DO PERIPHERAL WORKERS DO PERIPHERAL WORK? COMPARING THE USE OF HIGHLY SKILLED CONTRACTORS AND REGULAR EMPLOYEES

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This paper uses data from a 2002 survey of project managers in a large, U.S.-based financial services institution to compare how contractors and regular employees were assigned to work within an information technology department. The author uses these data to test standard core-periphery arguments about the use of contingent workers, as well as accounts of contingent work that emphasize the interests of frontline managers. He finds that contractors and employees were used very similarly in most respects, although there were some differences. Contractors were less likely to be used in roles that were more critical to the firm, but more likely to be used when frontline managers' interests could conflict with the organization's. Contractors were also less likely to be given positions requiring knowledge of the business. No evidence is found, however, that other kinds of firm-specific skills affected how contractors were used.

In recent years there has been growing academic interest in contingent workers such as temporary agency workers, contract workers, and independent contractors. In contrast to the open-ended nature of regular employment, contingent workers have explicitly short-term relationships with the firms that use them. Contingent workers are also excluded from the detailed personnel policies that apply to regular employees. Often, they are not even directly employed by their place of work, being engaged instead as arm's-length suppliers or employees of a labor market intermediary. Despite these sharp differences between the relationships that contingent workers and regular employees maintain with their place of work, research suggests that these two groups often work alongside each other, engaged in apparently similar tasks (Smith 2001b; Davis-Blake, Broschak, and George 2003). This raises the question of how the different employment statuses of contingent workers and regular employees affect the kind of work they are assigned.

Examining how contingent workers are assigned to work is important to understanding how contingent employment shapes individuals' day-to-day experiences of work. The kind of work individuals do has important consequences for their well-being, affecting both the psychological rewards they derive from

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Additional analyses, and copies of the computer programs used to generate the results presented in this paper are available from the author on request, at mbidwell@wharton.upenn.edu.

Industrial and Labor Relations Review, Vol. 62, No. 2 (January 2009).
0019-7939/00/6202 $01.00

their work (Hackman and Oldham 1976) and their opportunities to develop new skills (O'Mahony and Bechky 2006). Studying how contingent workers are managed may also help us understand the effects of the recent loosening of firms' internal labor market rules (Cappelli 1999; Jacoby 1999). Employment theories argue that job security helps firms to manage their workers (for example, Williamson 1975; Osterman 1987b), yet much evidence suggests that firms are reducing the security offered to employees (Cappelli 1999; Osterman 1999). Studying how firms manage workers who lack any job security can help us understand how these broader declines in security might affect the way in which work is organized and managed.

In this paper, I examine differences in the work performed by highly skilled contingent workers and regular employees. I use data from a survey of project managers in the information technology (IT) department of a large U.S. financial services firm to examine which project roles were occupied by contractors as opposed to employees. Use of contingent workers is common in the IT industry, and IT contractors are often seen as archetypal, highly skilled, independent professionals (for example, Ang and Slaughter 2001; Barley and Kunda 2004). By examining how such workers were used within a single firm, during a single time period, I hold constant the state of the external labor market and the human resources (HR) practices of the firm. I then test two sets of predictions about how contingent workers will be used, one based on efficiency-oriented, core-periphery theories of contingent work, and the other based on the interests of frontline managers.

This study extends existing research on the use of contingent workers in important ways. A focus on collecting quantitative data allows me to conduct formal hypothesis testing, extending insights from ethnographic studies by Smith (2001a), Lautsch (2002), and Barley and Kunda (2004). Those earlier studies stressed some of the practical difficulties firms face in separating contingent workers from regular employees. I am able to use quantitative data to examine just how different the work done by these groups is.

The use of detailed survey data from within a single firm also allows me to conduct a much more detailed analysis of the use of contractors than has been possible in previous quantitative research. Masters and Miles (2002) examined the nature of the jobs that contingent workers were brought into, using a cross-industry survey of HR managers. They found that contingent workers were less likely to be brought into positions that were longer-lasting, harder to monitor, or more training-intensive. Because their study used job descriptions from the time of initial contracting, however, they cannot tell us whether contingent workers ended up doing different work after being engaged. Mayer and Nickerson (2005) used archival data to examine which projects a software consulting firm was most likely to subcontract, and found that subcontracting was most likely when the work was harder to monitor and the costs of opportunism were greater. By collecting surveys on each individual project, I am able to examine not only which projects used contractors, but also how contractors and employees were deployed within projects, providing a more detailed picture of how contractors were used. The data also allow me to separate the effects of tenure and staffing arrangements on how individuals were managed. In the firm studied, many of the contractors had tenure similar to that of employees. By controlling for worker tenure in my analyses, I am able to distinguish the effects of turnover from the absence of job security.

This study also departs from existing work by exploring how managerial politics might affect the use of contingent workers. Previous research has focused on how the needs of organizational efficiency should shape the use of contingent workers. Yet the structured employment practices that cover regular employees also reshape authority within the firm, by constraining frontline managers' abilities to set employment terms. To the extent that contingent workers are not covered by these practices, frontline managers often have more control over contingent workers than over regular employees. I argue that this greater personal control over contingent workers may affect how frontline managers use them.

Table 1. Comparison of Employment Terms for Contractors and Employees.

Policy	*Employees*	*Contractors*
Layoffs	• Entitled to extensive severance benefits • Risk of litigation • Informal norms discourage layoffs	• No severance benefits • Relationship explicitly allows termination of contract at any time
Firing for Cause	• Managers required to place employee on probation and extensively document performance before termination	• No restrictions on managers' ability to terminate contracts
Career Development	• Jobs organized into different levels • Promotion across levels is main means of raising pay and benefits • Managers expected to create development plans for each employee	• Not assigned to job levels • No career ladder • Cannot be promoted into management • Managers take no responsibility for career development
Performance Management	• Extensive annual performance review process • Performance-related bonuses of around 10–20%	• No formal evaluations • No performance pay
Benefits	• Generous pensions and health benefits • Can use fitness facilities and attend company events for free	• May receive basic benefits from staffing firms • Cannot use fitness facilities • Must pay to attend company events
Costs	• Lower cost	• Higher cost: 25–30% more than employees

The Use of Contractors and Regular Employees at the Bank

I studied the use of IT contractors at a large, U.S.-based financial services institution that I call "the Bank." Like most large companies, the Bank had an internal IT department that was responsible for developing and modifying proprietary applications, as well as for ensuring that the firm's IT systems ran smoothly. The Bank made heavy use of contingent workers within its IT department—contractors made up around one-third of the Bank's IT work force during my study.[1] These contractors often remained at the Bank for long spells. Although they might initially have been engaged for a specific project, they usually moved on to work on several others. As a consequence, the average tenure for contractors was three years—lower than employees' average tenure of six years, but substantial nonetheless.

Contractors were primarily used to increase the Bank's numerical flexibility. The contractors had skills similar to those of employees; their engagement was rarely owing to a need for specialist skills from outside.[2] Indeed, contractors and employees often seemed to have similar backgrounds. A number of the contractors I spoke to explained that they had been engaged as contractors because of restrictions on hiring employees at the time

[1]The Bank's contractors were hired through staffing firms that specialized in providing short-term technical personnel, and the contractors generally remained employees of these staffing firms. However, the relationship between the workers and the staffing firms was very weak. The staffing firms played no role in the management of the contractors' work. Furthermore, most of the contractors I spoke to did not expect to be paid by the staffing firm when they were not on an assignment with a client company.

[2]Of all the managers I surveyed, spanning 44 projects, only two reported that they had engaged contractors because they needed a specialist skill. The vast majority of projects used contractors with the same skills as employees

they joined. Similarly, several employees had previously spent time contracting at the Bank or elsewhere. As a result, differences in the use of contractors and employees at the Bank were largely driven by the terms of these groups' relationships with the Bank, rather than by differences in skills. These differences are summarized in Table 1.

Differences in how the Bank treated contractors and regular employees were shaped by administrative rules that determined how employees could be hired, paid, and fired. These rules are often described as constituting an "internal labor market," and are influenced by economic, legal, and normative considerations (Doeringer and Piore 1971; Osterman and Burton 2004). Although there is wide variation in the kinds of policies and practices that make up different firms' internal labor markets (Althauser and Kalleberg 1981), the Bank's policies corresponded closely to policies in the white-collar internal labor markets described by Osterman (1987b:51; see also Jacoby 1999:133). The Bank therefore provided a representative setting in which to examine how white-collar employment terms shape the difference between regular employees and contractors, at least within large firms with strong personnel policies.

The most salient difference between contractors and employees was in job security. When an employee's position disappeared, the Bank would try to redeploy the employee to another position within the firm. If the Bank was unable to do so, and was forced to lay off the employee instead, the employee would be entitled to substantial severance benefits. These benefits amounted on average to 60–70% of the employee's annual cost of employment. Severance benefits like this are a common feature of employment in the United States: in a survey of displaced Massachusetts workers, Kodrzycki (1998) found that 86% were eligible for severance payments from their employers. In addition, the Bank could face litigation over unfair dismissal when firing workers (Autor 2003). The situation for contractors was very different: contractors could be let go at any time, for any reason, without any entitlement to compensation. Indeed, this lack of separation costs was the main reason the Bank used contractors.

The "morale costs" associated with layoffs were also much higher when those let go were regular employees than when they were contractors. The Bank had strong norms against laying off employees, and until three years before the study had performed very few layoffs. Although the economic climate forced the Bank to undertake multiple rounds of layoffs between 2000 and 2003, these were very traumatic for the organization. By contrast, the relationship with contractors was explicitly arm's-length, and terminating the relationship with contractors was a more acceptable practice than dismissing employees—at least as far as managers were concerned.

Frontline managers were also very constrained in their ability to dismiss employees for poor performance. Firing an employee required managers to go through an elaborate process of putting the employee on probation, setting targets, and monitoring performance. By contrast, frontline managers faced few constraints in terminating contractors.

A wide range of personnel policies also shaped how employees were managed and paid. The Bank organized employees' jobs into different levels, based on a formal evaluation of their skills. Each job level had a defined pay band associated with it, within which individual salaries were set. Promotion through these positions on the job ladder was an important means by which employees could increase their pay and benefits, and the administration of this system was of great concern to HR managers and employees alike. Managers were expected to create a development plan with individual employees, specifying how they could climb the career ladder. The HR group and senior management then oversaw evaluations and promotions to ensure equity across groups. The performance management process was also taken very seriously at the Bank, and IT professionals could expect to receive a performance-related bonus equal to around 10–20% of salary. Employees also received generous benefits, such as health insurance and pensions.

Contractors were not subject to any of these personnel policies. Applying these rules to contractors might have been seen as an admission that contractors were *de facto* employees of the Bank. Like most employers, the Bank was keen to avoid blurring the distinction between employees and contractors in this way (Barley and Kunda 2004). As a consequence, frontline managers had much more latitude in how they managed contractors. Instead of being set administratively, contractors' pay was negotiated directly (based on a rate card that the vendor department used). Contractors received no benefits from the Bank, although some received basic benefits from their staffing firms. Contractors were not assigned to specific grades, could not be promoted, and did not have development plans. They had no formal performance evaluations, and received no bonuses. If contractors wanted to move into management roles at the Bank, they needed first to secure a conversion to employee status, a move that was often difficult to accomplish. Contractors were even barred from using the company fitness facilities and had to pay their own way at the Christmas party.

Despite these differences, the average contractor cost the Bank around 25–30% more than the average regular employee, including benefits. This higher cost of using contractors reflected both the higher pay that contractors demanded for taking on riskier work, and the commissions that the Bank paid to the staffing firms through which it engaged the contractors.

In the rest of this paper, I explore how contractors and employees were assigned to work. I take the fact that the firm used contractors as a given. I then analyze whether specific roles within projects at the Bank were more likely to be occupied by an employee or a contractor.

Contractor Assignments: Organizational Efficiency Theories

One important set of theories about how contingent workers are used within firms argues that they will be assigned to work in ways that increase organizational efficiency (for example, Masters and Miles 2002; Lepak and Snell 1999). These perspectives, sometimes referred to as core-periphery theories, see the use of contingent workers as a response to the strengths and weaknesses of regular employment relationships (for example, Davis-Blake and Uzzi 1993; Kalleberg 2001; Osterman 1987a). Internal labor markets, such as the one adopted by the Bank, can reduce firms' flexibility to adjust their work force in response to changes in demand. Hiring a periphery of contingent workers provides this flexibility. Yet internalized employment relationships can also generate advantages for firms, such as increased investment in firm-specific skills and greater worker identification with the interests of the firm. Core-periphery theories suggest that contingent workers should therefore be restricted to roles in which the benefits of internalization are smallest (Lepak and Snell 1999).

Economic theory proposes three ways in which internal labor market practices may promote workers' development of firm-specific skills. First, Prendergast (1993) argued that the prospect of promotion serves as a strong, credible incentive for employees to invest in firm-specific skills. Second, Williamson (1985:246) argued that structured pay policies and security guarantees encourage investment in firm-specific skills by protecting both parties against severance of the relationship. Most simply, Lautsch (2002) noted that management should have a greater incentive to invest in training workers who have higher employment security and are thus less likely to be laid off. Taken together, these arguments suggest that, for similar levels of tenure, employees within the internal labor market will have made more investments in firm-specific skills and received more training than contingent workers. Regular workers should therefore be more productive than contingent workers in tasks that require higher levels of firm-specific skills. Whether these differences are reflected in the work that these individuals do may depend in part on the organization of the work. Both Lautsch (2002) and Barley and Kunda (2004:188–98) noted that it may be difficult for organizations to divide up the production process between

work needing more and work needing fewer firm-specific skills. Nonetheless, to the extent that work does vary in its skill requirements, these economic theories would predict the following:

Hypothesis 1: Work that requires high levels of firm-specific skills is more likely to be performed by regular employees than by contingent workers.

A variety of theories also suggest that the increased job security and structured career ladders found at the Bank may increase workers' identification with the long-term goals of the organization. Research in social psychology argues that regular employees will have higher organizational commitment than contingent workers. These theories propose that when firms demonstrate greater commitment to employees, by providing employment security and other benefits, the workers will reciprocate with higher commitment to the organization (McLean Parks et al. 1998; Pearce 1993). In contrast, the bounded nature of the exchange with a contingent worker should lead to a more transactional psychological contract. Empirical research by Van Dyne and Ang (1998) and Ang and Slaughter (2001) has found that contingent workers do have less organizational commitment than employees, although Pearce (1993) failed to find such an effect.

Organizational commitment is particularly important in focusing workers on the long-term interests of the firm, rather than their immediate task (O'Reilly and Chatman 1986; Organ 1988). Hence, while contractors will have many other sources of motivation to do a good job, such as professional commitment and concerns for their reputation, employees may be more focused on doing what is best for the firm. Many of the managers I interviewed believed that contractors were indeed less committed than employees. One reported, "With some [contractors] you see—'I do my job, I do it well, you tell me what to do. You don't tell me what to do, that's your problem. You just pay me.'" Regular employees, in contrast, were expected to be more concerned with the outcome of their work.

Agency theory also suggests that white-collar internal labor market practices may improve the alignment between workers' interests and the long-term interests of the firm. Where regular employees have greater job security, the firm can credibly make use of incentives that reward effort over longer time periods, and make the workers' rewards more contingent on the performance of the firm. Such incentives include promotions (Lazear and Rosen 1981; Williamson 1975) and subjective performance bonuses (Baker, Gibbons, and Murphy 1994) that reward long-term performance across a wide range of dimensions. Contractors may face strong short-term incentives to perform their work well, because of the ease with which they can be dismissed, but they have little long-term stake in the firm's performance.

Taken together, these arguments suggest that regular employees will have greater intrinsic and extrinsic motivation to contribute to the firm's goals than contingent workers do. The motivation to contribute to the firm is likely to be more important the greater the impact on firm performance of the kind of work being done. Where work is particularly critical to the organization, it will be most important to use workers who care about furthering the long-term interests of the firm rather than simply carrying out the instructions they are given.

It is important to note that such an effect is dependent on contingent workers and regular employees having similar general skills. Previous research on IT workers has argued that firms may actually assign their most critical tasks to contractors because external workers have superior, more up-to-date technical skills than regular employees (Barley and Kunda 2004:195). Where contingent workers and regular employees have more similar skills, I predict the following:

Hypothesis 2: Work that is critical to the firm is more likely to be carried out by regular employees than by contingent workers.

Managerial Control and the Use of Contingent Workers

The organizational efficiency theories outlined above assume that managers make the decisions that will bring most benefit to the firm. Yet it is well known that managers

within different organizational sub-units often pursue different goals (Cyert and March 1963). The agendas of specific groups of managers may therefore affect how contingent workers are assigned to work. In particular, frontline managers may exploit the greater control they have over contingent workers to pursue their own interests.

An important function of firms' personnel policies is to limit frontline managers' control over employees. Compensation of employees has to conform to the firm's pay scales. Employees can be promoted out of the manager's group. Frontline managers' ability to remove workers for poor performance is closely regulated. By contrast, frontline managers usually have much more control over contingent workers. In the Bank and other firms, it is usually frontline managers who make decisions about when to terminate the relationship with contractors, without any need to justify their actions to senior management or personnel departments (Smith 2001b; Barley and Kunda 2004). As one manager told me: "Those [contractors] that didn't work out, I had no problem getting rid of them. I guess that's the difference—if you have difficulty with employees it's too much effort to get rid of them."

Indeed, internal labor markets were initially developed to curb the power of frontline managers (Cappelli 2000; Jacoby 1985). Under the early twentieth-century "drive system," foremen were responsible for hiring, rewarding, and dismissing workers, and they used this power (as well as threats, verbal abuse, and even physical abuse) to extract effort from workers. This arbitrary power often led to high turnover and low levels of coordination within the organization, and contributed to labor unrest. The development of internal labor markets transferred employment decisions to the personnel department and introduced formalized policies and procedures to protect workers from the vagaries of the foremen (Cappelli 2000). There are, of course, many differences between the drive system and modern use of contingent workers: foremen themselves often worked as subcontractors to the firm, and employed levels of coercion that would be unacceptable today. Nonetheless, whereas internal labor markets took power out of the hands of frontline managers, the use of contingent workers restores greater control to frontline managers.

Frontline managers' greater personal control over contingent workers may affect how they assign them. I noted above that job security and other personnel practices can serve to align employees' interests with those of the organization as a whole. A corollary of this argument is that the interests of the workers and their immediate managers are more closely aligned for contingent workers than for regular employees, particularly given the authority managers have to terminate contingent workers' contracts. This stronger alignment between the interests of the frontline manager and contractors may affect how contractors are used.

In most cases, there should be little distinction between the interests of the manager and those of the organization. Occasionally, however, these interests may conflict. For example, when business users want to change the requirements for an ongoing IT project, the project may be delayed and may take resources from other work for which the project manager is responsible. The project manager may therefore be unwilling to make the changes, even when they will be beneficial for the firm overall.

This kind of conflict is exacerbated by interdependence. Organization theorists have long recognized that interdependence among units raises the potential for, and intensity of, conflict (for example, Thompson 1967:60; Schmidt and Kochan 1972; Victor and Blackburn 1987; Jehn 1995:262). Where projects involve little interdependence with outside groups, there is less scope for conflict: managers can address the challenges they face on an individual project without dealing with external parties. Where a project involves substantial interdependence among groups, however, managers must trade off the ability to meet their own project goals with the needs of other groups to meet their goals. Such trade-offs give rise to conflicts.

Conflicts with other groups were certainly a problem for managers at the Bank. Well over half of the managers I surveyed cited

problems in their relationships with users or with other development groups as the most important cause of problems in their project. Where such conflicts arose, a manager might have stood to benefit by working with contractors, whose primary loyalties were to that manager rather than to the firm as a whole.

This logic parallels Cappelli's arguments for the growth of internal labor markets (2000:82–83). He argued that reducing frontline managers' power over workers allowed the workers to be accountable to several managers, improving coordination. While such coordination may benefit the organization, it can come at the expense of the frontline managers. For these managers, it is better to have workers accountable to them alone in situations where conflicts are more likely. Hence, I predict the following:

Hypothesis 3: Group interdependency will be positively associated with the likelihood that work is carried out by contingent workers rather than regular employees.

Empirical Strategy

I used a survey of projects to investigate how the characteristics of the work done by contractors and employees differed. The characteristics were shaped by three distinct aspects of the work being performed: the specific software program or "application" being worked on; the project's goals; and individuals' roles in the project—that is, the set of tasks each individual performed. Staffing decisions about these different aspects of the work were often shaped by different actors.

The Bank's IT group was organized into departments that were aligned with particular sets of business users, and ultimately with particular applications. Different project managers were responsible for overseeing different groups of applications. Each of these project managers supervised a group of subordinates (both employees and contractors) who performed all the work on the relevant applications. The balance of contractors and employees working on each of these applications was shaped in part by headcount restrictions put in place by senior management.

Any development work on the applications was organized as a discrete project, with its own set of goals and organization. These projects involved anything from minor, incremental changes to existing systems to developing a new piece of software to support an important strategic initiative. The project manager had complete discretion as to which of his or her subordinates would staff any given project. Each subordinate, whether an employee or a contractor, would usually work on more than one project at a time, although normally under the direction of the same manager.

Assignment to work also involved deciding what roles workers would take within each project. Workers could be assigned different parts of the software to work on. There might also be one or more team leads, who worked on specific pieces of software but also took on additional responsibility for overseeing and coordinating the work of other individuals in the team. Many teams also included analysts, who did not write software but were responsible for interfacing with users to develop specifications and design. Again, project managers had complete discretion over what roles their subordinates took. Analyzing how contractors were assigned to applications, projects, and roles therefore gives us insight into how both senior managers and project managers preferred to use contractors and employees.

Data Collection

I collected data from the IT group that serviced one of the Bank's largest business units. This IT group had a work force of roughly 2,000 people, including contractors, at the time of the study. I selected projects to survey from within this IT group, applying the following criteria. First, all of the projects had been worked on during the previous year (2001). This enabled me to capture what happened over the entire course of the project. Second, they were all new development (rather than support and maintenance) projects. Narrowing the type of project enabled me to ask specific questions about project features that were comparable across all projects. Third, in or-

der to minimize organizational variance and make it possible to control for organizational unit, I confined my study to projects that were within the six largest departments of the IT group. Finally, all the projects included in the study were large ones. Each project required more than 700 person hours, according to the accounting database. Larger projects would have been more salient to the managers, increasing the quality of the responses.[3] This selection process yielded a sampling frame of 183 projects, representing 14% of the hours worked within the focal IT group in 2001.

Given the heavily decentralized nature of development at the Bank, I found that knowledge of specific projects was not shared among managers. Only the individual project manager was in a position to give an accurate portrayal of the work involved. I therefore used these project managers as informants. Out of my sampling frame of 183 projects, I was able to identify project managers for 124 projects, using informants within the organization. The preferred respondent for a given project was the person who was involved in managing its day-to-day development. Because there was no one-to-one correspondence between titles and levels of responsibility in the organization, employees filling similar positions across different projects were not necessarily of the same rank. As a result, the individuals who were surveyed did not have a single title or position in the hierarchy. In order to control for any problems this might cause, I include the respondents' hierarchical level in the analyses. I had particular difficulty identifying project managers in one department that was in a remote location. Hence, the distribution of projects for which I was unable to locate a manager was non-random. In my analyses, I control for whether the project was in a remote location.

The 124 projects were managed by 70 individuals (some managers managed multiple projects). Given the considerable length of the survey for each project, it was not possible to question the same manager about multiple projects. Any manager who had overseen two or more projects within my sample was surveyed about only one of those projects, selected at random.

I decided to collect data in person because the Bank's managers had a very poor record of responding to surveys (four surveys were conducted by phone, as the respondents were in remote sites; all of the other surveys were conducted face to face). Meeting with the managers also enabled me to verify their answers, to include a number of open questions, and to capture the respondents' qualitative comments and insights. It took between 1.5 and 3 hours to gather complete data on each project, often requiring multiple meetings with the same individual.

I initially contacted project managers by email. A senior manager within the organization also sent an email encouraging the managers to take part. I followed that introductory communication with a telephone call. Overall, 49 project managers were surveyed, for a response rate of 70%. None of the project managers explicitly refused to take part in the survey, but many failed to answer repeated inquiries. There was no statistically significant difference in organizational rank or departmental affiliation between respondents and nonrespondents. Furthermore, the projects surveyed were not significantly different from those in the overall sampling frame in the total number of hours reported in the accounting database, although slightly more people were reported as working on them (an average of 11.4 versus 8.1).

I took great care to ensure that the information gathered was comparable across the projects. In eight cases, the survey revealed that the projects had not been directly managed by the respondent, creating concerns about the quality of the data. I therefore dropped these projects from the analyses.

[3]In conducting the survey, I discovered that the accounting data were often highly inaccurate. Many managers would assign hours to projects with little regard for who had actually worked on them, so some of the projects surveyed may have fallen below the threshold size. Similarly, there may have been some large projects that were not included in the sample frame. Because each of the projects surveyed involved substantial amounts of work, these problems should not seriously compromise the validity of the results. They did, however, prevent me from using timesheet data in my analyses.

Another project was dropped because it involved ongoing maintenance, rather than new development. A further four projects had missing data. The final dataset used for the quantitative analysis covered 36 projects.

Much of the survey collected data on individual workers. I was also concerned that the workers included within the dataset should be doing comparable work. I therefore eliminated from the dataset seven people (administrators, lawyers, and business liaison personnel) who were not involved in technical aspects of the project; the respondents themselves, and other managers who had been involved in the project; five individuals whom their managers identified as playing very minor roles; eight individuals who worked for software firms or systems integrator companies, as these were neither comparable to the other contractors, nor employees; and 14 individuals for whom I had no tenure data. The final sample for analysis therefore contained data on 210 individuals. The number of individuals on each project ranged from two to 15, with a median value of between 5 and 6.[4]

Differences between Contractors and Employees: Analysis of Comments

Part of the survey asked open-ended questions about how the managers thought contractors differed from employees, what challenges they faced in managing contractors, and in what ways their treatment of contractors differed from their treatment of employees. I analyzed these responses, and tabulated the themes that appeared more than once (I also included a theme on firm-specific skills that appeared only once).[5] Table 2 summarizes managers' comments about how they perceived the differences between regular employees and contractors. More concrete statements about the ways in which managers' treatment of contractors differed from their treatment of regular employees are presented in Table 3.

The dominant theme in managers' comments was the similarity between contractors and employees. For the managers who were tasked with the direct supervision of these workers, contractors' lack of job security and other structured employment practices that applied to regular employees were seen as creating only minor differences between how those contractors behaved relative to regular employees, necessitating only minor differences in how these two groups were managed.

The few differences the managers did find were surprisingly consistent with the theoretical perspectives outlined above. Contractors' different sources of motivation were particularly salient for managers. On the one hand, 13 managers expressed a belief that contractors were less committed to the organization than were regular employees. A common theme was that while contractors would do the job they were given, they would not go out of their way to help the organization (although seven of these managers qualified their statement by saying that this had not been a problem with the contractors they had worked with). Three managers also commented on the limited range of tools they had to reward contractors. On the other hand, five managers stated that contractors were more motivated than employees because of concerns about losing their jobs.

Managers discussed firm-specific skills in two contexts: the need to train contractors when they arrived, and the problem of losing valuable knowledge when contractors left. Their concern was not the theft of proprietary information (Matusik and Hill 1998), but rather the erosion of organizational capabilities as the Bank lost the knowledge needed to maintain the applications. Managers' descriptions of the nature of this knowledge varied. Four managers discussed business knowledge as an important element of firm-specific skills; two described knowledge of the Bank's processes and development

[4]The substantial difference between this average and the average reported from the accounting database indicates the lack of reliability of the timesheet data.

[5]I analyzed the qualitative data by coding the managers' comments using categories that emerged from the data. I went through each of the managers' responses line by line, assigning a code to each statement. I then employed an axial coding technique to group these codes (Strauss and Corbin 1998). Finally, I reviewed each of the codes and statements in order to ensure consistency.

Table 2. Summary of Qualitative Comments on Differences and Challenges Presented by Use of Contractors.

Category	*Theme*	*Count*	*Sample Quote*
No Difference	No difference between contractors and employees	21	"In my case I really can't see any difference [between contractors and employees]."
Commitment and Control	Contractors less committed than employees	13	"Through the years I have had consultants—that since there's no loyalty and no real incentive to go out of your way for the Bank—they will do as told and do not do anything proactively."
	Contractors in this group as committed as employees	7	"The level of commitment in some consultants may not be as high as for some employees. For everyone in this group there was no difference, though."
	Contractors more motivated than employees	5	"I think they [consultants] have a vested interest in trying to do a good job so their contract is renewed."
	More difficult to reward contractors	3	"They are the experts, and we are forced to interact with them differently as you can't say this will reflect on your review, your bonus."
Firm-Specific Skills	Contractors do not understand the Bank's systems and business as well	6	"Mostly it's employees who are in charge—they are the project leaders. The consultants are technicians. [Why?] Because employees know the business and consultants usually don't."
	Problems of knowledge leaving with contractors	10	"The only thing is if they are temporary then the knowledge might walk out of the door—then they're not around to support [the application] afterwards."
Managerial Power	Managers have fewer responsibilities toward contractors	5	"If I'm training someone to be a manager, I'll put a consultant under them. That way there's less of a chance—it's practicing ground. If it doesn't work out, I can move the person over to some one else. It's not like an employee where you're tracking that person and molding their career."
	Managers do not need to carry out firm processes with contractors	4	"They don't have to attend junk meetings or do stupid training. There's way more benefits than anything else. I used to be a consultant too. Everybody should be a consultant."
General Skills	Contractors have better skills	2	"Higher skill sets."
	Consultants more motivated to learn	3	"They're more self-motivated on learning the new technologies."

Notes: N = 41 (includes projects with incomplete data); all themes mentioned more than once are included.

Table 3. Summary of Qualitative Comments on how Managers Treat Contractors Differently from Employees.

Category	*Theme*	*Count*	*Sample Quote*
No Difference	No difference	28	"I don't treat them differently."
Commitment and Control	Put employees in positions of greater responsibility	3	"You tend to deal more with regular employees—give them more responsibility and make them responsible for the consultants."
Firm-Specific Skills	Give employees work that requires more firm-specific technical skills	1	"For production support, our leaning was more heavily weighted to employees, because of their years of experience in dealing with the application and knowing how to deal with problems at 11 o'clock at night."
	Build employees' skills more	3	"Usually if I have a project to be assigned to two persons, if both have the same skills I would give it to the employee first and the consultant second, and if it is a one-time quick thing I would tend to give it to the consultant. Because I want the knowledge to stay with the group and we need to develop the employee and give them more opportunity to grow."
Managerial Power	Can dismiss underperforming contractors	6	"Sometimes you find out they are not what they say they are. Lots of times you end up terminating their contract, where with an employee you would shift them to a lesser role and develop their skill."
	Can pay contractors for overtime	2	"Sometimes for tasks that would require a lot of overtime I'd give it to the consultants as they get paid and I'd consider that. The consultants are more willing to work the overtime and there is not as much guilt on my part."

Notes: N = 41 (includes projects with incomplete data); all themes mentioned more than once are included.

protocols; and six described experience with the applications.

The managers' comments also provided support for the managerial control view of contingent work. A number of managers stressed the advantages that came from their reduced responsibilities to contractors, such as not needing to give contractors time out for organizational events or training. The fact that managers were not expected to foster contractors' professional development also made them easier to manage: as a rule, contractors uncomplainingly took the assignments they were given. The managers also had greater latitude in how they could manage the contractors. In particular, the fact that they could easily terminate the contractors was seen as a benefit.

Two managers suggested that contractors had stronger general skills than employees. This was not, however, a common theme in managers' comments.

Description of Variables

I tested the three hypotheses using quantitative measures drawn from the survey. An advantage of studying a single workplace is that such a setting allows us to test theories using specific characteristics of the work process. Many of the independent variables I used in this study were therefore based on the specifics of IT projects at the Bank. Before designing the survey, I interviewed 14 project managers and 16 other individuals who dealt with contractors and the employment system. I used these interviews to develop indicators to test the key concepts outlined above. Where possible, the indicators were based on objective features of the project. For example, some questions asked what percentage of hours was spent on certain tasks. Where questions were more subjective, I used seven-point Likert scales, which were anchored at 1 ("not at all"), 4 ("the average amount for a project"), and 7 ("a great deal"). The questions were pre-tested with four further managers to ensure their face validity.

The use of such a survey method creates two important methodological concerns. The first is common method bias. Where all of the data are gathered from a single source, there is a concern that spurious links between constructs can be generated by respondents' general affect, need to give socially desirable responses, or implicit theories (Podsakoff et al. 2003). Although both dependent and independent variables are gathered from a single source, the dependent variable—who worked on the project—is straightforwardly factual. It is therefore unlikely that responses will be contaminated by any of the perceptual biases outlined above. Moreover, the measures of the independent variables relate to specific aspects of the work, have little conceptual relationship to one another, and should be minimally affected by concerns about social desirability, affect, need to maintain consistency, or implicit theories. The specific nature of this study therefore limits anticipated problems from common method bias.

The second concern regards the reliability of the measures. Traditionally, reliability is assessed by using multiple measures of the same construct and examining their correlation using Cronbach's alpha. However, I chose to exploit the fact that I was researching a single site to devise measures of the work that were specific to the site. This strategy should increase the accuracy of the measures, as they are more concrete and easier for the respondents to understand. However, evaluating constructs such as firm-specific skills, work criticality, and need for coordination based on features of the work entails constructing "formative measures" in which the construct of interest is caused by the measures. In contrast to "reflective measures," there is no *a priori* reason to believe that formative measures should be correlated, and hence alpha is not an effective measure of their reliability (Bollen and Lennox 1991; Jarvis, MacKenzie, and Podsakoff 2003).

Given this difficulty in establishing the reliability of the measures, I developed multiple measures of the key constructs based on different features of the work. To the extent that these measures all have similar effects on the constructs I am interested in, I would expect them to have a consistent pattern of effects on staffing outcomes. These measures are

outlined below. Exact questions are listed in a table in the appendix.

Dependent variable. The dependent variable in the analyses is whether the individual filling a particular project role is a contractor or an employee. Data on the individuals working on each project, their roles, and their employment status were gathered from the project manager, and their status was confirmed using HR data.

Importance of the work. Two questions examined the criticality of the applications. I asked whether the applications involved were critical to keeping the business running. I also asked whether the Bank's clients ever used the application directly. Mistakes would be more likely to have a negative impact on the Bank's business where they were directly visible to the client. In some of the analyses, I include each of these measures separately. In other analyses I combine the standardized scores from these two questions to get a single measure of "application importance." I also asked about the criticality of the project—specifically, whether the project was important to senior management. Controlling for the characteristics of the application, the project importance variable measures how frontline managers' decisions about the use of contractors were affected by the work's criticality.

Firm-specific skills. The qualitative data demonstrated the particular importance of two kinds of firm-specific skills for application developers at the Bank: knowledge of the business, and knowledge of the Bank's applications. Business knowledge allowed developers to understand the context in which the applications would be used, so that they could design and implement an appropriate solution to users' needs. This business knowledge was highly firm-specific, as it required knowledge of the Bank's products and processes. In my interviews, managers repeatedly referred to this kind of knowledge as a potential differentiator between contractors and employees. As a consequence, we might expect project managers to have assigned employees the tasks requiring specific business knowledge while leaving contractors to specialize in tasks requiring more general technical knowledge.

I included two role-based indicators of the need for such business knowledge. First, I included a dummy variable taking the value 1 when individuals were in "analyst" roles, in which the main activity was generating requirements for applications. These roles required particularly detailed understanding of the business. Second, I asked how much time per week each individual had spent interacting with users, both during the requirements phase (when the interaction was most intense) and afterward, and then summed the standardized scores of these two measures to create "user interaction." These interactions also indicate the importance of understanding users' needs and translating them into technical requirements. I then summed the standardized scores of the user interaction and analyst variable to create a single variable ("business knowledge").

The second kind of firm-specific skills was knowledge of the Bank's software applications. The Bank's applications were usually proprietary, poorly documented, and complicated. Workers needed to develop specific knowledge of these applications in order to be able to work on them. When answering questions about how they staffed the project, 31 out of 41 managers said that experience of the specific application involved was the first or second most important factor in their staffing decision. This knowledge was role- as well as firm-specific. Understanding of an application could be gained only by having worked on that specific application in the past.

Application knowledge was needed most on projects that involved modifying existing applications rather than developing new ones. I therefore measured the need for firm-specific technical skills by asking what percentage of the work on the project involved modifying existing applications.

Interdependence with external groups. I measured three different aspects of interdependence: whether the project required the management of interfaces with other applications; whether the project had interdependencies with other development projects going on at the time; and how much the project needed to be coordinated with business users. Again, I included these measures separately in some analyses, and also summed the standardized

scores of all three to get a single measure of the overall level of interdependence ("project interdependence").[6] Note the distinctions between these measures and the measures of individual interaction with users. Because the interdependence measures are at the level of the project, they measure the extent to which managers faced a conflict of interest on a specific project, controlling for the amount of time that specific individuals spent interacting with users.

I also include a number of controls in my analysis.

Tenure. I calculated the tenure of contractors and employees at the beginning of the project, based on hiring dates provided by the Bank. The variable is reported in months. Where this number was negative (because individuals had been hired during the project), I set it to zero. Including tenure in the regression makes it possible to control for whether staffing decisions were based on workers' tenure rather than their employment status.

Need for technical expertise. The indicators for both project importance and firm-specific skills may be correlated with the overall technical difficulty of the project. Since it is possible that on average contractors had higher technical skills than employees, I controlled for the project's needs for technical expertise and innovation.

Team size. Large projects might exhaust the pool of available employees and require contractors. I therefore controlled for team size.

Team lead. I also controlled for whether or not an individual was a team lead. Team leads may be more likely to be employees because their central roles have a particularly important impact on overall project performance. It is also possible that managers prefer to put employees in team lead positions because of the political and legal problems involved in having employees report directly to contractors.

Time to completion. It is often difficult to swap workers in or out during the course of a project because of the need to retain specific project knowledge (Barley and Kunda 2004:193). It is therefore possible that managers would be reluctant to use contractors on long projects, as the difficulties involved in changing personnel in the middle of the project would reduce their flexibility to terminate the contractors' contracts. To control for this, I asked the project managers how long the project had taken to complete. One project was ongoing, and so was given the same value as the longest project in the dataset, at 18 months.

Date. A large number of contract terminations (and a smaller number of employee layoffs) occurred at the Bank over the course of 2001. I therefore expected projects that began later to use fewer contractors. I controlled for the month in which the project began, using a linear trend.

Project manager characteristics. Project manager seniority could be correlated with both the use of contractors and the nature of projects, either because more senior managers handle systematically different projects, or because they perceive those projects in different ways. To control for this, I used organization charts to measure how many levels each project manager was below the head of IT. I call this variable "manager level." These data were not available for four of the managers, and so I interpolated values for them, based on their rank and organizational unit.

Organizational affiliation. I controlled for the identity of the largest department in all of the analyses. (In analyses not reported here, I also controlled for the identity of all five of the other departments. This modification did not change the results.) In addition, I

[6]Cronbach's Alpha was low for user interaction, the three scales of interdependence, and business knowledge, at 0.61, 0.35, and 0.07, respectively. Alpha for application importance could not be computed due to a (very small) negative correlation between the variables. As noted above, however, a low alpha is not a sign of low reliability for formative measures such as those used here (Bollen and Lennox 1991; Jarvis, MacKenzie, and Podsakoff 2003). For example, a project might involve heavy interaction with users, but not with other developers (or vice-versa). Hence, correlation between the different construct measures is low. Summing items into composite measures gives an assessment of the overall level of application importance or project interdependence, even though the individual indicators may not be correlated.

Table 4. Distribution of Employees among Surveyed Projects.

Proportion of Project Team Who Are Employees	*Number of Projects*
0	2
0.01–0.2	2
0.21–0.4	7
0.41–0.6	11
0.61–0.8	7
0.81–0.99	3
1	4
Total	36

Table 5. Summary of Role Characteristics by Employment Status.

Characteristic	*Employees*	*Contractors*
Total Number	120	90
Number of Analysts	13	3**
Number of Team Leads	22	5***
Average Interaction with Users (hours per week)	2.50	1.51**

Notes: Asterisks denote the significance level of differences in means between consultants and employees: *statistically significant at the 0.10 level; **at the 0.05 level; ***at the 0.01 level.

controlled for whether or not the project took place in a remote location. Because these locations were in different labor markets, they may have used contractors differently.

Results

I begin the analysis of project staffing by presenting basic descriptive statistics on the use of contractors across different projects and roles. Table 4 shows the proportion of employees in the projects for which I have full data. The table demonstrates that almost all projects used a mix of contractors and employees. Only four of the 36 projects did not use any contractors at all. These projects were slightly more likely to involve client-facing applications ($p < 0.09$); otherwise there was no statistically significant difference between these employee-only projects and projects that used contractors. Only two projects were staffed entirely by contractors. There was no statistically significant difference between these and projects involving employees on any of the independent variables. It therefore seems that there was very little segregation of contractors and employees by project. Instead, the organization appeared comfortable allowing contractors to work on almost all projects. There was, however, a great deal of dispersion in the proportion of contractors on a project. This suggests that there is some value to understanding how project characteristics shaped the use of contractors.

Table 5 compares the means of basic role characteristics across contractors and employees. This table provides more support for the idea that contractors perform work different from that of employees. Although we do find examples of contractors who were team leads and analysts, on average contractors were significantly less likely than employees to occupy such positions, and had less interaction with users.

I tested the hypotheses by performing a logit analysis on whether a given role was occupied by an employee. The dependent variable in these analyses was 1 if a role was occupied by an employee and 0 if the role was occupied by a contractor. I clustered the errors by project (Froot 1989) to account for the possibility that errors within projects were correlated.[7] Descriptive statistics for these data are presented in Table 6. The results of the analyses are presented in Table 7. I first included the controls alone. I then added the

[7]The analysis uses dependent variables at two different levels: some are at the project level, others at the individual level. As Raudenbush and Bryk (2002:99–102) noted, running analyses at the higher level (the project level in this case) is inefficient and renders the inclusion of individual-level data problematic. By the same token, analysis at the lower, individual level can lead to underestimation of standard errors by ignoring the possibility of correlation among errors within projects, perhaps because of unobserved project-level variables. Given the small number of individuals per project, hierarchical linear modeling, which first calculates regression slopes within each project, is not indicated. By clustering errors, I am able to take advantage of the greater efficiency of using individual-level variables, while avoiding the misestimation of standard errors that would arise from ordinary logit regression.

Table 6. Descriptive Statistics and Correlations for Variables Used in the Regressions. (N = 210)

	Variable	*Mean*	*Std. Dev.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Employee Dummy	0.57	0.50	1.00								
2	Importance to Sr. Mgmt.	5.42	1.53	0.11	1.00							
3	App. Importance	–0.01	0.70	0.13*	0.42***	1.00						
4	Criticality	4.61	1.96	0.01	0.25***	0.70***	1.00					
5	Clients Use App.	0.31	0.47	0.17**	0.34***	0.71***	–0.01	1.00				
6	Interdependence	0.03	0.67	–0.10	0.32***	0.06	0.24***	–0.16**	1.00			
7	Managing Interfaces	14.96	16.85	–0.07	0.00	0.13*	0.32***	–0.13*	0.67***	1.00		
8	Business Issues	24.30	17.51	–0.19***	0.25***	–0.01	–0.05	0.03	0.72***	0.23***	1.00	
9	Dependence	3.92	1.93	0.06	0.40***	0.00	0.24***	–0.24***	0.67***	0.15**	0.23***	1.00
10	Modifying Existing App.	81.83	27.53	–0.03	0.50***	0.37***	0.20***	0.33***	0.06	–0.12*	0.10	0.15**
11	Business Knowledge	0.03	0.76	0.19***	–0.02	–0.14*	–0.08	–0.11	0.14**	0.21***	0.10	–0.01
12	Analyst Dummy	0.08	0.27	0.14**	–0.03	0.01	0.06	–0.04	0.08	0.15**	–0.02	0.03
13	Interaction with Users	0.02	0.88	0.13*	0.00	–0.21***	–0.18***	–0.12*	0.13*	0.14**	0.17**	–0.05
14	Team Lead Dummy	0.13	0.34	0.19***	0.13*	–0.02	–0.02	–0.01	–0.12*	–0.12*	–0.10	–0.04
15	Dept. 1 Dummy	0.48	0.50	–0.24***	0.07	0.04	0.17**	–0.12*	–0.03	0.00	0.05	–0.12**
16	Remote Site Dummy	0.10	0.31	0.20***	0.11	0.01	0.05	–0.03	–0.28***	–0.26***	–0.37***	0.07
17	Manager Level	3.68	0.62	–0.12*	0.31***	0.15**	0.06	0.16**	0.14**	0.08	0.14**	0.06
18	Project Length (mths.)	8.76	3.84	0.06	–0.34***	–0.19***	–0.07	–0.19***	–0.09	0.16**	–0.16**	–0.19***
19	Project Team Size	7.76	3.40	0.07	0.01	0.02	0.26***	–0.22***	–0.29***	–0.23***	–0.38***	0.02
20	Project Starting Month	13.40	3.55	0.07	–0.06	0.08	–0.18**	0.29***	–0.02	–0.05	0.10	–0.09
21	Need for Expertise	5.34	1.06	0.05	–0.20***	–0.01	–0.08	0.06	–0.30***	–0.04	–0.40***	–0.17**
22	Need for Innovation	4.86	1.54	0.14**	–0.40***	–0.33***	–0.07	–0.40***	0.03	0.18**	–0.21***	0.11
23	Worker Tenure (mths.)	49.66	45.75	0.36***	0.08	0.06	0.01	0.08	–0.08	–0.03	–0.15**	0.03

Continued

independent variables of interest, including composite measures of project importance, interdependence, and business knowledge. I also ran a model using the individual constituents of these variables.

The analysis finds mixed support for hypothesis 1. The composite indicator of need for business knowledge is positive and statistically significant, indicating that employees (versus contractors) were more likely to be assigned to a position the greater the business knowledge required in that position. When included separately, interaction with users is marginally significant, while the analyst dummy fails to achieve significance.[8] I do not find any evidence that a need for firm-specific technical skills shaped how contractors were used. The percentage of time spent modifying existing applications has a negative, non-significant coefficient.

I find strong support for hypothesis 2, that employees are more likely to be assigned to work that is critical for the firm. Both project importance and application importance were strongly statistically significant in the hypothesized direction. The two components of application importance (business criticality and client-facing applications) were also statistically significant. These results suggest that criticality to the firm affected both the proportions of employees and contractors available to project managers, and project managers' choices about how to deploy those employees and contractors.

I also find some support for hypothesis 3. Projects that were more interdependent with other parts of the organization were significantly more likely to use contractors. Unlike project importance, we do not find such strong effects of the constituent indicators. Only the amount of time spent managing interfaces is statistically significant when all three indicators are included together.

Some of the controls are also statistically significant. Worker tenure strongly predicts

[8]Although Table 5 demonstrated that analyst roles were significantly more likely to be occupied by employees than by contractors, this effect loses statistical significance once we take into account potential correlation of errors at the project level. Because a few projects account for most of the use of analysts, the differences in use may be due to unexplained heterogeneity in projects.

Table 6. Continued.

10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*
1.00												
–0.22***	1.00											
–0.23***	0.73***	1.00										
–0.08	0.71***	0.03	1.00									
0.11*	0.12*	–0.11	0.29***	1.00								
0.32***	0.12*	0.19***	–0.02	0.11	1.00							
0.23***	–0.10	–0.10	–0.04	0.10	–0.33***	1.00						
0.52***	–0.09	–0.02	–0.11	0.04	0.49***	–0.10	1.00					
–0.44***	0.02	–0.15**	0.18***	–0.07	–0.35***	0.13*	–0.50***	1.00				
–0.21***	0.03	0.09	–0.04	0.10	0.05	0.06	–0.28***	0.14**	1.00			
0.17**	0.03	0.09	–0.05	–0.02	0.08	–0.42***	0.21***	–0.30***	–0.15**	1.00		
–0.32***	0.09	0.21***	–0.08	0.00	0.03	–0.05	–0.08	–0.06	0.08	0.00	1.00	
–0.60***	.24***	0.24***	0.11	–0.15**	–0.30***	–0.05	–0.40***	0.38***	0.15**	–0.20***	0.41***	1.00
–0.01	0.12*	0.16*	0.02	0.22***	0.07	–0.03	0.06	–0.20***	0.07	0.09	0.07	0.00

*Statistically significant at the 0.10 level; **at the 0.05 level; ***at the 0.01 level.

whether or not an individual was a contractor or employee. The dummy for department 1 is also highly statistically significant. The month variable is significant and positive, indicating that projects that were carried out later were slightly more likely to use employees. Need for innovation also predicts the use of employees, perhaps because of the difficulties of monitoring work in more innovative projects. I also find that team leads were more likely to be employees.

Finally, the last column of Table 7 provides effect sizes, calculated from model 2. I report the change in the probability of a role being occupied by an employee when the independent variable increases from half a standard deviation below its mean to half a standard deviation above. This shows relatively small effect sizes.

Discussion and Conclusions

This study of how IT contractors were used within a single firm finds both differences and similarities between contractors and regular employees in terms of the work they did. Managers were more likely to use regular employees in positions that were more important to the firm or required more business knowledge, but more likely to use contractors on projects that involved interdependence among groups. I found that the need for firm-specific technical skills had no statistically significant effect on the use of contractors. These results are robust to controlling for workers' tenure, providing evidence that the terms of the firm's relationship with its workers matter above and beyond the prior length of the relationship.

The differences in how managers assigned work to contractors and employees provide support for theories about the motivational effects of job security and structured career ladders. Theories from economics and social psychology argue that such personnel practices should align workers' interests with those of the organization and thereby increase their commitment to the organization. I found that many managers believed contractors had lower levels of organizational commitment than employees. I also found that contractors were significantly less likely than regular employees to be assigned to work that was more important to the firm. These statistically significant effects held both for application-based and project-based indicators of importance.

It is possible that the assignment of employees to the most important applications also reflects the influence of organizational politics. Because these applications were most critical to the Bank, they are likely to have received more funding and support than less important applications did. Since employees were a scarce resource at the Bank, this increased political power may have allowed the managers responsible for critical applications to obtain a higher ratio of employees to contractors, independent of senior managements' beliefs about the com-

Table 7. Determinants of Use of Employees

	Independent Variable	*1*	*2*	*3*	*Effect Size*
Controls	Dept. 1 Dummy	–1.05** [0.42]	–1.09** [0.44]	–1.14* [0.62]	–0.12
	Remote Site Dummy	2.21*** [0.82]	1.89* [0.99]	1.56 [1.05]	0.13
	Project Team Size	.045 [.06]	–0.03 [0.06]	–0.05 [0.07]	–.02
	Project Starting Month	0.13* [0.07]	0.16*** [0.05]	0.15*** [0.05]	0.12
	Manager Level	0.17 [0.44]	0.13 [0.30]	0.22 [0.36]	0.02
	Need for Innovation	0.26 [0.17]	0.48*** [0.18]	0.45** [0.18]	0.16
	Need for Expertise	–0.03 [0.20]	–0.16 [0.15]	–0.21 [0.14]	–0.04
	Project Length (months)	0.04 [0.04]	0.08* [0.04]	0.12** [0.06]	0.07
	Worker Tenure (months)	0.03*** [0.01]	0.03*** [0.01]	0.03*** [0.01]	0.31
	Team Lead Dummy	1.48*** [0.52]	1.31** [0.58]	1.42** [0.56]	0.10
Firm-Specific Skills	Modifying Existing Applications		–0.002 [0.008]	–0.001 [0.009]	–0.01
	Business Knowledge		0.62** [0.26]		0.11
	Interaction with Users			0.31* [0.18]	
	Analyst Dummy			1.81 [1.31]	
Importance of Work	Importance of Project to Senior Mgmt.		0.40*** [0.14]	0.33** [0.15]	0.14
	Application Importance		0.65*** [0.20]		0.10
	Application Business-Critical			0.16** [0.08]	
	Clients Use Application			0.93** [0.36]	
Interdependence	Project Interdependence		–0.62** [0.28]		–0.09
	Managing Interfaces on Project (%)			–0.02* [0.01]	
	Dependence on Other Projects			0.02 [0.07]	
	Managing Business Issues on Project (%)			–0.02 [0.01]	
Constant		–4.94* [2.40]	–7.25*** [2.23]	–7.40*** [2.27]	
Observations		210	210	210	

Notes: All models use logit analysis. The dependent variable is 1 if a position is occupied by a regular employee. All models use robust errors, clustered by project. Coefficient standard errors are in brackets. Effect sizes denote the change in probability of the role being occupied by an employee when the independent variable goes from half of one standard deviation below the mean of the variable to half of one standard deviation above the mean of the variable. These effect sizes are calculated using model 2 (see the text).

*Statistically significant at the 0.10 level; **at the 0.05 level; ***at the 0.01 level.

mitment of contractors. The available data provide no basis for distinguishing between such a political story and more conventional accounts that cite employee commitment to explain how application characteristics affect the use of contractors. However, the finding that the criticality of the work had statistically significant effects on how *projects* were staffed demonstrates that the use of contractors was at least in part shaped by beliefs about their commitment. As outlined above, decisions about how to staff projects were taken by frontline managers, subject to the proportions of employees and contractors available to them. Controlling for those aspects of application importance that might shape availability of employees, I still find that frontline managers preferred to allocate their employees to their most important projects. The results therefore suggest that beliefs about the importance of worker commitment shaped how project managers assigned contractors to work.

Although job security and structured career ladders help align workers' interests with the firm's, they also limit frontline managers' ability to punish or reward subordinates. A particular contribution of this study is to highlight how frontline managers have more control over contractors than over employees, and to show how this can affect the way they use contractors. Previous research has highlighted the problems frontline managers face in integrating temporary workers into the work force (Barley and Kunda 2004; Smith 2001a). This paper highlights how contingent workers can also create opportunities for frontline managers, by providing them with greater personal control over the work force. My qualitative findings indicate that managers appreciated the greater flexibility of working with contractors. The quantitative results also provide some evidence that contractors were more likely to be assigned to projects in which managers' interests were likely to conflict with those of the organization, notably projects that were most interdependent with other parts of the Bank. Although I did not find that the individual indicators of interdependence had statistically significant effects on project staffing, I did find that the composite indicator had a statistically significant negative effect on the use of employees. This finding is particularly striking when we consider that coordination should increase the need for firm-specific skills and socialization, attributes traditionally associated with employees. To the extent that these considerations conflict, it seems that the needs of the individual managers to retain control may be winning out.

This study has focused on the role of interdependence among organizational units in shaping the benefits to managers of personal control over contractors. There are likely to be many other situations in which frontline managers value such control. In matrix organizations, for example, it is not uncommon for employees to report simultaneously to multiple project managers, creating sharp conflicts over workers' time and attention. Barley and Kunda (2004:47) noted that such matrix structures can tempt project managers to use contractors who will answer to them alone.

I have found mixed results on how the need for firm-specific skills shaped the use of contractors. On the one hand, the indicators for a need for specific *business* knowledge were associated with the use of employees. On the other hand, there was no correlation between a need for specific *technical* knowledge and how projects were staffed. There are two possible explanations for the different effects of these two kinds of specific skills. First, it may be that contractors have reduced interactions with business users for reasons other than a lack of specific business knowledge. For example, it is possible that managers thought it advisable to prevent contact between contractors and other parts of the organization, or felt that contractors were better suited to technical tasks. I found little evidence to support these explanations in my interviews. None of the managers, contractors, or employees who had converted from contracting suggested that there were attempts to segregate contractors from particular functions. One manager did suggest that he found contractors "more technical." No managers said that they tried to give contractors more technical tasks. By contrast, four of the managers did discuss the problems that came from contractors'

inadequate understanding of the Bank's business. Hence, the qualitative evidence most strongly supports an explanation of user interactions based on business-specific knowledge. Nonetheless, the effect of these decisions was to ensure that contractors tended to be in roles that focused more on the technical aspects of the work and less on user interaction.

A second explanation is that the different levels of specificity of technical and business knowledge determined their effects on staffing. At the Bank, much technical knowledge was role-specific as well as firm-specific. The most important specific technical knowledge at the Bank was an understanding of the particular application being worked on. This knowledge was not shared across many workers, and required role-specific experience of the particular application. By contrast, business knowledge could be useful when working on multiple applications within the firm.

This difference in specificity has important implications for how existing skills would have affected the way employees versus contractors were assigned to work. Where firm-specific business knowledge was required, possessing such knowledge would have increased worker productivity in many roles. Where employees were more likely to acquire firm-specific skills, managers would have wanted to use them in any role that required more business knowledge. But when role-specific application experience was needed, the only workers who would have been more productive would have been those who had previously worked on that application. When it came to staffing a new application, then, employees' existing knowledge would have been no more valuable than that of contractors. As a result, specific technical knowledge created less differentiation in how the knowledge of contractors and employees affected staffing. Having contractors staffed to positions that required role-specific knowledge could lead to other problems, such as increased dependence upon them (Barley and Kunda 2004:193). Yet to the extent that regular employment fostered the acquisition of firm-specific skills, we would expect to see greater effects of firm-specific business skills than role-specific technical skills on distinctions in the use of contractors and employees. Indeed, by making staffing highly path-dependent, with managers assigning workers to applications they had worked with before, role-specific knowledge may actually have complicated attempts to create distinctions in the use of contractors and regular employees. In these circumstances, staffing is shaped by what applications individuals have worked on before, rather than by attempts to retain distinctions between contractors and employees.

It is unclear how we should expect these results on firm-specific skills to generalize to other firms. Certainly Barley and Kunda's (2004) description of high-technology contracting suggests that much IT work contains a mixture of general and role-specific technical knowledge. Indeed, it may be in the nature of professional work for very general technical knowledge to be combined with highly role-specific knowledge, with little further differentiation across firms. At the very least, the results of this study suggest a need to unpack the effects of different kinds of specific knowledge on how firms manage external workers.

Although I did find statistically significant differences between managers' use of contractors and of employees, it is important not to overstate the magnitude of these effects. The simple correlations between task characteristics and employment relationships were low and often not statistically significant. Even the indicator for application importance had only a 0.13 correlation with the use of employees. Almost all projects involved both contractors and employees. While factors like commitment and control shaped how contractors were used at the margin, they were not important enough to effect a wholesale reorganization of the work that would allow managers to segregate the contractors. These similarities between how contractors and employees were treated are congruent with the dominant managerial opinion that contractors and employees behave similarly and should be managed the same.

The similarities between contractors and employees observed here provide quantitative corroboration for recent ethnographic evidence that contingent workers are frequently closely integrated into the workplace

(Lautsch 2002; Barley and Kunda 2004). Core-periphery accounts predict careful segregation of contingent workers within firms, so that these workers carry out work quite different from that of regular employees (for example, Atkinson 1987; Lepak and Snell 1999; Osterman 1987a). Yet contingent workers at the Bank were not comprehensively marginalized or shifted to different kinds of work. Instead, they had access to work similar to that of regular employees, and were managed in similar ways. While there are grounds for concern about the economic consequences of contingent work for workers (Barker and Christensen 1998), in the Bank at least, their day-to-day experience of work was not very different from that of regular employees.

The similarities in how contractors and regular employees are used also have implications for the growth of contingent work. Core-periphery theories imply that the extent of contingent work should be limited by the tasks a firm carries out: contingent workers can be assigned only to work that is not critical and does not involve firm-specific skills. Yet the evidence from the Bank suggests that there were few tasks managers were not comfortable assigning contractors to. The nature of the work provided little constraint on the use of contractors. The most important factor limiting the use of contractors was instead the Bank's willingness to pay a premium to use less secure workers.

The similarity between the work performed by contractors and that performed by regular employees also has implications for public policy. Employees and contractors have very different legal rights, yet at the Bank they often appeared to be doing very similar tasks. In theory, the law restricts the extent to which firms can treat contractors the same as employees, and firms may need to adjust some aspects of how they treat contractors in order to retain the legal appearance of an arm's-length relationship. In practice, firms often make little differentiation between how they treat these two groups of workers (see also Lautsch 2002; Smith 2001; Barley and Kunda 2004). Contracting therefore allows firms and workers to decide within which legal regime they wish to situate their relationship. It is important to consider the effects of this kind of opt-out on current employment legislation, and how, if at all, policy-makers should deal with it.

This study has a number of limitations. Some of the survey measures may suffer from common method bias or have low reliability. I have tried to manage these sources of error by using multiple measures for the constructs. The measures show a consistent pattern of effects for both project importance and firm-specific skills. The results are more varied for interdependence, although the composite indicator shows a strong statistically significant effect. The use of qualitative data alongside the quantitative analysis should also raise confidence in the overall validity of the findings, as the two sets of data tell a consistent story about how managers perceive and use contractors.

A second limitation is that I did not observe the proportions of contractors and employees in the pool of workers from which the manager drew for each project. I was able to control for two important correlates of the supply of contractors: the date the project began, and the department handling the project. I also explored the role of variables that might have affected decisions about the balance of employees and contractors in a work group, such as whether the applications were business-critical or client-facing. However, I did not have measures of the proportion of contractors in the specific work group. There are no theoretical reasons to believe that the supply of contractors should be correlated with the variables of interest—except to the extent that the make-up of the work group reflects the type of projects it performs. The absence of such supply information should not, therefore, bias the results. The errors arising from omitting such supply information may, however, affect the accuracy of my estimates.

It should also be emphasized that this study focuses on a single occupational group within a single organization. This approach allowed me to understand in detail the specifics of the work that drove staffing, and to hold organizational policies constant. However, this does raise a concern about how far the results will generalize to other situations. It is

possible to identify some aspects of the Bank's employment strategy that would shape how these findings might vary in other settings. For example, managers at the Bank seemed less concerned about the legal implications of how they managed contractors than are their counterparts in other organizations. In some firms, managers actively restrict the tenure of contractors to 18 months or less, in order to avoid blurring the legal boundary between employees and contractors. Such attempts to maintain clearer legal distinctions are likely to result in other differences in how contractors and employees are managed. The fact that the Bank was using contractors for flexibility rather than cost reduction may also have blurred differences with employees (Lautsch 2002). Where contractors are paid substantially less than employees, firms may attract less capable workers, who may, in addition, feel exploited. Firms may well make more of an effort to segregate workers in such a situation. On the other hand, where firms rely on contractors for skills that employees lack, they may have little option but to assign external workers to the most critical pieces of work.

Finally, much research suggests that high-skilled and low-skilled contingent work are different phenomena (for example, Davis-Blake and Uzzi 1993; Davis-Blake, Broschak, and George 2003). It would be a mistake to attempt to generalize the results of this paper to low-skilled contingent work. Rather, it is important that future research should examine the consequences of contractor versus employee status on how low-skilled workers are employed.

APPENDIX
Questions Used in the Survey

Variable	*Question*
Modifying Existing Applications	What proportion of the project, measured as a percentage of total hours spent, involved modifying or enhancing already existing proprietary applications, rather than developing or implementing totally new systems?
Managing Interfaces on Project	What proportion of the project, measured as a percentage of the total hours spent, involved managing interfaces with other Bank systems?
Managing Business Issues on Project	What proportion of the project, measured as a percentage of the total hours spent, involved resolving business issues rather than technical issues?
Interaction with Users	For each individual worker, could you please estimate how much time, in the average week: –They spent interacting with users during the requirements phase *about this project* –They spent interacting with users after the requirements phase was complete *about this project* (response in hours)
Clients Use Application	Do clients ever use the system directly?
	[Instructions for remaining questions: I would like you to compare this project with other new development projects that go on at the Bank. I will ask a series of questions about this project, and would like you to rate it against each of these criteria, on a scale of 1 to 7, where 1 is not at all, 4 would be about an average amount for a project, and 7 is a great deal.]
Business-Critical	Is the system business critical—that is, would temporary problems with the system be likely to lead to a significant loss of revenue for the Bank?
Importance of Project to Senior Management	How important do you think the outcome of the project was to senior management?
Dependence on Other Projects	How dependent was your progress on the work of other project teams?
Need for Innovation	How important was it to be technically innovative in order to implement an appropriate solution?
Need for Expertise	How high was the project's need for technical expertise?

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