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Designing Military Pay

Contributions and Implications of the Economics Literature

Beth J. Asch

National Defense Research Institute

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Preface

A primary goal of military compensation is to enable the military to meet its manning objectives for force size, composition, and wartime capability. To attain these manpower objectives, compensation must be appropriately structured to attract, retain, and motivate personnel at a reasonable cost even when national security goals are changing. A key question facing military manpower and compensation managers is, How should military compensation be structured?

The issue of military compensation design has been actively debated over the years. The dramatic changes in the military since 1989 have highlighted this issue to an even greater extent, because they have brought to the fore the question of whether the current design of military compensation will be appropriate and cost-effective in the military of the future. The research presented in this report addresses that question by drawing from the contributions of the recent (past 15 years) economics and compensation literature. From the implications of the literature, it derives guidelines that form a foundation for the design of military pay.

This report is part of a broader RAND research effort intended to address the following questions: (1) How should basic pay be designed? (2) How should retirement benefits be structured and what should be the size and structure of those benefits relative to basic pay? (3) What should be the mix between basic pay and special and incentive pays? A related draft in preparation that is also part of this research effort is

- Beth J. Asch and John T. Warner, "Military Compensation and Personnel Policy: Theory and Policy Analysis."

The broader research effort also includes two other studies. The first critiques the current civilian wage index used to adjust military pay annually; the second reviews compensation for work-related injuries:

- Danielle Cullinane, *Compensation for Work-Related Injury and Illness*, RAND, N-3343-FMP, 1992.
- James R. Hosek, Christine E. Peterson, Jeannette Van Winkle, and Hui Wang, *A Civilian Wage Index for Defense Manpower*, RAND, R-4190-FMP, 1992.

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Contents

Summary

The research presented in this report is concerned with the broad question, What should be the structure of military compensation for active-duty personnel? It seeks to lay a foundation for the design of military compensation by drawing from the economics literature the relevant findings and insights and applying them to the military setting. To the extent that the literature is incomplete or does not recognize the unique aspects of the military, the research also strives to delineate gaps in the literature, to fill in some of those gaps, and to suggest where future research would be useful.

Given the complex and multidimensional aspects of military compensation, our work focuses on providing design guidelines that address the following general questions: (1) How should military basic pay be designed? (2) How should retirement benefits be structured and what should be the size and structure of these benefits relative to basic pay? (3) What should be the mix between basic pay and special and incentive pays? These questions relate to key components of compensation that represent large portions of the military's personnel expenditures.

This report addresses the first question above. It summarizes the findings from our review of the economics literature, which provides an understanding of the interactions between pay and the cost-effective achievement of specific manpower goals. It then presents guidelines for the design of basic miltary pay derived from this review, guidelines that indicate specific ways to design basic pay in light of the pay–manpower-goals interactions.

We used the following questions to guide our literature survey:

1. What are some of the most important goals compensation helps achieve in the context of large, multitiered, hierarchical organizations such as the military?
2. What is the role of compensation in attracting and retaining personnel, matching them to occupations, motivating them to work effectively and develop skills, and ensuring that the most-qualified individuals are placed in the positions for which they are best suited?

3. Given the answers to 1. and 2., how should pay levels vary across occupations, across ranks or grades, within grades, and with promotion policy?

By way of summarizing our research findings, we list below some of the key guidelines derived from our literature survey.

To attract and retain personnel, an organization should pay each individual at least as much as his or her next-best opportunity; at the same time, compensation should reflect the value of the individual's contribution to the organization.

Individuals in occupations or positions with disamenities, such as those with greater injury, death, or health risks, or in unpleasant locations, must generally receive higher pay while those in occupations or positions with amenities can receive less pay. However, whether extra pay (or less pay) should be earned and the amount of the extra pay depend on individuals' attitudes toward occupation and position attributes, the intensity of those attributes, and the demand and supply for individuals in the various occupations and positions.

Compensation should rise with grade or with hierarchical level. This compensation structure motivates greater skill development to the extent that more skills are required in higher grades. This structure also ensures that the most able junior personnel strive for higher and more senior grades. Finally, this structure motivates better performance to the extent that attaining future grades is contingent on performance in lower grades. Greater compensation may take the form of higher pay, increased job amenities, or even greater but deferred retirement income.

The structure of compensation across grades or hierarchical levels should be skewed, i.e., the intergrade compensation spread should increase with grade. The reason for such skewing is that top positions are more important, in the sense of having more responsibility, and influencing and motivating more people, and because the best and most-talented individuals must be motivated to strive for these positions. A skewed structure may be achieved through pay, job amenities, or deferred compensation such as retirement income.

Promotion policy can increase each individual's motivation and performance. It can also improve the quality of each worker-job match by providing both a means for organizations to learn about otherwise unobservable worker abilities and an incentive mechanism for workers to reveal those abilities. The pay gap between grades or hierarchical levels should be larger when (1) individuals eligible for promotion are more able; (2) the number of positions to be filled is small relative to the number of individuals eligible for promotion; (3) achieving

the best worker-job match is important; (4) factors beyond the workers' control are important; and (5) workers are less averse to income variability.

Explicit up-or-out promotion policies can sometimes be replaced by implicit up-or-out policies. By structuring intergrade compensation so that those who fail promotion earn less than they would in their outside opportunities, a promotion scheme can operate as an implicit up-or-out mechanism that induces quits. On the other hand, an explicit up-or-out policy may be required if those who fail promotion are better off by staying rather than by quitting.

Individuals have different abilities to perform different jobs. Whereas those who are better able to perform the jobs associated with higher grades should be promoted, not all individuals who fail to be promoted should be dismissed or be otherwise penalized. Those who would be relatively less able in the higher grades may make significant contributions in the lower grades. To the extent that such individuals increase organizational capability, they should be retained and not be subject to up-or-out provisions. Thus, compensation should reward not only the current and future "corporate leaders" but all those who increase capability.

Compensation within a grade should be contingent on effort and/or performance. This policy helps ensure that individuals who are best matched in their current grade are still motivated to perform well despite their lack of promotion opportunities. Thus, compensation within a grade should be differentiated, with the higher pay going to those who meet performance standards. For those who fail performance standards, the contingent, within-grade pay structure can operate as an intragrade up-or-out mechanism whereby those who fail earn less than they would in their outside opportunities and quit. By "weeding out" those who make few contributions, this structure helps prevent "clogs" in the flow of personnel across grades.

The best matches between personnel and grades can be achieved by not motivating to move up in the ranks those who are relatively less able to perform the tasks associated with the higher grades. One way to achieve this outcome is to increase the amount of within-grade compensation that is contingent on satisfactory performance, i.e., increase the compensation differential within a grade between those who meet and those who fail within-grade performance standards. Since the less able are unlikely to perform satisfactorily at higher grades, they are also unlikely to earn the contingent pay in higher grades. As a result, the expected gain to promotion is lower and their motivation to strive for a promotion is reduced. Since promotion becomes less likely but motivation to perform remains an important goal, the slope of the within-grade contingent

compensation profile should be greater at higher grades. The slope is also greater because deterring less able workers is more important at higher grades; failing to match the right people with more responsible positions has an increasingly detrimental effect on total capability as one moves up the "corporate ladder."

The pay gap across grades should be greater than the pay gap within a grade. The amount of the intergrade gap should be large enough that those who are more able to perform at higher grades would rather strive for a promotion than work less hard and earn the intragrade pay.

These guidelines address some of the key aspects of basic-pay design. However, before they can be implemented for the military, they should also account for some of the unique aspects of the military and its manpower and personnel requirements. Although a full evaluation of the military's current compensation system must await further study, we can point to some obvious aspects of the system that seem to violate the guidelines summarized above.

First, the military applies the same pay table to all service members regardless of branch of service and/or occupation. Some aspects of the military are the same regardless of service or occupation; however, other aspects are, obviously, strikingly different. The analysis suggests that differences in the amenities and disamenities of different services and occupations should (in some cases) result in different levels and structures of pay across occupations and services. Thus, separate pay tables for the different services and/or occupational groups may be appropriate.

Second, the military grants automatic pay increases as members gain seniority. Thus, intragrade pay increases are automatic. The literature review suggests that effort supply would be greater if at least some of intragrade pay were contingent on performance.

Future work should apply the findings and insights from the literature more directly to the military setting. Examples of topics worthy of future research include

- An investigation of whether military compensation is skewed (as discussed above), and, if so, whether the mix of compensation used to accomplish such skewness is the most efficient.

- An investigation of the roles of the military retirement system and its effect on retention, effort supply, and ability sorting.

This report lays a foundation for the design of military compensation. Specific policy recommendations must await the findings of such further research.

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1. Introduction

Basic pay is the foundation of military compensation. It not only constitutes the basic paycheck of every service member, but it also affects the level of other military benefits, such as future retirement income. (See the Appendix for a description of the military compensation system.) The current basic-pay table determines pay by a service member's grade and time in service. These determinants have remained unchanged since World War II. Yet, despite this stability, a long-standing controversy has surrounded the appropriateness not only of these determinants but of the structure of military pay in general.

For example, some analysts have argued that the current compensation method is inappropriate for the modern military because, as Binkin and Kyriakopoulos (p. 20, 1981) state, the method is "the legacy of the small, relatively unskilled, cadre-type forces that characterized the American armed services during most of their history before Pearl Harbor." Many suggestions have been proposed, ranging from using occupation-specific pay tables (Warner, 1981) to replacing the current system with a salary system (see, for example, Cooper, 1977).[1]

Dramatic changes are occurring in the military and in the environment in which it operates: National security goals are being adapted to a new world order, and the force is being downsized. Such major changes highlight, more than ever before, the need to address two important issues raised by current and future national security goals: whether the current military pay structure best enables the military to meet its manning objectives and how military compensation should be structured.

Addressing the issue of how military pay should be designed is not a simple matter. First, it requires a general understanding of the interaction between pay objectives and overall organizational goals. Second, it requires an understanding of the role of pay in meeting specific manpower and personnel goals, such as attracting, retaining, and motivating personnel. Third, it requires an understanding of how these general analyses apply to the unique aspects of the military.

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[1]Some of the discussions about the disadvantages and advantages of the military pay method are summarized in General Accounting Office (1986).

The purpose of our research is to lay the foundation for the design of basic pay. Our research approach consists of a review of developments in compensation in the economics and personnel management literature over the last 5 to 20 years to gain insights that provide guidelines on pay design, to apply those insights to the military setting, and to identify areas of concern to the military that are not addressed by the literature. Specifically, the survey was directed toward obtaining answers to the following three questions:

1. What are some of the most important goals compensation helps achieve in the context of large, multitiered, hierarchical organizations such as the military?
2. What is the role of compensation in attracting and retaining personnel, matching them to occupations, motivating them to work effectively and develop skills, and ensuring that the most-qualified individuals are placed in the positions where they are best suited?
3. Given the answers to 1. and 2., how should pay levels vary across occupations, across ranks or grades, within grades, and with promotion policy?

While our survey cuts across many relevant aspects of the compensation literature, it does not include the many important contributions of the literature on organizational design, organizational behavior, and the sociology of organizations. Thus, its focus is on efficiency issues, i.e., meeting organizational goals cost-effectively.

Because we are interested in guidelines specifically applicable to the military, our focus is on compensation design in large, hierarchical organizations rather than in a generic organization. Further, we present our findings on the various roles of pay in a way that directly addresses the question of how pay should be structured. Thus, the report's main sections correspond to organizational policy concerns. The report is organized as follows. Section 2 delineates several key manpower and compensation goals identified in the economics literature; it also presents a discussion about how these goals apply to large, hierarchical organizations. Section 3 discusses the role of compensation in attracting and retaining personnel and in matching them to jobs or occupations. Sections 4 through 6 focus on the role of pay in matching individuals to the positions for which they are most qualified, in providing incentives for skill development and effort, and in encouraging retention and separation. Section 4 examines the important considerations for determining the structure of compensation across hierarchical levels. Section 5 discusses promotions, i.e., the movement of personnel across levels or grades, and Section 6 examines the structure of

compensation within hierarchical levels and how that structure relates to the cross-level compensation structure. Finally, we present our conclusions, some preliminary policy implications, and directions for future research, in Section 7. As background to the discussion, we briefly overview the main features of the military's compensation system in the Appendix.

2. Conceptual Framework: Manpower Goals and Compensation Objectives

Organizations, by their very nature, have goals and strategies. In the private sector, goals are often expressed in terms of profit maximization and growth. In the military context goals are related to national security objectives. In attaining their goals, organizations face constraints. For one, inputs (such as personnel) must be obtained at a cost because available resources are limited. There may also be technological, legal, and institutional constraints, such as accountability to stockholders or to the taxpayer, as well as social goals, such as equal opportunity.

For private-sector operations, constraints often mean that organizations must meet their goals efficiently and at the least cost. However, as a government institution, the military is not subject to the same competitive forces as private-sector institutions: No other institution has the charter to produce "national security." Furthermore, comparisons with single providers in the private sector, i.e., monopolies or (perhaps) oligopolies, are not direct because such institutions are profit maximizers and the military is not. Private-sector firms often do not rank social goals as an important constraint, while the military often does. Still, like private sector firms the military must often compete for its inputs, such as its personnel. While defense resources are often expropriated or obtained by command during wartime, such is not usually the case during peacetime.[1] And the military is accountable to the taxpayer. These constraints mean that the military must meet its national security goals with a concern for efficiency and cost-effectiveness.

Most organizations state their personnel and manpower objectives with reference to their overall goals. And compensation objectives are often stated with reference to meeting the personnel goals in a cost-effective manner. In the military, manpower goals are stated in terms of force size, its experience and pay-grade composition, and capability. To the extent that a key purpose of compensation is to enable the military to meet these goals, compensation should be designed to cost-effectively attract and retain personnel; motivate personnel to enhance their effectiveness by providing incentives to obtain skills, do their jobs well, and seek the occupations and jobs for which they are best suited; and be

[1]The exception is the draft from 1948 to 1972.

flexible to accommodate changes in national security goals. Other considerations may also enter into the design of military pay, such as administrative efficiency and equity.

Compensation Goals in Large Organizations

How are the above compensation goals attained in a large organization, such as the military, with its different levels of responsibility? Guidelines for answering this question occupy the remainder of the report. However, before discussing these guidelines, it is useful to specify more concretely what we mean by a hierarchical organization and what its typical compensation goals are.

Large organizations generally consist of several levels of personnel, called hierarchical levels or grades. At the top is the chief executive officer or the president of the organization; at the bottom tier are the entry-level workers. The number of workers in each tier decreases with each higher hierarchical level. Often, such organizations have internal labor markets,[2] which means that entry-level positions are filled by drawing from the general labor market while higher-level positions are primarily filled by drawing from the pool of workers who are already within the organization. Thus, long-term employment, which means that individuals spend most, if not all, of their careers within one organization, is common in an internal labor market.

Just as does any organization, large, hierarchical organizations usually place a high priority on designing a compensation system that attracts, retains, and motivates personnel in a cost-effective manner. However, in the context of an internal labor market, these personnel and compensation goals can be made more specific, as follows:

- These organizations must attract individuals who not only can perform the entry-level job but can also be taught to perform more responsible ones at higher hierarchical levels.
- They must ensure that occupations are filled with workers who are the best suited for those occupations.
- They must provide personnel with incentives to develop and effectively use their skills over the course of their career.
- Many organizations restrict lateral entry (i.e., hiring from the general, outside market for higher levels) and thus must encourage retention.

[2]The nature of internal labor markets is described in detail in Wachter and Wright (1990).

- These organizations must ensure the best person-job matches at each hierarchical level.
- Organizations must motivate individuals to work effectively alone and in teams regardless of whether their career progression across hierarchical levels is rapid or slow.
- Finally, to ensure that openings are available for the best suited, they must encourage the separation of those unsuited for further employment or advancement in a way that maintains morale and does not discourage retention.

To the extent that compensation helps achieve these goals, hierarchical organizations must decide (1) the level(s) of compensation; (2) the structure of compensation across tiers; and (3) the structure of compensation within tiers. Such decisions are often difficult to make because of problems in obtaining information about workers and their activities.

Generic Organizational Problems in Meeting Compensation Goals

Difficulties in achieving compensation goals often arise because information on workers' skills, abilities, and effort is sometimes costly to obtain and so is imperfect. Employers may inadvertently fill positions with under-qualified individuals, and individuals may supply less effort when detection is not always forthcoming. Thus, overcoming information problems is often another important goal in designing compensation and personnel policy in large organizations.

Throughout this report we refer to such information problems in our discussions of compensation design. Because of their importance, we provide as a background for the rest of the report a more detailed description of the nature of these problems and their implications for personnel management. Two aspects of imperfect information are particularly relevant: imperfect information about worker effort or performance, and imperfect information about worker qualifications or, more generally, characteristics.

Imperfect and Asymmetric Information About Worker's Effort and Performance

Employers are often less informed about worker activities than the workers themselves are; information on worker input, or effort, and on worker output, or performance, may be incomplete and costly to obtain. In large organizations,

direct contact between the employer and workers may be only intermittent. Even when such contact occurs, the nature of the work may not lend itself to providing accurate information on each worker's productivity. For example, determining a specific individual's contribution to team output may be difficult when individuals work together to produce a group product, such as on an assembly line. Sometimes employers use such performance measures as the quantity and quality of worker output or supervisor ratings to gain information on worker activities. However, such measures may be subject to error if a worker's effort and output are not amenable to measurement, such as when jobs involve intangible output in the form of ideas. Even when output is tangible, the cost of using supervisors or mechanical devices to measure output may be prohibitive.

The above situation describes imperfect and asymmetric information about a worker's effort and performance, i.e., information on worker effort and output that is known by workers but not by employers. The primary problem posed by imperfect and asymmetric information is that workers have an incentive to supply less effort. From the employer's viewpoint, the reason for that incentive is that a given level of worker performance is consistent with both hard work and bad luck and less work and good luck. For example, low military enlistment levels in a given area are consistent with recruiters working hard in a bad recruiting month, i.e., low enlisted supply, or with recruiters reducing effort in a good month. As a result, workers can reduce effort and attribute poor performance to measurement error, such as inaccurate supervisor ratings, or to circumstances beyond their control. In other words, workers can "hide" their true effort levels. In the literature, this problem is called "moral hazard."[3]

Again, military recruiting provides a good example of when such a phenomenon could happen. Recruiters spend a considerable amount of time away from the recruiting station in search of potential enlistees in local high schools, fast-food restaurants, etc. The station commander does not perfectly observe each recruiter's activities. As a result, the commander does not perfectly know whether a low level of enlistments, i.e., recruiter output, is due to ineffective recruiter input or to low enlisted supply. Given this situation, recruiters may be able to supply less effort without detection.[4]

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[3]Rasmusen (1989, pp. 133–136) provides a formal description of this problem. Numerous studies describe and investigate the implications of this problem; many are cited throughout this report.

[4]Dertouzos (1985) and Asch (1990) discuss recruiter incentives and provide empirical estimates of the effects of these incentives on enlistment outcomes.

The problem of low work incentives in the presence of imperfect and asymmetric information can often be addressed by appropriately designing compensation. In the case of military recruiters, incentive plans that reward the quantity and quality of enlistments are used. Throughout this report, we indicate how compensation design can be used to elicit effort and motivate effective work even when moral hazard is a problem.

Imperfect and Asymmetric Information About Worker 's Characteristics

Workers are not identical. Individuals have different preferences, abilities, qualifications, and opportunities. While many of these differences, such as hobbies, are irrelevant to the workplace, many are of great importance to an employer. From the employer's viewpoint, knowledge of workers' skills and qualifications for different occupations, positions, and even for the organization as a whole, is particularly useful for determining which workers should be hired and which should be assigned to various occupations and positions. When employers have less information about worker characteristics than the workers themselves do, information is asymmetric. When neither have perfect information, such as knowing whether the worker will be a good match for the firm, then information is symmetric but imperfect.

Imperfect and asymmetric information about worker characteristics is probably more the rule than the exception in the labor market. Without interviewing prospective employees and reviewing their applications, employers rarely know each individual's qualifications. And an individual is certainly better aware of his or her own educational attainments and work experience than the employer. On the other hand, employers may be more aware of the relative value of those attainments and experiences for their organization. Recently hired workers also may have plans to quit after so many months or years, plans that were undisclosed to the employer.

Imperfect and asymmetric information about worker differences or heterogeneity can cause a problem known in the literature as "adverse selection":[5] Employers may mistakenly hire less qualified workers and/or mistakenly match unsuitable workers with occupations and positions. Further, policies intended to attract and retain the most qualified may also attract, retain, and match the less qualified. For example, offering greater pay to attract high-quality enlistees also attracts

[5]Numerous studies have investigated the problem of adverse selection in the labor market. Representative papers are by Greenwald (1986) and Guasch and Weiss (1980, 1981).

less qualified ones. Without screening methods and careful compensation design, the military may inadvertently lower capability by recruiting ill-suited personnel. Throughout this report, we discuss compensation and personnel policies that attempt to remedy the adverse-selection problem.

Conceptual Framework

In the following sections, we summarize the research findings on compensation designs that help organizations meet their personnel and manpower goals. To make explicit the framework that underlies our discussion, we assume a particular hierarchical organization to serve as a backdrop for the literature review. Our "model" organization is intended to be general enough to capture the main ideas of the research. We also present our assumptions concerning the nature of the external labor market.

The hierarchy we assume is structured as follows. All hiring occurs at the entry level, and higher-level positions are filled by workers at lower levels. The organization offers lifetime employment. Higher hierarchical levels have more responsibility and status; lower ones have less. Higher levels have fewer positions available; lower ones have more.

The organization is characterized by different occupations. Within an occupation are jobs, each job reflecting the different tasks, duties, and responsibilities of the occupation. For each occupation, a group of jobs is associated with each level of the hierarchy. Jobs requiring more responsibility are at higher levels and those requiring less are at lower levels.

The hierarchy is characterized by different career paths within an occupation. A path consists of movement across jobs (or hierarchical levels) and/or staying in a single job and gaining experience. We assume, for simplicity, that individuals cannot change occupations.[6] Thus, individuals at a given hierarchical level may have different experience levels (e.g., different lengths of time in the organization and in the current level) and different jobs. We also assume that individuals have different abilities, different preferences toward job attributes, such as geographic location, and can vary their effort and performance levels.

In the rest of this report, we assume that the labor market is competitive, which is a fairly realistic assumption. Many employers compete for both entry-level workers and for workers who are more senior. Thus, workers have a variety of

[6]This assumption is not as restrictive as it first appears, because an occupation in the model can always be defined broadly enough to encompass possible changes that might occur.

employment alternatives. We also assume that the labor market consists of workers with a variety of skills, abilities, experience levels, and preferences. Although we make no assumptions regarding the nature of the output market and thus whether the model organization is a monopy, oligopoly, or competitor, we do assume that the organization attempts to meet its goals, including maximizing output or capability at the least cost.

3. Attracting and Retaining Personnel and Matching Them to Occupations

This section focuses on the role of compensation in recruiting and retaining personnel. In the context of the military, qualified enlistees must be recruited and matched to specific occupations or occupational groups and enlistment terms. Further, they must be retained to fill higher levels since lateral entry is not generally permitted. What level or levels of compensation accomplish these tasks?

To answer this question, we first address a more general question: Why do compensation levels vary? Here, we provide a brief overview of how the labor market works. To focus on the relevant determinants, we initially ignore the lifetime aspect of jobs in internal labor markets. Then, we address the question of how compensation varies across personnel and occupational characteristics in a discussion that focuses on how compensation serves as a mechanism that matches workers to jobs or occupations. Finally, we introduce the notion of career compensation to illustrate how the lifetime aspect of employment can affect pay determination at the entry level and to discuss motivation and retention explicitly.

Why Compensation Levels Vary: A Simple Model

Generally speaking, the role of compensation in the labor market is to match the number of individuals who are willing to work, i.e., the supply of labor, with the number of employers who are wishing to hire, i.e., the demand for labor. What determines demand and supply? Demand is related to workers' contributions to the organizational product, or productivity. More specifically, employers determine how many workers to employ by evaluating how much extra "product" or output they get by adding another worker. The value of this extra output is called the *value of the marginal product of labor* (VMP). To obtain labor services cost-efficiently, employers in a competitive labor market are willing to pay out in the form of compensation only what they gain from adding the last worker, the VMP.[1]

[1] As we discuss later when we introduce other considerations, such as training and incentives, employers may over- or underpay individuals for some length of time. Further, the text assumes (temporarily) that all workers are homogeneous.

The supply of workers is related to the value workers place on alternative activities, including school, household activities, recreation, or other employment opportunities. Workers forgo opportunities by working for a given employer. The number of individuals who work and the amount of time they are willing to devote to work depends on whether they are sufficiently compensated to forgo their next-best opportunity.

To mediate between demand and supply, compensation must therefore be at least as great as an individual's perceived next-best opportunities and be at most equal to the individual's contribution or VMP. Since an individual's next-best alternative is often a similar job and that job also pays, in theory, at most the individual's VMP, the individual's next-best alternative is generally equal to VMP. Thus, stating that compensation must equal the value of the worker's contribution to the organization is equivalent to stating that compensation must equal the value of an individual's next-best alternative.

Compensation may vary over time because of general shifts in the supply and demand for labor. On the supply side, demographic changes, such as the baby boom and increased immigration, increase the supply of labor. On the demand side, technological change and increased international competition may increase the demand for some types of labor, such as skilled workers.

Demand and supply forces will affect not only the number of workers employed but also the ability of organizations to retain them. Clearly, to deter workers from quitting, organizations must pay them at least the value of their next-best alternative. Those who have better opportunities, such as skilled workers, will require higher pay in general. Similarly, when the supply of workers is lower, pay must generally be higher to ensure retention.

Neither workers nor organizations are identical, as the above description implicitly assumes. Individuals and employers have different characteristics. Thus, the labor market actually consists of submarkets in which different types of individuals and organizations are matched. Compensation levels will vary across employers, occupations, and jobs because the value of the marginal productivity of labor will vary according to differences in corporate "culture"; technology and the availability of equipment; the nature of work, such as team versus individual product; and the work environment, such as its location. Pay levels will also vary because workers differ; the value of alternative opportunities will vary across workers according to differences in preferences, skill and ability, age, and household characteristics, such as the presence of a spouse and/or children. For example, skilled workers have better employment alternatives than low-skilled ones; therefore, they command higher compensation.

This simple labor-market overview provides the first guideline for designing a cost-effective compensation system. Compensation should be at least as great as the next-best alternative for the individual the organization is attempting to attract. On the other hand, compensation should at most equal the value of the worker's VMP. Compensation levels vary because VMP varies across organizations and workers. VMP varies because of different worker and organizational characteristics and because of shifts in the demand and supply of labor.

In the real world, compensation may not change every time a worker's VMP changes. Because conducting performance reviews, negotiating a new wage, and adjusting the payroll involve costs, changes in pay in large organizations usually occur only periodically, every few months or even every few years. Also, if the demand for labor falls—say, because of a drop in product demand—the quantity of workers rather than pay usually adjusts, at least initially. Thus, we tend to observe layoffs rather than direct pay cuts to reflect the lower worker productivity (VMP). Similarly, when demand rises, we often see quits instead of pay increases to reflect the higher worker productivity.

The explanation for quantity adjustments rather than pay adjustments lies in the costs of negotiating pay changes, according to Hall and Lazear (1984). The organization and the worker save negotiating costs if the wage schedule is prespecified before the worker is hired. Thus, having a pay table such as that in the military saves administrative costs. However, when demand changes, the set pay schedule constrains the organization from altering pay. Thus, we often observe the organization using layoffs and the worker using quits to adjust to demand and VMP changes rather than using changes only in compensation. However, eventually, the benefits of changing the pay schedule—in the form of retaining workers who are quitting in the case of high demand—may outweigh the costs, and compensation will adjust to reflect changes in VMP.

How and Why Compensation Varies with Individual and Organizational Characteristics

In its role of matching workers with employers, compensation will vary with individual and organizational characteristics, as discussed above. This matching role of compensation also carries over to occupational or job choice. By how much will pay differ across workers and occupations with different characteristics? Clearly, designing a compensation system requires an understanding of how much compensation is enough to efficiently sort workers into occupations. To answer this question, we must illustrate how compensation

differentials are related to the way this sorting function is accomplished (see Rosen [1974, 1986a]).

For compensation to serve as a method for matching occupations having different attributes with individuals having different preferences for those attributes, we must define the term *compensation* more generally. *Compensation* is the sum of pecuniary (cash) benefits and the value to the individual of nonpecuniary benefits. Such job amenities as a pleasant work environment and interesting job tasks are nonpecuniary benefits that increase compensation. However, disamenities, or negative nonpecuniary benefits, reduce compensation. Disamenities may include job content, health risks, a quick work pace, undesirable locations, and degree of supervision.

In general, occupations or jobs with disamenities must pay more to attract workers while those with amenities can pay less. The extra pay premium required for onerous jobs is minimized when the jobs with the most disamenities (or with the greatest amount of a given disamenity) are filled with workers who have the least aversion to those disamenities. Thus, the pay premiums offered construction workers who build skyscrapers are such that the least acrophobic individuals work in these jobs.[2]

However, sometimes an organization's requirements for filling an onerous occupation exceed the supply of unaverse workers. For example, the requirements may be quite large or the disamenities may be particularly severe. To meet their labor demand, employers must increase the pay premium associated with the disamenity in order to attract those who find the disamenity more onerous. For example, the military has had to offer a premium for combat-arms occupations in part because individuals often view these occupations as onerous and in part because it has a large requirement relative to the supply of unaverse individuals.

The analysis illustrates two important compensation guidelines that relate to pay differentials arising from differences in individual and occupational characteristics. First, occupations must generally offer individuals higher pay or a pay premium to compensate them for job disamenities. Conversely, occupations can generally offer lower pay or a pay deduction when they also offer job amenities. Second, the existence of a disamenity (or amenity) does not necessarily imply that workers require a pay premium (or deduction). And extreme disamenities may not require large pay premiums. Whether a pay premium is required and the amount of such a premium depend on variations in

[2]Similarly, cost-effectiveness is achieved when jobs with amenities are filled with workers who value the amenities the most.

worker preferences, variations in occupational attributes about which workers care, the supply of workers with different preferences, and the demand for workers by occupations that vary in the relevant attributes.

An Important Case: When Pay Levels Fail as a Cost-Effective Recruiting and Job-Assignment Tool

A crucial assumption implicitly made in the general labor market model outlined above was that employers and workers accurately know VMP before the workers are hired or shortly thereafter. In other words, we assumed that information about the value of the marginal contribution of labor was complete and symmetric—individuals and employers are equally and accurately informed. As discussed above, employers offer more qualified workers, i.e., those with higher VMP, higher compensation and offer less qualified ones lower compensation. When a firm demanding high-quality workers knows workers' qualification levels, it can screen out the least-qualified ones and therefore ensure that only the most-qualified workers earn the higher pay that it offers. Thus, when information on VMP is symmetric, compensation is an effective method of matching workers to organizations and occupations.

Under conditions of asymmetric information, compensation may fail to cost-effectively match workers to organizations and occupations. Undetected worker differences or heterogeneity can cause the adverse-selection problem introduced in Section 2: When employers offer high pay to attract qualified workers, they also inadvertently attract less qualified workers who earn more by portraying themselves as being more qualified than they really are. Consequently, by offering high pay, the organization attracts an applicant pool with an average quality level that is less than what is required to justify the high pay offered; expected VMP is less than compensation. This outcome is not cost-effective.

However, if the employer tries to increase cost-effectiveness by lowering compensation to a level equal to expected VMP, the problem actually gets worse rather than better. Lowering compensation to discourage less qualified applicants also discourages the more qualified ones; average quality of the applicant pool will fall. Adverse selection occurs because there is no level of compensation that will discourage the less qualified workers. As a result, employers cannot rely on compensation exclusively to match workers perfectly to organizations or occupations.[3]

[3]This analysis focuses on initial-period or entry-level compensation. Below, when we consider career employment, we discuss how pay and personnel policy over a career, such as the use of probationary periods, may help solve the adverse-selection problem.

The possibility of the adverse-selection problem means that employers may be required to complement their compensation policies with additional methods of attracting and matching workers to occupations. One reason why we highlight the adverse-selection problem in this section is to show why compensation policies must often be designed in tandem with other personnel policies. Another reason is to show how solutions to the adverse-selection problem may sometimes result in compensation within an organization differing from what workers can earn elsewhere.

One approach to overcoming the adverse-selection problem is to complement compensation with a method of screening applicants. Tests, interviews, educational requirements, grade-point averages, IQ tests, and résumés improve employer information. Similarly, performance reviews and exams improve employer information in determining promotions. Such screening does not necessarily solve the information problem, however, for two reasons. First, the screens may be subject to measurement error or may be too costly to administer. Second, the screens will not work if the less qualified individuals can easily obtain or pass them. For example, educational attainment is often used as an employment screen. However, to the extent that education is subsidized by the government or by family members, the value of education as a screen is reduced. Thus, employers may find that educational attainment alone is ineffective in screening out unqualified applicants.[4]

Another approach to overcoming the adverse-selection problem is to pay workers more than the average quality of the labor force, i.e., overpay them relative to their outside opportunities (see Weiss [1980]). To the extent that more high-quality workers apply when compensation rises, this policy increases both the number of high-quality applicants and the average quality of the applicant pool. Although employers attract both high- and low-quality workers, they increase their chances of hiring a more qualified worker; their applicant pool contains a greater proportion of high-quality workers than the labor market in general. This solution is not perfect; some low-quality workers may still be hired. On the other hand, employers are more likely to obtain the right worker-organization or worker-occupation match by overpaying relative to the market's average quality level than by paying an amount equal to its average quality.

This second approach forms the basis of an argument relevant to military compensation and recruiting managers: High entry pay may be required in the military, even when the force is being reduced, because it allows the military to attract a larger applicant pool with more high-quality applicants. The excess

[4]The use of tests is discussed in Guasch and Weiss (1980). The problems with job-market signaling was first addressed by Spence (1973).

supply of high-quality applicants that arises from overpaying relative to workers' outside alternatives, increases the military's chances of getting the best-quality service members. However, whether overcompensating workers relative to their alternatives is cost-effective depends on the value of employing high-quality entry workers and on the cost and accuracy of using other methods of hiring such workers (including more cost-effective screens).

Overpaying Workers Relative to Their Outside Opportunities: The Question of Motivation

Organizations not only want to attract and match workers to occupations, they also want to ensure that the workers do their jobs well. Motivating individuals to work effectively can be accomplished in a number of ways. Here, we discuss how overpaying individuals relative to their outside opportunities can induce better performance. This analysis is noteworthy because it shows that, while compensation may equal the workers' VMP within the organization, it may at the same time exceed (rather than equal) what workers could receive by pursuing other alternatives.

Eliciting better performance from workers increases their contribution to the organization. However, employers may find it costly to determine whether workers are meeting performance standards. As discussed in Section 2, imperfect and asymmetric information about workers' effort and performance may adversely affect effort incentives by creating a moral-hazard problem.

Effort may be better elicited by coupling the performance measures with compensation and personnel policies that motivate individuals to work more effectively. One such policy is to penalize unacceptable performance with unemployment. Workers are sometimes fired when their performance does not meet minimal standards. If they can find a comparable job, given their skills and experience, they are no worse off by being fired and may actually be better off if their new jobs prove to be a better match. Alternatively, such individuals may pursue other interests, such as school or early retirement, or become self-employed.

However, if workers within an organization are paid more than their next-best alternative, new jobs with comparable pay are harder to find. Alternative jobs may not overcompensate workers relative to their outside opportunities. On the other hand, even if every alternative organization offered comparable pay and overpaid workers relative to the value of self-employment, new jobs would still be harder to find. At higher compensation levels, employers hire fewer workers and the unemployment pool increases. The larger the pool of unemployed is, the

more workers are available to fill a given vacancy and the search time for finding a new job is longer. Thus, when workers are fired for poor performance, they face the penalty of a long search time while unemployed. The unemployment penalty may motivate greater effort, and this additional effort may increase VMP. Although workers are overpaid relative to their outside alternative, their greater effort and greater productivity mean that their pay and VMP are equal within the organization.

The implication that compensation will exceed what workers can earn elsewhere is derived from the "efficiency wage" literature.[5] Much controversy surrounds this literature for several reasons. First, the penalty of unemployment may not induce greater performance but may simply induce workers to be conformists and nondisruptive, so that they give no reason to provoke a separation. Second, as noted by Carmichael (1990), a scheme that creates unemployment increases the unemployed workers' motivation to find ways of improving their attractiveness to employers. Thus, an efficiency-wage scheme may eventually give rise to alternative methods that may not involve overpayment relative to outside alternatives. Third, the labor market offers alternative ways of penalizing workers who are fired. As discussed by Malcomson (1984), workers who are fired may be penalized by getting a bad reputation in the labor market. Poor references and unenthusiastic letters of recommendation reduce the likelihood that fired workers will find jobs with comparable pay and working conditions.

Despite this controversy, efficiency-wage models provide an explanation for a commonly observed phenomenon in the labor market: Larger organizations tend to pay more than smaller ones.[6] The cost of monitoring and measuring worker performance is likely to be greater in larger organizations. Unlike small employers, large ones find it less feasible to directly observe worker performance on a day-to-day basis; they must often resort to more costly methods involving supervisors and rating practices. Small employers often work closely with their employees, whereas, in large organizations, management is more removed from workers. Since large-organization monitoring costs are probably higher, the model above suggests that larger employers are more likely to overpay workers relative to their outside opportunities and penalize poor performance with

[5]Representative studies include Shapiro and Stiglitz (1984), Yellen (1984), Calvo (1987), and Calvo and Wellisz (1979).

[6]This phenomenon has been documented by a number of studies including Mellow (1982) and Brown and Medoff (1989). Other explanations have been offered for this phenomenon. Oi (1983) suggests that larger firms hire higher quality workers to reduce the cost of monitoring worker effort. Another explanation is related to unionization avoidance, as discussed by Foulkes (1980) and Freeman and Medoff (1984). Garen (1985) presents a model that suggests that, because large firms have higher costs of monitoring effort, they offer higher pay to attract a higher-quality work force that requires less initial screening.

dismissal and unemployment. To the extent that hierarchical organizations, such as the military, are large, the model implies higher compensation is offered within these organizations than outside them.

Accounting for Career Employment

The role of compensation in equilibrating between demand and supply forces is the same whether we mean pay at a point in time or over a career. The term *compensation* can refer to pecuniary and nonpecuniary benefits not only in a given time period, such as hourly wages or monthly salaries, but also over a time horizon, such as over a career or a portion of an individual's career.

The relevant concept when referring to compensation over a time horizon is the discounted present value (DPV) of compensation. The DPV depends on the level and pattern of compensation over time and the discount rate. Thus, the decision to work for an organization or take a job in a particular occupation depends not only on current compensation but also on the discounted present value of future compensation. While current compensation may be below what could be earned elsewhere, the DPV may be greater.

Individuals (and employers) may not know perfectly what they will earn in the future. However, they form perceptions based on their knowledge of their skills and abilities and on what individuals with similar skills earn over their lifetime. Thus, individuals weigh the "expected" discounted present value of compensation in their decisionmaking. An important insight for designing a compensation system is as follows: Compensation from period to period may differ from the worker's next-best alternative, but the expected DPV over his or her career must be equal to the DPV of his or her next-best opportunity.

Another solution to the adverse-selection problem discussed above is revealed once career paths are introduced into the analysis (Guasch and Weiss [1981]). This solution illustrates how compensation policy relates to general personnel policies. Employers often use probationary periods during which recently hired workers are supervised closely and compensation is low. Some training may be offered, also. Probation serves as a screening mechanism. If performance is unsatisfactory during this period, the worker is fired. However, when performance is fine, the worker is considered "permanent," compensation is increased, and more intensive training will be offered if needed. Whether employers choose to screen prior to or after hiring depends on the cost and the information content and accuracy of each screening method. For probationary periods, the total cost will include the costs of hiring and initially training

workers (if training occurs), as well as any costs associated with terminating the worker if he or she turns out to be a poor match.

Employers probably use both methods. In the military, screening applicants on the basis of Armed Forces Qualification Test (AFQT) category and high-school graduation status serves as an initial cut for determining whether an individual is qualified for military service and for specific occupational groups. However, placement into specific occupations may be based on test performance during basic training, as in the Air Force and Marine Corps, or on hands-on experience, for the fireman, seaman, and personnelman ratings in the Navy.[7] Similarly, the first enlistment term is a type of probationary period. Those who are less qualified may be screened out at reenlistment time, i.e., not permitted to reenlist in their occupation or not permitted to reenlist at all.

Retention

The preceding discussions showed that to attract qualified entry-level workers, the (expected) DPV of compensation must be at least as great as the workers' next-best opportunity. This result also holds true for retention. To deter quits, the expected DPV of pay over the remaining career of the individual must be at least as great as the next-best alternative. Further, employers must be willing to continue employing the individual. Thus, the discounted present value of compensation must be equal to the expected discounted present value of the individual's contribution to the organization.

This result indicates how compensation must vary to ensure retention. However, we have not shown any reason why retention is desirable. In a hierarchy with no lateral entry, the reason for retention is obvious: Without retention, more responsible positions will not be filled. Thus, the deeper question is not why retention is desirable but why it is desirable to have an organization with no lateral entry. What is gained by drawing only from the pool of workers already in the organization to fill higher positions? These topics are discussed in Section 4.

Motivation

Earlier we discussed how the organization could induce better performance to solve the moral-hazard problem if it overpaid workers relative to their outside opportunities. Once we account for career employment, we can incorporate

[7]The Army is the only service that matches all recruits to an occupational specialty before they access into the Army and go to basic training. The Army relies almost exclusively on preaccession screens for occupational placement rather than on probationary periods. See Asch and Karoly (1990) for a discussion of occupational placement in the services.

methods to motivate better performance that involve pay and personnel policies over individuals' careers. Specifically, the organization can sequence pay over a worker's career in such a way as to elicit more effective work. This analysis, which we overview below, is noteworthy because it shows how pay can deviate from (internal) productivity at a point in time.

As noted earlier, workers weigh the discounted present value of future compensation against that of their alternative opportunities. This DPV must equal expected discounted present value of career VMP within the organization. However, this equality is not necessary in every single period (month or year). As long as the DPVs are equivalent, employers can choose to overpay workers in some periods and underpay them in others.[8]

One way to motivate greater performance is to underpay workers relative to their VMP in the early periods and overpay them in later periods while ensuring that those who fail to perform effectively are separated. Thus, the compensation premium in the later periods serves as *contingent compensation*, compensation that is based on performance, such as the quality and quantity of output (see Section 6). However, to receive this premium, workers must avoid being dismissed for poor performance. The redistribution of compensation from the early periods to the later ones thereby increases work motivation.

The success of this compensation scheme depends crucially on the perception of workers that poor performers will indeed be dismissed and that employers are trustworthy. If poor performers are not dismissed, the value of deferring compensation is lost. Thus, the organization personnel policy must dismiss those who perform unsatisfactorily and increase pay (relative to VMP) for those who perform adequately. If workers do not trust the employer to pay up when the overpayment period comes due, they will quit. Employers have a strong incentive to fire workers before the overpayment period. However, they also have an incentive to maintain a good reputation, because a poor one will hurt their recruiting effort. Tilting the compensation profile increases the motivation of less experienced workers in the early periods. However, to continue workers' motivation during the payback periods, the employer must also offer pension or separation pay. Here, pensions serve as contingent compensation for more senior workers.

Although this compensation method can induce greater work effort, it also creates a problem. Overpaid workers never wish to separate; they will continue to work beyond the point at which they would have separated had they not been

[8]This discussion is based on Lazear (1979). Note that Lazear's model was not formulated in the context of an organizational hierarchy. In fact, his model applies equally well to compensation within a hierarchical level as across levels.

overpaid. Overpaid workers also increase employer costs, so that employers would prefer that these workers quit. As a result, the method must also include a mandatory separation mechanism for the most-experienced workers. In the military, the 20-year cliff vesting provision with its up-or-out requirement for service beyond 20 years would operate as such a mechanism. In the private sector, the mechanism is mandatory retirement.

This analysis suggests another compensation guideline. Offering contingent compensation increases motivation. Such contingent compensation can take many forms. The model described above suggests tilting the compensation profile while permitting only satisfactory performers to claim the higher compensation associated with more experience. This model is general and encompasses both hierarchical and nonhierarchical firms. In Section 6, we apply this model in the context of structuring intragrade and intergrade pay in a hierarchical organization.

4. The Structure of Compensation Across Hierarchical Levels

As the preceding section discussed, what matters for attracting and retaining personnel is the discounted present value of compensation in the organization relative to that which the worker could earn elsewhere. While this guideline is useful for setting the overall level of compensation, it does not tell compensation designers what the structure of compensation should be across hierarchical levels.

Many different compensation structures can achieve the same DPV. To design a unique structure geared toward the goals of a particular organization, additional guidelines are needed. In this section, we develop some of these guidelines. First, we focus on how the supply and demand for talent and ability affect the structure of compensation across levels. Then we discuss how the role of supervision in monitoring worker effort affects this structure. Finally, we discuss the role of skill development.

Compensation and the Role of Talent

That compensation follows leadership position is commonly recognized. Chief executive officers earn more than line supervisors, and line supervisors earn more than entry workers. Those in higher positions have greater responsibility and are paid more because their productivity has a filtering-down effect that alters the productivity of those in lower positions. Further, this multiplicative productivity effect is greater as one moves up the "corporate ladder."[1]

Less obvious, however, is how to determine the amount by which compensation should increase with responsibility and ability. Does the fact that presidents have twice the responsibility of vice presidents and supervisors have twice the responsibility of production workers mean that compensation at each hierarchical level is twice the amount paid in the level just below? The answer is no. The distribution of compensation across hierarchical levels is highly skewed in large corporations; presidents earn vastly more than vice presidents, but supervisors earn only somewhat more than production workers. Why is this the

[1]This discussion draws from Rosen (1982).

case? The answer is not found by considering job attributes—primarily responsibility—alone. As Rosen (1982, p. 312) states, "The job does not make the man." To understand why the compensation distribution is skewed, we must also account for the attributes of the individuals who fill the jobs.

Individuals vary in their ability to accomplish different tasks. A great singer may have difficulty answering algebra problems correctly, while a great mathematician may make a poor singer. Thus, singers have a comparative advantage in music, whereas mathematicians have a comparative advantage in algebra. Comparative advantage, or relative ability, means having a greater ability to do one set of tasks than to do another set. In a large corporation, individuals have different comparative advantages in performing the different tasks associated with different responsibility levels. A mechanic may be a whiz at repairing engines but may be relatively less able at running the mechanics shop. On the other hand, another mechanic may make a good engine repairer but would make an even better leader, i.e., one who can ensure that all repairs in the shop are done properly and on time.

Differences in comparative advantage are more likely to be larger the greater the number of individuals in the organization is: The pool of (relative) ability from which to draw is larger. Yet, even among a large number of individuals, great talent for performing a particular task is rarer than average talent. Put differently, the upper tail of the talent distribution usually has fewer people than the middle of the distribution. Outstanding ability is harder to find.

How does comparative advantage explain the skewed compensation distribution across hierarchical levels? First, it should be recognized that the organization's capability or output is maximized when those with the greatest talent are placed in positions requiring the most talent. More generally, capability is maximized when individuals and positions are matched according to the comparative advantage of the individuals and the responsibilities of the positions.

Second, the extreme talent necessary to fill the upper ranks is rare. Positions requiring great ability must be made attractive to those who have that ability. This need is particularly true in organizations with no lateral entry, because the individuals with this great talent may still be working their way to the top. Thus, compensation in the top position or positions must be viewed as large, and it will need to be larger (1) the scarcer the great talent is and (2) the larger the filtering-down effect of the most-responsible positions is. When the filtering-down effect is larger, the importance of filling the position with great talent increases. Thus, the top managers in extremely large corporations, such as IBM and General Motors, not only earn more than the top managers in relatively smaller ones but

are also more able. Further, the difference in compensation between the top managers and the middle managers will be greater in the extremely large organization because the filtering-down effect of the top manager is larger.

The relatively higher compensation at higher levels need not take the form of current or even monetary pay. Compensation may come in the form of fringe benefits and deferred pay, such as retirement income. A skewed compensation distribution could even be achieved with a set of prizes that, from the worker's point of view, are highly valuable (because they are scarce) but are relatively inexpensive from the employer's viewpoint. Examples are plaques and gold watches given to those with different achievement levels.

Finally, for the lowest-ranked positions, comparative advantage is less important because such positions usually do not require extraordinary talent. Higher compensation is not required to attract those with relatively little talent.

Several important insights for compensation designers follow from this analysis. First, the highly skewed compensation distribution found in large corporations contrasts sharply with the military's and the government's distribution in general. The intergrade compensation spread does not vastly increase as one moves from the rank of private to the rank of sergeant major, or from the rank of ensign to the rank of admiral. Yet the enormous size of the services and their hierarchical structure would argue for a more skewed compensation distribution. On the other hand, individuals at higher responsibility levels also have greater power and status. To the extent that these are job amenities, individuals can be paid less since these amenities form a part of compensation. Thus, the compensation distribution across hierarchical levels may be highly skewed while the pay distribution is less so.

Second, some occupations may require greater ability at higher levels than others; thus, the skewness of the compensation distribution may vary across occupations. Third, the analysis implies that not all individuals should move up the ladder and be promoted at the same rate. Some individuals have a comparative advantage in the lower and middle hierarchical levels. The lack of upper-rank skills does not mean that these individuals are unproductive and should be separated. Rather, their contribution lies in performing duties that, although important, require abilities that are more appropriate in lower levels.

The Role of Supervision

The job tasks of those at upper hierarchical levels often include the supervision of workers in the level or levels below them. Supervision involves monitoring

workers and measuring their performance to ensure that decisions about which tasks should be done, how to do them, when, and where are carried forth. Supervision and leadership skills are related; a part of being a good leader is knowing how to motivate others. However, supervision time may also detract from leadership time.

Part of maximizing organizational output at the least cost is ensuring that all individuals work effectively. Thus, supervisors at each level must properly motivate those below them to be not only productive team members but also good leaders and supervisors of the workers below them. Supervision has a multiplier effect. Poor performance resulting from poor supervision at one level adversely affects the performance of individuals in lower hierarchical levels. This filtering-down effect of supervision increases as one moves up the hierarchy.

Earlier, we discussed how overpaying workers relative to their outside alternatives may enhance worker motivation. In that discussion, we noted that supervision or, more generally, relying on monitors of worker performance, may not sufficiently motivate workers to supply effort when such monitors are costly to use and when supervisor reports and measures are subject to error. As a result, compensation policy also played a role in motivating effective work. In the context of a multilevel hierarchy where supervisor responsibility and influence increase at higher levels, overpaying workers relative to their outside opportunities may also play a role.

Supervisors need to be motivated to be good supervisors. When an organization consists of many supervisorial levels, the employer faces two important motivation problems: (1) motivating performance that is directly tied to organizational output and (2) inducing supervisors to accurately measure and report on that performance. Supervisors are workers, too, and they may choose to devote insufficient effort in their monitoring and measurement activities.

One way to enhance supervision is to overpay supervisors at each hierarchical level relative to their outside opportunities.[2] Such a compensation policy increases the cost of dismissal for ineffective supervision because individuals at supervisory levels cannot expect to earn comparable compensation in their alternative activities including unemployment. Thus, more effective supervision is achieved by imposing a penalty on ineffective supervisors. Since poor supervision is more costly to employers at higher hierarchical levels, because of the greater multiplicative effect of supervision, those at higher levels must be

[2]This model is based on Calvo (1987) and Calvo and Wellisz (1979).

overpaid more than those in the lower levels. Put differently, the increment to compensation rises with rank because poor supervision at higher ranks has a more adverse effect on organizational output. Thus, the distribution of compensation across ranks will be highly skewed.

The implication of a skewed distribution is the same result we found earlier in the case of ability and talent. However, the argument here does not depend on relative ability or comparative advantage. In fact, even if all individuals were equally talented in all positions, those in the top positions would earn substantially more than those in the middle, whereas those in the middle would earn only somewhat more than those in the bottom rank. The argument here hinges on the influence of supervision at each level rather than on that of ability.

Despite these similarities, the supervision model differs in one important way from the comparative-advantage model discussed earlier. In the supervision model, workers are overpaid relative to their alternatives. However, since their motivation and performance also increase, their compensation equals their VMP within the organization. Thus, within the firm, their higher pay is justified. On the other hand, the ability model is perfectly consistent with compensation being equal to what workers would earn in their next-best alternative.

Compensation and Skill Development

Education and training are investments in skill that involve both monetary costs and time.[3] Individuals undertake these investments because they anticipate that compensation will be higher as a result. In other words, they expect a return on their investment. The lower the return is, the less willing individuals are to incur the investment cost, and the less investment they make.

In general, to attract and retain skilled workers, an organization must pay higher compensation than for low-skilled ones, for two reasons. First, they must pay more because individuals will not be motivated to incur the cost of obtaining skills otherwise. Second, with greater skills, individuals' outside opportunities increase. Individuals usually invest in their skills when they are younger because they then have more years to capture the return of higher compensation. Thus, the typical pay profile over the career of someone who invests in skills is relatively low pay at young ages, because this is the investment period, and higher pay when older and the investment's returns are received. This logic

[3]This discussion draws from Becker (1962), Mincer (1962), and Hashimoto (1981).

explains why more educated workers have steeper pay profiles over their career than less educated ones.

This logic is especially clear when individuals pay for their own skill investments, such as schooling. Often times, however, individuals do not pay for their own skill development—at least not directly. Many workers receive on-the-job training (OJT), either formally in employer-provided classrooms or informally through experience and watching others perform the same job.

The shape of the career profile when OJT is present depends on whether the skills learned during OJT are general and can be used in any organization, or are organization specific and can be applied only in the organization providing the OJT. For example, computer literacy and knowledge of a universally used computer language are skills that workers could use in a variety of organizations. However, detailed knowledge of a particular weapon system may be a skill that has its greatest application in the military.

Training is rarely completely general or completely specific; usually, it is a mixture of both. However, across the spectrum, OJT can often be characterized as leaning either toward the specific or toward the general. When training is more general than specific, the career-pay profile is similar to that for individuals obtaining their skills in formal institutions, such as school, rather than in their jobs. Employers are unwilling to bear the costs of training for general OJT because workers may quit and use their training elsewhere. The employer providing the training is not guaranteed to reap the return on its investment: having more skilled and productive workers. Consequently, employers providing general OJT will do so only if workers "pay" the cost in the form of lower compensation during the training period. If workers incur the cost, employers are unaffected if workers separate. Thus, general training implies that compensation is lower when workers are younger and receiving and paying for OJT and higher when they are more experienced and are reaping the return on their investment.

Organizations finding themselves in a situation of rapid change present one possible exception to the phenomenon of workers paying for general OJT. For example, firms undergoing rapid technological change may undertake and pay for their own training programs, even though the skills imparted are general and some trained workers will leave and work elsewhere. Viewed strategically, paying for general training may be more timely and less costly to the firm than waiting for other firms (or schools) to provide the necessary training. Such

delays might damage the firm's competitive advantage.[4] Thus, even when on-the-job training is general, the organization may find it wise to incur the costs of providing it.

The model of general OJT implies that workers' compensation rises with experience in the organization and in the labor market in general. The model further implies that workers' compensation equals their VMP over their careers. Workers choose between organizations that do and do not offer general training. If they choose the organizations offering training, their VMP is lower during the training period than it would be in the ones that do not, because when their time is diverted away from immediately productive activities and toward training, they are less productive. However, their compensation is also lower, because they "pay" for their training by receiving lower earnings. Thus, compensation equals VMP during the training periods. Once training is completed, workers earn the full return on their investment. Their VMP is higher than if they had not obtained training because they are more skilled, and their compensation is higher because they earn the full return. Thus, VMP and compensation are equal once training is completed.

When training is specific to a job or organization, workers have fewer opportunities to use their learned skills in other organizations. If they quit, therefore, they cannot expect to earn higher compensation elsewhere. Although it might seem, at first, that specific OJT would increase retention and that, consequently, the employer, guaranteed of reaping the return, would be willing to pay the training costs, this is not necessarily the case. If workers do not pay for their specific OJT in the form of lower initial compensation, the fact that they also do not earn higher pay elsewhere does not deter them from quitting. Individuals who do not pay for their specific OJT and do not reap the full return during training are no worse off than if they had never received the OJT. Therefore, employers would be unwilling to bear the full cost of training because workers may quit. Only when workers bear some portion of the investment cost and earn some portion of the return to the investment are they motivated to stay.

On the other hand, workers would also be unwilling to bear the full cost of training. When workers incur the full cost (and capture all returns), firms are not deterred from firing them. Once a worker is fired, he or she is no longer able to reap the training return. Only when the firm bears a portion of the cost (and retains a portion of the returns) is it motivated to keep workers.

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[4] Tan (1989) presents evidence of the relationship between skill acquisition and technological change.

Therefore, when training is specific, both the employer and the employee must share the costs and returns of the investment, and career-compensation profiles are flatter than those of general training. Since workers do not bear the full brunt of the cost, their compensation is lower during the training period but not as low as that of general training when workers pay all the cost. On the other hand, since such workers do not capture the full return on their investment, their compensation rises with job and organizational experience, but not as much as that for general training. Thus, the incentive to retain workers and the incentive to deter involuntary separation in the presence of specific OJT cause the career profile to be flatter than it would otherwise be.

The degree to which the career profile is flatter with specific OJT depends on two probabilities. The first is the ex ante likelihood of a worker quitting, which, in turn, will depend on the degree of training specificity. A worker would quit if an alternative opportunity were perceived as better. But, the worker's quitting would deprive the firm of its portion of the returns on the specific investment. As a result, the firm would choose to bear a smaller portion of the investment cost and opt to receive a smaller expected return. Thus, the greater the likelihood of quitting is, the steeper the profile will be. The second is the probability of involuntary separation, which may depend on such factors as cyclical fluctuations or other downsizing circumstances. The greater the probability of layoff is, the flatter the profile will be. The reasoning is similar, but now the worker's expected returns have declined.

The flatter pay profile generalizes beyond just specific training to any case where personnel costs and returns are match specific, i.e., where the cost and returns are specific to the employer-worker relationship. For example, search and hiring costs are match specific. Organizations often devote significant resources to finding eligible applicants, interviewing them, testing them, and completing the paperwork associated with hiring them. The cost associated with using probationary periods when workers must prove themselves is also a match-specific cost.[5] When all such costs are large, flatter pay profiles are implied.

The above arguments suggest that retention will be associated with flatter compensation profiles than with completely general training. The extent to which the profile is flatter depends on three factors: (1) The presence of *match-specific rents*, the returns that make both sides better off with the match than

[5]The term generally used in the literature is match-specific "capital" or "rent" rather than match-specific costs. The reason is that a gain or rent is created by having a successful match and is destroyed if the match is undone. Sharing rules between workers and employers over the costs and returns associated with matches are really rules about how much of the rent or capital goes to the worker and how much to the employer.

without it. Clearly, without match-specific rents, neither employers nor workers care whether the relationship continues. Thus, these rents are essential for retention to be a feasible employer-worker goal. (2) The trustworthiness of employers, i.e., about the workers' chance of being laid off involuntarily. If they were assured of the goodwill of the employer, workers would be willing to bear the full cost of the match-specific capital in the form of lower compensation. They would be certain that they would also reap any future returns. In this case, the career profile would be just as steep as in the general case where no match-specific rents were present. (3) The workers' propensity to quit. Similarly, firms would reap their full return if the workers planned to stay and not quit.

When workers have different probabilities of quitting, the career profile may be just as steep as in the general OJT case (Salop and Salop [1976]). When retention is an important goal, employers prefer workers who are less likely to leave. Unfortunately, whether an individual is a "stayer" or a "leaver" may not be obvious to the employer at the time of hiring. If workers are better informed than employers of their quit propensities, then adverse selection is a problem.

One way to sort out the leavers and attract the stayers is to steepen the career compensation profile by offering lower compensation initially and higher compensation later. Leavers are not attracted by this profile, because they will most likely quit before realizing the higher compensation. Stayers who discount future income at a high rate will also be deterred by this profile. On the other hand, stayers are more willing to accept low compensation initially than leavers, because stayers are less likely to quit before accumulating the tenure required for earning higher compensation. Thus, retention is not always accomplished by a flatter career compensation profile.

Another key implication of specific OJT (or match-specific rents) is that compensation over a worker's career will generally not equal either VMP within the organization or the value of the individual's opportunities outside the organization. Rather, compensation will lie between VMP and the value of the worker's outside alternative. In the early years, when training occurs and their VMP inside the organization is low, individuals are paid less than their alternatives but more than their VMP within the organization. The reason is that workers "pay" for a part of their training costs by earning less than their next-best alternative. However, they earn more than their VMP within the organization because their training costs are shared with their employer.

In the later years, when the returns to training occur, individuals earn more than their next-best alternative but less than their VMP within the organization. The reason is that the returns are specific to the organization; they cannot be earned

anywhere else. However, they earn less than VMP because they share the returns with the employer. It is exactly because of the departure of compensation from VMP and outside opportunities that workers are prevented from quitting and firms are prevented from dismissing. Further, the extent to which compensation leans toward VMP or the value of outside alternatives depends on how flat the specific OJT career profile is to the general-training case.

This analysis of skill development and match-specific capital suggests several guidelines for compensation managers. First, career compensation rises more rapidly with experience or job tenure when OJT is present. Second, to the extent that different occupations or jobs require different amounts of training, the steepness of the profile will vary across occupations and jobs. Third, the presence of match-specific rents, such as organization- and job-specific skills, is one reason retention is desirable. Fourth, the compensation profile across hierarchical levels (and within them) will generally be flatter when job training is specific than when it is general. Fifth, when the profile is flatter, compensation is greater than the workers' marginal productivity and less than their next-best alternatives during the training years; it is less than the workers' VMP and greater than their next-best alternatives during the years when the returns to training are reaped.

Skill Development in the Military

Much military training is organization specific, as are the initial selection and screening investments; therefore, a flatter profile than that for general OJT would be expected. Whether this is the case depends on the probability of involuntary dismissal and the probability of quitting. The compensation profile will be more similar to the general OJT case under three conditions: (1) the attrition rate is high, (2) retention is low, or (3) the probability of dismissal is low. These conditions suggest a greater willingness on the part of enlistees to bear a significant share of match-specific capital costs and returns. Thus, despite the nontransferability of many military skills, the compensation profile may not be much different from the comparable civilian profile. On the other hand, to the extent that the probability of dismissal is higher, as may be the case during a drawdown, the profile will be flat relative to the general OJT case. Similarly, it will be flatter when retention is high and attrition is low.

Many skills learned in the military are general, including habits of dress; punctuality; and ability to work in teams, carry out orders, solve problems, take responsibility, and communicate clearly. These general skills argue for a military compensation profile comparable to that in the civilian sector.

The analysis also suggests that insofar as the amount and specificity of training in the military vary across occupations and services, different occupations (or occupational groups) and services should have different pay and experience profiles. In Section 3, we saw that pay *levels* may differ across occupations (and services) because of differences in their characteristics—amenities and disamenities—and the supply and demand for individuals with tastes (or distastes) for these characteristics. This analysis indicates that the *structure* of compensation across levels should differ as well across occupations (and service). It argues that those military specialties with greater specific training or capital should have flatter pay and experience profiles, whereas specialties requiring mostly general training (or capital) should have steeper profiles.

5. Compensation and Promotion: Position and Pay Movements Across Levels

So far, we have ignored how individuals are to be moved across hierarchical levels. In this section, we discuss promotion explicitly and examine why and how the promotion process itself can alter the distribution of compensation across personnel tiers.

Generally speaking, a *promotion* is defined as a change in a worker's job (duties and content), level of responsibility, and compensation. Promotions are distinct from general compensation changes; they accompany a change in job duties and are related to the flow of personnel through the hierarchy. They are *movements* of personnel within the organization. In contrast, general compensation changes are related to the problems associated with recruitment, retention, and occupational matching.

Because promotions are movements of personnel within the organization, employers generally seek to fill available positions with the most-qualified individuals within the organization rather than with those in the general labor market. A key question is, Why do employers use promotion, i.e., why do they seek workers who are internal rather than external to the organization? In seeking the answer to this question, we show below the role of promotion in personnel management and how that role can affect the structure of compensation across hierarchical levels.

Two important aspects of personnel management are matching individuals with the jobs for which they are most qualified and motivating individuals to work effectively, as discussed in Section 2. In achieving these management goals, employers face three important problems. The first two relate to person-position matching; the third problem relates to motivating work effort:

1. How to obtain information about each worker's comparative advantage to achieve the best match. Information about workers' relative abilities and the quality of every potential worker-job match is imperfect and costly to obtain.
2. How to induce workers to self-select themselves into the positions for which they are best suited. Information may be asymmetric and cause adverse selection. And underqualified workers can misrepresent themselves as highly qualified.

3. How to eliminate adverse work incentives and motivate effort when effort is imperfectly observed. Workers may have an incentive to work less effectively when employers cannot easily and/or costlessly observe their effort/performance.

Identifying solutions to these three problems is a key theme running throughout this section and the next.

How and why does promotion or "hiring from within" solve these problems? Internal labor markets offer employers two cost-reducing advantages. First, successful worker-job matches are more likely to result with "hire from within" policies because employers, through direct observation, have more information about their own employees' abilities than they do about the abilities of workers in the general labor market. Second, internal hiring enables employers to motivate effort among workers in the lower ranks. Employers generally base promotions on observations of performance in lower hierarchical levels.[1]

Internal labor markets also have disadvantages. First, poor recruiting outcomes have perpetual negative effects that cannot be overcome in the absence of lateral entry, at least in the short run. Second, the most-able workers must climb through the ranks before reaching the top positions, the positions for which they are best suited. Lower levels will consist of both less able but suitably matched workers and more able workers who are moving toward their best match. This wide ability range at the lower and mid-levels may lead to several problems.[2] Unless properly motivated, the most-able workers will be underutilized, performing adequately in lower levels with less effort. And, if the promotion criteria are an inaccurate selection tool, capability will be reduced by mismatching less able workers to higher positions. Not only is productivity reduced by the poor matches, but these matches "clog" the hierarchy by reducing the availability of higher positions for more able workers.

These disadvantages imply that the promotion process must be structured so that

1. All individuals within a hierarchical level, regardless of their ability, are motivated to work effectively.
2. All individuals are motivated to reveal their true ability level.

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[1] Although our focus is on promotion, demotion (or firing) of workers also has a role. Firing and demotion enable the employer to recognize and to weed out the least able and to motivate workers negatively with fear of punishment.

[2] In the following discussion, we make reference to *less able* and *more able* individuals. This reference is intended to provide a distinction between workers whose best match lies in higher levels and those whose best match lies in lower ones. The reference is in no way meant to be derogatory.

3. Poor matches are minimized.

In other words, the promotion process must solve the three deterrents to effective personnel management identified above: moral hazard, imperfect information on ability, and adverse selection. How is this accomplished? While the answer is not clear cut, part of the answer lies in the structure of compensation. We turn to this topic next.

Promotion and Compensation

In the context of promotion, how should compensation be structured to ensure that good worker-job matches are produced, performance is motivated, and ability is revealed? The discussion below indicates some key considerations and provides some guidelines for designing such a compensation structure.

Promotions as a Contest

In many ways, promotions can be thought of as contests.[3] Workers attempt to surpass a performance standard or the performance of other workers to win a "prize" (higher compensation) that is fixed in advance. The number of winners is limited to the number of available positions. Further, those who fail to win face the penalty of not only lower compensation but also the costs associated with their unfruitful bid for promotion, such as time and effort. Winners also face these investment costs. However, they realize the return on their investment, whereas the losers do not. Viewed as a contest, promotions represent a gamble with a prize spread. Workers pay an "entrance fee," in the form of investment costs, to participate in the contest, but the return on their investment is uncertain.

The structure of the promotion contest, then, is usually the same. However, promotion contests can serve three different purposes. Sometimes they are intended to solve a moral-hazard problem—to motivate better-quality work when effort is not easily observed. Sometimes contests are intended to induce ability revelation—to motivate individuals to provide information about their qualifications so that employers can ensure the best worker-level match. For example, lawyers compete for partnership. The purpose of the partnership

[3]Lazear and Rosen (1981) conducted the original work on promotion contests. This discussion draws from that work as well as from the works of Green and Stokey (1983), O'Keeffe, Viscusi, and Zeckhauser (1984), Rosen (1986a), McLaughlin (1988), and Malcomson (1984). These studies focus on the role of contests in motivating performance. Gifford and Kenney (1986) focus on the role of contests in motivating ability revelation.

contest is to motivate lawyers with similar *observable* qualifications—a law degree and long work hours—to demonstrate their interpersonal, business, and other unobserved abilities and thus their suitability for promotion. And, sometimes, promotion contests are intended to help solve the adverse-selection problem—to identify that less qualified workers are striving for higher positions while more qualified workers are not.

Contests for Effort Motivation and Ability Revelation

These three purposes correspond to the three problems faced by personnel managers. The following discussion focuses on the first two purposes: effort motivation and ability revelation. We defer our discussion of how a promotion system may solve the adverse-selection problem until Section 6.

To motivate worker effort or ability revelation, employers have three tools: the prize spread, the precision of their measure of performance, and the performance threshold against which workers compete. The *prize spread* is the difference between the compensation associated with winning the promotion and the compensation associated with failing to be promoted, i.e., the compensation in the level below. Since losers stay at their current hierarchical level, the size of the prize spread is increased by raising compensation at the next higher level.

Measurement precision is how accurately the measure reflects performance and ability. The more accurate the measure is, the greater is the probability that hard work (or ability) translates into winning. Thus, employers can alter the probability of winning by altering the measurement precision.

Performance threshold is less easy to define. We assume that workers compete against a prespecified performance standard (as is generally the case for the military's enlisted force) rather than directly against other workers.[4] From the worker's viewpoint, standards and rank-order contests (where employers rank one worker's performance against that of another) are not always distinct. Under a standard, workers indirectly compete against one another for the limited number of higher-ranked positions. In a rank-order contest, the competition is direct but may expose workers to less risk: Factors beyond workers' control but common to all workers (such as a bad recruiting month for recruiters) are netted out when workers are compared to one another but are not netted out when compared to a standard.

[4]Officers in the military compete against each other.

To the extent that employers must always proclaim a winner with a rank-order contest but can falsely claim that all workers are losers with a contest against a standard (thereby avoiding the higher cost associated with paying workers more), workers prefer rank-order contests because they guarantee that employers will be truthful. On the other hand, for workers to accept the rank-order system as fair, the evaluation criteria and the measurement approach must be explicit. Rank-order evaluations relying on ill-defined and subjective judgment run the risk of appearing arbitrary. From the employer's viewpoint, standards may be more costly to use because the appropriate standard must be determined, mistakes are costly, and worker performance levels must be measured. With rank-order contests, the employer needs to measure only whether one worker is better than another and not by how much.

Given the three tools, workers' motivation to work hard or to reveal their true comparative advantage is increased by increasing the prize spread, the measurement precision, and/or the standard.

The Contest's Constraints on Employers

Employers also face constraints. First, to induce workers to "play" in the contest and not quit before it occurs, expected compensation[5] must equal workers' expected contribution, or VMP. Thus, workers must anticipate that their compensation will be, in a probabilistic sense, equal to what they could earn elsewhere. The relationship between the prize spread, VMP, and a worker's outside alternatives will differ according to whether the contest is intended to motivate effort or to motivate workers to reveal their true ability, as discussed below.

If the purpose of the contest is to motivate effort, compensation *will not* equal VMP once the contest is over. Winners will earn more than their VMP, and losers will earn less. The positive effects of a promotion on work incentives (before the contest) are created both by the chance to earn an extra premium (over VMP) for winning—the prize—and by the possibility of losing compensation and receiving a deficit for losing—the penalty. Although losers are worse off, ex post, their expected payoff is equal to expected VMP, ex ante.

Those who lose the contest will not necessarily quit, even though their compensation falls below VMP. Whether they are retained depends on whether their compensation is greater or less than the value of their outside opportunities.

[5]Expected compensation equals the probability of winning times the "prize" plus the probability of losing times the "penalty."

For example, compensation may fall below VMP but exceed the workers' next-best alternatives when there are match-specific rents due to specific on-the-job training or large worker-replacement costs.

Of course, when contest losers can earn more elsewhere, they will separate. In this case, the promotion contest is essentially an up-or-out contest; the penalty for losing is not lower compensation but separation. Sometimes, the employer wants to dismiss workers who would prefer to stay, i.e., some losers may not be induced to quit because their losing compensation exceeds their outside alternatives. For example, match-specific investments may have been made at a time when the employer believed that the investment's returns would be large. But because of unforseen circumstances, the value of the returns turned out to be small from the employer's viewpoint. The organization is willing to lose its share of the returns but the worker is not. In such a situation, the employer may be required to formally institute an up-or-out policy whereby workers who lose do not quit but are dismissed.

If contest losers can quit and earn more elsewhere, then the true prize spread is *not* the difference between the prize and penalty within the organization. Rather, the true spread is the difference between the winning prize and the value of the workers' next-best alternatives. The true prize spread is smaller than the one inside the organization because workers who lose do not earn the penalty, they earn their better outside opportunities. With a smaller spread, workers' incentives to supply effort are reduced; the extra gain to winning is not sufficiently above their outside opportunities to motivate hard work. Thus, when losers can quit and retention is important, the employer must increase the prize spread to maintain motivation.[6]

Contests intended to motivate effort make all workers more productive. That the winner earns more does not necessarily mean that he or she worked harder than the losers. Rather, to provide an incentive for all workers to work hard, one worker must gain a premium over VMP and the others must earn less than VMP. For this reason, policies that attempt to equalize compensation at each hierarchical level with some proxy of compensation in the external labor market (in the name of retention) will adversely affect the value of the promotion system as a means of motivating effort. What need to be equalized are not compensation and outside alternatives but expected compensation and expected VMP. Similarly, promoting all eligible workers (thereby making the probability of winning equal to one) has an adverse affect on effort motivation.

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[6]The problem of losers' separating is discussed by Dye (1984). The discussion of why they might not separate and of what happens to the prize spread is taken from McLaughlin (1988).

The above discussion describes the relationship between VMP, the prize spread, and outside alternatives when the contest is intended to elicit effort. When the purpose of the contest is to motivate ability revelation, the relationship differs. Compensation *will* equal VMP once the contest is over. Winners have revealed themselves as being of higher ability. They therefore receive higher compensation because their VMP *is* higher than that of the losers who are not promoted. The losers are worse off only in the sense that they were unlucky and were not misclassified as a winner. Their compensation is lower but, then, so is their VMP. Here, losers are retained to the extent that their compensation (and VMP) exceeds their outside opportunities. If their VMP compensation falls short of such opportunities, the losing workers will separate.

This analysis shows why the value of a promotion system is reduced when promotion is used to improve retention. Promoting workers with little comparative advantage into higher positions has three adverse effects on capability: (1) Poor matches are made, resulting in lower productivity. (2) The flow of the more able workers through hierarchical levels is hampered. (3) Negative signals are sent to workers in lower levels about the correlation between hard work, ability, and higher compensation. Retention is better achieved by setting appropriate compensation levels than by accelerating the promotion rates of individuals who may be unqualified for future jobs.

In addition to the ex ante no-quit constraint, employers face another constraint in designing the promotion contest: They cannot indiscriminately offer enormous prize spreads despite their incentive to do so. Worker motivation increases as the prize spread increases. But worker investment costs rise, as well. Enormous prize spreads can create destructive competition (sabotaging of others), rat races, and fatigue that ultimately harm the workers and the employer. A similar argument holds for indiscriminately raising the measurement precision. Excessive standards can cause either destructive competition or futility, leaving workers so discouraged they have no motivation at all.[7] Given these constraints, what should be the prize spread, precision, and threshold?

Optimal Prize Spread

The three policy tools available to employers offer many combinations that can motivate workers. However, a number of results have been found for determining the optimal prize spread (holding the other two tools constant). The

[7]This problem can also arise in rank-order contests when less able workers must compete against vastly more able workers. See O'Keeffe, Viscusi, and Zeckhauser (1984).

prize spread should be larger (1) the lower the (marginal) costs of investing in winning are; (2) the lower the probability of winning is; (3) the greater the importance of match quality and effective work is; (4) the greater the importance of luck and factors beyond the worker's control is; and (5) the less the workers are averse to income variability.

The first result implies that the prize spread should be larger for more able workers because such workers have lower investment costs. These individuals can produce the same amount of effort as less able individuals, at a lower investment cost. Therefore, they can rest on the job and have the same chance of winning as a less able worker. Increasing the prize spread deters this type of behavior.

The second result implies that the prize spread is larger when the number of available positions is small relative to the number of eligible workers. This result provides another explanation of why organizations bar lateral entry and promote "from within": When an organization can turn to the external labor market, it increases the number of "contestants" and reduces the probability that a worker inside the organization wins the higher position. Therefore, lateral entry reduces motivation.

The second result also suggests one remedy to the problem of reduced retention when promotion tempo is slowed.[8] When promotion tempo is slowed because the probability of promotion is small, retention can be improved by increasing the prize spread, i.e., increasing the compensation associated with attaining a promotion and/or reducing the compensation associated with failing promotion.[9]

The third result implies that the distribution of compensation across hierarchical levels should be skewed. The prize spread for top-level managers must be larger than for middle managers because producing the best match is more important at the top.

The fourth result means that the prize spread is larger when measurement precision is poorer. Precision is often poorer for workers in higher positions because their "output" (i.e., good leadership decisions) is less amenable to

[8]Buddin et al. (1990) show that retention falls with promotion tempo.

[9]Of course, this is not the only solution. If slow promotion tempo is caused by the fact that less able workers have been mismatched into higher positions and are motivated to stay because their compensation exceeds their VMP, then another solution is to demote or fire these workers. By making higher-ranked positions more available, the probability of winning the promotion contest increases as does promotion tempo.

measurement. Thus, this result also argues for a skewed compensation distribution.[10]

Finally, the fifth result means that the prize spread increases when workers are more willing to take gambles with their compensation. To the extent that workers often do not like such gambles, the employer must trade off the positive incentive effects created by large prize spreads against the adverse effect on retention.

While these results suggest that the intergrade pay structure should be skewed, the possibility of destructive competition among individuals will tend to temper the skewness (Lazear [1989] and Milgrom [1988]). A more compressed pay profile reduces individuals' incentives to engage in opportunistic behavior, including hiding one's weaknesses and exaggerating one's output to a supervisor, or even harming others' chances of success. While smaller pay spreads enhance cooperation, they also reduce effort, as discussed above. Thus, the organization must trade off the costs and benefits of a more skewed profile. Clearly, the production technology will matter. In functions (or occupations) for which cooperation is important, pay spreads should be more compressed. When cooperation is less important, the pay spreads can be larger.

Dual-Intent Contests

These results provide useful guidelines when the contest's intent is solely either to motivate effort or to motivate ability revelation. However, the more realistic case, especially in lower hierarchical levels, is a contest whose intent is to motivate *both* effort and ability revelation. Employers often face a situation, particularly in lower hierarchical levels, in which they would like to motivate effort among workers with unobserved differences in ability.[11] Determining the best prize spread, measurement precision, and threshold when ability and effort vary is a difficult task. The solution depends, in part, on whether workers know each other's abilities and performance and whether workers are more informed about their behavior than the employer is. Although several studies have

[10]A final reason for a skewed compensation structure in the context of promotion is that as workers move through the ranks, the number of future promotion contests declines. The highest-ranked worker has no incentive to work hard since he or she has no contest to work toward. Thus, the prize spread must increase with the hierarchical level to account for the decline in the number of future contests. To motivate the highest-ranked worker, other motivational devices must be used. In the private sector, such devices often tie the president's compensation to company performance and include stock options and profit-sharing pension plans.

[11]Unequal ability is a more severe problem at lower levels than at upper hierarchical levels. The ability distribution is narrower at higher levels because individuals with lower ability have been screened out; for a worker to make it to the top, he or she has had to demonstrate sufficient ability to win all the previous contests.

examined the various possible combinations, determining solutions has sometimes proven difficult. Thus, we sketch two possible solutions below, although they are by no means all-inclusive.

First, we consider the case when no one has superior information about worker ability,[12] such as when the number of workers eligible for promotion is large and workers may not know the abilities of the other individuals. Furthermore, workers may be uninformed about their own comparative advantage to the extent that every future position represents an unknown challenge. Similarly, because the employer has never observed a lower-ranked worker in a higher position, he or she may be uninformed as well. In this symmetric (but imperfect) information case, the employer may be able to elicit appropriate incentives with the following promotion system. First, offer a substantial prize spread to induce work effectiveness even among the (undetected) less able. Then, to ensure the best worker-job matches, carefully identify the most-able workers using a precise performance-measurement method. The optimal threshold in this case has not been determined formally in the literature; clearly, however, it will depend on the number of positions to be filled. In addition, since workers do not know their own ability, they will not know whether they can easily surpass the threshold. Thus, the number of positions would seem to be the main consideration.

The second example is when workers know not only their own abilities but the ability distribution of the other workers or of the field of contestants. This is the more difficult case. Any promotion system that guarantees that the most-able individuals win will also adversely affect work incentives. For example, if the probability of winning is extremely high for more able workers, they will be unmotivated because they are confident of winning. Less able workers will also be unmotivated because, for them, hard work will go unrewarded. The problems posed by this case are particularly acute for less able workers, because the employer always prefers that they lose the contest.

One possible solution is to structure the promotion system along the lines of the bar exam for attorneys, which sets not only a large prize spread but also ensures that even the most able are uncertain about whether they will pass the threshold. All students study hard because the prize (being certified) is large, and, never having taken the exam, no one can predict how well he or she will do. The large spread may motivate the least able, and the added uncertainty may motivate the most able. In addition, the performance measure must be precise to ensure that

[12]This solution and the next one are based on O'Keeffe, Viscusi, and Zeckhauser (1984).

upward matches are made with more able leaders rather than hard-working but less able leaders.[13]

Conclusions and Guidelines

The problem of motivating effort from the less able workers while motivating the more able to work hard and reveal their ability severely limits the structure of the contest. In fact, a contest that accomplishes these goals may not exist. However, if we could introduce an additional motivation mechanism for the relatively less able workers, then the range of solutions would increase. The problem then is only one of motivating the more able individuals.

One possible tool is compensation within a hierarchical level. Workers with relatively less talent will be promoted less rapidly; therefore, most of their careers will be spent within one level, and compensation within a level will be more relevant for such individuals. Section 6 addresses the issue of compensation structure within a level.

Before turning to that discussion, we first indicate some important guidelines offered by the preceding discussion: First, promotions serve not only as a means of matching the best workers to the best jobs, they also serve as a work-incentive mechanism to the extent that promotions are contingent on performance in lower levels. Second, promotions also serve to reduce the cost of obtaining information on eligible applicants, because employers know more about their own workers than they do about those in the general labor market. Third, larger prize spreads, higher standards, and greater measurement precision increase work incentives and ability-revelation incentives, but there is a limit to how much they can be increased. Fourth, the prize spread should be larger the more able the group competing for promotion is and the slower the promotion tempo is.

Fifth, promotion contests imply that the compensation distribution across hierarchical levels should be skewed. Sixth, to the extent that the importance of work incentives, match quality, and the number of higher positions varies across occupations, prize spreads may differ across occupations. Finally, seventh, explicit up-or-out policies may not be necessary. If the compensation of those who fail to be promoted is set below the value of their outside alternatives, then

[13]The term *measurement precision* begs the question of how performance should be measured. *Precision*, as referred to in the text, means both accuracy in general and accuracy in distinguishing between hard work and high ability. Thus, the measure must be designed to capture performance owing to hard work as well as ability to perform the tasks associated with greater leadership positions.

the promotion system will implicitly induce quits. On the other hand, if those who fail promotion earn more than their outside opportunities and retention of these workers is not desirable, explicit up-or-out policies may be necessary.

6. Compensation Structure Within and Across Hierarchical Levels

Workers only periodically move from one level to another. All workers spend time gaining experience in their job-level assignments. However, those with relatively less ability will spend more of their career in a given level than those with more. All workers also hope to win a promotion, at least up to some level, and all may be eligible to try. But, the fact that the least able have a small chance of winning (and, in fact, it is in the employer's interest that they lose) means that promotion systems may not be a fully adequate motivation device for such individuals. Three aspects of motivation need to be considered. First, employers must motivate skill development among the least-able workers, despite the fact that their promotion opportunities are limited. Second, they must motivate effort. Third, employers must motivate workers to seek their best person-position match. This section focuses on these aspects of motivation.

Although some workers will consistently lose the promotion contest, all losers should not necessarily be dismissed. Contest losers fall into two groups: those who are productive in the organization and those who are not. Some individuals consistently lose because they are only productive in their current hierarchical level. On the other hand, others lose because they are unsuitable in the organization. Generally, employers want to dismiss the latter workers because they "clog" the movement of more able individuals across hierarchical levels. In the preceding section, we discussed how employers can use a cross-level promotion contest as an up-or-out mechanism to induce quits among contest losers.

In this section, we focus on the role of cross-level *and* within-level compensation in skill development and motivating effort among productive losers, i.e., those to be retained, and in motivating ability revelation among unproductive losers, i.e., those to be dismissed. This section also has another purpose: to examine how employers can use within-level compensation together with cross-level compensation to solve the adverse-selection problem discussed in Section 5. Earlier, we noted that one of the problems personnel managers face in ensuring the best person-position match is that less able workers may attempt to strive for higher-level positions, i.e., those for which they are unqualified. Similarly, highly qualified workers may prefer to coast in their current level rather than seek the higher-level positions for which they are best suited. Thus, solving the

person–position-match problem means inducing workers to self-select themselves into the positions for which they are most productive. This section therefore expands on the preceding one by not only examining the problems of effort motivation and ability revelation but also the problem of incorrect sorting, or adverse selection.

Skill Development

The analysis on the role of compensation in skill development within a hierarchical level is similar to the analysis for cross-level development discussed in Section 4. We therefore do not repeat the arguments here. However, to summarize, skill development will steepen the compensation profile with respect to level-related experience (or "time in grade" for the military). The degree of steepness depends on how the employer and worker share the costs and returns to any match-specific capital and the quit and dismissal rates.

Effort Motivation and Ability Revelation

Workers who will spend much of their career in one level of the hierarchy can be motivated to work effectively through contingent compensation. Contingent compensation can operate through either the compensation method such as performance pay or via the compensation profile (discussed in Section 3). Although contingent-compensation methods, such as performance reviews, merit raises, and the quality and quantity of output, are subject to criticism,[1] properly structured, they can induce better worker performance.

A good example is Army recruiter incentives. Army recruiters face an incentive plan that rewards them on the basis of quantity and quality of enlistments generated relative to their mission. In contrast, the military basic-pay table automatically increases pay with time in service. Since this pay is only contingent on service length, other (possibly less cost-effective) methods must be used to motivate effective work.

A compensation system that rewards level-specific experience provides the employer with the ability to manipulate the experience-compensation profile to better achieve organizational goals. As discussed in Section 3, the organization can motivate greater performance by underpaying workers relative to their VMP in early periods and overpaying them in later periods while ensuring that those

[1]See, for example, Murnane and Cohen (1986).

who fail to perform effectively are dismissed. In the context of within-grade compensation, the "dismissal clause" can come in the form of an up-or-out provision. Here, the up-or-out feature serves two purposes: (1) It motivates effort. (2) It enables the employer to identify and dismiss unproductive workers who have no comparative advantage in the current (or higher) levels, thus enhancing ability-revelation incentives.[2]

This application of the Lazear model (and of our earlier guideline of making compensation contingent on performance to increase motivation) suggests tilting the within-level (or time-in-grade) compensation profile while dismissing those with inadequate performance. In contrast, the military basic-pay table provides automatic rather than contingent step increases in pay within a grade. This guideline suggests that pay within a grade should be contingent on effort and/or performance.

Although we have presented this model in the context of within-level experience profiles, it applies equally well to the compensation profile across hierarchical levels. However, in the context of cross-level compensation, the nature of this compensation profile is distinct from that under a promotion system. In the within-level model, workers are guaranteed to be overpaid relative to their VMP if they work effectively. These workers post a "bond" in the form of lower pay when they are inexperienced, with the right to get it back later if they work hard. Under a promotion system, workers post a bond (or pay an entrance fee) for the right to participate in a gamble. If they lose the gamble, they do not receive their bond back. Hard work does not guarantee winning the gamble. On the other hand, this model and a promotion system have certain elements in common; for example, some workers are overpaid relative to their VMP in both models. Thus, mechanisms that automatically separate more senior workers may be required under both systems. Also, some workers are underpaid relative to their VMP in both models. Under a promotion system intended to motivate greater effort, losers are underpaid, ex post.[3]

These commonalities suggest that both a promotion system that compensates cross-level movements and a "bonding" scheme that compensates within-level

[2]Contingent compensation has an additional role. To the extent that unproductive workers with little comparative advantage know their abilities and know that they will fail to meet the performance standard, they are discouraged from attempting to seek a grade level at which compensation is contingent on performance. Thus, contingent compensation with an up-or-out policy can induce self-selection and solve adverse selection. This role is detailed below.

[3]As discussed in Section 5, losers who are underpaid relative to their VMP may or may not quit upon losing. Their quit decision depends on whether the contest penalty or losing compensation exceeds or falls short of their outside opportunities. Their VMP within the organization may exceed their outside opportunities if match-specific capital is important.

movements could be used simultaneously.[4] The coupling of the two methods may be able to solve the problem of ensuring the best matches while simultaneously motivating all individuals to work effectively. For example, within a level, workers are initially underpaid relative to their VMP but later overpaid, consistent with the bonding model. This scheme provides incentives for stayers, i.e., those with a comparative advantage in their current level. However, the composition of workers within a level will consist of both stayers (those who will not move up) and movers (those who will). As a result, both movers and stayers are underpaid relative to VMP.

But underpayment will not adversely affect the incentives of the movers because the promotion prize is what produces positive incentives. In fact, in a contest, workers paying their "entrance fee" are underpaid relative to their VMP in any case. Nor will underpayment adversely affect the incentives of the stayers: They will be overpaid relative to VMP in the future because some of their pay has been deferred.[5]

Solving the Adverse-Selection Problem

Coupling a within-level contingent-compensation scheme with a cross-level promotion system can handle both the moral-hazard problem and the ability-revelation problem. However, for the coupling to be a successful personnel management tool, it must also address two additional problems. These problems are called "climbing" and "slumming" in the literature and are specific cases of the more general problem of adverse selection.

If the firm does not know perfectly which workers should be stayers and which should be promoted, it may inadvertently motivate stayers to behave as movers, i.e., to climb. For example, the structure of the promotion system may induce the less able workers to work excessively hard to win a promotion. As a result, the probability of mismatching less able workers with higher positions and of reducing capability is increased. On the other hand, lacking information on worker ability, employers may inadvertently induce more able workers to

[4]MacLeod and Malcomson (1988) explicitly examine how to manage incentives across hierarchical levels and, implicitly, how to manage them within levels. In their model, incentives are managed across levels by a promotion system based on performance. Within a level, some workers are underpaid relative to their VMP. However, MacLeod and Malcomson do not explicitly examine the structure of the within-level compensation profile and how that structure affects within-level performance. Thus, their model does not provide a complete story. The discussion in the text is a modification of their analysis and is the author's hypothesis.

[5]An alternative to combining promotion contests with within-level contingent compensation is to use two types of contests. The first type would be for across-level changes, as in the text. The second type would be for within-level changes. Thus, there would be "promotions" within a hierarchical level, but they would not involve a change in job duties.

behave as stayers, i.e., to slum by offering, for example, too small a promotion prize. In this case, the promotion contest demotivates the more able workers, causing them to prefer staying in their current level rather than working hard for a promotion. Thus, slumming results in mismatches, as well. To solve this sorting problem, employers must either expend resources to identify the less able from the more able or structure the within-level and across-level compensation system to induce self-selection.

The problems of climbing, slumming, and, more generally, adverse selection in promotion contests have been studied by a number of researchers.[6] Their studies focus on how to design compensation to ensure that applicants (of unknown ability) seek the organizations and hierarchical levels for which they are best suited. Consequently, they implicitly assume that lateral entry is possible.[7] However, the current discussion explicitly assumes (see Section 2) that lateral entry is not possible. Workers do not choose the level at which they enter; all workers enter at the bottom.

The problem then is how to motivate workers within a level to either stay or move up, depending on their ability and effort. Below we suggest how the results of the literature might be modified. A second reason why previous studies are not directly applicable to our discussion is that they do not consider mixing promotion contests with a bonding scheme.

Slumming

The problem with slumming from the organization's viewpoint is that the more able workers are not induced to seek higher-level positions. One might at first think that the way to prevent slumming is to simply increase the prize spread, i.e., the promotion reward.[8] This solution will not necessarily work, however, because greater ability does not necessarily imply better performance. It is true that those who coast on the job and fail promotion will earn less, but it is also true that they do not have to work as hard; they can "rest" on their greater ability and get by with less effort. And, because of their greater ability, their lower effort will not prevent them from earning within-level contingent compensation. Similarly, although they will earn more if promoted, they also have to work harder to earn the promotion; they incur the investment costs associated with

[6]Lazear and Rosen (1981), Green and Stokey (1983), O'Keeffe, Viscusi, and Zeckhauser (1984), Rosen (1986b), McLaughlin (1988), Malcomson (1984), MacLeod and Malcomson (1988), and Bhattacharya and Guasch (1988).

[7]The exception is MacLeod and Malcomson (1988).

[8]Of course, compensation is not the only way to deter slumming. A corporate culture that engenders "be all that you can be" may also prevent workers from being unmotivated in their jobs.

their bid to win. Merely offering a pay differential will not solve the slumming problem.

It turns out that the way to deter slumming is to not just offer a prize spread but to offer one sufficiently high that more able workers prefer to work hard and forgo the low-effort–low-compensation alternative. More specifically, the expected gain from winning must exceed both the DPV of the compensation in the level below, i.e., what workers earn if they coast, and the worker's investment costs.[9]

Note that prior to the promotion contest, able workers must view hard work as worthwhile despite the possibility of failing. This is the ex ante no-quit constraint. However, once the contest is over, able workers who fail promotion are worse off than those who did not try at all; unlike the coasters, they incurred investment costs. Thus, ex post, some workers feel regret. However, losers do not necessarily quit. As long as their losing compensation exceeds their outside opportunities, as would be the case with match-specific capital, they remain.[10]

This conclusion suggests another guideline for designing compensation: The optimal structure of compensation between and within levels may be such that differentials across levels exceed the differentials within levels by an amount that compensates more able workers for expending greater effort.

Climbing

The climbing problem is more complex. If within-level compensation is contingent on performance, less able individuals work hard regardless of whether they focus on within-level performance or on cross-level promotion. Thus, the problem is not that less able workers are unmotivated but that they work too hard and are mistaken for more able workers.

At first, the solution would appear to be to reduce the promotion prize spread and, hence, the gain to promotion. Unfortunately, this solution exacerbates the slumming problem: More able workers are more likely to coast when the gain to working hard is reduced. Conversely, increasing the spread to solve the

[9]Note that whether workers lose the contest or are unmotivated to attempt to win, the DPV of the compensation stream in the level below will include the within-level contingent compensation. More able workers will meet the performance criteria for this compensation because of their exceptional ability.

[10]Losing can be demoralizing, and severely demoralized individuals may leave to seek a fresh start even when their losing pay exceeds their pay elsewhere. Thus, we must define *losing compensation* as being equal to both the monetary pay and the (negative) value of being demoralized. Losers stay if this losing compensation exceeds both the monetary and the value of the nonmonetary aspects of their alternative opportunities.

slumming problem exacerbates the climbing problem. The greater the gain to promotion is, the greater is the less able worker's incentive to climb. The climbing problem must be solved jointly with the slumming problem. More generally, a policy designed to ensure that less able workers are not promoted must not inadvertently demotivate the more able workers.

A solution to the mismatching problem in the context of a hierarchy has not been fully explored in the literature; however, the solution will clearly have the following features.[11] To prevent slumming, more able workers must perceive the prize spread as sufficiently high that they would rather work hard and attempt a promotion than rest on the job and remain in their current level, as described above. To deter climbing, the prize spread must be perceived by less able workers as sufficiently low that they would rather work toward deferred compensation in their current level than toward a promotion. How can both perceptions be met? The perceived prize spread must increase with ability. The solution we discuss below has this feature. Although it is by no means the only solution, it is suggestive of how the structure of compensation can induce greater motivation and deter bad matches.

The solution we propose involves using within-level contingent compensation to alter how different ability types perceive the value of the promotion contest. To see how it would work, first note that offering contingent compensation within a level creates uncertainty for less able workers because deferred compensation may not be forthcoming. Their uncertainty is greater when they are inadvertently promoted. Less able individuals must work even harder, given the higher performance standards associated with their new level, and this harder work (greater effort) may be insufficient, given their ability. To the extent that they fail to meet these higher standards, they will be dismissed. More able workers do not face such uncertainty because promoting them results in good matches. For them, working hard guarantees receiving the within-level deferred compensation. This difference in uncertainty among ability types means that less able workers will perceive the promotion prize, i.e., the expected DPV of the compensation stream in the next level, as relatively small and more able workers will perceive it as relatively large.

Thus, to deter mismatches, the compensation structure can be configured as follows: First, the promotion prize is set sufficiently high to deter slumming. Then, for those workers who are promoted, the within-level compensation

[11]This analysis focuses on determining the prize spread. However, as discussed in Section 5, employers can also vary the standard against which performance is measured and the measurement precision. The implications of altering the standard or measurement precision in the present context have not been explored.

profile is steepened.[12] Tilting the within-level compensation profile relative to the VMP profile within the organization increases the amount of compensation that is deferred. The more compensation is deferred, the more it is contingent on performance and the smaller is its expected DPV from the viewpoint of the less able. Thus, a promotion prize that is high enough to motivate hard work among the more able workers will be perceived as too small by the less able workers to be worth the extra effort.

This compensation design implies that the slope of the within-level contingent compensation profile will be steeper at higher hierarchical levels than at lower ones; that is, more compensation is deferred at higher levels. The steeper profile at higher levels is necessary for two reasons. First, a more tilted profile reduces the incentive to climb by reducing the perceived value of promotion for less able workers. Second, deterring climbing is more important at higher levels. As discussed in Section 4, obtaining the best person-position match is more important at higher levels because productivity in a hierarchy has a multiplicative effect. Of course, deferring more compensation also reduces the value of promotion for more able workers. Thus, to maintain incentives for the more able workers, the expected DPV of the within-level compensation profile must remain the same (and be equal to the DPV of VMP) regardless of its slope.

This solution suggests other guidelines for compensation designers so that the structure of compensation within a hierarchy can produce good matches even when ability is not easily observed. One way to solve the matching problem is to set the compensation differentials across levels sufficiently high to deter slumming and set the compensation differentials within levels so that (1) some compensation is contingent on performance and (2) the tilt of the experience profile within a level is sufficiently steep that climbing is deterred. In addition, weed out unproductive workers by (1) setting the cross-level compensation so that those with no comparative advantage find that, ex post, their compensation is less than their next-best outside alternatives; (2) setting within-level compensation so that those who fail to meet the within-level performance standards are dismissed.

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[12]From the more able workers' point of view, the tilted profile must have the same DPV as the untilted profile.

7. Conclusions, Preliminary Policy Implications, and Directions for Future Research

This report lays a foundation for the design of basic pay. It surveys the recent literature on compensation to obtain a list of important compensation guidelines that are aimed toward meeting overall organizational goals. The survey focused on ways of structuring compensation to maximize organizational capability at least cost. Specifically, it focused on the role of compensation in attracting and retaining personnel, matching them to occupations, motivating them to work effectively and develop skills, and ensuring that the most-qualified individuals are placed in the positions for which they are best suited.

The survey results are discussed in the context of large, hierarchical organizations with many personnel levels, such as the military. We provided several guidelines on how to determine the level of pay that attracts, retains, and matches individuals to occupations, the structure of compensation across hierarchical levels and within levels, and promotion policy. Some of the key guidelines that we derived and presented are summarized below. We then distill some preliminary policy implications from these guidelines in light of some of the main features of military pay, which are discussed in the Appendix. We also highlight areas worthy of future work.

Summary

To attract and retain personnel, expected career compensation levels should be at least as great as an individual's next-best opportunity and, at the same time, reflect the individual's contribution to the organization or productivity.

Occupations with disamenities, such as unpleasant job duties, must generally offer higher compensation while those with amenities can offer less. Whether a pay premium (or deduction) is required and the amount of such a premium depend on variations in both worker preferences and occupational attributes, and the supply and demand for workers in the various occupations.

Overpaying individuals relative to their outside opportunities may motivate individuals to work effectively. The idea here is to penalize ineffective work

with unemployment or with poor recommendations and a reputation for substandard work. By motivating greater performance, the higher compensation is justified even though it exceeds what individuals can earn elsewhere. Overpaying relative to outside opportunities may also be necessary when highly qualified workers cannot be easily distinguished from less qualified ones. The idea here is that overpayment creates both an excess supply of applicants and an increase in the proportion of applicants who are highly qualified. This scheme increases the employer's chances of hiring the best applicants. To the extent that better workers are hired, the higher compensation is again justified.

The structure of compensation across hierarchical levels should be such that compensation rises with rank. This structure motivates greater skill development, better worker-job matches, and, possibly, greater retention. In addition, when compensation is contingent on performance, motivation increases as well. Greater compensation may take the form of higher pay, increased job amenities, or even greater but deferred retirement income.

Individuals have different abilities to perform different tasks. Those who are relatively more able to meet the job requirements associated with higher positions should move up the ranks. However, those who are relatively less able in higher ranks should not necessarily be induced to quit or be dismissed. Such individuals may make significant contributions in performing other tasks. Thus, compensation should reward not only the current and future leaders but all who increase capability.

The structure of compensation across hierarchical levels should be skewed, i.e., the interrank compensation spread should increase with rank. This structure helps ensure that the most-talented individuals strive for higher-ranked positions and that supervisors are motivated to accurately measure and report on worker performance. A skewed structure may be achieved through pay, job amenities, or deferred compensation, such as retirement income.

Promotion policy can improve effort motivation and performance. It can also improve the quality of worker-job matches by providing both a means for organizations to learn about otherwise unobservable worker abilities and an incentive mechanism for workers to reveal those abilities. The pay gap between hierarchical levels should be larger when (1) individuals eligible for promotion are more able; (2) the number of positions to be filled is small; (3) achieving the best worker-job match is important; (4) factors beyond the worker's control are more important; and (5) workers are less averse to income variability.

An explicit up-or-out promotion policy is not always necessary. By structuring across-grade compensation so that those who fail promotion earn less than their

outside opportunities, a promotion scheme can operate as an implicit up-or-out mechanism that induces quits. On the other hand, an explicit up-or-out policy may be required if those who fail promotion are better off by staying rather than by quitting.

Compensation within a hierarchical level should be contingent on effort and/or performance. This policy helps ensure that individuals who are best matched in their current rank are motivated to work effectively despite their lack of promotion opportunities. Thus, compensation within a level should be deferred, with the higher pay going to those who meet performance standards. For those who fail performance standards, a contingent within-grade compensation system can operate as an intragrade up-or-out mechanism. By weeding out those who are not even productive in their current level (let alone in any future level), within-level contingent compensation helps prevent "clogs" in the flow of personnel across levels. Finally, intralevel pay gaps also motivate skill development within a level.

To achieve the best matches between personnel and levels, those who are relatively less able to perform tasks in the upper ranks should be deterred from moving up the ranks. One way to achieve this outcome is to increase the amount of within-level compensation that is contingent on satisfactory performance. Since the less able are unlikely to perform satisfactorily at higher levels, they are also unlikely to earn the contingent pay. As a result, their gain to promotion is lower and their motivation to strive for one is reduced. This result implies that the slope of the within-level contingent compensation profile is greater in higher levels of the hierarchy. The slope is also greater because deterring less able workers is more important at higher levels; failing to match the right persons with more responsible positions has an increasingly detrimental effect on total capability as one moves up the "corporate ladder."

The pay gap across levels should be greater than the pay gap within a level. The amount of the interlevel gap should be large enough that those more able to perform at higher levels would rather strive for a promotion than work less hard and earn the intralevel pay.

Some Preliminary Policy Implications

These guidelines, by accounting for the interactions between compensation and manpower goals, organizational and personnel characteristics, and the motivation of personnel within large organizations, address some key issues on how compensation should be designed. However, to increase their applicability

to the military, the guidelines should also account for unique aspects of the military. Although a full evaluation of the current system and alternatives must await further study (see below), we indicate below some obvious aspects of military compensation that seem to violate the guidelines summarized above.

Occupation- and Service-Specific Pay Tables

As described in the Appendix, the enlisted and officer pay tables in the military are the same for all members, regardless of service and occupation. Some aspects of military service—long hours, the yielding of important civil liberties, the demands of wartime, etc.—are the same regardless of branch of service and occupation. However, it is obvious to even the most casual observer that, in many ways, the branches of service and the various occupations have large nonpecuniary differences: The duties of an infantryman obviously differ from those of an aircraft mechanic; the demands of being at sea for large portions of the year differ from the demands of being a yeoman or clerk stationed at the Pentagon.

Military occupations and branches of service differ in their nonpecuniary characteristics in important ways, and the theoretical analysis of the preceding sections suggests that compensation should differ across occupations and services.[1] Military compensation recognizes differences in military occupations and assignments (and thus service) by means of allowances and bonuses: Enlistment bonuses are offered to recruits who enlist in hard-to-fill occupations; reenlistment bonuses are offered to those facing reenlistment decisions to enhance retention in (or to divert personnel toward) occupations experiencing shortfalls. These bonuses adjust the level of compensation across occupations.

Still, the analysis indicates that both the level and the structure of compensation may need to differ across occupations. Thus, those occupations and/or services requiring greater specific human-capital investments should have flatter pay and experience profiles, whereas those requiring more general human-capital investments should have steeper ones, as discussed in Section 4. The theory also suggests that occupations and/or services in which cooperation across grade levels is a more important part of the productive technology should have flatter intergrade pay spreads, whereas those in which individual effort is more important should have a more skewed compensation system, with intergrade pay spreads rising with grade.

[1]This statement assumes that the supply of individuals willing to accept disamenities is less than demand and/or those who prefer the amenities of service are in short supply.

The lack of different pay structures for the different services and/or occupational groups appears to be in direct violation of the theoretical guidelines summarized above. It appears that the DoD system is inefficiently paying rents in some occupations and services, i.e., paying individuals more than it needs to attract and retain a sufficient number of personnel in these occupations and services.

Contingent Time-in-Service Pay Increases

Personnel in the military receive automatic seniority increases, which generally occur about every two years. Only promotions are contingent on performance. The theoretical analysis indicates that effort supply increases when pay depends meaningfully on performance. Therefore, the analysis suggests that within-grade increases should be at least partially linked to performance. The current military practice appears to be in direct violation of this guideline and would appear to be inefficient. Of course, administering a performance-review process is costly, and the cost may outweigh the benefits. But there may be ways of minimizing that cost. Future research should address whether and how contingent intragrade compensation can be made cost-effective.

Areas for Future Research

To increase the applicability of the guidelines derived earlier to the military setting, more research is required. Summarized below are several areas in which further research would be fruitful.

The Skewness of the Military's Compensation Profile

As discussed above, one pay guideline derived from the literature review is that the structure of compensation across grades should be skewed. A key question is whether military compensation is sufficiently skewed to motivate effort and ability revelation. Further, if the system is sufficiently skewed, is the skewness accomplished in ways that give the most-productive results? Thus, if the skewness is accomplished in ways other than through basic pay, such as through the retirement system, nonpecuniary benefits and perks, or through allowances, what are the implications of this mix of pay for the self-selection of individuals into grades? Are the most-able or the best workers motivated to move up? Are those who value the perks and benefits the most also the most-able and the hardest workers? Changing the mix of compensation that accomplishes a skewed profile may positively or negatively affect effort supply and ability sorting.

The Retirement System

A large fraction of military compensation comes in the form of retirement pay. The specific role and effects of the retirement system on the organization's ability to meet its objectives were ignored in the literature review. This gap should be filled. Thus, future work should address the questions of what roles the retirement system play and how they affect retention, effort supply, and ability sorting. In light of the answers to these questions, further work should seek to answer two additional, larger questions: (1) Is the military's current retirement system efficient? (2) What would be the effect of changing aspects of the current system—level of benefits, vesting provisions, and structure of benefits—on retention, effort, and ability revelation? Although previous efforts have addressed the question of the effect of the retirement system on retention, no work has specifically addressed its effect on effort supply and ability sorting.

Risk Aversion

The analysis of the previous sections implicitly assumed that individuals were risk neutral, i.e., that they would be willing to engage in a fair gamble. This assumption was convenient and allowed us to derive the fundamental guidelines summarized above. However, for risk aversion, whereby individuals prefer to buy insurance to reduce the risks they face, individuals prefer that at least some of their income be invariant to chance. Further, they prefer smaller pay spreads to larger ones, all else being equal. Clearly, some of the guidelines derived in earlier sections will be modified in light of risk aversion, and future work should investigate how incorporating this additional aspect changes the conclusions of this report.

Some of these research questions can be addressed by using military personnel data to investigate empirically the structure of military compensation and its effect on retention and the sorting of individuals by various characteristics, such as education and aptitude. However, because effort supply is often difficult if not impossible to measure, some of these questions may best be addressed within a simulation framework that allows sensitivity analysis of the results to various assumptions about effort supply and its relationship to compensation.

This report lays a foundation for the design of basic pay. Specific policy recommendations must await the results of such future research.

Appendix

Overview of the Military's Compensation System

As a backdrop to the discussion in the text, the main features of the military's compensation system for military personnel are described here. Some of these features are examined in Section 7 in light of the literature review to distill policy recommendations and to suggest areas for future research.

The foundation of military compensation—accounting for 75 percent of active-duty cash compensation in fiscal year 1991—is basic pay. For every service member, basic pay is derived from the pay table for either the enlisted personnel or the officers. Pay in the pay table does not vary by service or occupation for enlisted personnel or officers; it does vary with grade and rank, and years of service, or seniority. Seniority-based pay increases are automatic and do not depend on individual performance. However, promotion to a higher grade or rank depends on the member's performance, test scores, and other criteria, such as academic record.

A smaller component of compensation for active-duty personnel is allowances for housing and food. These allowances accounted for 19 percent of cash compensation in fiscal year 1991. Because members do not pay federal income tax on these allowances, their compensation also includes a tax advantage.

A myriad of special and incentive pays accounted for only 6 percent of active-duty compensation in fiscal year 1991. Such pays vary with individual circumstances and include enlistment and reenlistment bonuses, which are targeted toward individuals in hard-to-fill occupations, and compensation that varies with members' assignments, such as sea pay, flight pay, and submarine pay.

Retirement pay is the second-largest component of military compensation. In fiscal year 1991, DoD's retirement pay accrual was 43 percent of the outlays for basic pay. Probably the most notable aspect of the military's retirement system is its 20-year cliff vesting provision: Members who leave service after 20 years gain

the right to claim an annuity that begins immediately after they leave; those who leave prior to completing 20 years receive nothing.[1]

The military has three concurrent retirement systems. For those who entered service prior to 1981, the pension formula is 0.025*YOS*final-year basic pay, where YOS is years of service, and the pension is fully inflation protected. For those entering between 1981 and 1986, the retirement system is the same, except that the formula is based on the average of the individual's highest three years' basic pay instead of the final year's basic pay. Finally, for those entering after 1986, the retirement system uses a two-part formula. For those who separate before age 62, the formula is (0.4 + 0.035*[YOS–20])*highest three years' basic pay, and the cost of living adjustment is equal to the consumer price index (CPI) minus one percentage point. Thus, the level of benefit is lower than it is for those entering before 1986, but it grows at a faster rate with years of service. At age 62, the formula reverts to 0.025*YOS*highest three years' basic pay and the pension is fully adjusted to reflect inflation. After age 62, the CPI-minus-one-percentage-point rule begins again.

In addition to cash compensation, active-duty members also receive a number of in-kind benefits. These nonpecuniary benefits range from health care benefits for themselves and family members to the use of recreational facilities and commissary privileges.

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[1]Under some circumstances, individuals can earn separation pay that is a lump-sum payment rather than a retirement annuity. Further, during the drawdown, individuals are currently being given the option to take a lump-sum or an annuity payment if they separate voluntarily. These drawdown inducements are not part of the retirement system and are not a permanent feature of military compensation.

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