

# Seeking Alpha: Excess Risk Taking and Competition for Managerial Talent

Viral Acharya

Marco Pagano

Paolo Volpin

December 2011

## Abstract

We present a model of labor market equilibrium in which managers are risk-averse, managerial talent (“alpha”) is scarce, and firms seek alpha, that is, compete for this talent. When managers are not mobile across firms, firms provide efficient long-term compensation, which allows for learning about managerial talent and insures low-quality managers. In contrast, when managers can move across firms, high-quality managers can fully extract the rents arising from their skill, which prevents firms from providing co-insurance among their employees. In anticipation, risk-averse managers may churn across firms before their performance is fully learnt and thereby prevent their efficient choice of projects. The result is excessive risk-taking with pay for short-term performance and build up of long-term risks. We conclude with analysis of policies to address the resulting inefficiency in firms’ compensation.

JEL classification: D62, G32, G38, J33.

Keywords: short-termism, executive compensation, managerial talent, managerial turnover.

Authors’ addresses: Viral Acharya, New York University; e-mail: [vacharya@stern.nyu.edu](mailto:vacharya@stern.nyu.edu). Marco Pagano, Università di Napoli Federico II and Imperial College London, [mrpagano@tin.it](mailto:mrpagano@tin.it). Paolo Volpin, London Business School; e-mail: [pvolpin@london.edu](mailto:pvolpin@london.edu).

Acknowledgments: We are grateful to Ulf Axelson, Philip Bond, Mike Burkart, David Dicks, Michael Fishman, Hendrik Hakesen, Giancarlo Spagnolo and participants in the 2010 AEA Meetings, the Third Conference on Financial Integration and Stability in Mannheim, 2010 EFA Meetings, 2010 Mitsui Conference at University of Michigan, the 2011 WFA Meetings, the 2011 ESSET in Gerzensee, and in seminars at Arizona State University, Bocconi University, Boston College, INSEAD, New York University for helpful comments and discussions. We acknowledge financial support from the Fondation Banque de France, Europlace Institute of Finance, Inquire Europe and BNP Paribas Hedge Fund Center at HEC Paris.

*“The dirty secret of bank bonuses is that these practices have arisen not merely due to a culture of arrogance; the more pernicious problem is a sense of insecurity. Banks operate in a world where their star talent is apt to jump between different groups, whenever a bigger pay-packet appears, with scant regard for corporate loyalty or employment contracts. The result is that the compensation committees of many banks feel utterly trapped. ... [A]s one banker says: “These bonuses are crazy - we all know that. But we don’t know how to stop paying them without losing our best staff.” Against that background, what the members of some compensation committees are quietly starting to conclude is that the only real solution is to start clamping down on the whole “transfer” game. “If Fifa can stop clubs poaching other players and ripping up contracts, then why can’t the banks do the same?” asks one... It is time, in other words, for bankers and regulators to take a leaf out of football’s book and start debating not just the issue of pay, but also the poaching culture that is at the root of those huge bonus figures.” – Tett (2009)*

## 1 Introduction

Excess risk-taking by financial institutions and overly generous managerial pay are regarded by many as key factors contributing to the 2007-09 crisis.<sup>1</sup> In particular, it has become commonplace to blame banks and securities companies for offering compensation packages that reward managers (and more generally, other risk-takers such as traders and salesmen) generously for undertaking investments with high returns in the short run but with large “tail risks” that emerge only in the long run. As governments have been forced to rescue failing financial institutions, politicians and the media have stressed the need that managerial pay packages be cut and incentive systems based on options and bonuses be reined in, made more sensitive to long-term performance, and in some extreme cases be outright eliminated.<sup>2</sup> As the huge costs of bank rescues have become apparent, political pressure for such executive pay curbs has mounted around the world. It is natural to ask whether these limitations to

---

<sup>1</sup>See, for example, Rajan (2005, 2008), Richardson and Walter (2009) and Bebchuk, Cohen and Spamann (2009).

<sup>2</sup>For instance, in 2008 the German government included in its bank bailout plan the clause that banks accepting state aid must cap annual salaries of their executives at Euro 500,000, and may also be required to forgo bonuses and dividend payments. Similarly, in early 2009 the U.S. government has imposed a cap of \$500,000 on the compensation of top executives at companies that received significant federal assistance. Also in the United Kingdom, Sweden and Switzerland, governments have set limits on financiers’ compensation as part of their efforts to rescue their banking systems.

managerial pay are the right policy response to the problem, or are simply dictated by public anger at the wrong-doings of financial institutions' managers. Indeed, it is crucial to ask what is in fact the root of the problem, that is, which market failure in compensation practices has led to rewards for short-term performance at the expense of a build-up of tail risks.

The argument that we explore in this paper is that the root of the problem is the difficulty of rewarding managerial talent when managers can pick projects with long-term or tail risk and the market allows them to move across firms before that risk materializes. Intuitively, the idea is that in this situation managers have an incentive to take large tail risks in order to raise their short-term performance and pay, while moving rapidly from one firm to another, reducing their effective tenure at any firm and thereby the extent to which they can be held responsible for project failures. With such possibility of managerial churning, firms' competition for managerial talent induces a negative externality, insofar as each firm provides an "escape route" to the managers of others. This is to be contrasted with the case where the market for managerial talent is not very competitive, so that managers are more likely to be stuck with their initial employer and their types discovered relatively early.

More specifically, we consider a setting with a continuum of firms, risk-averse managers and scarce managerial talent. We model managerial talent as "alpha", that is, the ability to generate high returns without incurring high risks: lacking such talent, managers can generate high returns only by taking correspondingly high risks. However, risk emerges only in the long run. So managerial talent can be identified only if managers who have chosen potentially risky projects remain for a sufficiently long period of time with their initial employers: if they leave earlier, the long-term performance of the projects that they have initiated is never learnt, because it is more efficient for the firm to liquidate them.

In such a setting, if managers were tied to their initial employer, then over time firms could tell apart the talented from those which are not, and could also insure managers against the risk of finding out that they are not talented. So there would be two efficiency gains. First, a gain in the choice of investment projects: once managers

learn about their skills, they will pick the project that they are best suited to manage. Second, there is a risk-sharing gain: managers who are revealed to be low-skills are cross-subsidized at the expense of the talented ones.

However, competition for managers can prevent both of these welfare gains from being fully realized. If firms compete aggressively with each other in the labor market (“seeking alpha”), then managers can leave before the long-term risks that they have incurred materialize. In particular, managers anticipate that the few managers who are discovered over time to be the high-alpha type will extract all rents from their firms by generating competitive offers rewarding their alpha. This would prevent firms from subsidizing the other managers. In other words, managers face skewed performance rewards once there is a competitive labor market: high alpha types extract all rents, and low-alpha get no subsidy. Now, if risky projects have a greater expected return (even when chosen by a manager of unknown quality) than safe ones, then risk-averse managers are driven to choose risky rather than safe projects, get a higher pay than they would from the safe project, but then move to another firm before the risk of their project has materialized. In other firms, they are then going to replicate the same behavior. In the aggregate, managers will be moving continuously from one firm to the next, in each they will choose the risky project irrespective of their ability to avoid (or control) the implied risks, and talented managers will never be identified.

Viewed in a broader perspective, one economic purpose of the firm is to gather information about its employees’ talents and use it to allocate them efficiently to projects. Such efficient allocation of talent is also considered to be the key role of a competitive market for managers (see Gabaix and Landier, 2008, among others). But, as shown by our model, when projects have risks that materialize only in the long term, there may be a dark side to the market for managers: by destroying the boundary of the firm that encapsulates its employees, short-run labor market opportunities interfere with the long-run information gathering function of the firm. Indeed, this dark side gets exploited by managers as they prefer to take on projects with tail risks and use the labor market to move across firms, delaying the resolution of uncertainty about their talent.

To summarize, competition in the market for managers generates an inefficiency due to the contractual externality among firms. Indeed, the inefficiency is stronger the greater is the probability that a manager who leaves his employer will be hired by another firm. Therefore, the strength of the externality is predicted to correlate with the turnover rate of managers: one should observe that in markets and countries where there is greater managerial turnover, firms take greater risks, other things being equal. They would also reap greater short-term returns, but at the cost of inefficiently large risks. The financial sector appears to fit these criteria quite well since trader and sales skills are highly fungible across firms.<sup>3</sup>

Hence, we also bring our analysis to bear on the current policy proposals and interventions, primarily in the financial sector, aimed at introducing long-term features such as clawbacks in compensation or capping the salaries and/or bonuses of top managers (at all or at least some of the leading firms in the sector), primarily in the financial sector. Though none of these policies explicitly addresses the managerial turnover issue, we show that constraints on deferring compensation aggravate the problem of managerial churning. We also show that an appropriately chosen salary cap restores the employers' ability to cross-subsidize less talented managers at the expense of more talented ones. Thus, a salary cap can allow risk-sharing even in a regime where the managerial market features no obstacles to mobility. The same outcome could be obtained by "taxing mobility", namely, charging a sufficiently large tax on the income of managers who switch employers. This would effectively eliminate ex-post competition for managerial talent (so that the tax would not be paid in equilibrium), but may be relatively harder to implement in practice.

The paper is organized as follows. Section 2 discusses the related literature. Section 3 lays out the structure of the model. In Section 4 we solve for the equilibrium. In Section 5 we relax several of the model's assumptions to explore the robustness of our results. In Section 6 we examine the effectiveness of various possible policy interventions. Section 7 concludes.

---

<sup>3</sup>The propensity to take on tail risks appears to be related to banking revenues being increasingly tied to trading activity relative to interest and fee based activities (Stiroh, 2004).

## 2 Related literature

At a broad level, our paper is related to the large literature on executive compensation and corporate governance. Our novelty is to focus on the role of managerial turnover and study its effect on risk-taking. Our main result is to show that such turnover enables managers to extract short-term rents from firms, and leads to the buildup of inefficiently large long-term risks.

On the one hand, this result is related to the “pay without performance” view of Bebchuk and Fried (2004). But they attribute the rent extraction to CEO control over the board of directors and compensation committees, whereas we attribute it to the presence of a competitive labor market which forces firms to match the outside options of employees. On the other hand, our result presents a countervailing force to the benefits arising from competitive labor markets through efficient matching. Gabaix and Landier (2008) present matching models à la Rosen (1981) in which the rise in CEO pay is due to their scarce talent and its efficient matching to larger firms. In contrast, in our setting competition for talent among firms results in less efficient matching of managers to projects within each firm.

The fact that managerial turnover introduces an externality across firms in setting their compensation can be considered as a corporate governance externality. Such externalities have been the focus of several recent papers. Acharya and Volpin (2009) and Dicks (2009) formalize this argument in a model where a firm’s corporate governance is a strategic substitute for governance in other firms as it lowers a manager’s reservation wages, a result that according to Acharya, Gabarro and Volpin (2009) is consistent with the evidence. Cheng (2009) shows that earnings management in one firm may cause earnings management in other firms in the presence of relative performance compensation.

In contrast to these papers on governance externalities, our focus is on a dynamic setting in which firms need time to learn about their employees and allocate them to proper tasks, but this is hindered by managers’ ability to generate offers from other firms before their type is fully learnt. In this sense, it is reminiscent of Harris and

Holmstrom (1982), where an employer designs long-term contracts for risk-averse workers with unknown ability. Our paper extends their model by exploring the implications for project choice and the endogenous revelation of manager’s talent.

Another recent strand of papers study inefficiencies in managerial compensation in dynamic settings with moral hazard. Axelson and Bond (2009) show that smart workers may be “too hard to manage”, because their high outside options make them insensitive to firing incentives: in their model, competition in the managerial labor market worsens performance by lowering the employer’s ability to overcome the employees’ moral hazard. De Marzo, Livdan and Tchistyi (2011) show that in a dynamic model with moral hazard limited liability may make it too costly for the firm to keep its manager away from taking tail risks. Relatedly, Makarov and Plantin (2010) develop a model of active portfolio management in which fund managers may secretly gamble in order to manipulate their reputation and attract more funds, resulting in trading strategies that expose investors to severe losses. Our analysis differs from these models because in our context excess risk taking does not arise from dynamic moral hazard, but from inefficiently slow learning of employees’ skills.

Our paper is motivated by the anecdotal evidence of trader churning in the financial sector (see Tett, 2009, cited in the introductory quote) and the competitive “search for yield” (which we interpret as “seeking alpha”) on part of financial firms. The financial crisis of 2007-09 has provided a rich laboratory to learn how compensation and governance may have affected risk-taking, especially the buildup of tail risks in the financial sector during 2003-07. Rajan (2005) was one of the first to warn about excessive risk taking in financial institutions driven by short-termist pay packages, labeled as “fake alpha” in Rajan (2008). However, as of yet there is lack of full agreement on the role of pay packages in the financial sector’s risk taking. Fahlenbrach and Stulz (2009) present evidence that bank CEOs lost a significant portion of their long-run compensation that was in the form of restricted stock-based pay and thus conclude that pay excesses were not the likely cause of the risk-taking at financial firms. Bebchuk, Cohen and Spamann (2009) contend this view, by documenting that bank CEOs, including those of Bear Stearns and Lehman Brothers, had paid out to themselves huge payoffs prior to the crisis and that these payoffs far

exceeded the amounts they lost eventually. So they argue that bank management did benefit from short-term compensation that was not tied to long-run performance, as is the case in our model with managerial churning.

Chen, Hong and Scheinkman (2009) also present evidence linking compensation and risk-taking at financial firms over the period 1992-2008 that is consistent with payouts to top management being tied to short-term risk-taking incentives for at least a fraction of firms – an outcome that they attribute to the influence of institutional investors (who turn over their holdings relatively more frequently). Acharya, Cooley, Richardson and Walter (2009) argue that during 2003-07 a new banking model emerged, prone to “manufacturing tail risks”, largely in response to the mispricing of government guarantees accorded to too-large-to-fail financial institutions and the erosion of bank franchise values in traditional interest and fee businesses.

None of these papers examines explicitly the role of employee turnover in generating risk-taking incentives. The introductory quote by Tett (2009) compared the Wall Street turnover of traders and salesmen to the poaching of players across football clubs and recognizes that the real issue in addressing compensation in the financial industry is that of addressing the poaching culture of employers and the related high mobility of employees across firms. In another thought-provoking piece, Smith (2009) explicitly refers to the role of turnover in entrenching the culture of bonus without performance on Wall Street.<sup>4</sup> Our model suggests that to nail down this issue, it would be necessary for empirical work to also examine (depending on data availability) compensation and turnover of traders and sales force, since their skills are most fungible across firms and they have the greatest direct control over risk-taking.

---

<sup>4</sup>An extended quote borrowed from Smith (2009) runs as follows: “*In time there was significant erosion of the simple principles of the partnership days. Compensation for top managers followed the trend into excess set by other public companies. Competition for talent made recruitment and retention more difficult and thus tilted negotiating power further in favor of stars. Henry Paulson, when he was CEO of Goldman Sachs, once remarked that Wall Street was like other businesses, where 80% of the profits were provided by 20% of the people, but the 20% changed a lot from year to year and market to market. You had to pay everyone well because you never knew what next year would bring, and because there was always someone trying to poach your best trained people, whom you didn’t want to lose even if they were not superstars. Consequently, bonuses in general became more automatic and less tied to superior performance. Compensation became the industry’s largest expense, accounting for about 50% of net revenues.*”



### 3 Model

There are  $K$  profit-maximizing firms (indexed by  $k = 1, \dots, K$ ), which live forever and are owned by risk-neutral shareholders, and  $I$  risk-averse managers (indexed by  $i = 1, \dots, I$ ), each living for  $T$  discrete periods. The analysis will focus on a generation of managers who start their career in period  $t = 1$  and retire in period  $t = T$ .

Firms are competitive and maximize their expected profits. Managers maximize their expected utility  $U = E[u(\bar{W})]$ , where  $u(\cdot)$  is an increasing and concave function of final (period- $T$ ) wealth  $\bar{W}$ . The assumption that managers only care about final wealth not only avoids dealing with intertemporal optimization problems (which are not central to the analysis), but more importantly puts no limits on deferring compensation: payments can be deferred to the end of the employment period, at no cost for the employer. The case with partial deferral or intermediate consumption is discussed as an extensions.

Each employer can condition its own compensation package on the manager's resignation date and on the type of projects that he manages during his employment relationship. But the employer cannot encroach on the compensation paid by other employers – a realistic assumption about the legal reach of each employment contract. Managers start their career with no initial wealth and have limited liability, so that their final wealth earn from each employer they worked from cannot be negative. For simplicity, there is no discounting: the interest rate is normalized to zero.

#### 3.1 Projects and managers

Managers can run one new project per period. Each project is “long term”, that is, lasts for two periods. Hence, a manager that works with the same firm for his entire career runs two projects in each period, except in the first and the last period of employment. Not all managers are equally talented: a fraction  $p \in (0, 1)$  of managers are good ( $G$ ) and a fraction  $1 - p$  are bad ( $B$ ). Each manager  $i$  initially does not know his own quality  $q_i = \{G, B\}$ .

Firms are endowed with a continuum of projects of two types:

(i) safe projects  $S$  yielding  $y$  at the end of the first period and 0 at the end of the second period, irrespective of the ability of the manager in charge of it;

(ii) risky projects  $R$  yielding  $x$  in the first period and either 0 or  $-c$  in the second period, depending respectively on whether they are matched with a good or bad manager.

The dependence of the risky project's revenue on the manager's type can be interpreted as a reflection of his ability in managing the risky project. Good managers add value to a risky project by reducing its risk (for simplicity, to zero, which is the same level as risk of the safe project), without reducing its expected revenue. In this sense, good managers generate "alpha", in that they improve the risk-return tradeoff of the firm that employs them. Conversely, bad managers can generate the same short-run return  $x$  but only at the future cost  $c$ .<sup>5</sup>

A key assumption is that if a manager initiates a project of type  $R$ , his ability becomes known *only if* he remains in charge of it for *both* periods. The assumption that the project's first-period performance is uninformative captures the idea that failure is an infrequent event ("tail risk"), so that it takes time to screen a person's ability to manage a risky project. Indeed, to capture the fact that the wait to ascertain the quality of a match can be considerable, in an extension we generalize the model to the case in which the project may also have uninformative outcomes, so that learning typically requires more than two periods.

By the same token, if a manager leaves after one period, the quality of the project can no longer be gauged. We assume that in this case the project is liquidated, and that in the process the information about the identity of the project's initiator is lost.<sup>6</sup> The reason why incomplete projects are sold is that their in-house completion

---

<sup>5</sup>Project  $R$  can be interpreted as a carry trade. To generate a profit  $x$  the trade needs to be closed in time. So the skilled trader chooses the right time to close the trade and incurs no cost in the second period; while the unskilled trader (who has no clue when to close out the trade) incurs a cost  $c$  in the second period.

<sup>6</sup>Avoiding such information loss would require an institution that is capable both of (i) pooling information about the identity of the departing manager (obtained from his initial employer) and the eventual performance of the project (from the project's buyer), and (ii) reselling such information to the new employer of the manager. Establishing such an "information broker" would require a

is inefficient: using another manager from the firm to complete an unfinished project would prevent him from starting a new project of his own. In contrast, outside the firm there are managers who can complete the project at zero cost. In other words, within the firm there is a scarce supply of “creative managers” who can initiate new projects, while outside the firm there is abundant supply of “non-creative managers” who can complete them.

If the project is liquidated, it is sold for its expected value  $x - (1 - \lambda)c$ , where  $\lambda$  denotes the probability that the risky project was initiated by a good manager. We assume that each firm has a large number of managers, so that one can apply the law of large numbers to compute  $\lambda$ : for instance, if the pool of departing managers is representative of the population, then  $\lambda = p$ .

We assume that

$$x - (1 - p)c > y > x - c. \tag{1}$$

The left-hand side inequality indicates that the expected revenue of project  $R$  exceeds that of project  $S$  if the manager is of unknown quality: this captures the idea that accepting greater risk entails higher expected return. The right-hand side inequality indicates that the expected revenue of a safe project exceeds that of a risky one if the manager is known to be bad. The implication of assumption (1) is that it is optimal to assign bad managers only to safe projects, and good ones only to risky projects. Assigning bad managers to risky projects would imply excessive risk-taking.

### 3.2 Market for managerial talent

In each period, the pool of projects available to a firm includes at least one safe and one risky project per manager. Therefore, managers – not projects – are the scarce factor of production, since only they can start a new project.

Let  $i$  denote a generic manager,  $k$  a generic firm and  $t$  a generic period. At the beginning of period  $t$ , the firm decides whether to make an offer to the manager. The offer consists of a compensation  $W_{ikt}$  contingent on manager  $i$ 's choice of projects

---

unrealistic level of coordination.

$\{P_{ikt}\}_{t=1}^{t=T-1}$  over his employment life, where  $P_{ikt} \in \{R, S\}$  if manager  $i$  is employed by firm  $k$  in period  $t$  and  $P_{ikt} = 0$  otherwise:

$$W_{ikt} = W \left( \{P_{ikt}\}_{t=1}^{t=T-1} \right),$$

where  $W(\cdot)$  is a mapping  $(0, R, S)^{T-1} \mapsto \mathbb{R}^+$ , 0 indicates that manager  $i$  is not working for firm  $k$  in period  $t$ , and  $R$  ( $S$ ) indicates that manager  $i$  undertakes a risky (safe) project for firm  $k$  in period  $t$ . The only constraints on the firm's choice of compensation are that it must be non-negative ( $W(\cdot) \geq 0$  because of managers' limited liability) and feasible ( $W(\{0\}_{t=1}^{t=T-1}) = 0$  because a firm cannot pay a manager who has produced no output for the firm). To save on notation, we set  $W_{ikt} = 0$  when firm  $k$  chooses not to make an offer to manager  $i$  in period  $t$ .

The manager can then accept or reject the offer  $W_{ikt}$ : let  $F_{it} \in \{1, 2, \dots, K\}$  denote the employer he works for in period  $t$ . Hence,  $F_{it} = k$  means that manager  $i$  works for firm  $k$  in period  $t$ .

It is important to notice that firms can precommit to the wage contracts  $W_{ikt}$ . As we will see, this precommitment prevents firms from exploiting any informational advantage that they may gain over their competitors by gauging their employees' ability. We also assume that, in offering such long-term wage contracts, firms bid competitively for managers, anticipating their future performance: this ensures that managers extract entirely the expected profits that they will generate over the course of their tenure with any employer.

While *ex ante* there is perfect competition for managerial talent, *ex post* switching costs may prevent it: over time, managers may make location- or firm-specific investments or develop location- or firm-specific tastes, so that it becomes difficult or impossible for other firms to poach them. To bring out the implications of *ex-post* competition for managerial talent, we will focus initially on the two polar cases where switching costs are either totally absent – the “competitive regime” – or prohibitively high – the “non-competitive regime”. In both regimes, managerial performance is assumed to be publicly observable: if a manager's ability becomes known to the cur-

rent employer, it becomes equally known to outside employers.<sup>7</sup> In an extension, we shall also consider an intermediate case where the managerial labor market features some frictions, so that upon resignation managers do not receive immediately a job offer from another employer.

In the competitive regime, at the end of each period managers can choose whether to leave their current employer or not. In the non-competitive regime, they cannot leave the initial employer once they have accepted the initial offer. Formally,  $F_{it} = F_{it+1} = k$  if manager  $i$  employed by firm  $k$  in period  $t$  chooses to remain there also in period  $t + 1$ , while  $F_{it} \neq F_{it+1}$  if the manager leaves firm  $k$  at the end of period  $t$ . When indifferent between staying with the current firm and leaving, managers are assumed to stay with his current employer. This tie-breaking assumption can be motivated with the presence of a tiny switching cost even in the competitive regime.

The difference between the non-competitive and the competitive regime may capture the changing relationship between bank managers and their employers: in the past, banking used to entail much local knowledge, so that over their careers bank managers developed employer- and location-specific skills; currently, banking is less local, due to technological change and new financial products. In turn, company loyalty has probably lost considerable appeal in the world of finance.

### 3.3 Time line

A representative manager  $i$  lives for  $T \geq 2$  periods, from 1 to  $T$ . Because managers are scarce, in what follows we assume without loss of generality that manager  $i$  is employed in all periods. The sequence of actions is as follows:

- (i) In period 1, manager  $i$  is hired by firm  $k$  ( $F_{i1} = k$ ) that pledges to pay him a

---

<sup>7</sup>However, note that this assumption is inessential in our context, due to the multiperiod nature of the employment relationship. To see why, suppose that a manager's performance were visible only to his current employer. Then, in the competitive regime a manager who turned out to be good could be hired by an outside employer, who could condition his pay on his subsequent performance. The manager would have the incentive to choose a risky project and remain with the same employer for at least two periods, to allow him to verify that he is good. So even in an opaque labor market, outside offers would be effectively conditioned on the manager's true type, if this has become known to the manager (and current employer).

final compensation  $W_{ik1}$ . The manager then chooses a project:  $P_{ik1} \in \{R, S\}$ . Then the manager chooses whether to stay with employer  $k$  ( $F_{i2} = k$ ) or to leave ( $F_{i2} \neq k$ ). If he leaves, the project is sold for a price equal to its expected revenues (including any first-period revenues).

(ii) In period 2, there are two cases to consider. (a) If the manager stays ( $F_{i2} = k$ ) with employer  $k$ , he chooses a new project  $P_{ik2} \in \{R, S\}$ . (b) If the manager leaves ( $F_{i2} \neq k$ ), he is hired by a new firm  $j$  ( $F_{i2} = j$ ) that pledges to pay him a final compensation  $W_{ij2}$  and then chooses a project  $P_{ij2} \in \{R, S\}$ . In both cases, at the end of period 2 the manager decides whether to stay with the current employer or to leave.

(iii) In any subsequent period from  $t = 3$  to  $t = T - 2$ , the sequence of moves is the same as under (ii) with appropriate change of time indices.

(iv) The sequence of events is also the same in the penultimate period  $T - 1$ , with the only exception that the manager cannot leave (as he will not be starting a new project in period  $T$ ).

(v) In period  $T$ , the manager will complete the project started in period  $T - 1$  and will consume his final wealth, which is the sum of the compensations awarded by the various employers that have hired him:  $\bar{W}_i = \sum_{k=1}^K \sum_{t=1}^{T-1} W_{ikt}$ , where  $k$  is a generic firm and the terms inside the sum are zero for any firm  $k$  and period  $t$  in which either no offer is made or the manager rejects the offer.

### 3.4 Learning about managers' types

In any period  $t$  the employment history of manager  $i$  can be summarized by the belief  $\theta_{it}$  that his type is good ( $q_i = G$ ). Since in our setting information about the manager's quality is symmetric, the belief  $\theta_{it}$  is shared by all players. At the beginning of his career, the manager's quality is unknown: he is good with probability  $p$  or bad with probability  $1 - p$ . Hence,  $\theta_{i0} = p$ . In each period  $t$ , the belief  $\theta_{it}$  is updated on the basis of manager  $i$ 's performance in period  $t$ .

As projects last for two periods, there is no updating of beliefs in period 1:  $\theta_{i1} = p$ .

In period 2, there is no change in belief if manager  $i$  left his initial employer  $k$  ( $F_{i2} \neq F_{i1}$ ) or if he chose the safe project in period 1 ( $P_{ik1} = S$ ), that is,  $\theta_{i2} = p$ . If instead the manager did not leave his past employer ( $F_{i2} = F_{i1}$ ) and he chose the risky project in period 1 ( $P_{ik1} = R$ ), then the second-period revenue of the initial project reveals his quality: if the total revenue  $\pi_{ik1}$  from the project chosen in period 1 equals  $x$ , manager  $i$  is revealed to be good and therefore  $\theta_{i2} = 1$ ; if instead  $\pi_{ik1} = x - c$ , manager  $i$  is revealed to be bad, so that  $\theta_{i2} = 0$ .

Following the same logic, information about the manager's type is updated in all periods  $t \geq 3$  as follows:

(i)  $\theta_{it} = 0$  if either the manager is already known to be bad ( $\theta_{it-1} = 0$ ) or if his quality was unknown in period  $t - 1$  ( $\theta_{it-1} = p$ ) but is revealed to be bad in period  $t$ , which happens if he remains with his previous employer ( $F_{it} = F_{it-1}$ ), chooses the risky project in period  $t - 1$  ( $P_{ikt-1} = R$ ), and produces a low revenue ( $\pi_{ikt-1} = x - c$ );

(ii)  $\theta_{it} = p$  if previously the manager's type was uncertain ( $\theta_{it-1} = p$ ) and in period  $t - 1$  he chose the safe project ( $P_{ikt-1} = S$ ), or chose the risky one ( $P_{ikt-1} = R$ ) and left his previous employer ( $F_{it} \neq F_{it-1}$ );

(iii)  $\theta_{it} = 1$  if either the manager is already known to be good ( $\theta_{it-1} = 1$ ) or if his quality was unknown in period  $t - 1$  ( $\theta_{it-1} = p$ ) but is revealed to be good in period  $t$ , which happens if he remains with his previous employer ( $F_{it} = F_{it-1}$ ), chooses the risky project in period  $t - 1$  ( $P_{ikt-1} = R$ ), and produces a high revenue ( $\pi_{ikt-1} = x$ ).

### 3.5 Strategies and payoffs

At the start of each period  $t$ , firm  $k$  offers to any manager  $i$  not currently employed in the firm a compensation based on its belief about the manager's quality. This belief is conditional only on information available as of period  $t - 1$ , since the offer is made before period- $t$  revenues are realized. Formally, the firm's strategy is an offer of the compensation schedule  $W(\cdot \mid \theta_{it-1})$  to manager  $i$ .

The strategy of a generic manager  $i$  in period  $t$  is a choice of employer and a

project. Formally, manager  $i$  employed by firm  $k$  in period  $t - 1$  will choose (i) which firm to work for in period  $t$  ( $F_{it}$ ), and (ii) which project  $P_{ikt} \in \{R, S\}$  to carry out in that firm, as a function of the belief  $\theta_{it-1}$  about his quality, so as to maximize the utility from his compensation  $U(\overline{W}_i \mid \theta_{it-1})$ .

The revenue that firm  $k$  obtains from the project started in period  $t$  by manager  $i$  is:

$$\pi_{ikt} = \begin{cases} x & \text{if } P_{ikt} = R, F_{it} = F_{it+1} \text{ and } q_i = G, \\ x - c & \text{if } P_{ikt} = R, F_{it} = F_{it+1} \text{ and } q_i = B, \\ x - (1 - \theta_{it})c & \text{if } P_{ikt} = R \text{ and } F_{it} \neq F_{it+1}, \\ y & \text{if } P_{ikt} = S, \\ 0 & \text{if } F_{it} \neq k \end{cases}$$

where the first (second) line corresponds to the case of a good (bad) manager who chooses the risky project and stays with his current employer in periods  $t$  and  $t + 1$ ; the third line corresponds to the case of a manager who chooses the risky project and at the end of period  $t$  leaves firm  $k$  (which sells the project at a price reflecting the belief  $\theta_{it}$  about its initiator's quality); the fourth line refers to the case of a manager who chooses the safe project; and the fifth line refers to the case where manager  $i$  is not employed by firm  $k$  in period  $t$ .

Hence, the payoff to firm  $k$  from hiring manager  $i$  in period  $\tau$  equals the sum of the revenues generated by the manager over his remaining employment career net of the promised wage:

$$\sum_{t=\tau}^{t=T-1} \pi_{ikt} - W_{ik\tau}.$$

## 4 Equilibrium

In this section we solve for the equilibrium in each of the two alternative labor market regimes described in Section 3.2: the competitive and non-competitive regime, respectively. If there is *ex-post* competition, managers can choose to work in a different firm  $F_{it}$  in each period, if he wishes to do so; in contrast, in the non-competitive regime managers are constrained to remain with their initial employer  $F_{i1}$ , so that good managers cannot be poached by outside employers even if their talent has been



revealed by their performance with the current employer. Thus, in the competitive regime managers choose both their preferred employer and project in each period; in contrast, in the non-competitive regime they choose their preferred project in every period, and their preferred employer only in the first period.

Recall however that in both regimes firms are assumed to compete for managers *ex ante*: they all bid for managers, and managers choose the highest bid. Even though in equilibrium this drives their expected to zero, we make the usual tie-breaking assumption that they prefer to attract as many managers as possible.

Formally, we solve for the perfect Bayesian equilibrium of the game:

(i) in any period  $\tau$ , firm  $k$  chooses  $W_{ik\tau}$  to maximize its expected profits from hiring manager  $i$ , where the expectation is conditional on the belief  $\theta_{i\tau-1}$  about manager  $i$ 's quality:

$$\max_{W_{ik\tau}} \left[ \sum_{t=\tau}^{t=T-1} E(\pi_{ikt} \mid \theta_{i\tau-1}) - W_{ik\tau} \right] \cdot I_{F_{i\tau}=k}, \quad (2)$$

where  $I_{F_{i\tau}=k} = 1$  if  $F_{i\tau} = k$  and  $I_{F_{i\tau}=k} = 0$  otherwise, taking as given the strategy of the manager and of other firms;

(ii) in any given period  $t$ , manager  $i$  chooses his employer  $F_{it}$  and the project  $P_{ikt}$  so as to maximize his expected utility conditional on the belief  $\theta_{it-1}$ :

$$\max_{F_{it}, P_{ikt}} U(\bar{W}_i \mid \theta_{it-1}) = E \left[ u \left( \sum_{k=1}^K \sum_{s=1}^{T-1} W_{iks} \right) \mid \theta_{it-1} \right]. \quad (3)$$

taking as given the firm's strategy;

(iii) beliefs are updated according to Section 3.4.

This defines the equilibrium for the competitive regime. The equilibrium for the non-competitive regime differs from this only because the firm's problem (2) and the manager's problem (3) are solved under the additional constraint  $F_{it} = F_{i1}$  for all  $t$ . In other words, either the firm succeeds in hiring manager  $i$  in period 1 ( $I_{F_{i1}=k} = 1$ ) or it never does. Hence, the equilibrium allocation of managers across firms is irrevocably set in period 1, and only the choice of projects can change over time. Since solving for

the equilibrium in this case is simpler, in the next section we start from the analysis of the non-competitive regime.

## 4.1 Non-competitive regime

When there is no ex-post mobility of managers, firm  $k$ 's problem (2) simplifies to:

$$\max_{W_{ik1}} \left[ \sum_{t=1}^{t=T-1} E(\pi_{ikt} | p) - W_{ik1} \right] \cdot I_{F_{i1}=k}, \quad (4)$$

because the hiring decision is done only in period 1, where the belief  $\theta_{i0} = p$  is based on the unconditional distribution of managers' quality. Due to to *ex-ante* competition, the solution to this problem is simply

$$W_{ik1} = \sum_{t=1}^{t=T-1} E(\pi_{ikt} | p). \quad (5)$$

Hence, the equilibrium lifetime wage of manager  $i$  is the revenue that he is expected to generate over his entire career at firm  $k$ . By their symmetry, all firms pay an identical lifetime wage, implying that managers are indifferent between them. Moreover, managers are perfectly insured against the risk arising from their unknown quality: equation (5) implies that good managers subsidize bad ones.

Given this result and considering that manager  $i$  will be employed by the same firm  $k$  throughout his career, the problem (3) simplifies to

$$\max_{P_{ikt}} E \left[ u \left( \sum_{t=1}^{t=T-1} \pi_{ikt} | \theta_{it-1} \right) \right]. \quad (6)$$

In other words, in each period  $t$  manager  $i$  chooses projects so as to maximize their expected revenue, conditional on the belief  $\theta_{it-1}$  about his quality as of period  $t - 1$ .

To solve problem (6), the manager must learn his own quality as early as possible, by choosing the risky project in period 1. In period 2 he will not have learnt his quality yet, but by assumption 1 it will still be efficient for him to choose the risky project. From period 3 onwards, he will be able to condition the choice of projects on his true quality: he must choose only risky projects if he discovers to be good, and only safe projects otherwise.

This policy ensures that in expectation over his career the manager will generate revenues

$$\Pi^* = 2[x - (1 - p)c] + (T - 3)[px + (1 - p)y]. \quad (7)$$

The first term in (7) is the expected period-1 and period-2 profits from the risky project undertaken at  $t = 0$  and  $t = 1$  by a manager of unknown quality (because it takes two periods to learn manager's type, the manager is still of unknown type at  $t = 1$ , and hence, assigning him to the risky project yields the highest profit by assumption 1); while the second term is the sum of the expected continuation revenues of the two groups of managers in periods 3 through  $T$ , weighted by their respective frequencies.

This equilibrium outcome coincides with the first best: it features both (i) optimal risk-sharing, that is, complete insurance of managers by firms (as the latter are risk neutral) and (ii) productive efficiency, that is, optimal choice of projects conditional on managers' quality. So in the non-competitive regime, the managers' equilibrium final wealth is  $\bar{W} = \Pi^*$  and their utility is

$$U^* = u(\Pi^*), \quad (8)$$

while firms earn zero expected profits.

This argument proves the following result:

**Proposition 1 (Equilibrium under no competition)** *Without ex-post competition for managers, the first-best outcome is attained in equilibrium.*

Note that optimal risk-sharing requires the firm not to condition the salary on the quality of the employees, even though this information is used in the matching of managerial talent to projects. This implies that good managers subsidize bad ones: this cross-subsidy is feasible only because in the non-competitive regime good managers cannot leaving the company to get a higher compensation from other employers. Indeed this cross-subsidization breaks down in the competitive regime, to which we turn next.

## 4.2 Competitive market for managers

When there is *ex-post* competition for managerial talent, the first-best allocation characterized above may no longer be an equilibrium. The key observation is that competition changes the outside options for managers who chose the risky project and remained at least two periods with an employer: since in this case outside employers can infer the manager's ability, they will bid the per-period compensation up to  $x$  for good managers, and offer  $y$  to bad ones. From expression (7), it is immediate that the first-best compensation per period,  $\Pi^*/(T - 1)$ , is smaller than  $x$  and greater than  $y$ : hence, good managers will leave, while the bad ones will stay. Hence, paying  $\Pi^*$  would entail losses for the initial employer, and the cross-subsidization required to provide optimal risk-sharing becomes infeasible.

Notice, however, that the initial employer may offer a contract that still provides optimal risk sharing and manages to deter managerial mobility by imposing a penalty on good managers if they leave the firm. The most effective such contract is one that makes the entire date- $T$  compensation  $\Pi^*$  contingent on the manager never leaving the firm: in other words, the firm will pay nothing if the manager leaves at any time in his career.<sup>8</sup> Formally, at any time  $\tau \in (1, \dots, T - 1)$  firm  $k$  offers the following contract to manager  $i$ :

$$W_{ik\tau} = \begin{cases} \sum_{t=\tau}^{t=T-1} E(\pi_{ikt} \mid \theta_{i\tau-1}) & \text{if } F_{it} = k \ \forall t \in (\tau, \dots, T - 1), \\ 0 & \text{otherwise.} \end{cases} \quad (9)$$

Given this contract, a manager who at beginning of period  $\tau$  knows to be good ( $\theta_{i\tau-1} = 1$ ) will choose the risky project in all subsequent periods, and will be paid  $x$  per period. Similarly, a manager who at beginning of period  $\tau$  knows to be bad ( $\theta_{i\tau-1} = 0$ ) will choose the safe project in all subsequent periods, and will be paid  $y$  per period.

Now consider the optimal choice for a manager of unknown type ( $\theta_{i\tau-1} = p$ ): if he never leaves, contract (9) gives him insurance against the risk about his own quality. Moreover, the contract gives him the incentive to choose the risky project at time

---

<sup>8</sup>Recall that, having zero initial wealth and limited liability, the manager cannot be penalized more than this.

$\tau$  so as to learn his quality, and thereafter choose the risky project if he learns to be good, and the safe one otherwise. Notice that, if the manager plans not to leave the firm, under this contract it is best for him to learn about his quality as early as possible, so as to maximize his compensation. Hence, we can focus on a manager who takes the decision about staying or leaving from the employer that hired him in period 1.

Formally, at time 1 firm  $k$  offers the following contract to manager  $i$ :

$$W_{ik1} = \begin{cases} \sum_{t=1}^{t=T-1} E(\pi_{ikt} | p) & \text{if } F_{it} = k \ \forall t, \\ 0 & \text{otherwise.} \end{cases} \quad (10)$$

The firm that offers this contract will earn zero expected profits only if the manager does not leave the company: if he does, the company makes positive profits because it earns the revenues produced by the manager but does not pay him anything. Therefore, we need to check whether the manager who accepts this contract has no incentive to leave.

First of all, notice that if a manager plans to eventually leave the firm, under contract (10) he will want to leave no later than period 2, since staying longer with the firm would only increase the penalty for resigning. Second, leaving in period 1 is inefficient, because it entails no learning about the manager's quality, yet it implies a penalty equal to the first period's revenue. Third, a manager who has been revealed to be bad in period 2 has obviously no incentive to leave the firm. Hence, we need only to consider a manager who has been revealed to be good in period 2. If he were to stay with the initial employer, his final wealth would be  $\Pi^*$ . If instead he were to leave at the end of period 2, he would earn a final wealth  $(T - 3)x$  from the new employer, as shown above.

The comparison between  $(T - 3)x$  and  $\Pi^*$  yields a cutoff value  $\widehat{T}$ , which defines the maximum time horizon that allows the firm to retain its managers through the contract just described:

$$\widehat{T} = 3 + 2 \frac{x - (1 - p)c}{(1 - p)(x - y)}. \quad (11)$$

If  $T \leq \widehat{T}$  the first-best allocation can be sustained even in the competitive regime, while if  $T > \widehat{T}$  it cannot. Intuitively, if the manager's employment horizon  $T$  is very

short, then he must spend a large fraction of his career with an employer just to be recognized as being of good quality and therefore loses a large fraction of his wealth if he chooses to leave. For instance, if his career were to span three periods ( $T = 3$ ), he would lose  $2/3$  of his lifetime stream of revenue to the initial employer, and only earn  $1/3$  with the new one. So leaving would not be optimal, as witnessed by the fact that  $\hat{T} > 3$ . In this case, the first-best would be feasible.

If instead the manager's employment horizon is longer, i.e.,  $T > \hat{T}$ , then contract (10) would not deter the manager from leaving. Intuitively, the penalty for leaving (which is the loss of the revenue produced in periods 1 and 2) is small compared to the gain in later periods. In such case, the first-best would not be feasible.

It is instructive to see how the cutoff value  $\hat{T}$  responds to changes in the other two main parameters of the problem. In Panel A of Figure 1, we show that an increase in the fraction of good managers,  $p$ , expands the range of values of  $T$  for which the first-best allocation can be achieved (for instance, for  $p$  very close to 1 it can be achieved even for very large  $T$ ): intuitively, the cost of subsidizing bad managers is quite low because there are few of them. In Panel B, instead, we see that an increase in the excess profitability of a well-managed risky project over that of a safe one,  $x - y$ , reduces the range of values of  $T$  for which the first-best allocation can be achieved: when these excess profits are large, outside employers can lure away a good manager even if his remaining job tenure is relatively short.

The following proposition summarizes the discussion up to this point:

**Proposition 2 (First-best region under competition)** *In a competitive managerial market, the first-best outcome can be attained in equilibrium if and only if the manager's employment horizon is sufficiently short, i.e.  $T \leq \hat{T}$ , where  $\hat{T}$  is defined by expression (11).*

What happens when the first best cannot be attained, that is, when  $T > \hat{T}$ ? In such case, contract (9) cannot be offered in equilibrium because managers would leave and firms would make positive profits. This is inconsistent with equilibrium, because it would firms to deviate from contract (9) by offering a higher compensation

to managers.

To find the equilibrium, we start by noticing that, due to competition for managers, equilibrium contracts must lead to zero expected profits, conditional on the *current* belief about the manager's quality  $\theta_{it-1}$ . Formally, at any time  $\tau \in (1, \dots, T-1)$  firm  $k$  offers the following contract to manager  $i$ :

$$W_{ik\tau} = \sum_{t=\tau}^{t=T-1} E(\pi_{ikt} \mid \theta_{it-1}). \quad (12)$$

Because managers are paid the entire stream of revenue, managers choose the project that maximizes revenue conditional on their beliefs about their quality. Each manager who learn to be good (bad) will choose the risky project (safe), and each manager of uncertain quality will choose the risky project, from assumption (1). Hence, a manager of good quality is paid  $x$  per period; while a manager of bad quality is paid  $y$  per period. Instead, a manager of unknown quality is paid  $x - (1-p)c$ .

What still remains to be pinned down to characterize the equilibrium is the managers' choice whether to stay with their initial employer or to leave. We focus on the following candidate equilibrium: the manager changes employer (and chooses project  $R$ ) in each of the first  $K$  periods, earning the expected revenue  $x - (1-p)c$  per period, with  $K \in \{0, T-3\}$ . From period  $K+1$  onwards, he remains with the same employer. Since the manager will optimally choose project  $R$  in periods  $K+1$  and  $K+2$ , by period  $K+3$  his quality will be known, so that subsequently he will chooses project  $R$  if good, and project  $S$  otherwise. Hence, the manager's problem in (3), upon substituting for the compensation (12) and for the optimal choice of project described above, can be rewritten simply as:

$$\max_K pu(W_G) + (1-p)u(W_B) \quad (13)$$

where

$$W_G \equiv (K+2)[x - (1-p)c] + (T-3-K)x \quad (14)$$

is the final wealth of a good manager, and

$$W_B \equiv (K+2)[x - (1-p)c] + (T-3-K)y \quad (15)$$

is the final wealth of a bad manager. Hence, the manager's problem reduces to the choice of  $K$ , namely, the number of periods in which he “churns” jobs: churning is a way for the manager to delay the revelation of his type and thus obtain insurance, but this comes at the cost of greater inefficiency, as the bad managers should be assigned to the safe project rather than the risky one. Therefore, the trade-off is between insurance, which is obtained by delaying the revelation of the manager's quality (a larger  $K$ ) and productive efficiency, which comes with earlier revelation (a smaller  $K$ ). The two polar cases are  $K = 0$  and  $K = T - 3$ : in the first case, the manager never leaves his initial employer, and thus obtains no insurance (except in periods 1 and 2), but achieves productive efficiency; in the second case, the manager achieves perfect insurance by churning jobs all the time, at the cost of very limited productive efficiency. The optimal  $K$  maximizes the expression (13) above.

**Proposition 3 (Churning equilibrium)** *In a competitive managerial market, if  $T > \hat{T}$  in equilibrium the manager changes employer in every period for the first  $K^*$  periods, and subsequently stays with the same employer, where  $K^*$  solves*

$$\frac{u'(2[x - (1 - p)c] + (T - 3)y + K^*[x - (1 - p)c - y])}{u'(2[x - (1 - p)c] + (T - 3)x - K^*(1 - p)c)} = \frac{pc}{x - y - (1 - p)c}. \quad (16)$$

**Proof:** As the only reason to leave a firm is to preserve uncertainty about one's type, in a given period  $t \in [2, T - 1]$  a manager will leave the current employer only if he has done so also in previous periods  $t' \in [1, t)$ . Otherwise, his type is already known and there is no reason to churn. Conversely, if a manager chooses to stay with the same employer in a given period  $t \in [2, T - 1]$ , he has no reason to leave in subsequent periods  $t'' \in (t, T - 1]$ . This is because his quality is already known and again there is no reason to churn. Therefore, the equilibrium simplifies to the choice of the number of periods  $K$  of churning that maximizes the manager's expected utility in (13). The first order condition is

$$-pu'(W_G)(1 - p)c + (1 - p)u'(W_B)[x - y - (1 - p)c] = 0, \quad (17)$$

where  $W_G$  and  $W_B$  are given by (14) and (15). The first term in condition (17) is negative (as  $W_G$  is decreasing in  $K$ ), while the second is positive by assumption (1)



(as  $W_B$  is increasing in  $K$ ). The second order condition is satisfied, since

$$pu''(W_G)[(1-p)c]^2 + (1-p)u''(W_B)[x-y-(1-p)c]^2 < 0,$$

recalling that  $u''(\cdot) < 0$ . ■

The equilibrium is described graphically in Figure 2 in the space  $(W_G, W_B)$ . Point A on the  $45^\circ$  line represents the final wealth obtained by churning for  $T - 3$  periods: in such case the manager obtains the same wealth independently on its type. Point B in the figure represents instead the case in which the manager chooses not to churn. In such a case his final wealth if his type is good ( $W_G$ ) is much greater than his wealth if his type is bad ( $W_B$ ). By setting the number of churning periods  $K$  between 0 and  $T - 3$ , the manager can choose any point on the line between A and B. The optimal choice on that line depends on the probability of being a good type  $p$  and the utility function  $u(\cdot)$ : in particular, it depends on the marginal rate of substitution between the two states of the world (the state in which the type is Good and the state in which the type is Bad) and thus on the degree of risk-aversion of manager. Intuitively, a more risk-averse manager will choose a higher  $K$  to smooth consumption more between the two states. A less risk averse manager will choose a lower  $K$  to maximize expected wealth. As shown in the graph the solution is point C, where the indifference curve of the manager is tangent to the segment  $\overline{FB}$ .

Proposition 3 yields a testable cross-sectional prediction: that all else equal, that is, with same residual uncertainty about type, junior managers are more likely to churn than senior ones, and therefore more likely to be associated with excess risk-taking by firms (indeed, if type uncertainty were greater for juniors, it would only strengthen their incentives to churn). Since in the equilibrium with competition  $K^*$  can be taken as a measure of the pervasiveness of churning, it is interesting to investigate how it responds to changes in the parameters of the problem. We establish these comparative statics results for the case in which managers have a power utility function:

**Proposition 4 (Comparative statics in the churning equilibrium)** *If managers have a power utility function  $u(w) = \frac{w^{1-\gamma}}{1-\gamma}$  (with  $\gamma \geq 0$ ), then the optimal*

number of churning periods is

$$K^* = \max \left\{ \frac{(T-3)(x-gy) - 2(g-1)[x-(1-p)c]}{g[x-y-(1-p)c] + (1-p)c}, 0 \right\}, \quad (18)$$

where  $g \equiv \left[ \frac{pc}{x-y-(1-p)c} \right]^{\frac{1}{\gamma}} > 1$ .  $K^*$  is increasing in the managers' employment horizon  $T$  and degree of relative risk-aversion  $\gamma$ , and is decreasing in the magnitude of tail risk  $c$ .

**Proof:** The result that in (18)  $K^*$  is increasing in  $T$  is immediate. To establish the other results, first notice that clearly  $g$  is decreasing in  $\gamma$ . Then, differentiating (18) with respect to  $g$ , we find

$$\begin{aligned} \frac{dK^*}{dg} &= - \{ [2[x-(1-p)c] + (T-3)y] [g(x-y) - (g-1)(1-p)c] \\ &\quad + [(T-3)(x-gy) - 2(g-1)[x-(1-p)c]] [x-y-(1-p)c] \} \\ &\quad \cdot [g(x-y) - (g-1)(1-p)c]^{-2}. \end{aligned}$$

This derivative is negative, because all the terms in square brackets are positive. It follows that  $K^*$  is increasing in  $\gamma$ . Next, the derivative of (18) with respect to  $c$  is

$$\begin{aligned} \frac{dK^*}{dc} &= - \frac{2[x+gy-2(1-p)c] + (T-3)(x-gy)}{[g(x-y) - (g-1)(1-p)c]^2} (1-p)(g-1) \\ &\quad + \frac{1}{\gamma} pg^{\frac{1}{\gamma}-1} \frac{x-y}{[x-y-(1-p)c]^2} \frac{dK^*}{dg} < 0. \end{aligned}$$

since  $dK^*/dg < 0$  (as just shown). ■

These results are intuitive. A longer employment horizon  $T$  makes the manager more averse to revealing his type, because the implied risk refers to a larger future cash flow, and therefore induces him to churn for a longer interval. By the same token, a more risk-averse manager will seek more insurance, and therefore churn longer. The cost of project completion  $c$  has the opposite effect, since it captures an efficiency loss arising from the manager's departure and therefore can be regarded as the cost of churning (which they pay for in their wages).

## 5 Extensions (incomplete)

### 5.1 Gradual learning about manager's type

A stark assumption of the baseline model is that, as soon as a manager's performance is observed for two periods, his type becomes known for sure. We now consider a setting where instead managers can get lucky for some time, in the sense their investment can have an uninformative average performance  $(x - (1 - p)c)$  with some probability  $\pi$ . With probability  $1 - \pi$  instead, the first period payoff is  $x$  while the second period reveals the true quality of the manager: a good-quality manager produces no cost and a bad-quality manager generates a cost  $c$ . This case introduces project-level risk besides the manager's type-level risk, and shows that in this case, since the project's outcome is not always informative, there is less type-level risk to be born. Hence, there is less need to churn: in equilibrium, managers will not move whenever the realized payoff is the uninformative average  $(x - (1 - p)c)$ ; instead they will move when the realized payoff of the project is  $x$ . Therefore, managers will leave the company upon success and stay when they perform average.

### 5.2 Asymmetric information about the manager's type

The assumption of symmetric information between firms and managers is critical. If managers knew their type, then there would be no insurance in equilibrium that can be obtained through churning. In fact, good managers would stay in their initial firm so that they are revealed as good and can enjoy higher pay. Bad managers would then also be revealed and assigned to safe projects from period 2 onwards.

In the less extreme case, there is a fraction  $\phi$  of informed managers who know from the start their type. In this case, we expect churning to decrease in equilibrium for two reasons: (i) mechanically, the fraction  $p\phi$  of managers who know that they are good will stick with their initial employer; (ii) the managers of unknown type will not like to pool with the bad types. Hence, they will churn for a shorter number of periods than in the baseline model.

### 5.3 Labor market search frictions

Assume now that the manager who leaves his employer must search  $N$  periods before finding a new job: this should reduce churning, i.e. translate into a lower  $K$ . Notice that this implies that young workers must also search for  $N$  periods, implying a loss of production in the early stages of a manager's life. Hence, it is not a forgone conclusion that society is better off with a very large  $N$ : it is true that strong labor market frictions will stabilize employees but it is also true that this will cause welfare losses to young employees. Hence, it may be better for society to have no such frictions, even though this induces churning.

### 5.4 Limits to deferring compensation

Recall that an important assumption made in deriving this result is that there are no constraints on withholding compensation to a manager who resigns. In practice, however, legal restrictions assumed away in the previous argument may exist: it may be illegal to write an employment contract where the manager is denied any compensation for past employment just because he chooses to switch to a new employer. This is also because in practice at least a portion of the total compensation is paid in the form of salary, to fund intermediate consumption (possibly because otherwise managers would be unable to achieve the desired consumption smoothing due to borrowing constraints). In conjunction with limited liability, such salary payments could not be reclaimed by the initial employer, and therefore they reduce the parameter region where the first-best can be attained, compared to the region described in Proposition 2. Intuitively, the more the firm is constrained in deferring compensation, the lower is the penalty that it can threaten to inflict on resigning managers, and therefore the smaller is the parameter region for which it can attain the same employees' loyalty as in the non-competitive regime – and offer the implied risk-sharing to them. This point is formally stated in the following result:

**Proposition 5 (First-best region with limited pay deferral)** *If part of the total compensation is paid as non-recoverable per-period salary  $\underline{w} > 0$ , the maximum*

time horizon for which the first-best outcome can be attained is:

$$\hat{T}(\underline{w}) = 3 + 2 \frac{x - (1 - p)c - \underline{w}}{(1 - p)(x - y)}, \quad (19)$$

which is strictly decreasing in  $\underline{w}$ .

## 5.5 Illiquidity of the securities market

If the market for incomplete projects is sufficiently illiquid, firms will not want to sell them, so that they are forced to learn about the manager's type. Hence, they will not be able to provide insurance. Moreover, there will be no churning because the manager's type is learnt any way. Hence, there is a loss of risk-sharing benefit. However, there will be an efficient choice of projects after 2 periods. Conclusion: the illiquidity of the security market offsets one of the two inefficiencies arising from the mobility of managers, namely, the excess risk taking inefficiency.

## 6 Policy interventions

The model presented in the previous sections highlights that competition for managerial talent induces inefficiencies in two ways: first, it limits risk-sharing opportunities that firms can offer to managers; second, it induces excess risk taking and therefore a loss of productive efficiency. In this section we consider which policy interventions can limit or eliminate these inefficiencies. Such public interventions are warranted by the fact that in our churning equilibrium, no individual bank has the incentive to deviate and unilaterally stop competing for other banks' managers: in the words of the initial quote by Tett (2009), banks "feel utterly trapped", and only the intervention of a public authority (such as FIFA for soccer) can stop banks from poaching employees from each other.

### 6.1 Clawbacks and long-term indexing

Several recent proposals to reform managerial compensation in financial institutions are based on the idea that it would be desirable to defer ("claw back") a part of

the managerial compensation and index this deferred compensation to long-term managerial performance. The idea behind such proposals is to address excess risk-taking. Note that excess risk-taking also arises in our “churning equilibrium”. Hence, it is desirable to discourage managers from taking projects that are likely to be highly profitable in the short run but feature “tail risk”.

However, in our benchmark setting deferring compensation would be inconsequential. The model places no constraints on deferral of managerial compensation: indeed, in the above analysis compensation is already assumed to be paid at the end of the manager’s career. Even in the churning equilibrium, it is inessential whether in each period the employer pays the manager’s compensation for that period or defers it to some future date: the essential point is that the compensation cannot be made contingent on the manager’s type. In such an equilibrium, long-term indexing would be ineffective, because the past performance of the manager is uninformative about his type (his “true alpha”).

It is true instead that anything that constrains the firms’ ability to defer compensation is inefficient. As shown by Corollary 3, if for some exogenous reason firms cannot defer compensation entirely and make payments contingent on the employees’ loyalty, then the parameter region where the first-best outcome obtains shrinks.

## 6.2 Salary caps

Another very frequently mentioned policy proposal is to impose a cap on managerial compensation. How would such a policy change the equilibrium in our model with managerial competition? Specifically, would it make churning – and the associated excess risk taking – less attractive to managers?

Suppose that policy-makers were to introduce a salary cap on the per-period compensation of managers, at the first-best level  $w^*$ . Such a cap would indeed prevent employers from poaching high-quality managers from each other in the competitive regime, and make the perfect risk-sharing and no-churning outcome sustainable in equilibrium. To see this, consider the candidate equilibrium where each employer offers the wage  $w^*$  to all his managers, and assigns them optimally once their type

becomes known. Then, due to the salary cap, a competing employer could not poach the managers who have proved to be good from their current employer. Moreover, churning for  $K$  periods would not be an equilibrium: in that case, on a per-period basis he would earn utility (13) which is smaller than the first-best utility  $u(\Pi^*)$ , so that he would not deviate from an employer who offered him  $w^*$ .

So a binding price cap would guarantee efficient risk-sharing between employees by shutting down competition for good managers. It would also simultaneously ensure the avoidance of excess risk-taking by firms, since it would discourage managers from churning across firms to avoid revealing their true ability. This highlights that current policy proposals about caps on the pay of top managers of financial institutions may have an efficiency rationale, not just a basis in ethical and political concerns (though this efficiency rationale is yet to be spelled out by those proposing caps). Indeed, according to the model, an appropriately set pay cap would raise the expected utility of managers themselves.

### 6.3 Taxing mobility or FIFA-style no-compete clauses

An effect similar to that of a salary cap could be achieved by a tax on managerial mobility: suppose that the compensation of a manager who switches to a new employer were taxed at a higher rate than that of a loyal manager. If the tax is set at a sufficiently high rate, it would effectively move the economy to the first-best even if the managerial labor market is competitive, as it would effectively block *ex-post* competition for managerial talent. Note that such a tax would never be paid in equilibrium, since managers would not switch to other employers. Therefore, the policy prescription arising from the model is to “throw sand in the wheels of the managerial labor market”.

To see this, consider the equilibrium where each employer pays the first-best compensation  $\Pi^*$  to all his managers, and assigns them optimally once their type becomes known. After the first two periods, managers learn their type. Hence, the good manager could leave and obtain a utility  $u((T - 3)x)$ . As shown in Section 4, this deviation is profitable if  $T > \hat{T}$ , where  $\hat{T}$  is given in (11). Then, a tax on

mobility

$$\tau \geq u((T - 3)x) - u(\Pi^*) \quad (20)$$

would prevent this deviation. Notice this condition would also ensure that there is no deviation after the third period because the benefits of deviating in period  $H > 2$  (i.e.  $u((T - 1 - H)x)$ ) decreases in  $H$  while the cost of deviating (i.e. the loss of  $u(\Pi^*)$ ) does not change. With such a tax on mobility (20), a competing employer could not poach the managers who have proved to be good from their current employer.

## 6.4 Investments in “alpha”

As discussed above, both a salary cap and the equivalent tax on managerial mobility would redistribute income from good to bad managers. In the current setting this redistribution prevents managerial churning and facilitates productive allocation of talent. We note, however, that the redistribution could have a negative effect on efficiency in a richer setting in which managers invest in their quality *ex ante* at a private cost – for instance, by taking an MBA they can raise their probability  $p$  of being a good manager. In this case, capping their salary – and therefore their lifetime compensation – would reduce the “average alpha” of managers in equilibrium.

Moreover, in the real world preventing reallocation of managerial talent may have efficiency costs that are not captured by the present model: if both managers *and* firms are heterogeneous, they may both learn gradually about the quality of their match, so that it may be efficient for bad matches to be dissolved and new ones be formed. Also, limiting or preventing managerial mobility may confer market power to firms, and thereby create holdup problems. In our setting, this would be inconsequential because of *ex-ante* competition, but in reality this assumption may not hold either. Such considerations are worthy of further modeling in the context of our setup which focused exclusively on one dark side to managerial mobility.



## 7 Conclusions

In this paper we showed that the market for managers has a dark side, in that it allows them to take on projects with short-term rewards at the cost of exposing firms to long-run or tail risks, since they can move across firms before these risks are realized. If the market for managers is effectively shut (for example, due to firm-specificity of managerial investments), then the outcome is improved in that it features less inefficient risk-taking. This is associated with two benefits: (i) firms can learn about their managers' types over time and use this information to achieve production gains, because employees do not leave; and, (ii) firms can offer insurance gains to their employees, because the better employees can be used *ex post* to subsidize the worse ones, and thereby all employees can be insured against the risk arising from the value of their own human capital *ex ante*. We do not intend to suggest that there is no economic value to the market for managers and employees, but simply highlighting the counterintuitive possibility that the market for managerial mobility pierces through essential firm boundaries and fundamentally interferes with firms' ability to generate information about employees.

Besides our theoretical contribution that is especially suitable for understanding risk-taking in the financial sector, our line of research also suggests an empirical one. The immediate testable prediction of our model is that there should be a positive correlation over time between the mobility of senior managers and traders across financial institutions and their risk-taking. Moreover, according to the model, cross-sectional differences between managers can make some of them more prone to switch jobs than others, for instance, because – in keeping with the model – they are at the start of their careers and have a lower degree of firm loyalty and firm-specificity of skills. Then our analysis implies a second testable prediction: the larger risks taken by financial institutions should be systematically related to the subset of managers (e.g., young traders with substantial type uncertainty) that are more likely to move across financial institutions. In other words, the hypothesis is that there is a group of highly rewarded managers who specialize in taking tail risks and move rapidly across

employers.<sup>9</sup> We plan to pursue empirically the full set of testable implications of our model in future research.

---

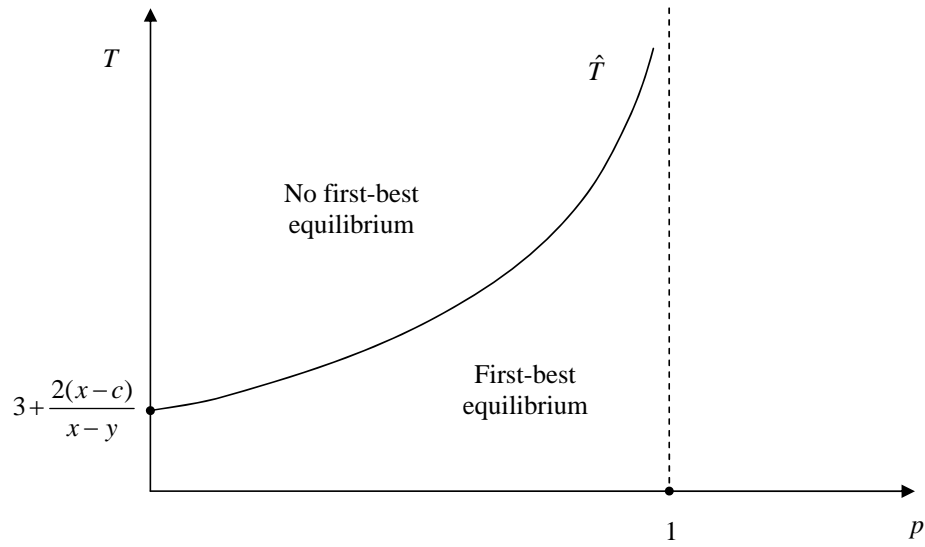
<sup>9</sup>Indeed, recent empirical work by Deuskar, Pollet, Wang and Zheng (2009) suggests that the turnover of managers from mutual fund industry to hedge-fund industry may be a potentially useful setting to test the implications of our theory. In particular, they find that best-performing mutual fund managers stay in-house and do hedge-fund style investments, whereas average performers switch to the out-of-house hedge funds.

## References

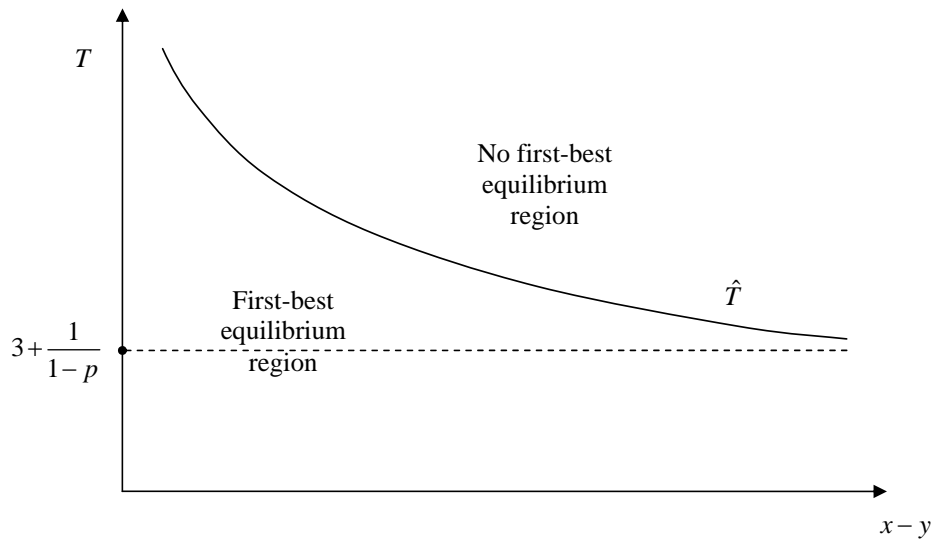
- Acharya, Viral, Thomas Cooley, Matthew Richardson and Ingo Walter, 2009, “Manufacturing Tail Risks: A Perspective on the Financial Crisis of 2007-09,” forthcoming, *Foundations and Trends in Finance*.
- Acharya, Viral, Marc Gabarro and Paolo Volpin, 2009, “Competition for Managers, Corporate Governance and Incentive Compensation,” Working Paper, New York University.
- Acharya, Viral, and Paolo Volpin, 2010, “Corporate Governance Externalities,” *Review of Finance*, 14(1), 1-33.
- Axelson, Ulf and Philip Bond, 2009, “Investment Banking Careers,” Working Paper, University of Pennsylvania - Wharton.
- Bebchuk, Lucian, and Jesse Fried, 2004, *Pay Without Performance: The Unfulfilled Promise of Executive Compensation*, Harvard University Press.
- Bebchuk, Lucian, Alma Cohen and Holger Spamann, 2009, “The Wages of Failure: Executive pay in Lehman and Bear Stearns 2000-2008,” Working Paper, Harvard University.
- Cheng, Ing-Haw, 2009, “Corporate Governance Spillovers,” unpublished manuscript, University of Michigan.
- Cheng, Ing-Haw, Harrison Hong and Jose Scheinkman, 2009, “Yesterday’s Heroes: Compensation and Creative Risk-Taking,” Working Paper, Princeton University.
- DeMarzo, Peter, Dmitry Livdan and Alexei Tchisty, 2011, “Risking Other People’s Money: Gambling, Limited Liability, and Optimal Incentives,” Working Paper, Stanford University.
- Dicks, David, 2009, “Executive Compensation, Incentives, and the Role for Corporate Governance Regulation,” Working Paper, University of North Carolina.

- Deuskar, Prachi, Joshua Pollet, Jay Wang and Lu Zheng, 2009, “The good, the bad or the expensive? Which mutual fund managers join hedge funds?”, Working Paper, Emory University.
- Fahlenbrach, Rudiger and Rene Stulz, 2009, “Bank CEO Incentives and the Credit Crisis,” Working Paper, Ohio State University.
- Gabaix, Xavier, and Augustin Landier, 2008, “Why Has CEO Pay Increased So Much?,” *Quarterly Journal of Economics* 123, 49-100.
- Harris, Milton, and Bengt Holmstrom, 1982, “A Theory of Wage Dynamics,” *Review of Economic Studies* 49, 315-333.
- Makarov, Igor and Guillaume Plantin, 2010, “Rewarding Trading Skills Without Inducing Gambling, ” Working Paper, London Business School.
- Philippon, Thomas, and Ariell Reshef, 2009, “Wages and Human Capital in the U.S. Financial Industry: 1909-2006,” NBER Working Paper No. 14644.
- Rajan, Raghuram, 2005, “Has financial development made the world riskier?,” *Proceedings, Federal Reserve Bank of Kansas City*, August, 313-369.
- Rajan, Raghuram, 2008, “Bankers’ Pay Is Deeply Flawed,” *Financial Times*, January 9.
- Richardson, Matthew and Ingo Walter, 2009, “Rethinking Compensation Practices in Financial Firms”, Chapter 8 in Acharya and Richardson, eds., *Restoring Financial Stability: How to Repair a Failed System*, John Wiley & Sons.
- Rosen, Sherwin, 1981, “The Economics of Superstars,” *American Economic Review* 71, 845-858.
- Smith, Roy, 2009, “Greed is Good,” *Wall Street Journal*, February 7.
- Stiroh, Kevin, 2004, “Diversification in Banking: Is Noninterest Income the Answer?,” *Journal of Money, Credit and Banking* 36, 853–82.

Tett, Gillian, 2009, "What Bankers Can Learn From Chelsea Football Club," *Financial Times*, September 11.

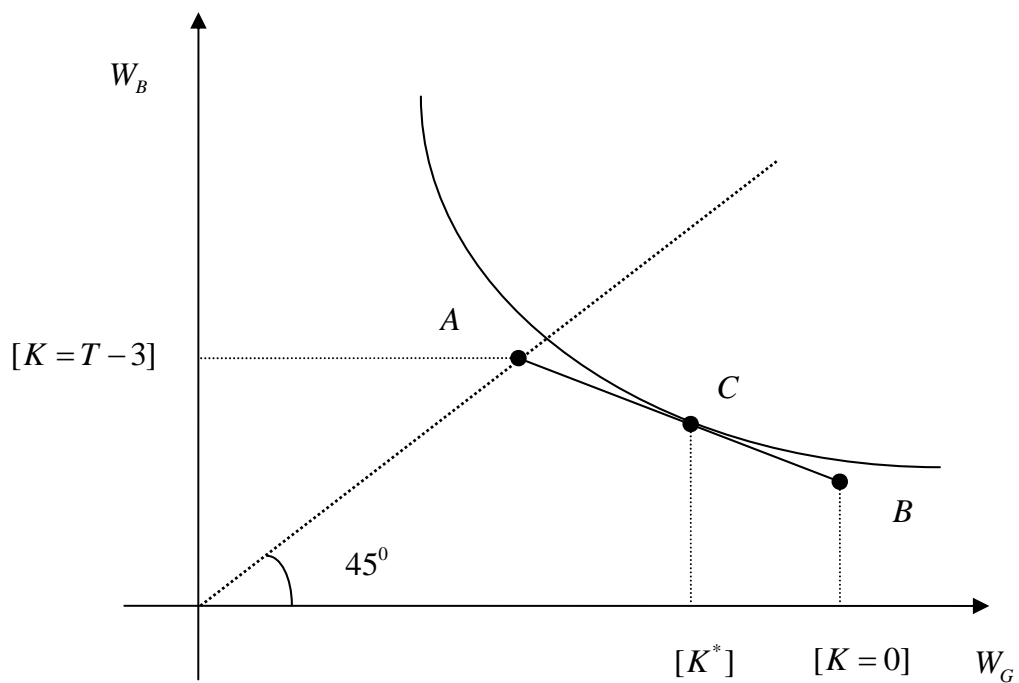


Panel A. First-best equilibrium, career duration ( $T$ ) and fraction of good managers ( $p$ )



Panel B. First-best equilibrium, career duration ( $T$ ) and excess return of risky project ( $x-y$ )

**Figure 1. First-best equilibrium region**



**Figure 2. Churning equilibrium**