inefficiency. Formally:

Lemma 2 $\left(w_B^H, w_B^L, w_R^H, w_R^L, \alpha^H, \alpha^L, p, r\right)$ *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.*

We next establish a form of the first welfare theorem, i.e., that the decentralized equilibria of our economy are Pareto efficient. Recall that, in establishing our results, we have imposed no restrictions on the total budget M of regulatory agencies. Consequently, our equilibrium

gains from misbehaving. This effect acts to *reduce* the equilibrium wage that must be offered to regulators. If this third effect is strong enough to be the dominant one, an exogenous increase in the number of regulators may actually decrease a regulatory agency's total expenditure. In this case, one can show that there exists an interval of regulatory budgets M such that multiple equilibria exist. Conversely, one can show that the equilibrium is unique whenever the regulatory budget M is either sufficiently high; or sufficiently low; or if the the misbehavior detection function G is sufficient unresponsive to changes in the pools of bankers and regulators. Finally, it is worth noting that a standard consequence of equilibrium multiplicity is that the equilibrium correspondence is discontinuous in the regulatory budget M and the banking payoff function, implying that small changes may have very large effects on equilibrium outcomes.

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, and to stipulate any transfers to and from both workers and consumers (who are the victims of banker misbehavior). 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 2 *(A) Banks appropriate all surplus of successful investments, which is then equal to $P(n)$. (B) The cost of misbehavior in banking exceeds the banker's gain, i.e., the net cost is positive.*

Part (A) ensures that any inefficiency we may uncover in the decentralized equilibrium would result from the allocation of workers, the focus of this paper, rather than from the more obvious channel of distorted investment policies by banks. Part (B)'s assumption that banker misbehavior is, on net, socially costly is natural: if this were not the case, it is hard to see why society would be interested in regulation in the first place.

Proposition 3 *Any decentralized equilibrium is constrained Pareto efficient.*

If given the same resources M, a social planner who observes workers' types and wants to maximize the total surplus in the economy will find optimal to allocate workers just like in our decentralized equilibrium. Allocating less skilled workers to regulatory tasks and more skilled workers to banking tasks is a socially efficient response to the existence of intrinsic benefits in the regulatory sector.

Note that Proposition 3 is not an immediate consequence of standard welfare results because regulatory agencies have a fixed budget, and related, do not maximize profits. 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., lower-skilled—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.

4 Risk-Averse Workers

In this section, we relax the risk-neutrality assumption and verify that the main results from the risk-neutral setting still hold. More interestingly, risk aversion also generates the additional implication that regulators receive less performance pay than bankers, which is consistent with widely held perception. Importantly, note that we obtain this prediction without making any assumption about the comparative observability (or contractibility) of output in the two sectors. Related, if regulatory output is more difficult than banking output to accurately measure — and we should emphasize this is not obvious to us — then this would reinforce the result.

A banker who receives compensation w and has an opportunity to gain z will misbehave if and only if:

$$(1 - r)\, u(w+z) + r u(w + z - K(z)) > u(w) .$$

To eliminate wealth effects in a banker's decision of whether to misbehave or not, which are tangential to our main analysis, we assume that workers have constant absolute risk aversion (CARA), i.e., $u(c) = -e^{-\gamma c}$, where γ is the coefficient of absolute risk aversion. The decision rule reduces to

$$\left(1 - r + re^{-\gamma K(z)}\right) e^{-\gamma z} u(w) > u(w) .$$

Since u is negative, this inequality says that the banker misbehaves if and only if z, the gain from doing so, exceeds some critical level. Moreover, by defining

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

we can write a worker's utility from banking, $U^i\left(w_B^j\right)$, as[12]

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

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

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

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 wage contract times a multiplier that either adjusts for the extra benefits from misbehaving as a banker or from working as a regulator.

Our first main result for the risk-averse setting is that 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. The following proposition is the analog of Proposition 1 for the risk-averse setting.

Proposition 4 *In any equilibrium with $\Delta > -\frac{1}{\gamma}\ln\Phi\left(r\right)$, bankers are more skilled than regulators. Formally, there is no equilibrium in which $\Delta > -\frac{1}{\gamma}\ln\Phi\left(r\right)$, 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 3 *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 3 is equivalent to $\Delta > -\frac{1}{\gamma}\ln\Phi\left(0\right)$, and hence ensures that $\Delta > -\frac{1}{\gamma}\ln\Phi\left(r\right)$ and so

[12]Note that the ability to write $U^i\left(w_B^j\right)$ in this way is a consequence of our assumption that the misbehavior decision is taken after a banker observes whether he has succeeded or failed. While this assumption facilitates our analysis and exposition in the risk-averse setting, it is not required for any of our derivations in the risk-neutral setting.

any equilibrium is of the form of Proposition 4. The reader should note, again, that Assumption 3 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 new to the risk-averse setting, namely that the adverse selection problem forces banks to offer wage contracts that are more sensitive to performance than those regulatory agencies offer. Because workers are strictly risk-averse, by a standard argument any equilibrium must entail full-insurance for the low-skill workers. Focusing on regulation contracts, suppose to the contrary that in equilibrium a low-skill worker is not fully insured, i.e., $w^L_{RS} \neq w^L_{RF}$. Then a regulatory agency could offer a new full-insurance contract, $\tilde{w}_{RS} = \tilde{w}_{RS} = q_L w^L_{RS} + (1 - q_L)\, w^L_{RF} - \varepsilon$, 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-based pay ($w_S \neq w_F$). For the case in which both high- and low-skill workers are bankers, this is easy to see. 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-wage contracts. But then profits would not be zero for both types of workers in banking. An identical argument applies in the case in which both high and low skill workers are employed by regulators.

The following result is then easily obtained:[13]

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.*

[13] The only case not handled in the text immediately above is that in which all high-skill workers become bankers and all low-skill workers become regulators. This case is dealt with in the appendix.

Here, the safer compensation contracts for regulation jobs is a direct consequence of the allocation of skilled workers in equilibrium. 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.

This result is different from the mechanism that Dixit (2002) suggests where the intrinsic benefit is increasing in effort. In that case, the more agents derive utility from exerting effort, the less sensitive to performance compensation has to be to secure a given level of effort. In our model, agents 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).

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's compensation is easy to describe—by Lemma 1, expected wage 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 more complicated. Again, low-skill regulatory worker compensation is determined by the indifference condition with banking contracts. The complication is that now the indifference condition

entails the banking contract for high-skill workers, which, as discussed above, is distorted and features performance-based compensation. However, the size of the distortion depends on the employment conditions of low-skill regulators. Lemma 5 in the Appendix establishes that it is possible to simultaneously (and uniquely) determine the level of regulator compensation and the extent to which high-skill banking contracts are distorted.

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)).[14]

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

The comparative statics are immediate from the proof of Proposition 6:

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

The intuition behind the comparative statics for the risk-averse setting is identical to that for the risk-neutral setting.

5 Human Capital Formation in a Two-Period OLG Model

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. As we noted in the introduction, this interpretation of Δ has the added benefit of making our model applicable to non-regulatory contexts, such as credit-rating agencies, where one might be sceptical

[14]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 are 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 there are 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.

about the existence of direct utility benefits. In this extension of our basic model, lower-skilled young workers enter regulation, while higher-skilled young workers immediately become bankers. Some of the workers starting in regulation acquire human capital, and then move to banking when old, consistent with the existence of a "revolving door" leading from government to the private sector.[15]

As in Section 3, 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.

Switching occupations in mid-career—i.e., moving from regulation to banking, or vice versa—carries some cost. 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.

There are a number of 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 at the end of this section.

The gain from working in regulation when young, which we denote Δ_y, can then be expressed as follows. Write V_i^R and V_i^B for the expected utility of an old worker with skill $i \in \{L, H\}$ who worked *when young* in regulation and, respectively, banking. (A worker's occupation when young

[15] As will become clear below, our model cannot easily account for movements from the private sector into government.

has a direct effect on utility when old because of the switching cost c.) Hence:

$$\Delta_y = \theta \left(V_H^R - V_L^R \right) + \alpha \left(V_H^R - V_H^B \right) + (1 - \alpha) \left(V_L^R - V_L^B \right). \tag{1}$$

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 (1)), capturing human capital accumulation; and the consequences of switching costs on a worker's occupation when old (the last two terms of (1)). 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.

Exactly as before, 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 (see Lemma 3). 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 $s < p$.

Given $s < p$, all old workers would 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. However, the switching cost c means that workers who started in regulation may prefer to remain there. Conversely, no old worker would switch from banking to regulation. Note that high-skill old workers have a larger incentive to switch to banking than do low-skill workers. The economically interesting case is when at least some workers switch occupations, which occurs if the switching cost c takes an intermediate level given by

$$pq_H + \phi(r) - sq_H \geq c \geq pq_L + \phi(r) - sq_L, \tag{2}$$

i.e., if high-skill old workers switch from regulation to banking, but low-skill workers do not.

Given inequality (2), the gain to working in regulation when young, (1), becomes

$$\Delta_y = \theta \left(pq_H + \phi \left(r \right) \quad c \quad sq_L \right) \quad \alpha c \quad \left(1 \quad \alpha \right) \left(pq_L + \phi \left(r \right) \quad sq_L \right). \tag{3}$$

Finally, regulator compensation s is determined by the condition that the marginal regulator is indifferent between regulation and banking. Since we are looking at the case in which some young workers start in each of the two sectors, the marginal regulator is young, and the indifference condition is

$$s = p \quad \frac{\Delta_y \quad \phi \left(r \right)}{\tilde{q}}, \tag{4}$$

where $\tilde{q} = q_H$ if the marginal regulator is high-skill, and $\tilde{q} = q_L$ otherwise.[16] Substitution of (4) into (3) gives the benefit of regulation Δ_y in terms of p, $\phi \left(r \right)$, and the underlying parameters of the model.[17] A large enough human capital gain θ ensures that Δ_y, the benefit of starting in regulation, is positive. Moreover, a large enough θ and a small enough benefit from misbehaving, $\phi(r)$, satisfy our conjecture that $\Delta_y > \phi \left(r \right)$.

Equations (3) and (4) yield the comparative statics

$$\begin{aligned} \frac{\partial \Delta_y}{\partial p} &= \theta \left(q_H \quad q_L \right) \\ \frac{\partial \Delta_y}{\partial \theta} &= \frac{pq_H + \phi \left(r \right) \quad c \quad sq_L}{1 + \frac{q_L}{\tilde{q}} \left(1 \quad \alpha \quad \theta \right)}. \end{aligned}$$

Since Δ_y is positive only if $pq_H + \phi \left(r \right) \quad c \quad sq_L$ is, the gain Δ_y to starting in regulation is then increasing in both the profitability of banking (in the sense of Corollary 1) and the skill-gain θ associated with starting in regulation.

We conclude by revisiting our initial assumption that a worker's skill level is uncorrelated over time. Now, assume instead that workers who are high-skilled when young have a higher probability, α_H say, of being high-skilled when old. From expression (3), one can see that this

[16] For conciseness, we ignore the case in which all high-skill young workers are bankers and all low-skill young workers and regulators.

[17] Evaluating, $\Delta_y = \frac{\theta p (q_H - q_L) - (\alpha + \theta) c - (1 - \alpha - \theta) \left(1 - \frac{q_L}{\tilde{q}} \right) \phi(r)}{1 + \frac{q_L}{\tilde{q}} (1 - \alpha - \theta)}$.

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 (3) is decreasing in α by inequality (2): the cost of switching to banking when an old-worker is high-skilled exceeds the wage disadvantage of a low-skill old-worker remaining in regulation. (Note that regulatory compensation s is independent of a worker's type.) Consequently, 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.

Finally, as noted we have analyzed the dynamic model under the assumption of risk-neutrality, where adverse selection has no impact. However, it is worth noting that the combination of risk-adverse workers and unobservable skills might generate a partially countervailing effect in which starting in regulation is a negative signal, making promotion to banking more difficult; we leave a fuller exploration of this effect for future research.

qualitatively unchanged.[18] 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 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.

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 output-dependent, instead of output-independent as we have previously assumed. If regulators value 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 our model's prediction that whenever the fixed benefit of regulation, $\overline{\Delta}$, is larger than the net gain from misbehavior, $\phi(r)$, regulators hire high-skill workers only after they have completely exhausted the supply of low-skill workers and some regulatory budget remains.

Proposition 7 *In any equilibrium with $\overline{\Delta} > \phi(r)$, bankers are more skilled than regulators. Formally, there is no equilibrium in which some high-skill agents are regulators ($\alpha^H < 1$) and some low-skill agents are bankers ($\alpha^L > 0$).*

Finally, we have made the assumption of free-entry by banks, resulting in bankers extracting the whole equilibrium surplus p. Different assumptions on the industrial organization of the banking sector could result in bankers extracting only a fraction of the surplus and the banks that employ them extracting the remaining surplus. It is straightforward to see that all our qualitative results hold when bankers only extract a fraction β (> 0) of the expected payoff from financing projects just by defining $P(n)$ as $\beta E[x|x \geq X(n)]$ rather than $E[x|x \geq X(n)]$. Regulatory agencies still find it optimal to go after the low-skill workers first. However, there is a *quantitative* shift in

[18] 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.

the equilibrium outcome as regulatory agencies can now pay lower wages and attract more of the lower-skilled workers away from the banking sector, leading to a larger regulatory sector and less misbehavior by bankers.

7 Conclusion

We propose a career choice 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 some light on the interactions between the financial labor markets, the profitability of the financial sector, and its degree of misbehavior. We assume that the intrinsic benefit from working as a regulator (e.g., recognition for being a social servant) is greater than the ex ante benefit a banker can expect to extract through fraud or other types of misbehavior. Our model jointly endogenizes the occupational choice of workers and the compensation contracts offered in the two sectors. Bankers are, on average, more skilled than regulators and their compensation is more sensitive to performance. We show that during financial booms banks draw the best workers away from the regulatory sector and equilibrium misbehavior by bankers increases. We also provide an analysis of how human capital considerations might affect the allocation of workers between the two sectors when working in regulation improves future career opportunities.

Our analysis provides insights for policy makers in the government and in financial regulatory agencies about the competitive labor market forces at play. Our model shows that increasing the budget of regulatory agencies will 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. Regulatory agencies prioritizing the hiring of low-skill workers is socially efficient in our model when the intrinsic benefits from working in regulation are large enough. 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.

The appropriate regulation of financial markets has long been a topic of considerable importance. This paper adds to the existing literature by analyzing what worker skill levels are best suited to financial regulation, both positively and normatively. It is worth noting that although we have focused on financial regulation, our results potentially apply to other sectors of the economy where regulation and the primary activity being monitored require broadly similar knowledge and training.[19] Regulation of offshore oil production is one obvious and important example.

[19] For example, for the most part we do *not* think our model applies well to police and house burglars.

A Appendix

A.1 Results omitted from main text

The following result is standard to the analysis of competition subject to adverse selection. Note that the lemma is written so that it applies to case in which both types work in banking, or both types work in regulation.

Lemma 3 *Let $w_S^L = w_F^L$. Consider the problem:*

$$\sup_{w_S, w_F} q_H u\left(w_S^H\right) + (1 - q_H)\, u\left(w_F^H\right)$$

subject to the employer and incentive compatibility constraints

$$\frac{q_H}{q_H w_S^H + (1 - q_H)\, w_F^H} \geq \frac{q_L}{w^L}$$
$$q_L u\left(w_S^H\right) + (1 - q_L)\, u\left(w_F^H\right) \leq u\left(w^L\right).$$

This problem has a solution. At the solution, both constraints hold with equality, $w_S^H > w_F^H$, and

$$q_H u\left(w_S^H\right) + (1 - q_H)\, u\left(w_F^H\right) > u\left(w^L\right).$$

Proof of Lemma 3: Observe that $w_S^H = w_F^H = w^L$ satisfies both constraints, and so utility $u\left(w^L\right)$ is obtainable. From the employer constraint, for any given w_F^H we know w_S^H is bounded above by $\frac{w^L}{q_L} - \frac{1-q_H}{q_H} w_F^H$, and so utility is bounded above by $q_H u\left(\frac{w^L}{q_L} - \frac{1-q_H}{q_H} w_F^H\right) + (1 - q_H)\, u\left(w_F^H\right)$. This expression goes to $-\infty$ as $w_F^H \to -\infty$; so without loss we can restrict attention to values of w_F^H drawn from some closed interval. A parallel argument implies that we can likewise without loss restrict attention to values of w_S^H drawn from some closed interval. Consequently, the problem has a well-defined maximum. Given this, both constraints must bind, as follows. Clearly at least one constraint must bind. If the employer constraint is non-binding, there is clearly some perturbation of the contract w^H that strictly increases utility while leaving the incentive compatibility constraint binding. Suppose instead that the employer constraint binds but the incentive compatibility

constraint does not. If $w_S^H = w_F^H$, then both must equal $\frac{q_H w^L}{q_L} > w^L$, but then the incentive compatibility constraint is violated. If instead $w_S^H \neq w_F^H$, there is a contract perturbation that strictly increases utility but leaves the incentive compatibility constraint satisfied: move the two payments w_S^H, w_F^H closer to each other, while leaving $q_H w_S^H + (1 - q_H)\, w_F^H$ unchanged.

The similar argument to the one at the start of the proof implies that there are at least two contracts w^H that satisfy both the employer and incentive compatibility constraints at equality, and at least one such contract has $w_S^H > w_F^H$. It is straightforward to show that, since $q_H > q_L$, the solution with the highest value of w_S^H (and hence the lowest value of w_F^H) is the one that maximizes the objective. Hence $w_S^H > w_F^H$. The final strict inequality follows easily from $w_S^H > w_F^H$, $q_H > q_L$, and the incentive constraint at equality. ∎

The following result replicates Lemma 3 for the case in which all low-skill workers work for regulators and all high-skill workers are bankers.

Lemma 4 *Let $w_{RS}^L = w_{RF}^L$. Consider the problem:*

$$\sup_{w_B^H} U^H\left(w_B^H\right)$$

subject to the employer and incentive compatibility constraints

$$\begin{aligned} \Pi^H\left(w_B^H\right) &\geq 0 \\ U^L\left(w_B^H\right) &\geq U^L\left(w_R^L\right). \end{aligned}$$

This problem has a solution. At the solution, either $w_{BS}^H = w_{BF}^H$; or both constraints hold with equality, $w_{BS}^H > w_{BF}^H$, and $U^H\left(w_B^H\right) > U^H\left(w_R^L\right)$.

Proof of Lemma 4: Parallel to the proof of Lemma 3.

Lemma 5 *The following system of equations :*

$w_{RS}^L = w_{RF}^L$;

$\max_{w_R^H} U^H\left(w_R^H\right)$ *such that* $U^L\left(w_R^H\right) = U^L\left(w_R^L\right)$ *and* $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$;

$\max_{w_B^H} U^H\left(w_B^H\right)$ *such that* $U^L\left(w_B^H\right) = U^L\left(w_R^L\right)$ *and* $\Pi^H\left(w_B^H\right) = 0$;

$U^H\left(w_R^H\right) = U^H\left(w_B^H\right)$,

has a unique solution.

Proof of Lemma 5: Throughout, we write w_R^L for $w_{RS}^L = w_{RF}^L$. First, we use the pair of equations $U^L\left(w_R^H\right) = U^L\left(w_R^L\right)$ and $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$, together with the fact that w_R^H is chosen to maximize $U^H\left(w_R^H\right)$, to solve for w_R^H in terms of w_R^L. Note that as $w_R^L \to -\infty$, $U^H\left(w_R^H\right) \to -\infty$ since $U^H\left(w_R^H\right)$ is bounded above by its value under the full-insurance contract $\left(\frac{q_H}{q_L}w_R^L, \frac{q_H}{q_L}w_R^L\right)$; while as $w_R^L \to +\infty$ then $U^H\left(w_R^H\right) - U^L\left(w_R^H\right) \to 0$.

Next, we show that $U^H\left(w_R^H\right)$ is globally strictly increasing as a function of w_R^L. Note first that $w_{RS}^H > w_{RF}^H$ (see the proof of Lemma 3). Differentiation of $U^L\left(w_R^H\right) = U^L\left(w_R^L\right)$ and $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$ implies

$$\begin{aligned} q_L u'\left(w_{RS}^H\right) dw_{RS}^H + (1 - q_L)\, u'\left(w_{RF}^H\right) dw_{RF}^H &= u'\left(w_R^L\right) dw_R^L \\ q_H dw_{RS}^H + (1 - q_H)\, dw_{RF}^H &= \frac{q_H}{q_L} dw_R^L. \end{aligned}$$

So, it is possible to transform these two equations into the following two equations:

$$\begin{aligned} \left((1 - q_H)\, q_L u'\left(w_{RS}^H\right) - q_H (1 - q_L)\, u'\left(w_{RF}^H\right)\right) dw_{RS}^H &= \left((1 - q_H)\, u'\left(w_R^L\right) - (1 - q_L)\, u'\left(w_{RF}^H\right) \frac{q_H}{q_L}\right) dw_R^L \\ \left(q_H (1 - q_L)\, u'\left(w_{RF}^H\right) - (1 - q_H)\, q_L u'\left(w_{RS}^H\right)\right) dw_{RF}^H &= \left(q_H u'\left(w_R^L\right) - q_L u'\left(w_{RS}^H\right) \frac{q_H}{q_L}\right) dw_R^L. \end{aligned}$$

Define: $D = q_H (1 \quad q_L) u' \left(w_{RF}^H\right) \quad (1 \quad q_H) q_L u' \left(w_{RS}^H\right)$, and note that $D > 0$. Hence, the change in $u^H \left(w_R^H\right)$ is given by:

$$\begin{aligned}
& q_H u' \left(w_{RS}^H\right) dw_{RS}^H + (1 \quad q_H) u' \left(w_{RF}^H\right) dw_{RF}^H \\
= \; & \frac{1}{D} (1 \quad q_H) u' \left(w_{RF}^H\right) \left(q_H u' \left(w_R^L\right) \quad q_L u' \left(w_{RS}^H\right) \frac{q_H}{q_L} \right) dw_R^L \\
& \quad \frac{1}{D} q_H u' \left(w_{RS}^H\right) \left((1 \quad q_H) u' \left(w_R^L\right) \quad (1 \quad q_L) u' \left(w_{RF}^H\right) \frac{q_H}{q_L} \right) dw_R^L \\
= \; & \frac{1}{D} (1 \quad q_H) q_H \left(u' \left(w_{RF}^H\right) \quad u' \left(w_{RS}^H\right) \right) u' \left(w_R^L\right) dw_R^L \\
& + \frac{1}{D} \left(q_H (1 \quad q_L) \frac{q_H}{q_L} \quad (1 \quad q_H) q_H \right) u' \left(w_{RS}^H\right) u' \left(w_{RF}^H\right) dw_R^L \\
= \; & \frac{q_H}{D} \left((1 \quad q_H) \left(u' \left(w_{RF}^H\right) \quad u' \left(w_{RS}^H\right) \right) u' \left(w_R^L\right) + \left(\frac{q_H}{q_L} \quad 1 \right) u' \left(w_{RS}^H\right) u' \left(w_{RF}^H\right) \right) dw_R^L.
\end{aligned}$$

The term multiplying dw_R^L is strictly positive, making $u^H \left(w_R^H\right)$ strictly increasing in w_R^L.

Second, we use the pair of equations $U^L \left(w_B^H\right) = U^L \left(w_R^L\right)$ and $\Pi^H \left(w_B^H\right) = 0$, together with the fact that w_B^H is chosen to maximize $U^H \left(w_B^H\right)$, to solve for w_B^H in terms of w_R^L. First, observe that a solution only exists for w_R^L below some cutoff value. Moreover, when w_R^L equals this cutoff level, $U^H \left(w_B^H\right)$ is strictly negative.

We next show that $U^H \left(w_B^H\right)$ is globally strictly decreasing as a function of w_R^L. Note first that $w_{BS}^H \quad w_{BF}^H$ (see the proof of Lemma 3). Differentiation of $U^L \left(w_B^H\right) = U^L \left(w_R^L\right)$ and $\Pi^H \left(w_B^H\right) = 0$ implies

$$\begin{aligned}
q_L u' \left(w_{BS}^H\right) dw_{BS}^H + (1 \quad q_L) u' \left(w_{BF}^H\right) dw_{BF}^H &= \frac{e^{-\gamma\Delta}}{\Phi} u' \left(w_R^L\right) dw_R^L \\
q_H dw_{BS}^H + (1 \quad q_H) dw_{BF}^H &= 0.
\end{aligned}$$

So, it is possible to transform these two equations into the following two equations:

$$\begin{aligned}
\left((1 \quad q_H) q_L u' \left(w_{BS}^H\right) \quad (1 \quad q_L) q_H u' \left(w_{BF}^H\right) \right) dw_{BS}^H &= (1 \quad q_H) \frac{e^{-\gamma\Delta}}{\Phi} u' \left(w_R^L\right) dw_R^L \\
\left(q_H (1 \quad q_L) u' \left(w_{BF}^H\right) \quad (1 \quad q_H) q_L u' \left(w_{BS}^H\right) \right) dw_{BF}^H &= \quad q_H \frac{e^{-\gamma\Delta}}{\Phi} u' \left(w_R^L\right) dw_R^L.
\end{aligned}$$

Hence, the change in $U^H\left(w_B^H\right)$ is given by:

$$
\begin{aligned}
& q_H u'\left(w_{BS}^H\right)\Phi dw_{BS}^H + (1-q_H)\, u'\left(w_{BF}^H\right)\Phi dw_{BF}^H \\
= \quad & \frac{1}{e^{-\gamma\Delta}D}\left(q_H\,(1-q_H)\, u'\left(w_{BF}^H\right) + q_H\,(1-q_H)\, u'\left(w_{BS}^H\right)\right) u'\left(w_R^L\right) dw_R^L.
\end{aligned}
$$

The term multiplying dw_R^L is strictly negative, making $U^H\left(w_B^H\right)$ strictly decreasing in w_R^L.

Existence and uniqueness are then immediate from continuity. ∎

A.2 Proofs of results stated in main text

Proof of Lemma 1: Suppose to the contrary that an equilibrium in which banks expect to extract strictly positive profits from a worker type i exists. Let w_B^L and w_B^H be the equilibrium 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 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 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 $\Pi^i\left(\tilde{w}_B\right)$ 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 $\Pi^i\left(\tilde{w}_B\right) > 0$. 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 the result.

A similar proof by contradiction applies for regulatory agencies and the productivity per dollar of their workers. ∎

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

Proof of Proposition 2: For each possible number of bankers $n \in (0,\eta) \cup (\eta, 1+\eta)$, we construct a candidate equilibrium that satisfies all the equilibrium conditions other than the regulator budget constraint. 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 satisfies the regulatory budget constraint.

Let $n \in [0, 1+\eta]$ be the total number of bankers. Let $Y(n)$ be the associated total output of the banking sector (i.e., the number of successful projects funded). From Proposition 1, we know

$$Y(n) = \begin{cases} nq_H & \text{if } n \leq \eta \\ \eta q_H + (n-\eta) q_L & \text{if } n > \eta \end{cases}.$$

Note that Y is continuous in n. The average profit from investing in a successful project is $p = P(n)$ and is also continuous in n.

As discussed in the main text, we can assume without loss that banks offer contracts $\left(w_{BS}^L, w_{BF}^L\right) = \left(w_{BS}^H, w_{BF}^H\right) = (p, 0)$ and regulatory agencies offer contracts $\left(w_{RS}^L, w_{RF}^L\right) = \left(w_{RS}^H, w_{RF}^H\right) = (w_{RS}, 0)$, where w_{RS} is as determined below:

Case: $n \in (0,\eta)$ When $n \in (0,\eta)$, all bankers have high skill and w_{RS} is determined by the high-skill workers' indifference condition such that $w_{RS} = p - \frac{\Delta - \phi(r)}{q_H}$. This wage satisfies utility-maximization, profit-maximization, and misbehavior minimization conditions. First, low-skill workers do not become bankers since

$$q_L w_{RS} + \Delta - \phi(r) = q_L p - \frac{q_L}{q_H}(\Delta - \phi(r)) + \Delta - \phi(r) > q_L p.$$

Second, each bank cannot raise profits by paying high-skill workers less since it would not be able to hire any. To hire a low-skill worker, a bank would have to offer expected compensation greater than $q_L w_{RS} + \Delta - \phi(r)$ and it would be unprofitable. Third, each regulatory agency hires both types of agents, and gets the same efficiency from both. So it cannot gain by dropping one of the types, and if it tries reducing wages it will not be able to hire anyone.

Case: $n \in (\eta, 1+\eta)$ When $n \in (\eta, 1+\eta)$, all regulators have low skill and w_{RS} is determined

by the low-skill workers' indifference condition such that $w_{RS} = p \quad \frac{\Delta-\phi(r)}{q_L}$. This wage satisfies utility-maximization, profit-maximization, and misbehavior minimization conditions. First, high-skill workers do not become regulators since

$$q_H w_{RS} + \Delta \quad \phi(r) = q_H p \quad \frac{q_H}{q_L}(\Delta \quad \phi(r)) + \Delta \quad \phi(r) < q_H p.$$

Second, each bank hires both types of agents, and cannot raise profits by paying any agent less since it would not be able to hire them. Third, each regulatory agency hires only low-skill workers. To hire high-skill workers, it would need to pay them $p \quad \frac{\Delta-\phi(r)}{q_H}$, which would make them less productive at catching misbehavior per expected dollar paid than low-skill workers earning $w_{RS} = p \quad \frac{\Delta-\phi(r)}{q_L}$.

Case: $n = \eta$ When $n = \eta$, any value of w_{RS} in the closed interval

$$\left[p \quad \frac{\Delta \quad \phi(r)}{q_L}, p \quad \frac{\Delta \quad \phi(r)}{q_H}\right]$$

is consistent with the equilibrium conditions. These values for w_{RN} satisfy utility-maximization, profit-maximization, and misbehavior minimization conditions. First, high-skill workers do not become regulators and low-skill workers do not become bankers since $q_H p \quad q_H w_{RS} + \Delta \quad \phi(r)$ and $q_L p \quad q_L w_{RS} + \Delta \quad \phi(r)$. Second, each bank cannot raise profits by paying high-skill workers less since it would not be able to hire any. To hire a low-skill worker, a bank would have to offer expected compensation of at least $q_L w_{RS} + \Delta \quad \phi(r)$, and would yield at most zero profits (and potentially less). Third, each regulatory agency hires only low-skill workers. To hire high-skill workers, it would need to pay them $p \quad \frac{\Delta-\phi(r)}{q_H}$, which would make them at most as productive at catching misbehavior per expected dollar paid than low-skill workers and potentially less.

For any n, let $W(n)$ be the total regulatory wage bills associated with the candidate equilibrium characterized above. Since for $n = \eta$ the candidate equilibrium is not unique, in this case $W(n)$ is a set. Hence W defines a correspondence from $[0, 1 + \eta]$ into $<$. Substituting in the above

characterization of contracts,

$$W(n) = \begin{cases} ((\eta \quad n)\, q_H + q_L)\left(p \quad \frac{\Delta - \phi(r)}{q_H}\right) & \text{if } n < \eta \\ \left\{ q_L \left(p \quad \frac{\Delta - \phi(r)}{\chi}\right) : \chi \in [q_L, q_H] \right\} & \text{if } n = \eta \\ (1 \quad (n \quad \eta))\, q_L \left(p \quad \frac{\Delta - \phi(r)}{q_L}\right) & \text{if } n > \eta \end{cases}.$$

Note that $\lim_{n \to 0} W(n) = +\infty$ since $\lim_{n \to 0} P(n) = +\infty$, and so banking and hence regulator compensation must grow arbitrarily large. Moreover, $\lim_{n \to 1+\eta} W(n) = 0$, since in this case regulatory agencies do not employ anyone (and compensation is bounded, since banker compensation is bounded). Since the detection probability r and hence $\phi(r)$ are continuous in n, the function $W(n)$ is continuous over each of $(0, \eta)$ and $(\eta, 1 + \eta)$.

Moreover, $Y(\eta) = \left[q_L \left(p \quad \frac{\Delta - \phi(r)}{q_L}\right), q_L \left(p \quad \frac{\Delta - \phi(r)}{q_H}\right)\right]$, $\lim_{n \nearrow \eta} W(n) = q_L \left(p \quad \frac{\Delta - \phi(r)}{q_H}\right)$ and $\lim_{n \searrow \eta} W(n) = q_L \left(p \quad \frac{\Delta - \phi(r)}{q_L}\right)$. So by an obvious extension of the mean-value theorem,[20] there exists $n \in (0, 1 + \eta)$ such that $W(n) = M$. ∎

Proof of Lemma 2: "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, fix an equilibrium $\left(w_B^H, w_B^L, w_R^H, w_R^L, \alpha^H, \alpha^L, p, r\right)$ of the full-information economy. The full-information analogue of Lemma 1 is easily established: there exists s such that a banker of type i has an expected compensation of $q_i p$ and a regulator of type i has an expected compensation of $q_i s$. But then the simple wage contracts $w_B^H = w_B^L = (p, 0)$ and $w_R^H = w_R^L = (s, 0)$, together with the full-information equilibrium values of α^H, α^L, p, r, constitute an equilibrium of the asymmetric information economy. ∎

Proof of Proposition 3: Fix a decentralized equilibrium. Write r for the equilibrium detection probability, and n for the equilibrium number of bankers. In equilibrium, there is an s such that worker type i gets $P(n)\, q_i + \phi(r)$ as a banker and $s q_i + \Delta$ as a regulator. Observe that $s > 0$, since otherwise regulator agencies would hire all workers.

[20] More formally, W is upper hemi-continuous, and Lemma 4.1 of John (1999) applies.

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 do not exceed M.

Write B 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, $B \quad 0$. In the new allocation, the combined utility of these workers is simply

$$M + \left(1 + \eta \quad n \quad \sum_i \delta_i + \sum_i \varepsilon_i\right) \Delta.$$

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

$$M \quad \sum_i \delta_i s q_i + \left(1 + \eta \quad n \quad \sum_i \delta_i\right) \Delta.$$

So

$$\begin{aligned} B &= M + \left(1 + \eta \quad n \quad \sum_i \delta_i + \sum_i \varepsilon_i\right) \Delta \quad \sum_i \varepsilon_i \left(P(n) q_i + \phi(r)\right) \\ &\quad \left(M \quad \sum_i \delta_i s q_i + \left(1 + \eta \quad n \quad \sum_i \delta_i\right) \Delta\right) \end{aligned}$$

which simplifies to

$$B = \sum_i \delta_i s q_i \quad \sum_i \varepsilon_i \left(P(n) q_i + \phi(r) \quad \Delta\right). \tag{5}$$

Observe that $\varepsilon_i > 0$ is possible only if the decentralized equilibrium featured type i workers in banking; but in this case, $P(n) q_i + \phi(r) \quad \Delta + s q_i$, 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, $\sum_i \delta_i s q_i \quad \sum_i \varepsilon_i s q_i \quad B \quad 0$, and so the number

of useful reports must be lower in the new allocation, i.e.,

$$(\varepsilon_H \quad \delta_H) q_H + (\varepsilon_L \quad \delta_L) q_L \quad 0. \tag{6}$$

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 (6) implies that the new allocation has more bankers, $\sum_i \varepsilon_i \quad \sum_i \delta_i \quad 0$.

Write $n' = n \quad \sum_i (\varepsilon_i \quad \delta_i)$ 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, $n' \quad n$; and since there are more bankers and fewer useful reports, the new detection rate is lower, $r' \quad r$, given the properties of G.

Write $\Psi(n, r)$ for 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. Note that $\Psi(n, r)$ depends on the number of bankers, n, and the misbehavior detection probability, r; and in particular, the social cost of misbehavior is higher in the new allocation, $\Psi(n', r') \quad \Psi(n, r)$.

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

$$P(n)\left(\eta\alpha^H q_H + \alpha^L q_L\right) + M + (1 + \eta \quad n)\Delta \quad \Psi(n, r),$$

where the first term is monetary payments to bankers, the second term is monetary payments to regulators, and the third term is the total intrinsic utility received by regulators. So the sum of utilities in the new allocation is

$$\begin{aligned} & P(n')\left(\eta\alpha^H q_H + \alpha^L q_L + \sum_i (\delta_i \quad \varepsilon_i) q_i\right) + M + \left(1 + \eta \quad n'\right)\Delta \quad \Psi\left(n', r'\right) \\ & P(n)\left(\eta\alpha^H q_H + \alpha^L q_L\right) + M + (1 + \eta \quad n)\Delta \\ + & \sum_i (\delta_i \quad \varepsilon_i)(q_i P(n) \quad \Delta) \quad \Psi\left(n', r'\right). \end{aligned}$$

Hence the change in the sum of utilities is less than

$$\begin{aligned} & \sum_i (\delta_i \quad \varepsilon_i)(q_i P(n) \quad \Delta) \quad \left(\Psi\left(n', r'\right) \quad \Psi(n,r)\right) \\ = \quad & B + \sum_i \delta_i (q_i P(n) \quad \Delta \quad s q_i) + \sum_i \varepsilon_i \phi(r) \quad \left(\Psi\left(n', r'\right) \quad \Psi(n,r)\right), \end{aligned}$$

where the equality follows from (5).

Observe that $\delta_i > 0$ is possible only if the decentralized equilibrium featured type i workers in regulation; but in this case, $q_i P(n) + \phi(r) \quad \Delta + s q_i$, 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

$$B + \sum_i (\varepsilon_i \quad \delta_i)\, \phi(r) \quad \left(\Psi\left(n', r'\right) \quad \Psi(n,r)\right).$$

From above, $\sum_i (\varepsilon_i \quad \delta_i) \quad 0$ and $\Psi(n', r') \quad \Psi(n,r)$. Consequently, the change in the sum of utilities is smaller than the utility gain experienced by regulators in the *new* allocation, B. 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., $B > 0$) 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 $(\tilde{w}_{BS}, \tilde{w}_{BF}) = \left(w_{RS}^H + \lambda + \varepsilon_S, w_{RF}^H + \lambda \quad \varepsilon_F\right)$, where λ is such that, if $\varepsilon_S = \varepsilon_F = 0$, the new contract offers to any worker exactly the same utility as the regulator contract $\left(w_{RS}^H, w_{RF}^H\right)$ offers, i.e.,

$$u(w+\lambda)\,\Phi(r) = u(w+\Delta) \text{ for all } w,$$

or equivalently,

$$\Delta \quad \lambda = \quad \frac{1}{\gamma} \ln \Phi(r).$$

For use below, note that, from the condition stated in the proposition, $\lambda > 0$: in words, if offered the same wages, workers prefer regulation to banking, and so a bank must raise wages by λ 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

By setting ε_S' and ε_F' small, this can be made arbitrarily close to

$$\frac{q_L}{q_L w_{BS}^L + (1 - q_L)\, w_{BF}^L - \lambda}.$$

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 this ratio equals $\frac{q_L}{q_L p - \lambda}$, which since $\lambda > 0$ is strictly greater than $\frac{q_H}{q_H p - \lambda}$, which by (7) 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 regulator'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, and in which both types of worker are employed by regulatory agencies. The only remaining case is that all regulators are low-skill, and all bankers are high-skill. Suppose that, contrary to the claimed result, the banking contracts have fixed wages, i.e., $w_{BS}^H = w_{BF}^H = w_B^H$. From the main text, low-skill regulators have a fixed wage, i.e., $w_{RS}^L = w_{RF}^L = w_R^L$. So for both worker types $i = \{L, H\}$, $U^i\left(w_B^H\right) = u\left(w_B^H\right)\Phi\left(r\right)$ 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, since otherwise all workers would be either bankers, or all would be regulators. But then a regulatory agency could strictly increase its productivity by offering a fixed wage 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 $n \in (0, \eta) \cup (\eta, 1 + \eta)$, we construct a candidate equilibrium. We also show that, given n, 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). Finally, the comparative statics follow straightforwardly from the mapping used to establish equilibrium existence.

We start by considering, in turn, the cases $n \in (0, \eta)$ and $n \in (\eta, 1+\eta)$. Banking output $Y(n)$ is defined as in the proof of Proposition 2. Likewise, as in the proof of Proposition 2 we construct a correspondence $W : [0, 1+\eta] \rightrightarrows \Re$ giving the total regulator wage bill for each candidate number of bankers n.

Case: $n \in (0, \eta)$

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, w_B^H. From the text prior to Proposition 5, $w_{RS}^L = w_{RF}^L$. From Lemma 3, w_R^H solves $\max_{w_R^H} U^H\left(w_R^H\right)$ such that $U^L\left(w_R^H\right) = U^L\left(w_R^L\right)$ and $\rho^H\left(w_R^H\right) = \rho^L\left(w_R^L\right)$. Note that from Lemma 3, $w_{RS}^H > w_{RF}^H$ and $U^H\left(w_R^H\right) = U^H\left(w_B^H\right)$, since otherwise either banks or regulatory agencies could profitably reduce the compensation of high-skill workers. Full-insurance for the contract w_B^H is impossible in equilibrium, since in this case, $U^L\left(w_B^H\right) = U^H\left(w_B^H\right) = U^H\left(w_R^H\right) > U^H\left(w_R^L\right) = U^L\left(w_R^L\right)$, implying no low-skill worker would accept the regulation contract intended for him. So Lemma 4 implies that w_B^H solves $\max_{w_B^H} U^H\left(w_B^H\right)$ such that $U^L\left(w_B^H\right) = U^L\left(w_R^L\right)$ and $\Pi^H\left(w_B^H\right) = 0$. From Lemma 5, this system of equations has a unique solution. In this case, the total wage bill of the regulatory sector is $W(n) = (\eta - n)\left(q_H w_{RS}^H + (1 - q_H) w_{RF}^H\right) + w_{RS}^L$.

Case: $n \in (\eta, 1+\eta)$

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, w_B^H. From the text prior to Proposition 5, $w_{RS}^L = w_{RF}^L$ and $w_{BS}^L = w_{BF}^L$. From Lemma 3, w_B^H solves $\max_{w_B^H} U^H\left(w_B^H\right)$ such that $U^L\left(w_B^H\right) = U^L\left(w_B^L\right)$ and $\Pi^H\left(w_B^H\right) = 0$. Finally, $\Pi^L\left(w_B^L\right) = 0$ and $U^L\left(w_B^L\right) = U^L\left(w_R^L\right)$.

Note that $\Pi^L\left(w_B^L\right) = 0$ and $w_{BS}^L = w_{BF}^L$ uniquely determines w_B^L, and that $\max_{w_B^H} U^H\left(w_B^H\right)$ such that $U^L\left(w_B^H\right) = U^L\left(w_B^L\right)$ and $\Pi^H\left(w_B^H\right) = 0$ then uniquely determines w_B^H. Finally, $w_{RS}^L = w_{RF}^L$ and $U^L\left(w_B^L\right) = U^L\left(w_R^L\right)$ uniquely determines w_R^L. In this case, the total wage bill of the regulatory sector is $W(n) = (1 + \eta - n)\, w_{RS}^L$.

Existence of candidate equilibrium n such that $W(n) = M$:

Note that $\lim_{n\to 0} W(n) = +\infty$ since $\lim_{n\to 0} P(n) = +\infty$, and so banking and hence regulator compensation must grow arbitrarily large. Moreover, $\lim_{n\to 1+\eta} W(n) = 0$, since in this case regulatory agencies do not employ anyone (and compensation is bounded, since banker compensation is bounded). Since the detection probability r and hence $\Phi(r)$ are continuous in n, the function $W(n)$ is continuous over each of $(0, \eta)$ and $(\eta, 1+\eta)$.

Define w_R^{-L} as the limiting value of w_R^L in the case $n < \eta$ as $n \nearrow \eta$, and w_R^{+L} as the limiting value of w_R^L in the case $n > \eta$ as $n \searrow \eta$.

If $w_R^{-L} < w_R^{+L}$, then $\lim_{n\nearrow\eta} W(n) < \lim_{n\searrow\eta} W(n)$. If $\lim_{n\nearrow\eta} W(n) < M$ then by the intermediate value theorem there exists at least one $n \in (0, \eta)$ such that $W(n) = M$. If instead $\lim_{n\nearrow\eta} W(n) \geq M$ then $\lim_{n\searrow\eta} W(n) > M$, and by the intermediate value theorem there exists at least one $n \in (\eta, 1+\eta)$ such that $W(n) = M$.

Next, we turn to the harder case in which $w_R^{-L} \geq w_R^{+L}$. For this case, we consider the possible equilibria when the number of bankers $n = \eta$, and so all regulators have low skill and all bankers have high skill. So the contracts accepted in equilibrium are w_R^L, w_B^H. From the text prior to Proposition 5, $w_{RS}^L = w_{RF}^L$.

There is no equilibrium with $w_R^L < w_R^{+L}$, as follows. By the definition of w_R^{+L}, there exists a contract w_B^L that banks can offer to low-skill workers such that $U^L\left(w_B^L\right) = U^L\left(w_R^{+L}\right)$ and $\Pi^L\left(w_B^L\right) = 0$. Hence there is a contract $\tilde{w}_B^L$ that banks can offer to low-skill workers such that $U^L\left(\tilde{w}_B^L\right) > U^L\left(w_R^L\right)$ and $\Pi^L\left(w_B^L\right) > 0$.

There is no equilibrium with $w_R^L > w_R^{-L}$, as follows. By the definition of w_R^{-L}, and from the proof of Lemma 5, there exists a contract w_R^H that regulatory agencies can offer to high-skill workers such that $U^H\left(w_R^H\right) > U^H\left(w_B^H\right)$ and $\rho^H\left(w_R^H\right) = \rho^H\left(w_R^L\right)$, and such that only high-skill workers accept the contract. Hence there is a contract $\tilde{w}_R^H$ that regulatory agencies can offer to high-skill workers such that $U^L\left(\tilde{w}_B^L\right) > U^L\left(w_R^L\right)$ and $\rho^H\left(w_R^H\right) > \rho^H\left(w_R^L\right)$, and such that only high-skill workers accept the contract.

Consider any w_R^L in $\left[w_R^{+L}, w_R^{-L}\right]$. Full insurance in the contract w_B^H is impossible in equilibrium: in this case, $U^L\left(w_B^H\right) = U^H\left(w_B^H\right)$; since $w_R^L \leq w_R^{-L}$, the proof of Lemma 5 implies

$U^H\left(w_B^H\right) \quad U^H\left(w_R^H\right)$, and also $w_{RS}^H > w_{RF}^H$, and hence $U^H\left(w_B^H\right) > U^L\left(w_R^H\right)$; but then $U^L\left(w_B^H\right) > U^L\left(w_R^H\right)$, a contradiction. Lemma 4 then implies that in any candidate equilibrium, w_B^H solves $\max_{w_B^H} U^H\left(w_B^H\right)$ such that $U^L\left(w_B^H\right) = U^L\left(w_R^L\right)$ and $\Pi^H\left(w_B^H\right) = 0$. This ensures that no bank can profitably poach the high-skill workers employed by other banks. Moreover, straightforward adaptation of the arguments in the last two paragraphs implies that no bank can profitably poach the low-skill workers employed by regulatory agencies, and no regulatory agency can profitably poach the high-skill workers employed by banks. So for any value of w_R^L in $\left[w_R^{+L}, w_R^{-L}\right]$, there is a candidate equilibrium.

In this case, W is a correspondence, since it takes multiple values at $n = \eta$. Moreover, $W(\eta) = \left[w_R^{+L}, w_R^{-L}\right]$, $\lim_{n \nearrow \eta} W(n) = w_R^{-L}$ and $\lim_{n \searrow \eta} W(n) = w_R^{+L}$. So by an obvious extension of the mean-value theorem,[21] there exists $n \in (0, 1+\eta)$ such that $W(n) = M$.

The arguments above establish the existence of 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. Since high-skill workers strictly prefer their contracts to the low-skill worker contracts (see above), 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 Proposition 7: 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 $\frac{q_H}{q_H p - \left(\overline{\Delta} + q_H d - \phi(r)\right)}$ and the regulatory agency could instead poach low-skill bankers who would carry a productivity of $\frac{q_L}{q_L p - \left(\overline{\Delta} + q_L d - \phi(r)\right)}$. Whenever $\overline{\Delta} > \phi(r)$, 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).

[21] More formally, W is upper hemi-continuous, and Lemma 4.1 of John (1999) applies.

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