

**PAYING MORE TO GET LESS: SPECIFIC SKILLS, INCOMPLETE INFORMATION
AND THE EFFECTS OF EXTERNAL HIRING VERSUS INTERNAL PROMOTION**

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ABSTRACT

Organizations often use both internal promotions and external hiring to fill similar jobs, yet we know little about how the differences between these matching processes affect subsequent outcomes in those jobs. Drawing on theories of firm specific skills and incomplete information, I propose that external hires will initially perform worse than internal promotes, yet will be paid more than promotes and have stronger observable signals of ability. I also argue that external hires will have higher voluntary and involuntary turnover. Analyses of personnel data from a financial company confirm strong effects of how jobs were entered on pay, performance and mobility.

Firms' hiring of experienced workers has grown substantially in recent years (Rynes, et al., 1997; Cappelli, 1999; Farber, 2008). Although entry level jobs must always, by definition, be filled from the outside, "higher level" jobs that require more skills are now filled both by promotion from within the organization and by hiring experienced workers from the external labor market (Royal, and Althausser, 2003). This opening up of firms' staffing systems raises the question of whether the use of hiring versus promotion to fill a job affects the characteristics of the workers staffed in that job, or such subsequent outcomes as performance, pay and mobility.

Organizational and sociological approaches to the employment relationship have long observed that the processes that match individuals to jobs have important effects on employment outcomes (Granovetter, 1981). Existing studies take two broad approaches to understanding these matching processes. One literature studies the effects of the rules and processes that allocate workers to jobs within organizations in "internal labor markets" (Doeringer, and Piore, 1971; Althausser, and Kalleberg, 1981; DiPrete, 1987; Osterman, 1987; Dencker, 2009). A second literature examines the nature of hiring processes in external labor markets; some studies, for example, explore the consequences of different job search methods (Bridges, and Villemez, 1986; Marsden, and Hurlbert, 1988; Mouw, 2003); others examine the effects of information availability on workers' mobility across organizations (Halaby, 1988; Fujiwara-Greve, and Greve, 2000; Greve, and Fujiwara-Greve, 2003).

As organizations increasingly use both promotions and hiring as equivalent means to fill similar positions, it becomes increasingly important to bridge the literatures on internal and external labor markets, and explicitly compare internal and external matching processes. Whether workers enter a job from within the same organization or from outside that organization has

profound implications for how those workers are matched to their jobs, and should therefore affect subsequent job outcomes. Explicitly comparing internal and external labor market processes can provide us with a theoretical basis for understanding the different consequences of these two routes for entering jobs, and how the patterns of individuals' pay and mobility prospects within organizations might depend on how they entered their jobs.

Yet despite the importance of comparing promotion and hiring as means of matching workers to jobs, we lack a well developed theoretical understanding of how they differ. Where studies have begun to contrast the consequences of promotions versus external hiring, they stop well short of a detailed comparison of these two kinds of matching processes. Drawing on tournament theory, Chan (2006) predicts and finds that external hires have faster subsequent promotion rates than internal promotes. A study of academic economists also indicated that lateral hires had stronger publication records than those hired internally (Oyer, 2007). In their study of a large financial services firm, Baker et al (1994a) showed that workers hired into higher levels of the organization had higher mean levels of work experience and education than internal promotes, but made no attempt to control for characteristics of the job that might confound those comparisons.

In this paper, I seek to develop a broader theoretical understanding of the differences between external hiring and internal promotions. That understanding draws on two theories that are often used in the study of internal and external labor markets: theories of firm specific skills (Becker, 1962) and incomplete information (Akerlof, 1970; Granovetter, 1981; Halaby, 1988). Existing theory on human resource systems and careers notes that internal promotes (workers who have been promoted into their current position from within the organization) and external hires differ

in their levels of firm specific skills (Doeringer, and Piore, 1971; Sonnenfeld, and Peiperl, 1988; Lepak, and Snell, 1999); they therefore argue that external hiring will do a poor job of filling the firms' employment needs where firms require skills that are unique to the firm. Theories of information and labor market matching emphasize that information availability plays a central role in shaping how workers get matched to jobs (Spence, 1973; Granovetter, 1981; Halaby, 1988; Greve, and Fujiwara-Greve, 2003). The reduced information that firms and workers hold about each other during external hiring might therefore also shape employment outcomes.

I integrate these two sets of theories to predict that external hiring will have two disadvantages for firms relative to promotions: that external hires will perform worse than promotes but be paid more. A straightforward prediction of firm specific skills theories is that external hires should have lower initial performance than internal promotes. Yet I argue that the effects of incomplete information can prevent employers from balancing this lower performance with lower pay for external hires. Because employers are more uncertain about external hires' abilities, they may compensate by hiring workers with stronger observable signals of ability than the promotes. Because external hires know less about their potential fit with the job than do promotes, they may demand more money to make up for the risk of a poor fit. As a consequence, I argue that external hires may actually be paid substantially more than promotes. While external hires benefit from that higher pay, their lack of firm specific skills and uncertain fit create costs for them too, in the form of higher rates of voluntary and involuntary exit than promotes.

I test these predictions using seven years of personnel data from a financial services institution, conducting what is, to my knowledge, the first comprehensive assessment of the differences between workers who are promoted and hired externally into similar jobs. The study contributes

to our understanding of labor market matching processes, and internal labor market theory in particular, by detailing many of the factors that shape the competition between external hiring and internal mobility within organizations.

FIRM SPECIFIC SKILLS, INFORMATION AND THE DIFFERENCES BETWEEN HIRES AND PROMOTES

While internal labor market theory has emphasized internal promotion as a means of entering higher level positions (Althausser, and Kalleberg, 1981), there are a variety of reasons why firms often also use external hiring to staff those same positions. An external hiring strategy can reduce firms' costs of developing workers internally, by allowing them to free ride on other employers' training efforts (Becker, 1962). Strategies based entirely on internal promotion can also be difficult to implement. Filling all higher levels through internal promotion requires organizations to produce accurate long-range forecasts of the number of higher level positions that they will have available, the skills required for those positions, the number of lower level workers who will be promotable, and the levels of turnover from each of those positions. Given the problems of making such predictions several years out, Cappelli (2008) argues that firms do better to complement promotions with some amount of external hiring.

These *ex ante* costs of promotion strategies mean that most firms use a combination of promotion and hiring to staff positions. But the use of both routes to staff positions does not mean that internal promotion and external hiring necessarily have the same consequences *ex post*. The central goal of this paper is to compare the employment consequences of these two different routes of matching people to jobs. In doing so, I hold constant the characteristics of the jobs being staffed, both theoretically and empirically. Other work has compared the pay and

performance of workers who move organizations or stay within the same organization (Brett, and Stroh, 1997; Groysberg, et al., 2008). Such work offers great insight into the prospects of different career strategies, but cannot tell whether gains and losses are due to the types of jobs accessed or the nature of the matching process. My complementary approach of holding job characteristics constant has the potential to tell us more about the specific effects of promotion versus hiring processes.²

Firm Specific Skills and Performance

A critical difference between internal promotes and external hires lies in their levels of firm specific skills (Lepak, and Snell, 1999). Firm specific skills are the set of knowledge and abilities that can only be utilized while working in a specific firm (Becker, 1962), and have played a central role in the development of internal labor market theory (Doeringer, and Piore, 1971; Althauser, 1989). Examples of such skills may include knowledge about the other workers that can be useful in getting the job done, familiarity with the formal processes and informal routines that are used in accomplishing work, and an understanding of proprietary technologies that are only used at that firm. Although the importance of firm specific skills likely varies depending on how the routines, processes and technologies within a job differ from those in other

² My focus on comparing promotions with external hires does exclude a third way in which jobs can be entered – lateral transfers. My main focus is on the different routes that organizations can use to acquire skilled workers, and that workers can use to attain career progression. Lateral transfers represent a means of redeploying already skilled workers, rather than moving workers into more skilled positions. Perhaps more pragmatically, lateral transfers represent a more heterogeneous phenomenon than either promotions or hires. Lateral transfers can occur because of a reorganization or reshuffle of responsibilities, with little deliberate matching of specific workers to jobs; or transfers can occur as part of a deliberate attempt to switch career tracks on behalf of a worker; or lateral transfers can occur when a worker has been in a position for many years and is perceived to lack the skills for promotion. Each of these cases suggests different consequences of those lateral transfers, making it difficult to develop a single, coherent set of predictions about such transfers. I do present empirical results for these transfers.

organizations, research suggests that effects of firm specific skills are pervasive. Meta-analyses show strong effects of organizational tenure on job performance (Sturman, 2003). In addition, studies in settings where jobs are heavily institutionalized and firm specific skills are expected to be weak – specifically securities research and surgery – have found strong effects of firm specific skills on worker performance (Huckman, and Pisano, 2006; Groysberg, et al., 2008).

We would expect that external hires, who have not had the chance to acquire firm specific skills, would have lower performance than internal promotes, all other abilities being equal. However, those differences should not be persistent. As external hires accumulate experience in a firm, they will begin to acquire firm specific skills. Where there are diminishing returns to such skills, the external hires should be able, over a period of time, to acquire comparable levels of firm specific skills to internal promotes. For example, Groysberg et al (2008) found that equity analysts who switched firms were able to recover their earlier performance after two years.

Overall, we predict:

H1a: External hires will have lower initial performance than internal promotes

H1b: The difference between the performance of external hires and internal promotes will decline as they spend longer in the job.

Incomplete Information, Promotions and Hiring

A second construct that plays an important role in theories of both internal and external labor markets is problems of incomplete information (Doeringer, and Piore, 1971; Greve, and Fujiwara-Greve, 2003; Royal, and Althausser, 2003). Theories of incomplete information emphasize that buyers in a market often struggle to evaluate the attributes of the goods on offer

(Akerlof, 1970; Spence, 1973). The presence of such incomplete information problems can have profound effects on how markets function. When a buyer has full information on a particular set of attributes, she can choose those products that best suit her needs. When she lacks information, she must assume that the product she chooses is, at best, average on those unobserved attributes. A key insight of theories of incomplete information is that actors respond strategically to those problems. For example, buyers may lower the price that they will pay when they cannot evaluate the quality of a good (Akerlof, 1970). Both buyers and sellers may also end up placing greater weight on those attributes that they can observe, even if those attributes are noisy signals of underlying quality (Spence, 1973; Holmstrom, 1999).

A particular feature of employment relationships is that there is incomplete information on both sides. Firms struggle to fully evaluate the true qualities of applicants, despite the many advances made in this area by personnel psychologists (Schmidt, and Hunter, 1998). Similarly, workers struggle to know which of the jobs available will best suit their preferences and abilities (Jovanovic, 1979; Halaby, 1988; Fujiwara-Greve, and Greve, 2000). It is these information problems that make matching processes so important for shaping employment outcomes; differences in the way that matching processes provide workers and firms with information about each other affect who gets what job and with what consequences (Granovetter, 1981).

Problems of incomplete information shape the differences between hiring and promotion because of differences in the information available in each of these processes. In particular, both workers and employers expect to know a great deal more about each other during promotions than during external hiring (Waldman, 1984; Greenwald, 1986). Although some information that employers draw on may be common to both promotion and hiring decisions, such as the worker's level of

education, their previous employment history, and even scores in standardized tests and interviews, other information, such as how a worker has performed in prior roles is only available to employers for promotion decisions. Similarly, while firms may seek to give prospective hires a clear description of what a new job will entail, workers inside the firm are likely to have a far greater understanding of the nature of the job and how well they will fit with it. The internal candidates should also have a clear understanding of how they fit the culture and values of the organization (Chatman, 1991). Such fit can be hard for an outsider to gauge.

There is a wealth of evidence that employers' opportunities for extended observation of their own employees yield valuable information. For example, Gibbons & Katz (1991) show that workers who are laid off have better employment prospects when their entire plant is shut down – a finding that makes most sense if future employers are concerned that partial layoffs apply only to weaker employees. Detailed studies of the hiring process find that recruiters set great store on references from previous employers in evaluating candidates (Crain, 1984; Bills, 1999). Given the difficulty of getting honest references from prior employers (Miller, and Rosenbaum, 1997), firsthand experience with the workers should be even more helpful. And while studies of hiring emphasize the relatively low predictive power of interviews and other common selection devices (Arvey, and Campion, 1982; McDaniel, et al., 1994; Posthuma, et al., 2002), analyses of performance ratings within firms demonstrate a very high cross-period correlation in performance over time (Sturman, et al., 2005). Observation of prior performance therefore appears to provide better predictions of future performance than traditional hiring methods.

The availability of superior information on workers within the firm has long been observed in research on internal labor markets (Doeringer, and Piore, 1971); yet the different routes by which

this information will shape the outcomes of promotions and hires have generally not been developed. I explore below how differences in the information available for promotions and hiring affects who gets hired and how they are paid.

Incomplete Information and Worker Characteristics

The differences in the information available for promotions versus hires can cause different kinds of workers to be promoted versus hired. Although firms have less information on potential hires than they do on potential promotes, they are not completely ignorant about them. Some correlates of performance, such as workers' levels of experience and education are publicly available and "observable" to all potential employers (Spence, 1973; Granovetter, 1981). Other correlates of future performance may be more difficult for potential employers to observe. In particular, how the worker fits the idiosyncratic demands of the job or the values of the organization affects performance (Chatman, 1991; Edwards, 1991; O'Reilly, et al., 1991) but can be hard to assess without actual experience of employing the worker.

The firm's challenge in staffing higher level positions is to find workers whose overall skills and ability will be a good match for the demands of those jobs. In choosing internal candidates for promotion, the firm will look for those workers who will be good performers based on what it knows about both their externally observable and externally unobservable attributes. We would therefore expect the pool of chosen internal candidates to be above average on both of these dimensions. For external candidates, the firm is unable to observe externally unobservable attributes. The firm can only assume that those candidates are, at best, average on those unobservable dimensions (adverse selection theories suggest that those candidates may even be worse than average on those unobservable dimensions, which is why they are seeking another

job (Akerlof, 1970; Greenwald, 1986)). As a result, we would expect internal promotes to have higher levels of valuable externally unobservable attributes than do external hires.

The firm can respond to these differences in the externally unobservable attributes of external hires and internal promotes in two ways. The firm could accept that external hires will perform worse than internal promotes, even after they have acquired firm specific skills. Yet many jobs, particularly those at higher levels, require a certain minimum level of performance in order for their incumbents to be at all effective. The firm may then be reluctant to hire external workers who are expected to fall below such a performance threshold. Alternatively, the firm can compensate for external hires' lower expected levels of externally unobservable attributes by ensuring that they have higher levels of observable attributes. Hence, by hiring workers with stronger observable signals of ability, the organization can achieve similar levels of performance among internal promotes and external hiring (after the acquisition of firm specific skills). We therefore propose that:

H2: External hires should have higher levels of observable signals of ability, such as experience or education, than internal promotes.

Incomplete Information and Pay

Differences in the information available to both parties during promotion versus hiring may also affect how workers are paid. A simple view of labor markets suggests that promoted workers should be paid more than external hires: as I have developed above, promoted workers should have higher performance than external hires; if promoted workers are more valuable to the firm, we might expect them to be paid more. Yet considering the effects of incomplete information leads to the opposite prediction – that external hires should be paid more than internal promotes.

In part, pay differences between internal promotes and external hires reflect the hypothesized differences in individual characteristics. The observable signals of ability possessed by external hires can help those workers to find high paying jobs in other organizations, and will therefore be highly rewarded in the labor market. By contrast, unobservable attributes do not help workers to find jobs in other organizations, and employers will face less pressure to reward such attributes. Given that external hires have higher levels of observable signals of ability, we should expect them to be better paid than promotes.

External hires are also likely to be paid more than internal promotes because of the reduced information that they have about the firm and job. As detailed above, workers who are promoted are likely to know much more about the job and whether it will match their preferences and abilities. Internal promotes will also understand much more about their fit with the organization; indeed, we expect that internal promotes are a good fit for the organization – otherwise they would have left the organization already. External hires lack this information, and can therefore assume that they will be, on average, a worse fit for the job and organization than internally promoted workers. Such poor fit has negative consequences for the external hires: person-organization fit is strongly correlated with satisfaction and turnover (Chatman, 1991; Schneider, et al., 1995); poor fit with the job can also lead to low job satisfaction (Edwards, 1991), slower career progression and higher voluntary and involuntary turnover (Jovanovic, 1979).

External hires' worse expected fit with the job and organization should make the job less attractive to them than to an internal promote. The pay that the employer needs to offer to persuade an external hire to take the job is therefore higher than the pay demanded by the internal promotes. Such a pay premium can be thought of as compensating the external worker

for the higher chance of a poor fit with their new position. Based on both these considerations of fit and observable signals of ability, we would predict:

H3: External hires are paid more than internal promotes

Implications for Subsequent Mobility

The above hypotheses have straightforward implications for how staffing jobs through hiring versus promotion should affect workers' subsequent rates of mobility. As noted above, workers are generally only promoted when the organization expects their performance in the next job to exceed a certain threshold. Performance in the current job is an important predictor of performance in a higher level job. If external hires exhibit lower initial performance than internal promotes (H1a), we would expect them to have lower rates of promotion.

H4: External hires have a lower rate of promotion than internal promotes.

A second way that workers can move out of jobs is by voluntary exit or turnover. Theories of matching suggest that workers often leave organizations because they learn over time that they are a poor match for their job or organization (Jovanovic, 1979; Farber, 1994). Research on turnover supports this argument, showing that turnover is often triggered by dissatisfaction with conditions in the current job (Griffeth, et al., 2000; Hom, and Kinicki, 2001). As noted above, external hires know less about the organization than do promotes, and are at greater risk of forming a poor match. We should therefore expect them to have a higher rate of voluntary exit than internal promotes.

In addition, studies suggest that there is variation in individuals' underlying propensity to leave jobs (Farber, 1994), such that some people move jobs repeatedly while others stay in the same

organization. Given that external hires have already left their prior organization, we would expect them to have a higher average propensity to move firms. Together, these factors predict:

H5: External hires have a higher rate of voluntary exit than internal promotes.

Workers can also move jobs through involuntary exit, due either to poor performance or to organizational layoffs. My above arguments offer two reasons to believe that such involuntary exit is more likely among external hires. First, I suggested that external hires would perform worse than internal promotes, at least during their initial years. Where the firm is looking to downsize workers, it is likely to begin with the lowest performers. That is likely to be workers who have recently been hired. Second, workers who turn out to be a particularly poor match for the demands of the job are also likely to be terminated. To the extent that the firm knows less about the potential match of external hires than internal promotes, we expect that external hires will have a higher proportion of very poor matches. We therefore predict:

H6: External hires have a higher rate of involuntary exit than internal promotes.

METHODS

I test these hypotheses using personnel data from the US capital markets arm of a financial services institution, which I call “Croesus.” Capital markets work represents an interesting context in which to study the effects of internal versus external mobility. Because much of the work involves interacting with clients and markets, work is very similar from company to company, potentially minimizing the effects of firm specific skills across organizations (although Groysberg et al (2008) nonetheless find evidence that some aspects of bankers’ skills are firm

specific). Workers in banking are also notoriously mobile, making this a context in which organizations regularly make use of both internal promotions and external hiring.

I have data on all Croesus employees from the year 2003 to 2009. These employees include both investment professionals, such as research analysts, advisors, traders and salespeople, as well as “back office” staff such as lawyers, Information Technology (IT) workers, operations workers and administrators. The data consists of annual records for each worker giving details of their job and compensation in that year, annual performance data, and demographic data.

My analyses focus on the consequences of how workers are staffed to different jobs. I define a job spell as the time that an individual spends with a given hierarchical rank in a given department (departments had a median size of 100 workers). Where an individual changes rank or department I treat them as moving to a new job (if a change in department is accompanied by more than 10% of the department’s staff or comprises more than 10% of a new department’s staff, I code this as a reorganization rather than a change in job).

As outlined above, many worker outcomes are likely to be dependent on the amount of time someone has been in their job. Workers may develop job specific skills over time; in addition, there are selection effects over time, as weaker workers are weeded out and stronger ones are promoted. I avoid selecting on the length of the job spell by limiting my sample to all jobs that began during or after the first year for which I have comprehensive data. I also exclude those job spells for which I cannot observe the beginning date (for example, some workers appear in the data set long after they were hired, often because they entered Croesus as part of a merger). I also exclude all job spells in the lowest rank. Unlike the other ranks, promotions in the lowest rank

can sometimes lead to another job in the lowest rank. This means that I am unable to distinguish entry level jobs which cannot be entered by promotion from higher level jobs in that rank.

The final data set contains information on 7234 workers in 9816 job spells. The median length of completed job spells was around two years for those that ended in promotion, and around 1.5 years for those ending in transfers or exits. The main variables are defined as follows:

Promotions. Promotions were identified either by a change in rank from one year to the next or by an entry in the personnel record indicating that the individual was promoted during that year.³

I created a variable called “Promoted” that takes a value of 1 when an individual entered their job by being promoted into it. 58% of job spells were entered by promotion. Around 11% of jobs were entered by transfers, where an individual moved departments but did not change their rank, and that move was not accompanied by a reorganization. I include a control variable for such transfers. As a consequence, the “Promoted” dummy provides an explicit contrast with the 31% of job spells that were entered through external hiring (I verified that those jobs were entered by hiring based on the hire date provided by Croesus). Note that when those external hires are promoted into new jobs, they will be recoded as “promoted” for those subsequent jobs.

I should note that such promotions may not always reflect a direct change in the nature of a worker’s job responsibilities. Within some parts of the organization, a worker may receive a promotion in rank, while performing similar work to before (such promotions in title rather than responsibility are common in many organizations. Promotions in rank among academics are a salient example. Promotions for many professional workers are similarly accompanied by only

³ In 0.8% of cases, a rank changes without a corresponding promotion date. I treat these as promotions.

subtle changes in responsibility). Rank is a central way in which jobs are characterized at Croesus. Rank determines both the pay a worker should expect in a given area, and the level of performance expected of that worker (as evidenced by lower performance ratings following promotion). Workers in higher ranks will also generally have more challenging responsibilities - but those changes in responsibility may not directly accompany a promotion. Promotion and external hiring into the same rank are therefore meaningful comparisons of entry into similar jobs. Nonetheless, the frequently strong similarity between the jobs workers would do before and after promotion may strengthen the performance advantage of promotes relative to external hires.

Signals of Observable Ability. I measure signals of observable ability with two variables that are used extensively in the labor economics literature: age and education level. Age is a common proxy for work experience (particularly when education is controlled for), which provides workers with valuable work related skills (Mincer, 1962). Education is also a commonly used signal of ability, both because education provides workers with valuable formal knowledge that can be used in their work, and because it may act as a signal of cognitive ability (Spence, 1973). Although neither experience nor education are strong predictors of job performance relative to cognitive tests or structured interviews (Schmidt, and Hunter, 1998), they are nevertheless valuable proxies for underlying characteristics, are highly observable, and are both heavily rewarded in the labor market as a consequence (Mincer, 1970; Dustmann, and Meghir, 2005).

Within the data set, 92% of workers had bachelor's degrees, 39% had masters degrees (including MBAs) and 8% had PhDs. I created dummy variables for whether or not a worker possessed each of these degrees. Education data is missing for around 3300 of 15000 workers in the data. This may be because those individuals lack degrees (missing data is more common among

workers who are in lower ranks of the organization and in administrative or operational positions). Missing data may also be due to a failure by workers or administrators to fill out these fields. To be conservative, I drop workers who lack education data from the analysis.

Performance. I use three measures from Croesus’s annual performance evaluations. The first measure is “Contribution”, which represents whether workers have hit their performance targets for the year. It is assessed on a 1 to 5 scale, where 1 represents “Objectives significantly exceeded”, 3 represents “Objectives met” and 5 is “Objectives not met”. Around 9% of ratings are a 1, 56% are a 2, 34% are a 3, 2% are a 4 and 0.03% are a 5.

Second, workers are measured on their “Competence”. This score is intended to assess a worker’s skills, relative to what is required for their job. Competence is measured on a 1-5 scale, with 10% of workers being awarded a 1 (the highest rating), 50% receiving 2, 37% receiving 3, 2% receiving 4, and 0.05% receiving a 5.

Third, the organization implemented a forced ranking for its workers, to determine compensation and other personnel decisions. The ranking splits workers into the top 10%, the next 20%, the next 60% (in 2009 this segment was itself split into a higher 40% and a lower 20%) and the bottom 10%.⁴ Because of the way that it is used, the organization intended this performance ranking to represent both level of performance and general value to the organization. The ranking would be carried out by multiple managers together, to encompass a large number of people at the same rank. Unlike the other performance measures, it is not shared with workers.

⁴ I converted this ranking into a 6 point scale, where the 60% category corresponded to a 4, and the divided category in 2009 represented 3 and 5 respectively.

I reversed the scales for each of the three performance measures so that higher values indicate better performance, for simpler interpretation of the results. Although I could combine these three measures to form a single aggregate measure of performance, I choose to keep them separate for two reasons. First, Cronbach's alpha for a combined scale is marginal at 0.69. More importantly, the performance indicators measure slightly different things; comparing them can therefore shed light on the effects of promotion on performance, as I develop below.

Subjective performance evaluations suffer from a variety of biases (Cascio, 1998). Nonetheless, researchers argue that such subjective evaluations are among the most valid measures of performance, in part because they exclude many sources of error, such as determinants of performance that are outside the control of the individual (Campbell, et al., 1993), and in part because they are more likely to capture a wide variety of behaviors and outputs relevant to the job, rather than a few, easy to measure outcomes (Medoff, and Abraham, 1981). Meta-analyses find reasonably high test-retest reliability in performance evaluations (Sturman, et al., 2005), and such supervisory rating are among the most common dependent variables in studies of performance (Sturman, 2003). Nonetheless, I examine the evidence for such subjective biases later in the paper.

Compensation. Croesus employees were paid an annual salary and an annual bonus. Salary is relatively stable across years, while bonuses vary much more, based both on individual performance and the performance of the firm. Bonuses represent 38% of pay, on average, and rise as high as 98% (the 90th percentile is 83% of pay). I run analyses on each component separately, and on the sum of total compensation. I use the logarithm of each of these

components because they are highly skewed (where individuals received zero bonus, I substituted in a bonus of one dollar in order to calculate a log value).

Controls. The conceptual goal of the paper is to compare people being staffed to similar jobs through different routes. I therefore control for as many aspects of those jobs as possible. First, I include separate dummies for each of the six hierarchical ranks defined by the organization. Second, I used job titles and department and group names to create dummies for 13 different functions: administrators; HR; corporate administration (managerial jobs in the central office); marketing; legal; internal finance and risk management; operations; IT; research; sales; trading; advisory; and other banking roles. Third, I include dummies for the interaction between rank and function, to allow for variation by hierarchy and rank. Fourth, I control for the city that the job is in (88% of workers are in the greater New York area). Fifth, I include dummies for the groups that workers are in. Overall there are 1380 groups (the maximum in any given year is 649), with a median number of 32 workers in each group. Since each group is working on a specific set of tasks, these groups provide an extremely fine grained set of controls for the nature of the work that the individual is doing.

A particular concern is that unobserved factors that make the firm more likely to hire from outside might also be correlated with pay or performance. For example, we would expect more hiring to take place in those areas which have higher turnover, or require new skills that the organization has not previously developed. These factors are controlled for in two ways. The group dummies should control for fixed propensities of different areas to engage in more external hiring. I control for over-time variation in propensity to hire by including measures of

the proportion of new hires in the worker's group, and the proportion of workers who left the worker's group, as measured both in the year that their job started and in the current year.

I also control for two aspects of time. First, I include dummies for each year in the sample. The years 2002 to 2009 saw a spectacular boom and bust in the capital markets. Labor market conditions generally, and pay in particular, therefore varied dramatically across this period.

Second, I include controls for how long an individual has been in the job, both at the point at which the performance evaluation was performed, and at the point at which compensation was recorded. I also interact this variable with the promoted dummy in various specifications.

Finally, I control for gender and ethnicity (Caucasian, Asian, and other).

RESULTS

Table 1 provides means, standard deviations and correlations for the main dependent and independent variables in the data. A year spent in a job is the unit of analysis.

Performance

Table 2 presents analyses of the three performance measures. The unit of analysis is the job-year. Because these are discrete, ordinal measures, I use ordered logit analyses. I cluster the errors by individual to account for non-independence among the errors. Controls for departments, city⁵, year, and all interactions between rank and function are included in the analyses but not reported.

Performance is scaled so that higher values always indicate better performance.

⁵ I drop the city controls in one model to achieve model convergence. Tests on other models indicated that the controls for city did not have a significant effect on the effects of the promoted variable.

The table demonstrates significant differences between the performance of promoted workers and those hired externally, on all performance measures. Internal promotes have higher performance, consistent with H1a. These differences also decline over time, consistent with H1b. The effect sizes can be estimated from simple OLS analyses (not reported here). These effects are strongest for the contribution measure, measured both in terms of the absolute value of the coefficients and the t-statistic. The difference between internal promotes and external hires is equivalent to 0.11 steps on the competence scale, 0.32 steps on the contribution scale, and 0.25 steps on the ranked performance scale. The coefficients on the interactions with time in job indicate that external hires catch up with those promoted into the job after around 3.5 years.

Among the controls, we find higher performance ranks for men and white employees. Men do not have higher competence or contribution ratings though, and Asians have slightly higher levels of competence and contribution than do whites. We find significant effects of having a PhD on performance, suggesting that such degrees do signal ability. Other educational variables are not significant, though and age has a negative effect on performance ratings. This result likely reflects the effects of age on selection into positions: when we hold position constant, the person who managed to reach that position at an earlier age is likely to have higher innate (and largely unobservable) ability, which shows up as higher performance.⁶

I conducted two supplementary analyses to explore these performance differences. First, I explored whether the convergence in performance of externally hired and internally promoted

⁶ In principle we could test this implication by exploring whether age has positive effects on performance when we do not hold the position constant. Unfortunately, performance ratings tend to be explicitly and implicitly relative to a particular job – higher performance is expected in more senior positions – making it difficult to test performance without also controlling for position.

workers reflects attrition from the sample or individual learning. Running fixed effects analyses of performance (not reported here), I found that the coefficients on time in job for promoted workers and hires were very similar to the cross sectional analysis. Performance convergence between new hires and promotes therefore appears to reflect learning rather than selection.

Second, I analyzed whether performance of new hires ever exceeds that of internal promotes. I created dummies for one year in the job, two years in the job etc and interacted these with the promoted dummy (results available from the author).⁷ I found that the performance of promoted workers was consistently better than new hires for the first three years, after which the performance of the two groups converged. Performance of new hires was never significantly better than those who were promoted.

Characteristics of External Hires Versus Promotes

I go on to test H2, that external hires will have stronger observable signals of ability than internal promotes. Table 3 reports an analysis of how each job in the sample was entered. The unit of analysis for this table is the job spell, rather than the year. The dependent variable is mode of entry. Promotions are the excluded category, allowing us to interpret coefficients as the extent to which external hires are more likely to have certain characteristics versus those who were promoted. Because some jobs were also entered by transfers, I conduct multinomial logit

⁷ I also conducted a Heckman analysis, correcting for sample attrition over time using interactions between year and function as an instrument. These analyses gave very similar results to OLS, and were not able to reject the hypothesis that the selection and performance equations were independent. A second possible concern is that workers who are in the same job after 5 or more years are a highly selected sample, given that they have neither been promoted nor dismissed, and so should have homogeneous performance. I explored this interpretation by including performance in subsequent positions in the analysis, controlling both for the position that someone initially entered (either by promotion or hiring) and the position where their performance was evaluated. This analysis replicated the prior analyses. Performance of internal promotes and externally hired workers converged over time; external hires' performance never overtook that of internally promoted workers.

analyses where either external hiring or internal transfers are alternative modes of entry to promotions. I hold characteristics of the job constant by controlling for department, city, year, and all interactions between ranks and functional dummies.

Consistent with H2, I find that external hires are older and better educated than internal promotes, being significantly more likely to have bachelor's degrees, masters degrees and PhDs. Differences between those promoted and transferred internally are much smaller, and nowhere significant. Overall, I confirm H2 that the firm hires workers with stronger observable signals of ability than the workers that they promote into similar positions.⁸

Pay

Table 4 analyzes determinants of compensation. I regress pay on individual characteristics, interactions between rank and function and rank and department, group, city and year (I use more detailed controls in this analysis because of a concern that pay may be more sensitive than performance to the exact details of the work that people do, and the skills that they therefore need). Panel 4A has log salary as the dependent variable, Panel 4B has log bonus, and Panel 4C has log total compensation. For each dependent variable I examine the effects of promotion with and without time trends, observable signals of ability, and performance evaluations. Because many observations lack performance evaluations – largely because people were hired too late to have an evaluation for that year – the fifth model in each panel includes only those observations for which I have performance evaluations, but does not control for those evaluations.

⁸ I checked whether this result might reflect the lowest level hiring people directly out of undergraduate courses while higher levels recruit directly out of graduate programs by dropping the second lowest level (the one that I was concerned would hire directly from graduate programs). The results were robust to this restriction.

The results in Panel 4A support H3. Promoted workers receive significantly lower salaries than do those who are hired externally. Controlling for time trends (model 2) we find that promotes receive initial salaries that are on average 17% lower than those hired into the same position. The interaction between time and promotion indicates that the gap between hires and promotes narrows over time, albeit slowly; the coefficients indicate that the salaries of promotes catch up with external hires after 7 years. The decline in the premium for external hires suggests that this premium may not be due solely to the higher human capital of external hires. Differentials due to signals of ability tend to be roughly constant over time, at least on average (Farber, and Gibbons, 1996), as those signals ultimately reflect real difference in value to all employers. Declining salary differentials therefore suggest that the increased pay of external hires is due to something other than observable signals of ability – most likely the need to pay external hires more than internal promotes given the higher risk of a poor match.

Model 3 estimates the effects of being promoted without human capital controls. The pay differential for promoted workers is only very slightly higher, indicating that differences in observable signals of ability (at least, those that are observable to us) do not contribute substantially to pay differences between internal promotes and external hires. Controlling for performance (model 4) slightly increases the gap between hires and promotes, given that external hires perform worse than promotes.

The effects of promotion on bonuses, as presented in Panel 4B, are more complex. Overall, there is no significant effect of promotion on bonuses (model 6), but this conceals lower bonuses for externally hired workers in early years followed by higher bonuses in following years (model 7) – the opposite pattern to salaries. This pattern is caused in part by individuals who enter the firm

later in the year getting no bonus or only a small one. When I exclude those individuals who do not receive a performance evaluation (model 10), largely because they entered too late in the year, the effect of promoted on bonuses is negative but not significant. This effect is significant once we control for performance (model 9). These results suggest that external hires are able to secure higher bonuses than an internal promote of the same level of performance, either because of the need to offer a higher total compensation package to attract them, or because their higher base salary anchors bonus expectations higher.

Panel 4C provides results for total compensation. I find that promoted workers receive lower compensation than external hires, again supporting H3. These effects are stronger when we control for performance. In their first year, promotes receive 26% less than internal promotes with the same performance (model 14). Comparison to model 15, which excludes observations for which we lack performance data, suggests that 56% of this pay differential is due to the higher pay received by external hires, and 44% is due to their lower performance.

Among the controls, measures of hiring and turnover at the group level generally have negative effects on pay, suggesting that our results are not being driven by particularly tight labor markets. These controls also have little impact on the main effects. We find positive effects of education (particularly Masters and PhDs) on pay, confirming their role as observable signals of ability within the market. The effects of age are more complex. Older workers receive higher salaries but lower total compensation, reflecting their lower performance. As noted above, older workers' lower performance likely reflects unobserved quality issues, correlated with how long it takes a worker to reach a given rank. When I drop job-level controls (not reported here), I find positive, significant effects of age on all components of pay. All three measures of performance

have substantial and significant effects on bonuses. Moving from the lowest to the highest level of competence, for example, would increase the bonus by 60%.

Promotion

The vast majority of promotions at Croesus occur during the annual personnel process and take place on the same date. Event history analysis is not therefore appropriate for analyzing promotions, as it assumes continuous probabilities of promotion over time. Instead, I assess the probability of promotion for a given individual in a given year. I drop all years in which workers are transferred or terminated from the data set, to analyze the determinants of promotion versus remaining in the job. Because there is likely to be extensive time dependence in such processes, I also control for how many years the individuals has been in the job (I drop the first year in the job because I am unable to observe promotions during that period).

Results of this analysis are presented in Table 5. Counter to Hypothesis 4, I find that external hires have a higher rate of subsequent promotion than internal promotes. The nature of this effect is somewhat sensitive to controls. When I add compensation in the prior year into the analysis, I no longer find a significant effect of entry mode. This may indicate that the higher human capital of external hires is a partial cause of their higher rate of promotion. Once performance is controlled for, however, I continue to find that external hires get promoted at a faster rate. I consider possible explanations for this effect in the discussion section. As noted in footnote 7, external hires higher rates of promotion do not affect my main performance findings.

Exit

Table 6 examines the determinants of voluntary and involuntary exit. The analysis uses Cox proportional hazard event history models with full controls. I only use data from 2006 to 2009

because the data on reasons for exit is incomplete for prior years. Of 13,633 person years analyzed, 1,282 ended in involuntary exit and 1,333 ended in voluntary exit.

I find strong support for my hypotheses. Workers who are hired externally have higher voluntary and involuntary exit rates than those who were promoted into their jobs. These effects are also substantial; the hazard rate of involuntary exit for external hires is almost double that of internal promotes (relative hazard rate = 1/0.55); external hires are also over 60% more likely to leave voluntarily than are internal promotes. As we might expect, the various measures of performance explain a substantial amount of the effect of having been promoted on probability of involuntary exit. Performance also predicts voluntary turnover, but shows less sign of mediating the effects of having been promoted. Intriguingly, we actually find a positive relationship between salary and voluntary exit. This may reflect pre-emptive attempts by Croesus to retain those most at risk of leaving.

Further Analyses

Sources of Hires. A core argument of this paper is that differences in the information available to firms and workers during the matching process lead to differences in the compensation of promotes and hires. Variation in the nature of the hiring process can be used to gain further insight into this effect. In particular, a corollary of my argument is that variations in the information available to firms and workers during hiring should also affect pay.

Most hires within Croesus come from three sources: unsolicited applications, employment intermediaries (employment agencies and executive search firms), and referrals by existing employees. Although the evidence on employee referrals is mixed (Fernandez, et al., 2000; Mouw, 2003; Castilla, 2005), we would expect that workers brought in through referrals would

have the most information about their potential match with the job. An internal social contact is more likely to provide applicants with richer information about the nature of Croesus and the proposed job than others involved in the recruiting process. The pre-existing relationship may also help the applicant to trust the information that they are given about the job (Granovetter, 1985). Comparing workers hired through intermediaries versus headhunters also allows for a test of how adverse selection affects performance. We would generally expect that workers sending in unsolicited applications are among those most likely to be leaving another job because of poor performance. To the extent that search firms are more likely to target workers who are comfortable in their current jobs, they may be less subject to problems of adverse selection.

The data provided by Croesus included the referral source for the hire of each worker (although this data was missing for 848 workers). Of the 2,247 workers who entered a job through external hiring and for whom the referral source was known, 754 came through an employment agency or executive search firm, 741 were referred by an employee, and 514 were hired following unsolicited applications. The remaining 238 employees were hired through a variety of other means, including advertisements, client referrals, internet applications, and temporary jobs.

I included these variables in analyses of human capital characteristics, performance, and pay. I found no significant differences among the observable signals of ability of externally hired workers based on the source from which they were hired. In the performance analyses, I found that workers hired through unsolicited applications had higher contribution ratings than new hires brought in through an agency or through employee referrals ($p < .0007$ and $p < .0001$). Such a finding is the opposite of what an adverse selection story would predict. There were no significant differences in ratings of competence or ranked performance.

The most dramatic differences between the different hiring routes were in how workers were paid. I present these analyses in Table 7. Employee referrals consistently received lower pay than workers hired through an intermediary, or through an unsolicited application. These differences are strongly significant for total compensation, but less so for its individual components.

This finding provides additional support for my argument that external hires' pay premium is due to reduced information about their fit in the job. When external hires have access to more information through internal contacts at the organization, they accept the job for less pay. This finding is also interesting in its own right: research on hiring has generally found that workers finding jobs through their personal networks receive higher pay than others (Bridges, and Villemez, 1986; Marsden, and Hurlbert, 1988). That I find the reverse is most likely due to the nature of the job being held constant. Although personal networks may help people to find higher paying jobs (but see Mouw (2003)), pay within those jobs is slightly lower among those who entered them through personal connections.

Variation by Job Function. There is substantial variation in the kinds of work that individuals do at Croesus. In particular, the data contains two very different sets of workers: investment professionals such as traders, salespeople, research analyst and investment bankers; and support staff in IT, operations, accounting and so on. As a robustness check, I separated out these two groups of workers to check how the basic results applied to each. For the core findings of pay, performance and subsequent mobility I found consistent, significant results in each of these two groups, demonstrating that results are not being driven by a particular occupational group.

Alternative Explanations

It is worth reviewing the evidence for alternative explanations of my findings. For example, scholars have previously drawn on tournament theory to examine differences between external hires versus promotions (Chan, 2006; Oyer, 2007). Tournament theory suggests that firms will be reluctant to hire outside workers, because such hiring mutes internal incentives based on promotion. As a consequence, firms will only hire external workers who have higher ability than internal candidates. While I also find that external hires have higher human capital than internal promotes, my other findings are inconsistent with tournament theory. In particular, the tournament theory perspective implies that external hires should perform better than internal promotes post-hire. I find that external workers perform worse than internal promotes initially, and never overtake them.

An alternative explanation for hires' weaker performance is that their ratings are depressed by supervisory bias. If supervisors believe that promotes will perform better than external hires, then they may give promotes stronger evaluations, even though their actual performance is no different. It is therefore possible that subjective biases may drive performance differences.

Although I lack objective performance data, there is variation in how the performance measures reflect objective outcomes. While competence measures are largely subjective, the contribution measure tracks concrete achievement of objectives. In addition, performance in some jobs is based on clearly measurable outcomes; in particular, traders and sales people have clearly measurable profit and revenue performance. If differences between hires and promotes were driven by supervisory biases, we would expect the differences to be smaller in these situations when performance measures are more objective.

Supplementary analyses revealed no support for an interpretation of the results based on supervisor bias. In fact, as table 2 revealed, results were *stronger* for the more objective contribution measure than for the competence or performance rank measures. In addition, performance differences between promotes and external hires were greater for traders and salespeople, not weaker as we would expect if differences were driven by subjective biases. If anything supervisory biases may be minimizing differences between promotes and external hires. Such a finding is consistent with prior research; Sturman's meta-analysis (2003) shows that objective performance measures are actually more sensitive to organizational tenure than subjective measures. Escalation of commitment following a manager's decision to hire a worker may also inflate appraisals for new hires (Schoorman, 1988), particularly if the manager has more discretion in choosing who to hire versus who to promote.

An alternative explanation for the pay findings is that they represent cohort effects rather than the effects of promotion. Baker, Gibbs and Holmstrom (1994b) find that pay of existing workers within the firm can respond less to market forces than the pay of new hires. If market pay was rising particularly rapidly during the period of the study, pay for new hires might have increased faster than pay for internal promotes, leading to a wage differential.

Fully teasing apart such cohort effects from the effects of hiring is complex given the relatively short time frame of our data. Year of hire is strongly correlated with how someone entered their job – almost everybody hired in 2008 and 2009 is only observed in jobs for which they were externally hired. As a consequence, we cannot simply include controls in the analysis for the year in which workers are hired. Instead, I compared trends over time in the pay given to new hires versus that given to all workers. I found that compensation of continuing workers actually

varied more from one year to another than did the compensation of new hires, with compensation for continuing workers growing faster than that of new hires from 2003 to 2008 (controlling for all demographic and organizational variables, as well as time in job), and falling faster in 2009. It is also possible that starting pay during the period of the study was substantially higher than previous periods. I therefore controlled in additional analyses for whether the workers were hired before 2002. Such a control slightly attenuated the effect of the promoted variable (as is not surprising given their correlation) but did not substantially change the results.

A further alternative explanation for the pay findings relates to the structure of negotiations. If external hires are already in jobs that they could stay in, their best alternative to a negotiated agreement might be better than internal promotes, who lack alternative jobs. If external hires have better alternatives, we would expect their pay to be higher (Bazerman, and Neale, 1992). Theoretical and empirical evidence does not support such a negotiations effect driving the results though. Theoretically, it is not clear that external hires genuinely have a better alternative than internal promotes; the fact that they are prepared to leave their current jobs suggests that external hires' prior employment situation may not have suited them so well (Lee, and Mitchell, 1994); similarly, internal promotes retain the credible threat of finding another job should they be underpaid. Empirically, we would expect that external hires who make unsolicited applications would have the poorest alternatives, as they have made the clearest effort to leave their current job – yet such hires do not receive any less money than other external hires. Furthermore, we find strong evidence that the jobs are less attractive to external hires than internal promotes; those hires face a performance disadvantage, have much higher rates of termination and higher rates of turnover. We should expect them to demand higher compensation to take the job.

DISCUSSION

This paper contributes to our understanding of internal and external labor market matching processes by comparing the outcomes of workers who are promoted internally into a position with those of workers who are hired externally into similar positions. I draw on theories of firm specific skills and incomplete information to predict how the characteristics, performance and subsequent mobility of workers might vary depending on which of these two routes they take to their jobs.

I find two important costs to organizations of external hiring: externally hired workers have lower performance than promoted workers during their first three years; yet despite this lower performance, external hires are paid more than the promoted workers. I also find that external hires are much more likely to be terminated or quit their jobs than are promotes, suggesting that cross-organization moves are risky for workers as well as employers. The findings are not only statistically significant but also substantively important: to hire externally someone of similar performance to an internal promote, the firm I studied would pay 35% more in the first year.

The empirical work also supports the role of two mechanisms in generating pay differences between external hires and internal promotes. First, I find that external hires have stronger observable signals of ability, such as age and education. Those signals correlate strongly with pay. A variety of evidence suggests that the poorer expected fit of external hires with their jobs also increases their pay. External hires' higher turnover and termination rates provide strong evidence of their poorer fit with their jobs. The lower pay premia received by employee referrals also suggest that workers demand less pay when they know more about the job. In addition, the observed declines in external hires' salary premia over time are not consistent with an account of

those premia that stems purely from observable signals of ability. The higher pay commanded by external hires also raises the question of why promotes don't leave for higher paid jobs elsewhere. As I have proposed above, the greater risk that those promotes will find a poor match with a different firm reduces the attraction of moving for money.

The one hypothesis that was not supported regarded rates of subsequent promotion. I predicted that internal promotes would have higher rates of subsequent promotion than external hires, based on their higher average performance. In fact, the analyses found that internal promotes had lower rates of promotion. One possible explanation for this finding is that there is higher variance in the ability of external hires. While external hires may on average have lower levels of valuable externally unobservable characteristics than do internal promotes, some of them will have levels of such characteristics that are just as high. Because external hires will also have higher levels of valuable observable characteristics, it is possible that the very highest performers may be external hires. Since subsequent promotions draw from the upper end of the ability distribution, they might then contain disproportionate numbers of external hires.

It should be emphasized that the main focus of this study was a single site. Two aspects of this site may help to shape the results. On the one hand, we generally expect that firm specific skills are reasonably weak in banking because of the way that exposure to the market promotes common knowledge and common approaches across organizations. Differences between promotes and external hires may therefore be weaker than elsewhere. On the other hand, the way that workers often continue to carry out similar jobs after a promotion may strengthen the performance advantages of promotes. Two factors suggest that these effects may not unduly bias the findings, though. First the results are consistent across the substantially different occupations

involved in “front office” investment work and “back office” support roles. Second, partial replication from two other organizations, one of which contains workers carrying out more traditional managerial work, confirms that the phenomenon of paying more to get less may be a more general problem among organizations. Broader replication would help us understand when these problems are most serious. It would also be valuable for future work to examine the kinds of skills that external hires initially lack, and the kinds of skills that are most difficult to assess for external hires relative to internal promotes.

The stark differences in cost and performance of external hires compared to internal promotes raises the question of why these organizations are choosing to hire at all. As I noted in the theory section, there are a number of *ex ante* costs to promotions, including training workers and estimating future demand, that are not captured in my empirical comparisons of *ex post* pay and performance. The findings of this paper should not, therefore, be treated as suggesting that external hiring is always a bad idea. Rather the paper seeks to understand and quantify some of the costs of that external hiring that must be set against its benefits.

As well as having practical implications for firms and workers, this study also contributes to research on internal labor markets. Internal labor market theory has generally focused on the patterns that shape compensation and mobility within organizations (Stewman, 1986; Osterman, 1987; Althausen, 1989; Baker, et al., 1994b). In conducting this work, scholars have often assumed that hiring was restricted to entry level positions. As a consequence, research has not examined how these processes of wage and position allocation change when workers can also be hired from outside. This paper shows that the route by which workers enter their job, promotion or external hiring, has substantial effects on each of these outcomes for workers. The paper

therefore contributes to a clearer understanding of how workers' trajectories may vary within internal labor markets as those markets become more open to external hiring.

The paper also contributes to the debates on the functions of internal labor markets. Scholars have variously argued that internalizing employment contributes to on the job training (Doeringer, and Piore, 1971), the retention of firm specific skills (Cappelli, 2000), control of the workforce (Williamson, 1975; Edwards, 1979) and resistance to unionization (Jacoby, 1985). Yet we have very little empirical evidence on the advantages that internal labor markets actually confer on organizations. By comparing promotes and external hires, this paper confirms the value of internal labor markets for fostering and retaining firm specific skills. The paper also identifies a novel benefit of internal labor markets - lowering wage costs by reducing the uncertainty that firms and workers face in the matching process. These findings are particularly important in helping to explain why internal labor markets appear to have been somewhat resilient in the face of increased pressures for worker mobility (Cappelli, 1999).

The findings also have implications for broader research on inter-organizational careers (Arthur, and Rousseau, 1996; Brett, and Stroh, 1997). Although prior work has made it clear that workers can pursue careers both between and within organizations, we have had little insight into the implications of those decisions. Building on Granovetter (1981), I show that how workers arrive in a position has important consequences for their careers, driving both their pay and future prospects. The paper provides strong evidence in particular that cross-firm moves represent a double-edged sword for workers: holding the nature of the job constant, those who enter a job from outside receive higher pay, but face a higher risk of termination. A further finding is that the opportunities for internal versus external advancement are not the same for all; workers with

stronger signals of observable ability such as experience or education are better able to reach higher level jobs externally. Building on these differences in antecedents and consequences of different career paths should allow us to understand in greater detail when people choose to build inter- versus intra-organizational careers.

One area in which such theory development may be particularly valuable is in understanding gender inequality. Recent research has begun to explore gender differences in promotions versus external hiring (Barnett, et al., 2000; Petersen, and Saporta, 2004; Gorman, and Kmec, 2009).

Those studies have explored the different ways that workers can get jobs, but have not examined whether those different routes might also have implications for the rewards that workers receive.

This research demonstrates that the different routes to jobs are not equal, and that gender differences in propensity for hiring versus promotion will also affect the pay and subsequent mobility of individuals within those jobs.

This paper also has implications for the literature on the effects of turnover on organizational performance (Glebbeck, and Bax, 2004; Shaw, et al., 2005). Existing research has shown that organizational units with higher turnover perform worse. This paper provides micro-level data on some of the sources of such performance deterioration: it is not just that external hires lack some of the skills that internal workers have; it is also that the firm needs to pay those hires more, in spite of those performance problems.

A final contribution of the paper is to provide further empirical evidence of the frictions found in labor markets. Under very simple neoclassical models of the market, workers should be paid according to their productivity. In this paper, though, we show that externally hired workers perform worse than internal promotes, but are paid more. Other work has suggested that

information asymmetries in the labor market may create rents for firms (Acemoglu, and Pischke, 1998; Autor, 2003). This paper provides some of the most direct evidence that employers are able to capture many of the returns from longer term relationships with workers –at least among those that turn out to be high performers.

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TABLE 1: SUMMARY STATISTICS FOR KEY VARIABLES

Unit of analysis is a year spent in a job. Each observation contains pay in that year, and most recent performance evaluation.

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) Promoted	0.58	0.49	1																	
(2) Transferred	0.09	0.29	-0.37	1																
(3) Age	37.90	7.16	-0.16	0.12	1															
(4) Bachelors	0.91	0.28	-0.05	0	-0.11	1														
(5) Masters	0.39	0.49	-0.07	-0.02	0.11	-0.19	1													
(6) PhD	0.08	0.27	-0.09	0	0.16	-0.07	-0.06	1												
(7) MBA	0.27	0.45	-0.03	-0.02	0.08	-0.09	0.76	-0.11	1											
(8) Perf. rank	3.82	1.38	0.27	-0.13	-0.17	0.02	-0.06	0	-0.07	1										
(9) Contribution	3.77	0.65	0.22	-0.1	-0.1	-0.01	-0.02	-0.02	-0.03	0.56	1									
(10) Competence	3.76	0.70	0.2	-0.12	-0.14	0	-0.01	0	-0.01	0.53	0.55	1								
(11) Log Comp.	12.40	0.88	0	-0.01	0.13	-0.01	0.1	0.06	0.16	0.18	0.2	0.2	1							
(12) Log Bonus	8.91	5.15	0.04	-0.01	-0.03	-0.01	0.03	0.03	0.06	0.2	0.19	0.18	0.64	1						
(13) Log Salary	11.72	0.27	-0.21	0.06	0.42	-0.02	0.12	0.16	0.12	0.05	0.05	0.01	0.6	0.15	1					
(14) Days in Job	647.15	431.61	0.14	-0.12	0.23	-0.03	-0.01	0	0.01	-0.21	-0.11	-0.16	0.04	-0.11	0.16	1				
(15) Year	2006.76	1.77	0.01	0.08	0.12	0	-0.01	-0.02	-0.03	-0.04	-0.03	-0.04	-0.15	-0.28	0.18	0.29	1			
(16) Rank	2.99	0.98	0.04	0.03	0.4	-0.02	0.08	0.09	0.14	0.12	0.12	0.08	0.64	0.2	0.8	0.13	0.05	1		
(17) Male	0.77	0.42	-0.01	-0.01	0.01	0	0.06	-0.01	0.06	0.02	-0.01	0.01	0.19	0.05	0.18	-0.02	-0.03	0.14	1	
(18) White	0.77	0.42	0.05	0.02	0.12	0.01	-0.11	-0.02	-0.02	0.03	0.03	0.02	0.13	0.08	0.12	0.06	-0.07	0.19	0.06	1
(19) Asian	0.16	0.37	-0.04	-0.03	-0.13	0	0.12	0.02	0.02	-0.02	-0.01	0	-0.09	-0.07	-0.07	-0.06	0.07	-0.15	-0.03	-0.81

TABLE 2: DETERMINANTS OF PERFORMANCE RATING

Ordered logit analyses. All analyses include dummies for rank, function, interactions between rank and function, department, year, and city. Additional analyses also controlling for business group yielded very similar results. Errors clustered by individual

Dependent variable	1	2	3	4	5	6	7	8	9 ^a
		Performance rank			Competence			Contribution	
Transferred	0.033 [0.0650]	0.157* [0.0696]	0.612** [0.141]	0.055 [0.0675]	0.129+ [0.0724]	0.316* [0.150]	0.161* [0.0655]	0.223** [0.0719]	0.841** [0.143]
Time in job	0.000320** [4.56e-05]	0.000632** [4.93e-05]	0.00103** [8.96e-05]	0.000275** [4.50e-05]	0.000469** [5.04e-05]	0.000679** [9.19e-05]	0.000362** [4.60e-05]	0.000567** [5.10e-05]	0.00110** [9.79e-05]
Promoted	0.317** [0.0415]	0.175** [0.0445]	0.680** [0.0865]	0.183** [0.0428]	0.101* [0.0470]	0.386** [0.0989]	0.476** [0.0440]	0.370** [0.0476]	1.065** [0.101]
Male		0.117* [0.0500]	0.116* [0.0498]		0.0314 [0.0543]	0.0315 [0.0543]		0.0166 [0.0547]	0.0129 [0.0543]
Asian		0.074 [0.100]	0.0782 [0.101]		0.188+ [0.108]	0.188+ [0.108]		0.239* [0.114]	0.245* [0.114]
White		0.288** [0.0917]	0.293** [0.0926]		0.300** [0.0962]	0.302** [0.0965]		0.330** [0.103]	0.342** [0.104]
Bachelors		0.0724 [0.0742]	0.0565 [0.0741]		-0.0721 [0.0767]	-0.0801 [0.0768]		-0.0675 [0.0841]	-0.0857 [0.0839]
Masters		0.0155 [0.0453]	0.0158 [0.0452]		-0.0401 [0.0473]	-0.0392 [0.0472]		-0.0104 [0.0502]	-0.0107 [0.0502]
PhD		0.283** [0.0862]	0.284** [0.0862]		0.371** [0.0930]	0.371** [0.0931]		0.205* [0.104]	0.201* [0.103]
Age		-0.0740** [0.00373]	-0.0739** [0.00375]		-0.0468** [0.00400]	-0.0467** [0.00400]		-0.0522** [0.00405]	-0.0514** [0.00403]
Promoted * time in job			-0.000570** [0.000102]			-0.000311** [0.000105]			-0.000773** [0.000109]
Transferred *time in job			-0.000559** [0.000181]			-0.000211 [0.000180]			-0.000753** [0.000170]
Observations	18314	15643	15643	17535	14968	14968	17538	14970	14970

** p<0.01, * p<0.05, + p<0.1; a: analysis excludes city dummies to allow for convergence. Tests suggest little effect of city on main coefficients

TABLE 3: DETERMINANTS OF HIRING VERSUS PROMOTION

Unit of analysis is an individual job. Multinomial logit analysis predicts whether the job was entered by promotion (base case, not shown), external hire, or internal transfer. All analyses include dummies for rank, function, interaction between each rank and function, year, sector, and city.

Dependent Variable	External hire	Transfer
White	-0.117 [0.116]	0.477 [0.327]
Asian	0.152 [0.126]	0.245 [0.355]
Male	0.236** [0.0708]	-0.154 [0.154]
Bachelors	0.507** [0.110]	-0.124 [0.229]
Masters	0.465** [0.0611]	0.2 [0.146]
PhD	0.654** [0.112]	0.166 [0.295]
Age	0.0621** [0.00562]	-0.01 [0.0158]
Observations	7356	7356

** p<0.01, * p<0.05, + p<0.1

TABLE 4A: DETERMINANTS OF LOG SALARY

Ordinary Least Squares Regression. Includes controls for city, year, all interactions between rank and function, all interactions between rank and department, and group. Errors are clustered by individual

	1	2	3	4	5
Full Time	0.231** [0.0429]	0.233** [0.0428]	0.248** [0.0402]	0.233** [0.0458]	0.231** [0.0461]
Terminated During Year	-0.00836** [0.00243]	-0.00654** [0.00242]	-0.00471* [0.00240]	-0.0021 [0.00262]	-0.00805** [0.00258]
Group Turnover Prop at time of hire	-0.0219* [0.0105]	-0.0155 [0.0104]	-0.0199* [0.0101]	-0.0118 [0.0106]	-0.00636 [0.0107]
Group Turnover Prop	0.00281 [0.00736]	-0.000738 [0.00722]	0.000877 [0.00684]	-0.00892 [0.00830]	-0.00726 [0.00841]
Group New Hire Prop at time of hire	0.0109 [0.0101]	0.016 [0.0100]	0.0181+ [0.00973]	0.0111 [0.0107]	0.00836 [0.0108]
Group New Hire Prop	0.00336 [0.00728]	-0.0180* [0.00741]	-0.0147* [0.00696]	-0.0289** [0.0110]	-0.0266* [0.0110]
Age	0.00220** [0.000316]	0.00216** [0.000317]		0.00191** [0.000323]	0.00147** [0.000322]
Male	0.0204** [0.00367]	0.0205** [0.00367]		0.0220** [0.00391]	0.0224** [0.00393]
Asian	0.00811 [0.00623]	0.00842 [0.00628]		0.00969 [0.00658]	0.00932 [0.00667]
White	0.000417 [0.00570]	0.000717 [0.00576]		-0.000965 [0.00599]	-0.000247 [0.00608]
Bachelors	0.00507 [0.00500]	0.00658 [0.00503]		0.00774 [0.00509]	0.00756 [0.00511]
Masters	0.00966** [0.00286]	0.00956** [0.00286]		0.0110** [0.00285]	0.0107** [0.00289]
PhD	0.0344** [0.00600]	0.0343** [0.00600]		0.0288** [0.00614]	0.0299** [0.00621]
Transferred	-0.0420** [0.00527]	-0.0564** [0.00691]	-0.0652** [0.00651]	-0.0615** [0.00859]	-0.0601** [0.00873]
Time in Job	3.85e-05** [3.31e-06]	9.26E-07 [5.30e-06]	1.68E-07 [4.85e-06]	2.07E-06 [7.07e-06]	5.94E-06 [7.40e-06]
Promoted	-0.116** [0.00346]	-0.155** [0.00482]	-0.167** [0.00446]	-0.176** [0.00700]	-0.161** [0.00705]
Promoted * Time in Job		5.85e-05** [5.88e-06]	6.09e-05** [5.39e-06]	7.53e-05** [7.51e-06]	6.27e-05** [7.81e-06]
Transferred * Time in Job		1.82e-05+ [9.73e-06]	2.26e-05* [8.94e-06]	2.30e-05* [1.03e-05]	1.95e-05+ [1.06e-05]
Last ranked Performance				0.00805** [0.00111]	
Last Contribution				0.000301 [0.00200]	
Last Competence				0.00415* [0.00182]	
Observations	18363	18363	21388	13405	13405
R-squared	0.856	0.858	0.849	0.869	0.867

** p<0.01, * p<0.05, + p<0.1

TABLE 4B: DETERMINANTS OF LOG BONUS

Ordinary Least Squares Regression. Includes controls for city, year, all interactions between rank and function, all interactions between rank and department, and group. Errors are clustered by individual.

	6	7	8	9	10
Full Time	0.639 [0.435]	0.637 [0.434]	0.584 [0.381]	0.63 [0.459]	0.575 [0.472]
Terminated During Year	-9.963** [0.0637]	-9.982** [0.0637]	-9.910** [0.0597]	-9.858** [0.0761]	-10.02** [0.0737]
Group Turnover Prop at time of hire	-1.049** [0.216]	-1.136** [0.216]	-0.957** [0.202]	-1.140** [0.251]	-1.007** [0.253]
Group Turnover Prop	0.233 [0.234]	0.299 [0.234]	0.175 [0.219]	0.334 [0.276]	0.376 [0.275]
Group New Hire Prop at time of hire	0.0427 [0.171]	-0.0015 [0.173]	-0.0445 [0.164]	0.447* [0.215]	0.389+ [0.219]
Group New Hire Prop	-0.0306 [0.181]	0.214 [0.190]	0.247 [0.173]	0.295 [0.272]	0.359 [0.273]
Age	-0.0295** [0.00426]	-0.0289** [0.00426]		-0.00941+ [0.00495]	-0.0206** [0.00495]
Male	-0.0361 [0.0507]	-0.0392 [0.0506]		-0.0197 [0.0594]	-0.0162 [0.0607]
Asian	-0.137 [0.0988]	-0.137 [0.0992]		-0.145 [0.122]	-0.15 [0.125]
White	-0.0714 [0.0879]	-0.0717 [0.0884]		-0.0534 [0.109]	-0.0313 [0.111]
Bachelors	0.0239 [0.0780]	0.00789 [0.0776]		-0.00327 [0.0910]	-0.0153 [0.0934]
Masters	0.0894+ [0.0469]	0.0882+ [0.0468]		0.0786 [0.0532]	0.0665 [0.0544]
PhD	0.159+ [0.0899]	0.159+ [0.0899]		0.0484 [0.102]	0.0762 [0.106]
Transferred	0.242** [0.0838]	0.894** [0.140]	0.831** [0.128]	0.0509 [0.201]	0.0954 [0.204]
Time in Job	0.000323** [6.53e-05]	0.000802** [0.000124]	0.000707** [0.000117]	-8.53E-05 [0.000186]	2.00E-05 [0.000191]
Promoted	0.074 [0.0562]	0.493** [0.105]	0.500** [0.0955]	-0.570** [0.182]	-0.185 [0.182]
Promoted * Time in Job		-0.000629** [0.000140]	-0.000585** [0.000131]	0.000384+ [0.000200]	7.40E-05 [0.000203]
Transferred * Time in Job		-0.00119** [0.000234]	-0.00112** [0.000213]	-0.000289 [0.000275]	-0.000375 [0.000280]
Last ranked Performance				0.151** [0.0232]	
Last Contribution				0.116* [0.0496]	
Last Competence				0.147** [0.0452]	
Observations	18363	18363	21388	13405	13405
R-squared	0.793	0.794	0.788	0.816	0.813

** p<0.01, * p<0.05, + p<0.1

TABLE 4C: DETERMINANTS OF LOG TOTAL COMPENSATION

Ordinary Least Squares Regression. Includes controls for city, year, all interactions between rank and function, all interactions between rank and department, and group. Errors are clustered by individual

	11	12	13	14	15
Full Time	0.340** [0.0934]	0.340** [0.0938]	0.363** [0.0815]	0.359** [0.0965]	0.344** [0.100]
Terminated During Year	-0.740** [0.0132]	-0.742** [0.0133]	-0.717** [0.0123]	-0.742** [0.0154]	-0.789** [0.0153]
Group Turnover Prop at time of hire	-0.150** [0.0430]	-0.158** [0.0426]	-0.135** [0.0398]	-0.239** [0.0469]	-0.200** [0.0485]
Group Turnover Prop	0.0145 [0.0455]	0.0214 [0.0456]	0.0134 [0.0412]	0.0788 [0.0562]	0.0905 [0.0562]
Group New Hire Prop at time of hire	0.0195 [0.0360]	0.0162 [0.0364]	0.00362 [0.0329]	0.0595 [0.0425]	0.0433 [0.0447]
Group New Hire Prop	-0.187** [0.0330]	-0.165** [0.0345]	-0.140** [0.0313]	-0.160** [0.0546]	-0.142** [0.0549]
Age	-0.00606** [0.000834]	-0.00601** [0.000833]		-0.00383** [0.000973]	-0.00714** [0.000992]
Male	0.0678** [0.0101]	0.0674** [0.0101]		0.0766** [0.0116]	0.0777** [0.0120]
Asian	-0.0239 [0.0195]	-0.0238 [0.0195]		-0.0368 [0.0225]	-0.0383 [0.0242]
White	-0.0297 [0.0182]	-0.0296 [0.0183]		-0.0476* [0.0212]	-0.0411+ [0.0229]
Bachelors	0.0197 [0.0155]	0.0183 [0.0154]		0.0237 [0.0171]	0.0201 [0.0182]
Masters	0.0186+ [0.00980]	0.0184+ [0.00979]		0.0283** [0.0108]	0.0248* [0.0116]
PhD	0.0782** [0.0197]	0.0781** [0.0197]		0.0582** [0.0216]	0.0656** [0.0231]
Transferred	-0.0187 [0.0157]	0.0591* [0.0247]	0.0399+ [0.0221]	-0.0704+ [0.0380]	-0.0551 [0.0396]
Time in Job	0.000152** [1.29e-05]	0.000197** [2.39e-05]	0.000177** [2.16e-05]	7.18e-05+ [3.73e-05]	0.000105** [3.96e-05]
Promoted	-0.101** [0.0120]	-0.0648** [0.0180]	-0.0658** [0.0160]	-0.264** [0.0347]	-0.149** [0.0358]
Promoted * Time in Job		-5.40e-05* [2.67e-05]	-5.65e-05* [2.40e-05]	0.000127** [3.97e-05]	3.45E-05 [4.19e-05]
Transferred * Time in Job		-0.000146** [3.82e-05]	-0.000139** [3.39e-05]	6.74E-06 [4.77e-05]	-2.08E-05 [4.97e-05]
Last ranked Performance				0.0464** [0.00474]	
Last Contribution				0.0438** [0.00969]	
Last Competence				0.0285** [0.00822]	
Observations	18363	18363	21388	13405	13405
R-squared	0.769	0.769	0.769	0.777	0.77

** p<0.01, * p<0.05, + p<0.1

TABLE 5: DETERMINANTS OF SUBSEQUENT PROMOTION

Logit analysis. Unit of analysis is a year spent in the job. Dependent variable is 1 if worker is promoted, 0 otherwise. Years in which worker exits firm or is transferred are dropped from sample. All analyses include controls for city, year, all interactions between rank and function, department and group. Robust standard errors clustered by individual.

	1	2	3	4
Full time	1.386 [1.138]	-0.436 [1.600]	-1.696 [1.653]	-2.768+ [1.607]
Age	-0.0538** [0.00892]	0.00553 [0.0104]	-0.0317** [0.0108]	0.0119 [0.0115]
Male	0.377** [0.111]	0.439** [0.126]	-0.00642 [0.125]	0.12 [0.141]
Asian	0.247 [0.217]	0.323 [0.276]	0.229 [0.222]	0.258 [0.267]
White	0.498* [0.198]	0.427+ [0.260]	0.612** [0.202]	0.530* [0.247]
Bachelors	0.280* [0.143]	0.225 [0.182]	0.211 [0.153]	0.175 [0.186]
Masters	0.237** [0.0866]	0.333** [0.107]	0.147 [0.0934]	0.203+ [0.111]
PhD	0.635** [0.163]	0.553** [0.207]	0.385* [0.185]	0.410+ [0.230]
Transfer	0.900** [0.184]	0.981** [0.210]	1.272** [0.188]	1.329** [0.215]
Third year of job	2.449** [0.109]	2.305** [0.136]	2.144** [0.117]	2.089** [0.141]
Fourth year of job	3.616** [0.130]	3.780** [0.165]	3.387** [0.142]	3.624** [0.165]
Fifth year of job	3.491** [0.183]	3.546** [0.217]	3.446** [0.201]	3.536** [0.229]
Sixth year of job	3.998** [0.255]	4.036** [0.267]	3.873** [0.276]	3.990** [0.295]
Seventh year of job	3.525** [0.433]	3.960** [0.463]	3.318** [0.477]	3.908** [0.463]
Promoted	-0.414** [0.0957]	-0.868** [0.123]	-0.159 [0.113]	-0.462** [0.135]
Last ranked performance		1.203** [0.0541]		0.992** [0.0614]
Last contribution		0.0532 [0.109]		-0.0643 [0.115]
Last competence		0.338** [0.0955]		0.340** [0.0977]
Last log salary			3.698** [0.588]	4.013** [0.675]
Last log bonus			2.491** [0.361]	1.845** [0.407]
Observations	7625	6936	7457	6936

** p<0.01, * p<0.05, + p<0.1

TABLE 6: DETERMINANTS OF EXIT

Cox analysis of hazard rates. Only contains years 2006-2009. Promotions and transfers treated as censored events. All analyses include controls for city, year, all interactions between rank and function, department and group. Robust standard errors clustered by individual.

Dependent variable	1	2	3	4	5	6
	Involuntary exit			Voluntary exit		
Transferred	-0.413**	-0.424**	-0.290**	-0.911**	-0.855**	-0.870**
	[0.0948]	[0.0957]	[0.109]	[0.120]	[0.120]	[0.133]
Age	0.0380**	0.0385**	0.0222**	-0.0181**	-0.0213**	-0.0389**
	[0.00463]	[0.00465]	[0.00525]	[0.00613]	[0.00628]	[0.00717]
Full time	-0.725*	-0.693*	-1.019**	-1.746**	-1.840**	-1.635**
	[0.288]	[0.293]	[0.354]	[0.211]	[0.214]	[0.220]
Male	0.0516	0.0558	0.088	0.146+	0.119	0.126
	[0.0687]	[0.0688]	[0.0788]	[0.0750]	[0.0750]	[0.0828]
Asian	0.0214	0.0188	-0.00244	0.0789	0.058	0.0635
	[0.128]	[0.128]	[0.146]	[0.129]	[0.128]	[0.146]
White	-0.306**	-0.309**	-0.263*	-0.0932	-0.105	-0.0771
	[0.112]	[0.112]	[0.130]	[0.118]	[0.117]	[0.133]
Bachelors	-0.000746	0.00113	0.0301	0.332**	0.317**	0.312*
	[0.0960]	[0.0959]	[0.108]	[0.121]	[0.121]	[0.129]
Masters	0.0633	0.0694	0.0808	-0.036	-0.0546	-0.0787
	[0.0600]	[0.0604]	[0.0687]	[0.0649]	[0.0652]	[0.0728]
PhD	1.918**	1.927**	2.024**	2.028**	1.977**	1.987**
	[0.171]	[0.172]	[0.215]	[0.255]	[0.255]	[0.300]
Group turnover prop at hire	-2.623**	-2.619**	-3.086**	-1.440**	-1.484**	-1.739**
	[0.484]	[0.484]	[0.586]	[0.404]	[0.405]	[0.467]
Group new hire prop	0.0665	0.0673	-0.634*	0.556*	0.569*	0.208
	[0.228]	[0.228]	[0.261]	[0.261]	[0.262]	[0.294]
Group new hire prop at hire	-0.101	-0.0947	0.0805	0.197	0.168	0.114
	[0.124]	[0.124]	[0.122]	[0.122]	[0.123]	[0.135]
Promoted	-0.588**	-0.611**	-0.348**	-0.412**	-0.340**	-0.265**
	[0.0679]	[0.0717]	[0.0821]	[0.0746]	[0.0767]	[0.0871]
Log salary		-0.228	0.553+		0.945**	1.892**
		[0.226]	[0.301]		[0.272]	[0.354]
Last ranked performance			-0.180**			-0.178**
			[0.0327]			[0.0343]
Last contribution			-0.499**			-0.00426
			[0.0652]			[0.0631]
Last competence			-0.249**			-0.0602
			[0.0598]			[0.0586]
Observations	13633	13632	10504	13634	13632	10504

** p<0.01, * p<0.05, + p<0.1

TABLE 7: DETERMINANTS OF COMPENSATION BY HIRING SOURCE

Ordinary Least Squares Regression. Includes controls for city, year, all interactions between rank and function, all interactions between rank and department, and group. Errors are clustered by individual

Dependent Variable	1	2	3	4	5	6
	Log Salary		Log Bonus		Log Total Compensation	
Full time	0.229** [0.0446]	0.232** [0.0479]	0.71 [0.458]	0.742 [0.485]	0.353** [0.0975]	0.386** [0.102]
Terminated during year	-0.00668** [0.00255]	-0.00174 [0.00268]	-9.878** [0.0689]	-9.742** [0.0797]	-0.745** [0.0142]	-0.729** [0.0159]
Group turnover prop at hire	-0.015 [0.0105]	-0.00916 [0.0107]	-1.094** [0.231]	-1.120** [0.269]	-0.136** [0.0446]	-0.216** [0.0491]
Group turnover prop	0.00383 [0.00764]	-0.00897 [0.00861]	0.456+ [0.259]	0.515+ [0.302]	0.064 [0.0509]	0.1000+ [0.0603]
Group new hire prop at hire	0.0166 [0.0101]	0.0136 [0.0107]	0.0403 [0.189]	0.553* [0.231]	0.022 [0.0382]	0.0844+ [0.0439]
Group new hire prop	-0.0106 [0.00845]	-0.0328** [0.0112]	0.297 [0.239]	0.359 [0.298]	-0.159** [0.0440]	-0.195** [0.0590]
Age	0.00198** [0.000308]	0.00188** [0.000310]	-0.0276** [0.00456]	-0.0081 [0.00523]	-0.00600** [0.000834]	-0.00357** [0.000975]
Male	0.0199** [0.00370]	0.0216** [0.00396]	-0.0575 [0.0547]	-0.0265 [0.0632]	0.0665** [0.0103]	0.0763** [0.0118]
Asian	0.00612 [0.00639]	0.00829 [0.00653]	-0.163 [0.107]	-0.161 [0.129]	-0.0296 [0.0197]	-0.0427+ [0.0226]
White	-0.00159 [0.00589]	-0.00221 [0.00597]	-0.0853 [0.0962]	-0.0679 [0.116]	-0.0341+ [0.0185]	-0.0507* [0.0214]
Bachelors	0.00587 [0.00505]	0.00748 [0.00497]	-0.0377 [0.0811]	-0.0282 [0.0948]	0.0114 [0.0157]	0.0205 [0.0172]
Masters	0.00913** [0.00285]	0.0107** [0.00282]	0.0852+ [0.0497]	0.0878 [0.0562]	0.0227* [0.00998]	0.0326** [0.0109]
PhD	0.0349** [0.00591]	0.0297** [0.00596]	0.0913 [0.0924]	-0.00582 [0.107]	0.0738** [0.0199]	0.0585** [0.0215]
Transferred	-0.0404** [0.00996]	-0.0511** [0.0123]	0.933** [0.192]	-0.0782 [0.253]	0.142** [0.0325]	0.00612 [0.0490]
Time in job	8.26E-06 [5.68e-06]	7.62E-06 [7.49e-06]	0.000685** [0.000127]	-0.000136 [0.000194]	0.000203** [2.61e-05]	7.94e-05* [3.95e-05]
Promoted	-0.137** [0.00856]	-0.166** [0.0113]	0.513** [0.165]	-0.717** [0.238]	0.0223 [0.0282]	-0.183** [0.0468]
Agency hire	0.0118 [0.00766]	0.00561 [0.00886]	0.17 [0.142]	0.0126 [0.176]	0.106** [0.0225]	0.0994** [0.0298]
Unsolicited hire	0.0129 [0.00860]	0.00855 [0.0104]	0.206 [0.156]	-0.0155 [0.215]	0.112** [0.0287]	0.117** [0.0428]
Employee referral	0.00539 [0.00789]	-0.00191 [0.00920]	0.00838 [0.142]	-0.330+ [0.174]	0.0477* [0.0243]	0.0168 [0.0326]
Promoted * time in job	5.05e-05** [6.34e-06]	6.93e-05** [7.95e-06]	-0.000517** [0.000146]	0.000436* [0.000210]	-6.06e-05* [2.93e-05]	0.000116** [4.21e-05]
Transferred * time in job	1.15E-05 [1.04e-05]	1.66E-05 [1.10e-05]	-0.00110** [0.000242]	-0.000262 [0.000287]	-0.000147** [3.96e-05]	-2.67E-06 [4.98e-05]
Last ranked performance		0.00800** [0.00115]		0.156** [0.0253]		0.0471** [0.00504]
Last contribution		0.00186 [0.00204]		0.126* [0.0534]		0.0479** [0.0101]
Last competence		0.00370* [0.00186]		0.150** [0.0487]		0.0225** [0.00862]
Observations	15979	12351	15979	12351	15979	12351
R-squared	0.858	0.87	0.786	0.808	0.762	0.771
P value (referral = unsolicited)	0.25	0.19	0.09	0.09	0.017	0.014
P value (agency = referral)	0.20	0.19	0.13	0.02	0.0040	0.0029

*** p<0.01, ** p<0.05, * p<0.1

