Contingent Employment in British Establishments: Organizational Determinants of the Use of Fixed-Term Hires and Part-Time Workers

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Abstract

Drawing on ILM, HRM, and new structuralist perspectives, we examine how organizational-based factors influence the intensity of two types of contingent worker use, fixed-duration contract hires and part-time employees, using a representative sample of UK establishments. Consistent with an organizational-based perspective, we find that the use of contingent workers depends on organizational-level structures which facilitate or inhibit the adoption of flexible employment strategies. Findings suggest that while firms seek to reduce their costs and increase their flexibility, their ability to capitalize on flexible employment systems depends heavily on organizational characteristics such as organization size and age, the quality of management-labor relations, governance structures, the organization of work, job control technology, and recruitment options that can promote or derail such use.

In the 1970s the use of short-term workers to fill permanent positions temporarily was an infrequent practice. By the mid-1980's, the trend was to replace permanent jobs with temporary ones indefinitely (Pfeffer & Baron 1988). As a result, one out of every four workers in the U.S. is presently a part-time or temporary employee;

and temporary workers comprise one of the fastest growing labor force segments (*Fortune* 1994; Plunkert & Hayghe 1995). From 1982 to 1984, the number of new temporary workers increased 70 percent in industries with 50,000 or more employees (Carey & Hazelbaker 1986). Similar changes occurred in other industrialized nations. Contingent workers constitute 30% of the European labor force (Belous 1989). In Britain, for example, the use of temporary workers rose 2.5% a year between 1983 and 1987 for all major public and private industries (Hunter, McGregor, MacInnes & Sproull 1993). The growth in part-time employment has also been substantial, such that part-time employees now constitute about 20% and 27.3% of the US and British workforces respectively (O'Reilly 1994; Tilly 1991).

Current arguments explain the use of contingent work arrangements by focusing primarily on the advantages contingent workers provide in terms of flexible staffing arrangements, expertise, and presumed labor cost savings. According to these arguments, contingent workers provide numerical flexibility, enabling firms to adjust staffing levels to uncertain market demands more easily than permanent employees who expect stable employment (Atkinson 1984; Atkinson & Meager 1986) or who are subject to bureaucratic policies and federal regulations that limit their hiring and firing (Abraham 1990). Contingent workers also add functional flexibility to a firm's employment system by contributing expertise that is costly to develop in-house or maintain if used only sporadically by the firm (Christensen 1991). Finally, contingent workers may lower payroll costs by economizing on fringe benefits and unemployment insurance costs, thus providing the firm with a direct means for adjusting its variable costs relative to its competitors (Osterman 1987).

Although much less researched, this shift in work arrangements also reflects key changes in the relationship between organization design and employment systems that can enhance flexibility (Pfeffer 1994). How trends toward corporate restructuring, the adoption of new work technology, and job reorganization contribute to the spread of alternative work arrangements raises important questions about how and why organizations adopt flexible work practices, in addition to informing the basic questions about how the spread of contingent work critically affects labor inequality (Smith 1997). Research in this area indicates that a focus on costs and product market uncertainty may be too narrow. A more balanced explanation of the adoption of alternative work arrangements requires that organizational-level factors be addressed. Tilly's findings (1992:331), for example, suggest that "Behind the averages . . . fascinating glimpses of diversity emerge." He reports that workflow interdependence among jobs reduces the use of temporary workers because the turnover of temporary workers disrupts transactions between interconnected jobs. He found that job and organizational characteristics moderate the relationship between fringe benefits costs and the use of contingent workers, suggesting that structural constraints augment or diminish the potential cost savings

to the firm provided by contingent workers. Approaches that focus on labor costs and fluctuating market conditions, moreover, demote the effects that key actors, such as unions, have on externalization, providing an incomplete explanation of the influence of these important organizational factors (Davis-Blake & Uzzi 1993).

This research suggests that a focus on the role internal organizational structure plays in regulating the use of contingent workers can help clarify how changes in organization design are linked to shifts in the employment arrangement. Osterman (1987), for instance, has argued that technology has a primary effect on the organization's choice of employment systems. He asserted the organization is more likely to use flexible labor systems where production processes can be distributed or "put-out" using micro-computers or other job technology that adjust the volume of output or smooth interruptions in process. Similarly, a firm's choice of employment systems is constrained by its "social technology" — the managerial and bureaucratic procedures which presumably enable a firm to minimize the risk of low-quality performance by temporary workers who have little commitment to the organization and experience few, if any, opportunities for mobility within the firm. Finally, by attending to organizational structure and change, research is potentially sensitized to new and important patterns underlying the shift to "flexible" employment arrangements (Smith 1997). Although temporary workers are associated with lower recruiting, insurance, and fringe benefit costs than permanent workers, their use may result in "hidden costs." These costs arise because a relatively large and expensive governance structure is required to monitor the output of temporary workers or resolve conflict and coordination problems between them and permanent workers (Geary 1992; Graham 1995; Hunter et al. 1993; Smith 1994; Thomas 1994). Consequently, an examination of the determinants of the use of contingent workers is likely to benefit from a fuller analysis of how organizational structures and strategic human resources practices facilitate or inhibit the use of various types of employment systems (Pfeffer 1994).

The main perspective on the effect of organizational-level factors on changes in the employment relationship is internal labor market theory (ILM). ILM theory is an amalgam of economic, sociological, and technical arguments which explore the manner in which certain organizational conditions and institutional arrangements shape employment arrangements in the firm (Baron 1984). It argues that firms attempt to optimize the fit between types of workers and the demands of the environment through the use of particular job arrangements. In bridging the needs between the firm and its environment, job arrangements perform several functions, such as socializing, training, and monitoring workers; directing inter-linked workflows; rewarding performance; and reducing transaction costs (Collins 1979; DiPrete 1987; Edwards 1979; Williamson 1985). According to ILM theory, organizations use employment structures strategically to lower costs, control labor, and smooth the flow of resource exchanges between the firm and its constituencies (Baron, Dobbin & Jennings 1986). While firms would like to increase their cost

savings and decrease their dependence on others, all else being equal, their organizational characteristics and employment structures either facilitate or constrain their ability to capitalize on the range of alternatives available for adoption (Pfeffer & Baron 1988). This approach is consistent both with the contemporary literature on externalization (Pfeffer 1994; Smith 1997) and Baron and Bielby's (1980) "new structuralists" argument which holds that much of the variance in the organization of employment arrangements is at the level of the firm or establishment.

We borrow ILM arguments, as well as arguments and findings (both qualitative and quantitative) from the flexible employment literature, to specify hypotheses about the relationship between organizational characteristics and the use of contingent employment arrangements. Based on prior research, our analysis examines the principle organizational factors affecting the use of different employment arrangements. Specifically, we focus on: organizational size; labor relations and collective action; organizational governance structures; the organization and design of jobs; job technology; and labor supply and demand.

There are several definitions of contingent work, which includes part-time, temporary, and independent or fixed-term contract work (Kalleberg & Schmidt 1997). All these perspectives, however, view contingent work as comprised of jobs that implicitly and explicitly enjoy few of the benefits generally associated with standard, full-time positions (i.e., job security based on merit, opportunities for career advancement, and fringe benefits). Contingent jobs, moreover, vary in their degree of externalization to the firm which can occur in terms of: (1) place (e.g., freelancing and homework), (2) administrative control (e.g., agency temporary workers and independent contractors), or (3) employment duration (e.g., part-time and temporary workers) (Callaghan & Hartmann 1991; Pfeffer & Baron 1988; Parker 1994; Smith 1997).

Consistent with the above definitions, we focus on two types of contingent workers — fixed-term contractors and part time workers — both of which are contained in our data and which possess the core analytical properties discussed above in the following ways. First, contractors and part-timers are externalized in terms of either administrative control or employment duration. Second, they are primarily hired by employers because they provide staffing flexibility and direct payroll cost saving benefits relative to full-time workers (Abraham 1988; O'Reilly 1994; Tilly 1991). Third, contractors and part-time workers lack the legal right to the job-related health insurance, vacation, and retirement benefits to which permanent worker are typically entitled (Levine 1987; Ronen 1984; Tilly 1992). Lastly, both groups have traditionally lacked formal unionization or advanced skills. Consequently, the working conditions and bargaining power within firms characteristic of these groups are similar. These analytical commonalities between fixed-term contractors and part-time workers permit us to examine how similar

features across different types of contingent workers respond to the same organizational characteristics.

Fixed-term hires and part-timers also vary in regard to some criteria that define contingent work — providing the potential for insights not yet explored in the flexible employment literature. In particular, they differ in the degree to which their administrative control and employment duration are externalized. First, contractors, normally have full administrative control over their work assignments, and are therefore accountable to the firm for the quality and timing of their output rather than for the process by which that outcome is produced. Part-time workers, in contrast, normally fall under the full administrative control of the firm. Second, contractors and part-timers can hold different types of jobs or have different skill sets. Contractors are typically hired for a specified assignment and substituted for an entire permanent job or a series of related permanent jobs. Part-timers, on the other hand, are generally hired according to the hours worked per week[1] and tend to perform the subcomponents of full-time, permanent jobs which can be segmented into discrete tasks (Tilly 1992). Third, although contract and part-time work is typically low-skilled, contract work also includes work that demands high, standardized skills such as accounting, nursing, or engineering, particularly when an employer needs access to specialized expertise or services that are only periodically required. Most part-time jobs, on the other hand, are low-skilled and tend to be dominated in the US and UK by women, minorities, and the young (ages 16 to 22) and the elderly (ages 65 and over) (Belous 1989; Walby 1989; Jensen 1989; Callaghan & Hartmann 1991; Kalleberg & Schmidt 1997). Finally, part-time employees have historically been the favored alternative to permanent workers. This contrasts with the increasing use of fixed-term contractors to replace permanent workers in recent years (Jacobs & Qian 1996; Smith 1997).

Given the commonalities and differences inherent in contingent work arrangements, our approach is to hypothesize how the known commonalities of contract and part-time contingent work arrangements impact the adoption and intensity of the use of externalized work practices. This approach to the study of contingent work should shed light not only on the organizational-level factors that affect adoption of alternative work arrangements, but also suggest how secondary dissimilarities may potentially affect the use of different types of contingent workers.

Our analysis uses a random sample of about 2000 UK establishments in the private and public sectors. In addition to being an important context in its own right, the British context helps expand our store of comparative research on the employment relationship. First, in contrast to the US, the length of continuous service with an employer determines employment rights regardless of temporary or permanent status in the UK (O'Reilly 1994). Until March 1994, part-timers working less than sixteen hours per week had to work for the same employer for five years before they were entitled to employment protection whereas full-time and contract workers were eligible after two years of continuous employment

(O'Reilly 1994). Second, part-time employees may be especially attractive to UK employers because state welfare policies provide for lower national insurance costs and other health benefits for these workers than they do for contractors (Hakim 1987; Hart 1990). Lastly, while part-timers' share of total employment in the two nations is comparable — 19.1% in the US and 24.6% in the UK in 1990 — growth in the British temporary employment sector has been more moderate than in the American sector. Between 1980 and 1991, temporary employment in the US increased 225 percent from 400,000 to 1.3 million (Kalleberg & Schmidt 1997). In the UK, it rose by 2.5 percentage points a year between 1983 and 1987 and increased 30.2 percent between 1990 and 1995 (Hunter et al. 1993; *European Industrial Relations Review* 1996).

Despite these differences, however, the British context is instructive because many of the organization, market, and regulatory forces at work in the U.K. during the 1980s paralleled similar occurrences in other industrialized nations, including the US. As in the US, changes in labor law, relatively high unemployment, and more intense global competition, favored managerial initiatives to cut labor costs, weaken unionization, and adopt flexible employment arrangements (Lee 1989). While U.S. employers effected the decline of unions with little legislative help (President Reagan's brinkmanship with the air traffic controllers aside), British employers relied on across-the-board regulatory changes to shift the power over work arrangements from employees to employers (Davies 1994; Summers 1992). The previous rights of workers and unions to protest disputes peacefully was narrowed; strikers who took part in unofficial industrial action lost protection against dismissal under the new laws. Companies also centralized their collective bargaining efforts, withdrawing from the multi-employer, industry level bargaining process to focus solely on establishment-level bargaining and decentralized organization design.

These changes attached new importance to establishment-level factors in setting labor practices that potentially enabled management to align labor arrangements more closely with market contingencies, particularly in regard to how unionization, new job technologies, and the corporate reorganization of jobs and evaluations systems could be reconditioned to promote the use of flexible work arrangements (Davies 1994; Goodman 1989; Hart 1990). For all these reasons, the British case, furnishes a valuable perspective on the role that organizational structures and strategic human resource policies play in the adoption and use of alternative work arrangements while expanding our knowledge base of comparative research on the employment relationship.

We organize the article as follows. First, we review arguments regarding the relationship between organizational factors and the use of contingent workers. We do not attempt to make distinctive arguments for the use of contractors as opposed to part-timers. This presumes that there exists sufficient evidence and arguments to posit non-constant effects for different types of contingent workers. Instead, we

build on the current literature and make general statements about contingent workers, using our discussion to interpret the results and furnish an empirical basis for future studies that might examine reasons why similar predictor variables affect particular types of contingent workers differently. Second, we analyze the intensity of firms' use of fixed-term contractors and part-timers using ordered logit models and data from a 1990 representative sample of about 2000 UK firms. We close by discussing the results and their implications for research on the employment relationship.

Theoretical And Empirical Expectations

ILM perspectives on the employment relation identify the principle variables which influence the use of different kinds of flexible work arrangements. Below, we describe the arguments behind each class of explanatory variables and their expected effect on the use of contingent workers.

ORGANIZATION SIZE

The relationship to which more attention has been devoted than any other is the link between organizational size and the nature of work arrangements (Baron 1984). Available evidence indicates a *net* positive relation between organizational size and the use of contingent workers (Abraham & Taylor 1990; Davis-Blake & Uzzi 1993; Magnum, Mayall & Nelson 1985). Several ILM perspectives exist on the relationship between organizational-size and contingent worker use. One argument asserts that large firms have a greater numerical probability of using part-timers and contractors to fill short-term staffing needs because they have a larger and more diverse pool of jobs that can be filled by contingent workers (Davis-Blake & Uzzi 1993). A second perspective focuses on the role played by economies of scale. "Economies of scale mean that large organizations also incur lower marginal costs of training additional employees than do small organizations" (Knoke & Kalleberg 1994:538). This should be true even if contingent workers are used as auxiliary employees or substitutes for permanent employees because larger establishments can spread the fixed costs of managing a large workforce, embedded in personnel and human resources departments, over contingent employees better than small organizations which have lower fixed costs on average. Consequently, the transaction costs of hiring and training contingent workers are lowered, possibly making the use of contingent workers more cost-efficient (Williamson 1985). Third, the range of products/services produced by large firms requires frequent access to expertise and services that are difficult to develop in-house at the same level of cost efficiency as is found in those firm functions that attain economies of scale cost savings (Harrison & Kelley 1991). Thus, big firms are more likely than

small firms to use contractors in non-technical (e.g., delivery, food service, maintenance services) and technical (e.g., bookkeeping, data processing, secretarial) functions (Uzzi 1996). In this way, the establishment can satisfy pressures to bring labor costs across all functions in the organization in line with the base-line costs set by functions that enjoy economies of scale in labor pricing. Finally, contingent workers should be more attracted to large firms than small firms because large firms offer better opportunities for permanent employment, as well as higher wages (Knoke & Kalleberg 1994). This suggests,

> *Hypothesis 1.* The larger the establishment, the greater the level of use of contingent workers at the establishment.

Management-Labor Relations

A key feature of the firm that affects the choice of employment relationships, is the nature of the relationship between management and labor, particularly as it is expressed by the presence of unions and collective bargaining (Baron 1984). The literature on contingent workers has forwarded two arguments to explain the relationship between management, labor (unionized and non-unionized), and the adoption of flexible work arrangements. Both arguments view contingent workers as a critical resource over which powerful organization actors compete in order to gain control over the firm's labor practices. One view holds that the use of temporary workers should *increase* in direct proportion to the percentage of unionized workers in the firm. This is because management seeks to weaken the union's power over labor practices through the use of workers who are inherently difficult to unionize and who can remind permanent employees of their substitutability (Pfeffer & Baron 1988). The second view holds that the use of contingent workers should *decrease* in direct proportion to the percentage of unionized workers in the firm because unions will fiercely defend their control over labor, their primary power base in the firm (Smith 1997).

Despite these apparently straightforward arguments, empirical tests have been mixed, both within and between studies. Abraham and Taylor (1990) found a positive association between the use of independent contractors and the percentage of unionized workers in the firm for one type of independent contractor, but found no relationship for five other types of contractors. Davis-Blake and Uzzi (1993) reported that the percentage of unionized workers in the firm was positively associated with the use of temporary workers, but unrelated to the use of independent contractors. Conversely, Abraham (1988) found that the level of unionization in an organization was negatively related to the use of temporary workers, while Hunter et al. (1993) reported qualitative data which suggested that management's hiring of contingent workers was unrelated to its desire to reduce union power.

Building on the above findings, we argue that the relationship between unionization and contingent worker use remains a matter of managing conflicting interests. Our approach suggests that the relationship is curvilinear rather than linear. On the one hand, we assert, consistent with current arguments, that the firm has little incentive to hire contingent workers to reduce the union's power when there is a low level of unionization. In this case, there is either no collective bargaining organization or the union has only limited control over work practices.

On the other hand, we argue that the firm is also unlikely to use contingent workers when there is a high level of unionization. We base this reasoning on several arguments. First, management can increase employment flexibility through training, recruitment, and other means that are less likely to spur management-labor conflict when the union is entrenched since the above activities also promote union goals (Freeman & Medoff 1984; Osterman 1987). This HRM strategy is typical in European co-determination labor relation systems which achieve a high level of employment flexibility without the extensive use of contingent workers or labor conflict (Wever 1995). Second, it is unclear what the net "power" benefits of adding contingent workers are in a highly unionized firm, because doing so entails creating new positions for temporary jobs, unless the firm intends to eliminate a significant number of union workers for the purpose of hiring contingent workers to replace them — an action that is likely to incite labor unrest. Thus, while management may face strong incentives to increase the use of contingent workers when the level of unionization is high, the possible benefits of bringing temporary workers into firm are offset by the real costs of conflict with a strong union, and the comparative costs of using other methods to gain labor flexibility.

Finally, we argue that a medium level of unionization in the firm will be associated with an intensive use of contingent workers. First, the union's more tenuous position in the firm enhances management's ability to impose employment practices on the organization without fear of union retribution. Second, a medium level of unionization implies that the organization already has discretion over a substantial number of non-unionized jobs that can be converted to contingent jobs without union interference. Third, changes in the regulatory environment during this period suggest that the legal barriers which had hampered management's ability to interfere with union hiring, legal immunities, and bargaining rights were reduced (Cordova 1996; Davies 1994; Summers 1992).[2] In Britain for example, a particularly critical change cut workers' rights to protest trade disputes. Strikers who took part in industrial actions (e.g., strikes, blacking of work, work-to-rule) lost their protection against dismissal under the new law. When coupled with the failure of several long strikes in the public sector in 1984, these changes enhanced perceptions that only a high level of unionization within the firm protected employees against a management backlash (Goodman 1989). Thus, the autonomy of unions with low to medium levels of representation in the firm was critically reduced because they could no longer rely on legal rights to promote their control

over the labor process. Their experience contrasted sharply with that of unions with high levels of representation in the firm. These bargaining units could credibly exercise control over the labor process simply by virtue of their extensive representation in the firm. This meant that management was not only more likely to react to unions with a medium level of representation by bringing in contingent workers, but also that their use of contingent workers was abetted by changes in the legal framework which gave management new authority over labor practices. This suggests:

> *Hypothesis 2.* There is an inverted U-shaped relationship between the level of unionization in the establishment and the likelihood of contingent worker use, such that establishments with low and high levels of unionization are likely to have a lower level of use of contingent workers than establishments with a medium level of unionization.

Following Pfeffer and Baron's (1988) argument, we argue that firms experiencing high levels of insurgent behavior among permanent employees, union or otherwise, are more likely to attempt to reduce their dependence on permanent workers through the use of contingent workers. This is because the firm can use exit rather than voice strategies with contingent workers to solve labor-related problems thereby reducing the transaction costs associated with extensive bargaining between labor and management (Williamson 1985). Similarly, contingent employees are likely to use exit rather than voice strategies to indicate their disagreement with the firm, leaving it to the firm's discretion whether to address or ignore the problem (Freeman & Medoff 1984). In both cases, the organization can reduce the source and severity of conflicts related to managing permanent employees by using contingent workers. Consistent with this argument, Harrison (1994:38) showed that the "externalization of activities that had formerly been performed inside the big firms ... In Europe ... and the United States ... [occurred because] managers seemed determined to reduce their dependence on militant .. . workers." Research on the use of temporary workers when the relationship between labor and management is positive also reveals a pattern of results that are consistent with this argument. Smith (1994) reported that management is unlikely to hire contingent workers when employee-management ties are positive because they add job reorganization, hiring, and administrative costs that are difficult to justify. The resulting increase in transaction costs is likely to diminish the attractiveness of the "buy" versus "make" decision (Williamson 1985). Harrison and Kelley's (1991) finding that US firms with cooperative labor-management relations were less likely to use independent contractors to gain flexibility than firms lacking cooperative labor-management relations supports this interpretation. This suggests,

Hypothesis 3. The greater the degree of labor-management conflict at the establishment, the greater the level of use of contingent workers at the establishment.

GOVERNANCE STRUCTURES

Several perspectives on the employment relationship suggest that organizational governance structures shape the firm's use of different employment arrangements (Baron 1984). Bureaucratization perspectives, for example, argue that firms adopt formal employment evaluation systems to retain skilled employees, as well as to monitor and control work behavior (Collins, 1979). Transaction costs economic theory makes a similar argument, but suggests that performance evaluation systems vary in their ability to minimize the transaction costs of monitoring and controlling different kinds of labor arrangements. According to this perspective, the costs of gathering information on employee performance at each step of the selection and job evaluation process determines the type of labor arrangements that can be most effectively adopted by the firm (Williamson 1985).

These perspectives suggest that there are two key methods of monitoring employee performance. First, there are formal evaluation systems which use objective assessment criteria (e.g., tests, metering, evaluations) and explicit rules that codify organizational standards of performance for workers who must be taught and learn organizational routines quickly. These features of formal evaluation systems should facilitate the increased use of contingent workers because they enable temporary employee performance and productive worth to be measured against clear organizational standards and can aid in socializing contingent workers into the firm by furnishing recognized guidelines for work-related behavior (Collins 1979; Williamson 1985).

The second class of monitoring and evaluation systems employed in organizations is direct managerial supervision or surveillance (Halaby 1978; Smith 1997). While a managerial staff is needed for the governance of permanent employees, a large managerial staff may be particularly critical for the effective use of temporary workers for several reasons (Smith 1997). First, managers are needed to add continuity to the transient nature of temporary work and the migration-like flow of different temporary workers through the firm. Second, managers are needed to broker exchanges between permanent workers and temporary workers who are unaccustomed to the organizational practices and unwritten routines that shape the work of permanent employees (Geary 1992). In this case, a managerial staff can also fine tune the work activities and job placement of temporary workers so that idiosyncratic requirements are met and conflict avoided. Third, managers can convey to contingent workers organizational norms and procedures that facilitate exchanges between them and permanent workers. As Geary (1992: 259) found in his qualitative study of three electronic plants, "Temporary employees in

the eyes of some permanent workers were seen to be "saucy" and "cheeky" . . . [while] temporary employees, in turn often felt abused by permanent staff . . . [and] complained that permanent workers were ordering them about unnecessarily." Misunderstandings between the two groups required supervisors to spend the majority of their time on the shop floor (Geary 1992). Smith (1994) also found that managerial staff played a critical role in mediating or even averting conflict in mixed work forces. For instance, she reported in her case study of a computer manufacturing and photocopying service firm that the successful use of temporary employees relied on "hidden hierarchies" of managers and permanent workers who could control the activities of temporary workers and smooth over conflicts between permanent and contingent workers that would otherwise lower performance (Smith 1994). This argument dovetails with Gottfried's (1991) qualitative study of four enterprises. Her results showed that successful temporary help service firms must rationalize the jobs of temporary workers when the hiring firm lacks the management staff needed to supervise contingent employees directly. She concluded, "The problem of control over temporary workers becomes one of managing individual workers dispersed across multiple job sites . . . The firm, along with its clients, secures the temporary worker's compliance with work rules through the application of a double layer of management" (Gottfried 1991:703-704).

These results indicate that the use of alternative work arrangements is likely to increase when formal systems for assessing job performance are available and/or the firm possesses a sufficiently large managerial staff that can capably oversee the work of contingent employees. This suggests the following hypotheses:

Hypothesis 4. The wider the scope of formal performance evaluation systems across jobs, the greater the level of use of contingent workers at the establishment.

Hypothesis 5. The larger the managerial governance structure at the establishment, the greater the level of use of contingent workers at the establishment.

The Organization and Design of Jobs

This set of arguments is related to the above idea of worker control and governance structures, but focuses on how the level of interdependence among related jobs restricts the organization's ability to implement alternative work arrangements that might disrupt the smooth flow of work between jobs presently in use at the organization (Baron 1984). According to this argument, firms may desire to adopt flexible work arrangements, but their ability and motivation to do so is likely to vary with the degree to which these work arrangements can be easily integrated with the formal and informal work practices already in place in the organization. This is because a lack of coordination among jobs can lower transactional efficiencies and increase conflict among workers (Williamson 1985) even if the new types of jobs are more cost efficient in some absolute sense (Smith 1997).

These arguments suggest two relationships between the organization of jobs in the firm and the use of contingent workers at the firm. First, the use of contingent workers should be inversely related to the age of the firm. This is because idiosyncratic job routines and practices tend to become resistant to change over time at the individual level as average employee tenure increases and at the organizational level as the establishment becomes accustomed to and rewarded for applying particular procedures that become standardized as the organization ages (Hannan & Freeman 1989; Zhou 1993). Moreover, this should be particularly true in older firms that were designed for stable environments and long-term job holders rather than the episodic involvement and high personnel turnover of temporary positions (Rousseau & Libuser 1997). Consistent with this argument, Smith (1997) summarized evidence from several sources that indicated a tendency between an organization's ability to adopt any of a wide range of flexible staffing arrangements such as contracting, just-in-time job systems, team-based work systems, or self-managed groups and the degree to which these systems required changes in employment practices that had been based on the type of historical job designs which are likely to be found in older firms.

Second, the use of contingent workers is likely to vary with job reorganization programs that are designed to decompose and realign historical work arrangements with current market needs, as well as to enlarge the firm's access to alternative sources of labor more generally (Pfeffer 1994). This conjecture is supported by economic trends which indicate a positive association between job reorganizations and the use of temporary workers (Keidel 1994; Pfeffer 1994). For example, before a firm was able to integrate temporary jobs and workers, Smith (1994: 229) found that permanent employees had to reorganize their jobs to accommodate the work output and routines of temporary workers because "permanent workers believe(d) that temporary workers are . . . not trained in 'thinking quality,' . . . [and questioned] . . . whether their work meets the standards set by permanent machine operators . . . [Thus] Permanent facilities workers had to organize their efforts around . . . temporary workers [who] can interfere with the [permanent] operator's ability to perform their jobs." Similarly, Pearce (1993) found that R&D supervisors increased their use of contractors after they reorganized the job interdependencies between permanent workers and independent contractors. The job reorganization smoothed production problems related to externalized jobs that had formerly been permanent and were staffed by workers who had standardized practices of exchanges with the staff in the R&D division. Thus, we propose:

Hypothesis 6. The older the establishment, the lower the level of use of contingent workers at the establishment.

Hypothesis 7. The wider the scope of recent job reorganization programs across jobs, the greater the level of use of contingent workers at the establishment.

Job Technology

Baron's (1984) review of organizations and work arrangements concluded that the effect of technology on work arrangements, while vital to a complete explanation of change in the employment relationship, is most informative when made context specific because of the variance in jobs, firms, industries, and technologies. Consistent with this approach, we examine the relationship between new computer technology and the use of contingent workers.

One argument within the job technology perspective is that new job technology reflects the increasing evolution of work and thus amplifies skill requirements and training (Poire & Sabel 1984). For example, the implementation of just-in-time manufacturing systems has been shown to increase the difficulty and complexity in work scheduling and the cognitive demands of workers in charge of production and inventory control (Dawson & Webb 1989; Brown and Mitchell 1991). The opposing argument asserts that technology increases production efficiency by reducing labor intensity or by permitting less skilled workers to perform tasks that could previously only be performed by higher skilled, higher cost workers (Hakim 1987; Milkman & Pullman 1991). Much research, for instance, shows that computerized systems de-skill jobs and enable management, through its ability to program the technology, to control the workforce more easily by monitoring the location of products, tracking detailed information on work performance, and building in quality control mechanisms (Skorstad 1991; Sewell & Wilkinson 1992; Taplin 1995).

In the case of contingent workers and new computer job technology, several studies offer arguments and findings for developing predictions. Most generally, Reskin and Roos (1990) examined fourteen occupational cases in which they showed that the adoption of new computer-related technologies in firms and occupations is often followed by a lowering of the skill requirements of jobs in the affected occupations as well as the increased hiring of workers who will accept lower pay and limited promotional opportunities. Hunter et al. (1993) and Smith (1994) argue that the firm's human resource management strategy is to adopt technology that, at least in part, permits the use of temporary workers by standardizing and simplifying the skills needed to perform jobs. Recent research supports these arguments and shows that computer-based work processes have facilitated the organization's use of temporary workers (Appelbaum & Albin 1989; Tilly 1991). Gottfried (1991:709) reported that one service enterprise she studied was able to incorporate "25 temporary workers without having to change its management structure [because] the time clock in the word processor [controlled the] ... pace of the worker and required the attachment of an identification code (e.g., a number of a name) to produce a paper trail." These findings suggest that the introduction of new computer job technology into the firm is generally undertaken to increase

the use of contingent workers or provides the opportunity to do so once it is in place.[3] Therefore, we propose:

> *Hypothesis 8.* The wider the scope of recently introduced new job-related computer technology across jobs, the greater the level of use of contingent workers at the establishment.

Recruitment and Labor Supply

The flexible employment literature has focused on the demand for contingent workers for purposes of cost reduction, particularly in regard to fringe benefits costs. It has proven difficult, however, to provide valid measures of fringe benefits costs because of differences in accounting practices, workforce demographics, and legal definitions that exist across firms and industries (Casey 1989; Christopherson 1989). A condition that explains, at least in part, the inconsistent empirical results on the relationship between fringe benefits costs and the use of temporary workers (Davis-Blake & Uzzi 1993). In response to the these problems and the dearth of representative data on costs, Hunter et al. (1993:395) suggested that research on contingent work should not focus strictly on the "pull" of the firm, but on the "push" of the market. They reasoned that employers do not regulate their demand for temporary workers based on narrow fringe benefits costs. Rather, employers use temporary workers when they can exploit the total wage differences between permanent and contingent workers which are a function of the supply of labor in the local labor market (Osterman 1987).

The premise is that workers are most likely to sell their skills to employers, and employers are most likely to purchase the skills of contingent workers, when unemployment rates are high. This occurs for several reasons. First when unemployment is high, firms are less likely to establish permanent jobs to retain competent workers because the probability that a worker will voluntarily quit in order to accept a competing position is lower. Also, in the event that the worker does leave the firm, the search costs related to replacing the lost employee should be relatively low. From the perspective of the firm, these factors should increase the firm's recruitment of contingent workers. From the perspective of prospective applicants, a soft labor market also makes the selling of one's skills on a contingent basis more likely because there is a smaller likelihood of finding permanent work. Under these conditions, contingent work may offer a possible springboard to permanent positions or present entrepreneurial opportunities that are more attractive than the low quality permanent positions offered by firms during soft labor markets (Belous 1989). This suggests,

> *Hypothesis 10.* The greater the number of job seekers in the establishment's hiring vicinity, the greater the level of use of contingent workers at the establishment.

Data

Data from the 1990 Workplace Industrial Relations Survey (WIRS) were used to test the hypotheses (Social and Community Planning Research 1992). WIRS surveys are concerned primarily with industrial relations structures and work practices. A minority of questions seek the perceptions of respondents; most questions are "factual." The establishment is the unit of data collection, with sub-units defined on a uniform basis for situations where practices may vary across the establishment. Data are collected on the establishment's basic organizational characteristics such as size, ownership, region, age, products, technology, SIC code, formalization, job evaluation scheme coverage, labor costs, and workforce characteristics which include unionization rates, collective bargaining arrangements, frequency of industrial action, and types of contingent jobs. Unfortunately, almost no data on the characteristics of jobs or job holders were collected because the study was designed to examine industrial relations, not jobs and organizations. Given the size of the sample, the costs of getting detailed data on individual jobs in large firms was deemed financially prohibitive.

All sectors of the British economy are represented in this cross-sectional sample, although there is a bias to over sample establishments with more than 25 employees. Therefore, general conclusions should be made judiciously. The survey involved face-to-face interviews and included multiple respondents: the primary management respondent (a senior person at the establishment responsible for industrial relations or personnel matters), manual and nonmanual union representatives, and the works manager. Management, union representative, and works respondents were selected on the basis of their role and presumed knowledge of the survey subject matter.

2016 establishments participated in the survey, a response rate of more than 80%. Sample sizes vary across our models and are less than the full possible N due to sampling and response rate differences across survey items, as well as the fact that we employ standard economic modeling techniques that use case-wise deletion of missing values. According to the WIRS documentation, the differences in response rate to individual items should be acknowledged although it is not considered systematic.

Statistical Model and Measures

To examine the determinants of the use of contingent workers, we utilized an ordered logit model, also known as a proportional odds model, to estimate the probability of the use of contingent workers across three levels of intensity of use. Ordered logit models estimate the relationship between an ordinal dependent variable and a set of independent variables (Greene 1993). An ordinal variable is

a variable that is categorical and ordered, for instance, "no use," "low use," "medium use," and "high use." In an ordered logit, an underlying probability score of how a one unit change in an independent variable affects the change in probability of intensity of use is estimated as a linear function of the independent variables and set of cut points. The probability of observing outcome i corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for the outcome:

$$\text{Pr}(\text{outcome}_j = {}_i) = \text{Pr}(k_{i-1} < B_1 x_{1j} + \ldots + B_k x_{kj} + u_j \leq k_i)$$

where u_j is assumed to be logistically distributed in the ordered logit. In either case, one estimates the coefficients $B_1, B_2, \ldots, B_{I-1}$ along with the cut points $k_1, k_2, \ldots, k_{I-1}$, where I is the number of possible outcomes. k_0 is taken as -1 and k_I is taken as +1. All of this is a generalization of the ordinary two-outcome logit model.

An important feature of the ordered logit model is that the substantive numerical values of the dependent variable are unimportant (Greene 1993). In ordinary regression, arbitrarily labeling "high use" as 4, "medium use" as 3, and so on is problematic because different labels (say 10 for "high use" and 8 for "medium use"), would obtain different estimates. This is not true in an ordered logit model. All that is necessary is that larger numerical values correspond to more intense outcomes or levels of usage. Thus, a positive and significant coefficient for an independent variable reflects the increased probability of the intensity of contingent worker use on our scale of "no use" to the last category of "high or maximum" use. A smoothness assumption between categories that restricts a significant coefficient to reflect differences in intensity in each category reduces efficiency but does not bias the estimation of regression parameters (Greene 1993).

To represent the distribution of the number of contingent workers employed at the firms in our sample, we created a categorical indicator variable for each dependent variable based on logical cutoff points around the "humps" in its distribution. For fixed-term contractors, a categorical variable was created with the following four cutoff points: if the firm used no contractors ("no use") it was assigned a value of "0;" if the firm used one to five fixed-term hires ("low use"), it was assigned a value of "1;" if the firm used six to twenty fixed-term hires ("moderate use"), it was assigned a value of "2;" if the firm used twenty-one or more fixed-term contractors ('high use"), it was assigned a value of "3." For part-time workers, the following five cutoff points were chosen because it had a different distribution: if the firm used no part-timers ("no use"), it was assigned a value of "0;" if the firm used one to ten part-timers ("low use"), it was assigned a value of "1;" if the firm used 11 to 20 part-timers ("moderate use"), it was assigned as value of "2;" if the firm used 21 to 250 part-timers ("high use"), it was assigned the value of "3;" and if the firm used 251 or more part-timers ("maximum use"), it was assigned a value of "4." In both analyses, "no use" was chosen as the baseline category consistent with previous research.[4] We conducted sensitivity tests by changing the cutoff points within a sensible range given the distribution and extant theory. For

example, the high ranges in each variable were broken into multiple levels of intensity, since these clusters had the widest dispersion of data. These changes produced no substantive differences in the results. The appendix describes the distributional features of both dependent variables and the logic of the chosen cutoff points given the distributional features.

An optional modeling strategy might have employed a Poisson or negative binomial regression. The Poisson and negative binomial regressions treat the dependent variable as a continuous count variable rather than an ordered categorical variable. The benefit is that the researcher avoids choosing cut points for levels of intensity and the model estimates a continuous probability for a change from one unit of the dependent variable to the next rather than from one category of like-clustered units to the next category of like-clustered units.

Given statistical and theoretical reasons, we could not validly use Poisson or negative binomial regression. First, Poisson regression is *not* statistically robust to violations of the assumption that the mean and variance of the dependent variable are equal (McCullagh & Nelder 1989) — a requirement which was violated for both dependent variables. Also, in Poisson regressions (not shown) using the variables presented in Table 1, the goodness-of-fit *chi*-square test and all the variables were significant at the $p< 0.000$ level; an implausible result that suggests that the process of contingent worker use is *not* Poisson generated (McCullagh & Nelder 1989). Second, although the negative binomial regression permits the variance and mean of the dependent variable to differ, it preserves the requirement that a Poisson process generates the dependent variable. A Poisson generated process demands that each event or unit of the dependent variable is generated independently (McCullagh & Nelder 1989). In the case of contingent workers, this means that the use of any one contingent worker must be independent of the use of any subsequent contingent worker. Theoretically, it is highly improbable that this assumption holds because organization experience in hiring and managing contingent workers ("past occurrences") almost certainly affects their subsequent use. Also, the highly significant *chi*-square value of the Poisson regression described above suggests on empirical grounds that the negative binomial regression, like the Poisson regression, is theoretically questionable and will generate misleading results. Finally, in our view, the substantive question for labor market theory is not the narrow issue of how the probability of contingent worker use changes with an increase from three to four to five, or from twenty-two to twenty-three contingent workers. Rather, the fundamental question is how the probability of the level of use changes as firms move from "no"-to-"low"-to-"moderate"-to-"heavy use", since these changes denote the critical qualitative shifts in the spread of contingent work arrangements and their societal effects. For these reasons, the ordered logit model succeeded as the optimal technique for obtaining both valid and substantively significant results.

TABLE 1: Distribution of Categorical Dependent Variables Specifying the
Number of Fixed-term Contractors and Part-time Workers Used by
the Firms in the Sample

		Fixed-term Contractors		
Category	Range	Number of Observations in Range	Mean of Observations in Range	Median of Observations in Range
No use	0	1,339	0	0
Low use	1-5	288	2.45 (1.4)	2
Medium use	6-20	219	11.2 (4.7)	10
High use	21+	143	111 (130.7)	54

		Part-time Workers		
Category	Range	Number of Observations in Range	Mean of Observations in Range	Median of Observations in Range
No use	0	305	0	0
Low use	1-10	736	4 (2.71)	3
Medium use	11-50	532	25 (11.1)	22
High use	51-250	269	115 (53.7)	100
Maximum use	251+	166	670 (452)	506

Another possible model might use the percentage of temporary workers as a dependent variable (*no. of contractors ÷ total employment*). We did not follow this path for two reasons. First our theoretical interest is in the factors that affect the intensity of use of contingent workers holding size constant, rather than in what affects the proportional use of contingent workers relative to size. Second, although the "percent of something" is occasionally used as a dependent variable, in our case it is likely to be inappropriate. First, operationalizing the dependent variable as a percentage of total employment can create a forced correlation with right-hand side variables that have *total employment* as their denominator (i.e., *percent manager, percent clerical, percent technical, percent women, percent minority,* and *organizational size,* which is based on *total employment*). In the extreme case, this can result in the dependent variable becoming a linear function of an independent variable(s) because the two variables use identical denominators. Thus, we followed the conservative route of using the order logit model which was developed to overcome these problems with no corresponding loss of statistical information.

Variables

DEPENDENT

In the WIRS survey, questions about the intensity of use of two types of contingent worker were included: (1) fixed-term contractors who are hired to work on-site for a temporary but preset duration, and (2) part-timers who are hired on-site to work for a regularly scheduled, but limited number of hours per week. As discussed, these variables were coded into four and five category variables.

INDEPENDENT

Organizational size is measured by the number of full-time employees at the establishment. Tests of normality showed that this variable was skewed by outliers, and thus required transformation. The chief reason for transforming right-hand side variables in logit regression is to reduce the leverage of outliers. In linear regression, right-hand side transformations may also serve this purpose, as well as the important purpose of linearizing relationships (D'Agostino, Balanger & D'Agostino 1990). To correct for the potential problems this might create, we used the square root of organization size to correct for the non-normality of number of employees in its raw form (Chi-square test for normality, $p < .000$). *Percent unionized* and *percent unionized squared* measure the number of full-time unionized workers divided by the number of full-time permanent workers at the establishment. *Management-labor conflict* measures the cumulative frequency of worker conflict at the establishment. Indicators of worker conflict reported by the establishment included the number of one day strikes, one week strikes, strikes of more than one week, "worked to rule," worker lock out, workers going slow, ban on overtime, blacking of work, and work-in/sit-ins over the past year. This variable ranged from zero to eighteen. The best fitting transformation to correct the non-normality of the distribution was a square root transformation (Chi test for normality, $p < .000$). *The scope of formal performance evaluation system* measures the number of formal job performance evaluation schemes in the organization that are designed for systematically comparing the relative value of different jobs, both contingent and permanent. Similar to the management-labor conflict variable, tests of normality for this indicator showed that it was skewed by outliers, and thus required transformation. The best fitting transformation to correct the nonnormality of the distribution was the square root transformation (Chi test for normality, $p < 0.00$). *Percent managers* is equal to the number of managerial personnel divided by total establishment employment. *The scope of recently implemented job reorganizations* measures the scope of job reorganization programs, which is the number of job classes affected by the job reorganization at the

establishment that have been implemented in the previous three years. It indicates the number of sections of the workforce that were significantly affected by job redesign. While this variable does not permit an exact identification of the job changes, it provides a scale of the scope of those changes. Thus, although this variable is not as fine-grained a measure as would be optimal, it provides a conservative test of our argument that the more extensive a firm's job redesigns are the more likely the establishment is to increase its level of contingent worker use. The sections of the workforce potentially affected include the full range of job classes in the data set: unskilled manual workers, semi-skilled manual workers, skilled manual workers, clerical/administrative workers, supervisors/foremen, junior technical/ professional workers, and senior technical/professional workers. *Organization age* measures the age of the establishment at its present address. Hence, if a ten year old establishment moved to its present address five years prior to the survey, it would have reported its age to be five years. While this has the potential to add error to the age variable, recent findings from population ecology and migration theory suggest that a major relocation "resets the clock" regarding organizational routines, roles, and work flows — the main characteristics of interest for this study (Amburgey, Kelly & Barnett 1993; Romo & Schwartz 1995). *The scope of recently implemented new job technology* measures the scope of newly implemented job-related computer technology at the firm. It indicates the number of sections of the workforce that were affected by the new technology. While this variable does not permit an exact identification of the type of technology within the broader class of computer-related technology, it measures the scope of change. Thus, it provides a conservative test of our argument that the more intensive the use of new job-related computer technology, the more likely the establishment is to increase its level of contingent-worker use. The sections of the workforce potentially affected include the full range of job classes in the data set: unskilled manual workers, semi-skilled manual workers, skilled manual workers, clerical/administrative workers, supervisors/ foremen, junior technical/professional workers, and senior technical/professional workers. *Male unemployment rate* and *female unemployment rate* measured the unemployment rate in the establishment's British equivalent of an SMSA.

Controls

Previous research has shown that controls for pay, job type, industry, and region influence the use of contingent workers (Abraham & Taylor 1990; Davis-Blake & Uzzi 1993). To control for the possibility that high paying establishments are less likely than low paying establishments to use contingent workers because there is something systematically different about high wage firms (e.g., they employ professionals from a labor market that is not serviced by temporary workers) or high wages reflect an organization with more productive labor and thus less need to use externalized workers, we include the variable, *average median pay*. This

variable measures the average of the median pay for all classes of workers in the establishment, including manual and nonmanual workers. Although this is a crude measure, WIRS documentation indicates that it is based on factual data recorded at the establishment. As such, it is a superior measure of wages than those available from aggregate industry level reports. *Percent female* and *percent minority* measure the proportion of women employees (i.e., total number of women employees/total establishment employment) and the proportion of minority employees at the establishment. To control for the fact that certain types of clerical and technical jobs affect the likelihood of temporary worker use, two variables were added to the logit model: (1) *Percent clerical jobs*, defined as the number of clerical employees divided by total establishment employment and (2) *Percent technical jobs*, defined as the number of technical/professional jobs divided by total establishment employment. Consistent with previous research we use five industry indicator variables to control for these and other industry specific characteristics (e.g., labor, capital, and technological intensity): *Construction*; *mining and manufacturing*; *distribution, retail and wholesale*; *social overhead capital*; and *other*, the omitted category (Davis-Blake & Uzzi 1993). Finally, eleven *regional* variables were created to control for region specific effects.

Results

The correlations, means, and standard deviations among variables are presented in Table 2. Thirty-three and 85% of the firms in the sample used fixed-term contractors and part-time workers respectively. As expected, organization size is correlated with most of the other variables. Consistent with some speculations in the literatures, a number of independent variables correlate differently with the two dependent variables — suggesting that contractors and part-timers are subject to distinct organizational effects.

The results of the ordered logit regressions predicting the likelihood of the level of use of fixed-term contractors and part-time workers are presented in Tables 3 and 4. The results show that the independent variables add significantly to the fit of the models above the baseline control variable model (Chi-square goodness of fit statistic at the $p < .001$ level) and that the statistical significance of individual independent variables is stable across models when independent variables are added consecutively into the equations. The full models (model 8 in Tables 3 and 4) are significant ($p < .001$) and show a large increase in the log likelihood over the control models (model 1 in Tables 3 and 4) and the subset models (models 2-7 in Tables 3 and 4).

The results of the pay, labor force power, and occupational control variables are most noteworthy. In both the contractor and part-time worker models, average median pay shows an inverse relationship with the level of contingent worker use.

Although this relationship cannot be fully explained with data at hand, the literature suggests that high pay is associated with high skill jobs for which there is steady demand, no temporary labor market, or an organizational strategy of maintaining a high-pay, high commitment workforce (Abraham 1990). As expected, percent female and percent minority both show a strong and positive relationship with the level of use of contractors and part-timers, although the effect of minorities in the contractor model is not significant. These findings are generally consistent with the substantial body of research documenting the over-representation of women and minorities in the contingent workforce, especially among part-time workers (Belous 1989; Callaghan & Hartmann 1991; Jensen 1989; Tilly 1991; Walby 1989), and Kalleberg and Schmidt's (1997) finding that organizations with lowest proportions of full-time women workers were also the least likely to use temporary or part-time workers. Percent technical jobs in a firm increases the probability of the level of contingent worker use, especially for contractors. A finding consistent with the underlying assumption that contractors possess the skills needed to self-administer their work. Thus, although these variables do not decisively test core hypotheses that low pay and weak labor power or low skill levels drive the level of contingent worker use, the pattern of effects is consistent with much tentative research that holds that the externalization of work is associated with low wage paying employers and the availability of women and minorities who have traditionally had weak bargaining power in the firm and limited skills.

Consistent with previous research, industry variables for both contractors and part-timers are significant across models (Davis-Blake & Uzzi 1993). Of the ten region variables, three had a positive effect on contingent-worker use (to increase readability they are excluded from the tables, but are available from the authors).

Consistent with hypothesis 1, organization size is significant and positive as expected in both the fixed-term contractor and the part-timer models. This suggests that larger organizations, net the effect of the other independent variables, are more likely to use high levels of contractors and part-timers.[5] Futhermore, consistent with new structuralist approaches to the study of the employment relationship, the log likelihood in both the contractor and part-timer models reveals that size has a larger effect on the intensity of contingent worker use than any other independent variable taken individually. Future research may find it instructive to disaggregate the effect of size into more finely grained components of structure such as formalization and differentiation and then to model their independent effects since these components should define the degree to which jobs can be routinized, specialized, and made substitutable (Kalleberg & Van Buren 1996).

Prediction 2 examined the effect of unionization on the intensity of contingent worker use. The effect of unionization is significant and non-linear in both models, as predicted. These findings indicate that firms with a medium level of unionization are most likely to use both types of contingent workers, whereas firms with a low or high level of union representation are less likely to use either type of contingent

TABLE 2: Means, Standard Deviations, and Correlations among the Variables

	1	2	3	4	5	6	7	8	9
1. Fixed-term Hires	1.00								
2. Part-time Workers	.26*	1.00							
3. Organizational Size	.35*	.38*	1.00						
4. Percent Unionized	.14*	.01	.26*	1.00					
5. Percent Unionized^2	.10*	-.02	.22*	.97*	1.00				
6. Labor Insurgency	.18*	.06*	.26*	.35*	.33*	1.00			
7. Scope of Formal Evaluations	.14*	-.03	.24*	.23*	.21*	.19*	1.00		
8. Percent Managers	.02	-.16*	-.11*	-.20*	-.20*	-.12*	.03	1.00	
9. Job Reorganization Past 3 Years	.13*	.05*	.24*	.17*	.17*	.16*	.13*	-.08*	1.00
10. Organizational Age	.02	.11*	.21*	.27*	.23*	.10*	.09*	-.18*	.14*
11. New Job Technology Past 3 Years	.18*	.06*	.33*	.18*	.17*	.15*	.18*	.05	.26*
12. Male Unemploy. Rate	.06*	-.02	.04	.22*	.23*	.13*	.02	-.02	.07*
13. Female Unemployment Rate	.07*	-.02	.02	.23*	.23*	.11*	.02	-.06*	.06*
14. Average Median Pay	-.01	-.34*	.25*	.17*	.18*	.08*	.19*	.06*	.14*
15. Percent Female Employees.	.10*	.14*	-.07*	-.13*	-.15*	-.06*	-.08*	.21*	-.07*
16. Percent Minority Employees	.07*	.14*	.25*	.00	-.01	.07*	.08*	.04	.08*
17. Percent Clerical Employees	.05	-.03	-.07*	-.12*	-.13*	-.05*	.04	.29*	-.03
18. Percent Technical Empl.	.24*	.20*	.13*	-.03	-.06*	.03	-.03	.10*	.03
Mean	.53	1.57	18.23	48.23	3,803	.28	.36	.07	1.14
Std. Dev.	.91	1.12	12.95	38.43	3,629	.55	.44	.08	1.74

TABLE 2: Means, Standard Deviations, and Correlations among the Variables (Continued)

	10	11	12	13	14	15	16	17	18
1. Fixed-term Hires									
2. Part-time Workers									
3. Organizational Size									
4. Percent Unionized									
5. Percent Unionized^2									
6. Labor Insurgency									
7. Scope of Formal Evaluations									
8. Percent Managers									
9. Job Reorganization Past 3 Years									
10. Organizational Age	1.00								
11. New Job Technology Past 3 Years	.09*	1.00							
12. Male Unemployment Rate	.02	.04	1.00						
13. Female Unemployment Rate	.04	.03	.92*	1.00					
14. Average Median Pay	.05	.16*	-.04	-.05	1.00				
15. Percent Female Employees	-.08*	.06*	-.01	-.02	-.26*	1.00			
16. Percent Minority Employees	-.05	.11*	-.08*	-.14*	.14*	.09*	1.00		
17. Percent Clerical Employees	-.10*	.14*	.01	-.03	.05	.42*	-.04	1.00	
18. Percent Technical Employees	.00	.16*	-.01	-.06*	-.14*	.19*	.05	-.01	1.00
Mean	15.94	2.20	.18	.20	.10	.30	.16	.19	.06
Standard deviation	6.97	2.11	.20	.23	.30	.46	.36	.39	.23

Note. Correlations between the Region/Industry variables and all other variables are available from the authors.

* p < .05 (two-tailed test with listwise deletion)

TABLE 3: Ordered Logit Coefficients Predicting the Intensity of Fixed-term Contractor Use: Workplace Industrial Relations Survey (UK), 1990

Independent Variables	Model							
	1	2	3	4	5	6	7	8
Organizational Size		.056*** (.005)					.046*** (.005)	
Percent Unionized			.028*** (.007)				.017* (.007)	
Percent Unionized²			.000*** (.000)				.000* (.000)	
Management-labor Conflict			.486*** (.107)				.303** (.114)	
Scope of Formal Evaluation Systems				.814*** (.130)			.443** (.152)	
Percent Managers				.513 (.748)			1.588+ (.827)	
Job Reorganizations in Prior 3 Years					.144*** (.032)		.078* (.036)	
Organizational Age					.003 (.008)		-.017+ (.010)	
New Job Technology in Prior 3 Years						.153*** (.028)	.063+ (.033)	
Male Unemployment Rate							-.036 (.048)	-.065 (.055)
Female Unemployment Rate							.140 (.107)	.201 (.125)

worker. Available evidence suggests that firms experiencing low levels of unionization are unlikely to use contractors or part-timers because one prime source of labor inflexibility and costs — unionization — is absent in the firm. Highly unionized firms, in contrast, may be dissuaded from using contingent workers because of the contract restrictions, fears of retaliation, or rigid work rules that prohibit contracting out or two-tiered wage structures. Finally, firms with moderate levels of unionization show the highest levels of contingent worker use.

TABLE 3: Ordered Logit Coefficients Predicting the Intensity of Fixed-term Contractor Use: Workplace Industrial Relations Survey (UK), 1990 (Continued)

				Model				
Control Variables	1	2	3	4	5	6	7	8
Average Median Pay	.002+	-.002	.001	.001	.002	.002	.002+	-.002
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.002)
Percent Female	.576+	.906**	.626+	.723*	.670+	.641+	.580+	.838*
	(.336)	(.342)	(.366)	(.344)	(.341)	(.351)	(.337)	(.391)
Percent Male	.195**	-.017	.150*	.168**	.172**	.161*	.202**	-.025
	(.061)	(.067)	(.067)	(.062)	(.062)	(.063)	(.061)	(.076)
Percent Clerical Jobs	.138	.142	.339	-.109	.235	-.212	.146	.126
	(.343)	(.349)	(.375)	(.355)	(.347)	(.361)	(.344)	(.409)
Percent Technical Jobs	1.620***	1.177***	1.694***	1.614***	1.560***	1.247***	1.639***	1.213***
	(.252)	(.260)	(.283)	(.256)	(.257)	(.265)	(.253)	(.306)
Construction Industry	-.713**	-.733**	-.324	-.794**	-.723**	-.745**	-.711**	-.536+
	(.241)	(.250)	(.257)	(.246)	(.243)	(.246)	(.242)	(.276)
Mining & Manufacturing Inds.	-.945***	-1.110***	-.685**	-1.025***	-1.008***	-1.076***	-.944***	-.973***
	(.178)	(.185)	(.200)	(.181)	(.180)	(.184)	(.178)	(.214)
Distribution Industry	-1.141***	-.958***	-.680**	-1.145***	-1.217***	-1.082***	-1.131***	-.709**
	(.196)	(.199)	(.228)	(.199)	(.201)	(.202)	(.196)	(.239)
Social Overhead Capital Industry	-.529**	-.472**	-.084	-.593**	-.564**	-.595**	-.524**	-.293
	(.175)	(.181)	(.196)	(.177)	(.179)	(.179)	(.175)	(.210)
Region 1-10	—	—	—	—	—	—	—	—
Cut Point 1	.992	1.300	1.659	1.212	1.118	1.093	1.392	2.134
	(.291)	(.299)	(.346)	(.300)	(.324)	(.310)	(.425)	(.525)
Cut Point 2	1.889	2.277	2.570	2.130	2.023	1.974	2.290	3.095
	.294	(.304)	(.350)	(.303)	(.327)	(.313)	(.427)	(.529)
Cut Point 3	3.067	3.583	3.754	3.336	3.201	3.162	3.469	4.389
	(.306)	(.318)	(.362)	(.315)	(.337)	(.324)	(.436)	(.540)
N	1,607	1,607	1,464	1,602	1,585	1,505	1,607	1,346
χ^2	187	335	208	228	210	192	189	301
df	19	20	22	21	21	20	21	30
Prob > χ^2	.000	.000	.000	.000	.000	.000	.000	.000

Note. Ordered logit regression coefficients are reported; standard errors in parentheses. All tests are two-tailed.

+ p <.10   * p < .05   ** p < .01   *** p < .001

Under these contingencies, organizations are both motivated to gain dominant control over work arrangements and are better equipped to curtail existing union power through the use of contingent workers.

Consistent with hypothesis 3, management-labor conflict has a positive and significant effect on the level of use of contractors. In contrast, although management-labor conflict has a positive effect in model 3, Table 4, it has a negative and significant effect on the use of part-time workers in model 8, Table 4 when all the other variables are present in the equation. A transaction cost economics perspective provides one explanation for these results and suggests that the use of contractors during periods of labor insurgency shifts the uncertainty of administrating and managing the work from the firm to the contractor. This reduces the organization's need to manage work processes and labor directly since the firm is now concerned only with evaluating the "outputs," rather than "throughputs," of the contractors' work (Pfeffer & Baron 1988). Part-timers, by contrast, may offer an alternative source of labor to permanent workers, but their use by the firm during periods of insurgency may create more uncertainty instead of less under conditions of bounded rationality and human asset-specificity as a result of their greater interdependence with permanent employees (Williamson 1985). This is because the creation of a significant number of part-time jobs requires separating holistic full-time jobs into multiple sub-jobs which require complex scheduling, planning, and integration at a time when the organization is in flux. Finally, taken as a group, our variables measuring management-labor relations have a large effect on the log likelihood of both models, underscoring the importance of these relationships net of other effects.

Results regarding governance structures were consistent with hypotheses 4 and 5 for the fixed-term contractors. Both the scope of the formal performance evaluation system and the percentage of managers in the firm increased the level of use of fixed-term hires. This positive effect of formal evaluation systems on the likelihood of the use of fixed-term hires is consistent with previous research that holds that formal evaluation systems enable firms to assess the relative performance and worth of permanent and contract employees who work comparable jobs (Collins 1979; Williamson 1985). For part-timers, the scope of formal performance evaluation systems had the predicted effect in model 4 of Table 4, but had no effect in the full model. The percentage of managers in the firm, however, negatively affected their use. The positive effect for formal evaluation systems in the bivariate case (model 4) supports qualitative research (Tilly 1992), but suggests that the effect may be spurious in the presence of other factors or that the jobs and output of part-timers are fragmented and thus difficult to evaluate via governance structures that are primarily designed to assess holistic job functions that can be controlled by and made accountable to a single, identifiable employee. Lastly, it is possible that the percentage of managers in the establishment is inversely related to the use of part-time employees because British law creates a work environment in which

small numbers of managers can monitor part-time workers more effectively than is possible in the US. UK law encourages part-timers to stay with the same employer for a continuous period of time in order to establish eligibility for employment protection, thus part-timers are likely to master routines or be selected out of the organization by management. This, in turn, should reduce the socialization and governance costs associated with managing this class of employees (Baron et al. 1986; Williamson 1985).

The effect of a job reorganization in the preceding three years was generally consistent with hypothesis 6. The broader the scope of a job reorganization in the prior three years, the greater the level of use of fixed-term workers. It also had a positive effect as predicted in model 5 of Table 4, but had no effect on the use of part-timers in the full model. One interpretation of these results suggested by Tilly (1992) is that job reorganizations in the mid-1980's were designed to accommodate the growing availability of externalized workers, such as contractors and temps, who were different from the traditional part-timer because they could perform whole jobs yet expected little opportunity for mobility or fringe benefits. This would supposedly increase the substitution rate of contractors for permanent employees but not part-timers for those same employees.

Consistent with hypothesis 7, the effect of age in the fixed-term contractor model is negative and significant. The effect of age in the part-timer model, in contrast, is positive and significant. One explanation for this result follows from Tilly's (1992) research which suggests that older firms have had more experience breaking up full-time jobs into part-time jobs than newer firms, in part as an attempt to lower costs over their life span, and in part because the historic source of contingent labor was primarily part-timers rather than fixed-term contractors or agency temporary workers who can perform the complete job of their full-time counterparts.

Finally, consistent with prediction 8, the wider the scope of newly implemented job-related computer technology in the preceding three years, the greater is the level of fixed-term hire use. As predicted, it also had a positive effect on the use of part-timers in the bivariate model (Model 7, Table 4). This effect faded, however, when the full set of independent variables was included in the equation (Model 8, Table 4). This suggests that technological changes in computing increase the likelihood of the use of contracting to perform work traditionally reserved for full-time, permanent employees, but has no independent effect on the use of part-timers net the effects of other organizational variables. Finally, contrary to popular wisdom, neither the unemployment rate for women nor for men in the firm's locale is significantly related to the firm's use of contingent workers. One reason for this null result may be that unemployment rates did not vary significantly across SMSA during this period.

TABLE 4: Ordered Logit Coefficients Predicting the Intensity of Part-time
Worker Use: Workplace Industrial Relations Survey (UK), 1990

Independent Variables	1	2	3	4	5	6	7	8
				Model				
Organizational Size		.099***						.100***
		(.005)						(.006)
Percent Unionized*			.028***					.013
			(.005)					(.006)
Percent Unionized^2			.000***					.000**
			(.000)					(.000)
Management-labor Conflict			.172+					-.244*
			(.097)					(.105)
Scope of Formal Evaluation Systems					.315**			-.121
					(.109)			(.128)
Percent Managers					-4.702***			-3.958***
					(.667)			(.763)
Job Reorganizations in Prior 3 Years						.105***		.014
						(.028)		(.033)
Organizational Age						.040***		.017*
						(.007)		(.008)
New Job Technology in Prior 3 years							.097***	-.002
							(.024)	(.028)
Male Unemployment Rate							-.067	-.040
							(.042)	(.048)
Female Unemployment Rate							.163+	.142
							(.091)	(.105)

Discussion

The use of contingent employees has become extensive among organizations and raises new questions about the determinants of externalization as well as the relationship between organizations designed for flexibility and new, perhaps less worker-desirable, employment practices. Our ordered logit analyses used a random sample of British firms in 1990 to examine the likelihood of the intensity of a firm's use of contingent workers. Our expectations built on new structuralist arguments, as well as qualitative and quantitative analyses of flexible employment

TABLE 4: Ordered Logit Coefficients Predicting the Intensity of Part-time Worker Use: Workplace Industrial Relations Survey (UK), 1990 Control Variables (Continued)

Control Variables	1	2	3	4	5	6	7	8
					Model			
Average	-.008***	-.015***	-.008***	-.008***	-.008***	-.009***	-.008***	-.014***
Median Pay	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Percent	.348	.541+	.364	.519+	.428	.563+	.341	.801*
Female	(.279)	(.284)	(.290)	(.281)	(.281)	(.288)	(.279)	(.312)
Percent	.411***	.108*	.384***	.380***	.410***	0.378***	.423***	.127*
Male	(.052)	(.054)	(.055)	(.052)	(.052)	(.053)	(.052)	(.061)
Percent	-.407	-.577*	-.553+	-.076	-.259	-.773**	-.376	-.470
Clerical Jobs	(.282)	(.287)	(.303)	(.288)	(.284)	(.295)	(.283)	(.331)
Percent	.540*	-.361	.415+	.686**	.427+	.202	.567*	-.326
Technical Jobs	(.223)	(.232)	(.242)	(.224)	(.226)	(.234)	(.223)	(.266)
Construc.	-1.581***	-1.808***	-1.572***	-1.507***	-1.610***	-1.644***	-1.594***	-2.020***
Industry	(.200)	(.205)	(.213)	(.201)	(.202)	(.205)	(.200)	(.229)
Mining &								
Manufact.	-1.479***	-1.775***	-1.412***	-1.480***	-1.530***	-1.584***	-1.484***	-1.924***
Industry	(.153)	(.159)	(.170)	(.154)	(.155)	(.159)	(.154)	(.188)
Distribution	-.544***	-.274+	-.367*	-.441**	-.536**	-.478**	-.538***	-.296
Industry	(.153)	(.157)	(.176)	(.153)	(.154)	(.160)	(.153)	(.190)
Social Overhead								
Capital	-1.106***	-1.195***	-0.927***	-1.158***	-1.076***	-1.163***	-1.103***	-1.238***
Industry	(.157)	(.160)	(.173)	(.158)	(.159)	(.161)	(.157)	(.188)
Region 1-10	—	—	—	—	—	—	—	—
Cut Point 1	-3.669	-3.794	-3.327	-3.849	-3.089	-3.814	-3.476	-3.503
	(.260)	(.269)	(.286)	(.265)	(.282)	(.275)	(.360)	(.432)
Cut Point 2	-1.448	-1.230	-1.106	-1.573	-.809	-1.578	-1.253	-.908
	(.247)	(.253)	(.274)	(.251)	(.273)	(.262)	(.351)	(.423)
Cut Point 3	.120	.714	.450	.042	.791	-.049	.318	1.003
	(.244)	(.252)	(.273)	(.247)	(.272)	(.258)	(.349)	(.423)
Cut Point 4	1.383	2.342	1.711	1.338	2.054	1.239	1.583	2.712
	(.253)	(.269)	(.284)	(.257)	(.282)	(.266)	(.357)	(.436)
N	1,631	1,631	1,480	1,625	1,607	1,527	1,631	1,360
χ^2	470	928	440	528	521	472	474	843
df	19	20	22	21	21	20	21	30
Prob > χ^2	.000	.000	.000	.000	.000	.000	.000	.000

Note. Ordered Logit regression coefficients are reported; standard errors in parentheses. All tests are two-tailed.
+ p < .10 * p < .05 ** p < .01 *** p < .001

structures, and focused on how organizational-level variables facilitate or inhibit a firm's use of contingent workers.

Several results are of interest to the new structuralist and strategic human resource management theory. Much research has focused on the power struggle between organized labor and management and how contingent workers are uniformly used by management to weaken the control of organized labor over work arrangements. We found that the relationship between unionized labor and the use of contingent workers varies curvilinearly with the level of unionization. High levels of unionization appear to empower unions to protect their core power base aggressively. When levels of unionization are low, it appears that the use of contingent workers to undermine union power is unnecessary. In organizations with moderate levels of unionization, however, the use of contingent workers as a control mechanism is not only needed by management, but possible. Here, management is both motivated and enabled to undermine the power base of organized labor. Longitudinal information on actual changes in levels of unionization over time and the resulting use of contingent workers would help clarify this finding, but the lack of such data in the WIRS study means that these tests must await further studies.

Similarly, this study offered support for the argument that management's interest in using temporary workers is a reaction to the level of worker insurgency in the firm and the quality of management labor relations (Pfeffer & Baron 1988). More importantly, it also suggests that contingent workers are used not only to gain flexibility to meet product market uncertainty, but to buffer the firm against labor uncertainty that may be unrelated to instability in the firm's product markets or its level of unionization. Under such conditions, contractors may paradoxically provide more stability and predictability than permanent workers because of their ability to self-administer their work on- and off-site and to be held accountable for outcomes.

Consistent with ILM perspectives on worker control, our evidence suggests that management strategically capitalizes on mechanisms of labor control to increase labor flexibility through the use of contingent workers. The results suggests that a variety of governance mechanisms — bureaucratic, human, and technical — have a disproportionately strong enabling effect on the use of contingent workers, particularly in the case of contractors. The results also imply that, although firms may face strong pressures to adopt contingent employment structures for the purpose of lowering costs and increasing flexibility, there are "hidden managerial costs" associated with the use of contingent workers. This conclusion is consistent with Gottfried (1991), Geary (1992), Hunter et al. (1993), and Smith (1994) who have speculated, based on field data, that hidden managerial governance costs rise dramatically with the use of temporary workers. Thus, the introduction of contingent workers, who are presumably less costly and more flexible, paradoxically appears

to require the attendant use of organizational governance structures that can be both rigid and costly in the long-term.

This suggests that the economics of contingent worker use is complex. The espoused benefits of flexible employment — cost reduction and ease in hiring and firing — are not constant, but vary with organizational structures. Employers who adopt contingent employment systems based on general assumptions that they reduce labor costs and increase flexibility may be making speculative decisions given the possible rise in other administrative and transaction costs. Future research should examine these economic cost issues directly, especially in comparative terms with employment systems such as those in Japan which have proven to be pliant in the face of mercurial consumer markets and intense price competition and which use contracting extensively but on a long-term basis (McMillan 1989; Wever 1995; Williamson 1985).

In relation to types of contingent workers, these findings demonstrate that the effect of organizational factors on the employment relationship varies in magnitude and direction depending on the type of contingent worker employed. The hypothesized effects were strongest and most consistent with the results for fixed-term contractors. Fixed term contractors are distinctive in that they self-administrate their work; organize and complete whole jobs, or whole sets of related jobs within the firm; and appear to be affected both by stable organizational structures (such as size, age, unionization, and bureaucratic controls) and by recent changes in organization design and job-related technologies. For part-timers, the hypothesized effects were consistent with expectations in the bivariate regressions, but less consistent in the full model. Whereas their use also appears to be affected by stable organizational structures such as size, age and unionization, it is less influenced by contemporary organization design changes and the introduction of new job-related technologies. Our assumption in interpreting these findings, consistent with qualitative research, is that reorganizations and technology have been aimed less at breaking down holistic, permanent jobs into part-time jobs and more at reshaping permanent jobs so that contingent workers who are able to complete the full sequence of a permanent job may be substituted more easily for permanent workers. Information on a spectrum of contingent workers could help clarify the relationship between the attributes of types of contingent workers and organization behavior. These findings suggest that future research should examine the qualities and characteristics of different types of contingent workers with the purpose of specifying unique hypotheses that can be validly derived and tested. Other work might examine how these differences developed in relation to organizational and market factors.

Although we offer important results on the use of contingent workers that go beyond the current inattentiveness to organizational factors and analyses that use a simple binary, yes/no variable to measure contingent worker use, our conclusions are necessarily tentative. Like most current work, our data are cross-sectional except

for retrospective questions on job reorganizations and the implementation of computerized job technology. Consequently, these findings must be interpreted carefully. It is possible, for example, that a large managerial staff is a result rather than a cause of the use of contingent workers. Although this interpretation is unlikely given the qualitative findings in the literature and the fact that management, on average, will probably find it disadvantageous to hire significant numbers of contingents workers before the supervisory staff is in place to manage them effectively, it cannot be ruled out with the data available to us. Similarly, the negative and significant association between the level of part-time worker use and labor insurgency may indicate that insurgency is less likely in a firm with large numbers of part-timers because part-timers are hard to organize rather than the alternative view that part-time hiring is inversely related to insurgency because it adds uncertainty during a period in which uncertainty is already high. Although the later interpretation is consistent with the literature and our findings on contractors, the former interpretation cannot be ruled out given the available data. Finally, the British case examined here occurs during a period of critical institutional change in labor law and labor-management relations that were aimed at expanding the use of flexible employment strategies in the economy. These findings underscore the need to collect and analyze longitudinal data on the institutional dynamics of contingent jobs. Disentangling and integrating the effects of market and organizational factors on the employment relationship is a key issue for organization and labor market theory in an age of flexibility.

Notes

1. In the US, the cut-off for part-time work is 35 hours per week (U.S. Department of Labor 1988); in the UK, it is 30 hours per week (O'Reilly 1994).

2. During this period, union membership in the UK, which had reached a peak of 13 million in 1979 and accounted for 55% of the total workforce, dropped to 10 million by 1987 (Davies 1994; Goodman 1989). The percentage of firms recognizing unions also fell from 66% in 1979 to about 50% in 1990 (*Economist* 1996).

3. Technologies that control of the pace and standardize the skill level of jobs may initially be adopted for reasons other than the use of contingent workers (e.g., new market competition). Once these technologies are implemented, however, we argue that firms will capitalize on their ability to regulate work processes and expand the use of contingent workers.

4. The empirical literature on contingent workers has typically used logit models to examine use versus no use of contingent workers (Abraham 1988, 1990; Davis-Blake & Uzzi 1993; Smith 1997). This model, while informative, is obviously less sensitive to the factors that determine the *level* of contingent-worker use since it groups together firms that use many different levels of contingent workers (e.g., 1, 10, and 1,000 contingent workers) into one class and compares them to firms that use no contingent workers —

thereby obscuring variation. By comparison, the ordered logit produces much richer and more precise results.

5. Only the sign and statistical significance of ordered logit coefficients are directly interpretable. See the appendix for a technical note on how to calculate the predicted probability of the intensity of use of contingent workers by category of use over the empirically observed range of a continuous variable or for an indicator variable while holding the value of the other variables in the equation constant at a particular value (e.g., the mean or median).

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APPENDIX

Determining Categories

The logic for determining categories of the dependent variable is to examine the distribution for logical "cutoff points" that represent natural patterns in the data (Greene 1993) and to use extant theory. Previous research showed that the initial cutoff point must be between no use and use (e.g., Abraham 1988, 1990; Davis-Blake & Uzzi 1993; Smith 1997). This established the first category for both variables. The next set of categories from "low use" to "high use" was determined from research and the shape of the distribution of fixed-term contractors and part-timers in the study. The contractors' distribution, for example, showed that there was a "hump" in the distribution from zero to five and then a hump from six to twenty, and then a final hump from twenty-one or more. These ranges were then chosen and inspected for the mean and median of values within each cutoff range to insure that the range within a category was not highly skewed. The same logic, common to most survey designs, is used when making categorical variables to represent income distributions. Table 1 represents the qualitative names for each of the cutoff points, the range of values that fall within the cutoff points, the number of observations in the range of each cutoff points, and the mean and median of observations in each range.

Technical Note: Hypothesis Tests and Predictions in an Ordered Logit Model

For the ordered logit, the predicted score, S_j is defined by equation 1. The ordered logit predictions are then the probability that $S_j + u_j$ lies between a pair of cut points k_{i-1} and k_i. The requisite formulas are:

$$S_j = B_1 x_{1j} + \dots + B_K x_{Kj} \tag{1}$$
$$\Pr(S_j + u_j < k) = 1/(1 + \exp[S_j - k]) \tag{2}$$
$$\Pr(S_j + u_j > k) = 1 - 1/(1 + \exp[S_j - k]) \tag{3}$$
$$\Pr(k_1 < S_j + u_j < k_2) = 1/(1 + \exp[S_j - k_2]) - 1/(1 + \exp[S_j - k_1]) \tag{4}$$

To calculate the predicted probability for the use of contingent workers for a continuous variable over the empirically observed range of a continuous independent variable while holding the other significant covariates at their sample means, first use equation 1 and follow these steps: (1) multiply the sample mean of each significant covariate in the equation in Table 3 by its coefficient; (2) multiply the empirically observed range of values of the independent variable of interest by its coefficient; and (3) sum the products to a score, S_j. Second, use Equations 2 through 4 to calculate the probability for different levels of use, no use, low use, medium use, or high use. To do this, use the cut point coefficients provided at the bottom of the ordered logit outputs for k in the above equations. For example, the predicted probability for "high use" in the fixed term contractors model is equal to: 1- 1/(1+exp (S_j - 3.816658)). Where 3.816658 is the value of the coefficient of cut point 3 which corresponds to "high use" in the full model for fixed-term contractors and S_j is the score calculated in steps 1-3 above.