This is to certify that the

dissertation entitled

CONTINGENT WORKERS' IMPACT ON THE PAY AND PROMOTIONS OF TRADITIONAL EMPLOYEES IN THE INFORMATION TECHNOLOGY PROFESSION

presented by

Jannifer Lynn Gregory

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Social Science

Ed Mantemay
Major professor

Date 8/23/01

CONTINGE
TRADITI

CONTINGENT WORKERS' IMPACT ON THE PAY AND PROMOTIONS OF TRADITIONAL EMPLOYEES IN THE INFORMATION TECHNOLOGY PROFESSION

By

Jannifer Lynn Gregory

AN ABSTRACT OF A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

School of Labor and Industrial Relations

2001

Edilberto Montemayor

CONT
TRA

This

Contingent

regular emp

market by e

workers fro

potential for

workforce, e

with all of th

employers w

accommodat

protection ha

differences in

employees ar

adjustments a

for craft famil

ABSTRACT

CONTINGENT WORKERS' IMPACT ON THE PAY AND PROMOTIONS OF TRADITIONAL EMPLOYEES IN THE INFORMATION TECHNOLOGY PROFESSION

By

Jannifer Lynn Gregory

This research tests for any effects that firms' use of Information Technology Contingent Staff (ITCS) will have on the regular, IT employees hired by the firm. These regular employees have traditionally been protected from the forces of the external labor market by either craft or enterprise Internal Labor Markets (ILMs). These ILMs shielded workers from swings in pay due to labor supply and demand and provided workers with potential for career growth through promotions and training. By bringing ITCS into the workforce, employers are directly exposing their employees to the external labor market with all of the potential and pitfalls that may come with it. It is hypothesized that employers will probably need to make adjustments in their pay policies and practices to accommodate the information brought into their systems by the ITCS. The ILM protection has typically varied for craft and enterprise ILMs and it is suggest here that the differences in how employers handle the introduction of ITCS will also depend on if the employees are part of a craft or an enterprise job family. Results indicate that no such adjustments are made for enterprise families and that only limited adjustments are made for craft families.

To my pa

To my parents, Tom, and my sister, without their support and understanding this research would not exist.

Th

I would be

chairperso

that not on

thought thr

including K

extremely h

Each one, us

the way to m

and particula

endeavor by

unfailingly s

that this diss

assistance. T

ACKNOWLEGEMENTS

The research in this dissertation was achieved with the help of many individuals. I would be remiss to not acknowledge their contributions. My dissertation committee chairperson, Edilberto Montemayor, has spent countless hours working with me to ensure that not only this project but also my entire graduate school experience was carefully thought through and that I achieved the goals I had set. My dissertation committee including Karen Roberts, Alison Barber, Michael Moore, and Neal Schmitt, have all been extremely helpful and patient while reading through the multiple drafts of this document. Each one, using their own specialties and knowledge, has asked the right questions along the way to make the most of this research. Also, the people of William M. Mercer, Inc. and particularly the Data and Systems Group, who have assisted me greatly in this endeavor by supplying the data on which this research is founded. They have also been unfailingly supportive in providing me great flexibility in my own work arrangements so that this dissertation could be completed. Thank you all for your contributions and assistance. They were greatly necessary and appreciated.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Th

worke c

compa es

worke th

experi ce

work a in

conside ed

of work P

researcl ore

employe s

appear t d

or not th w

continge w

employe pe

T re

employee im

(Wachter 90

workers w h

behave wi g

such as hea h

employees on

CHAPTER 1 - INTRODUCTION

There has been a growing concern in the United States about the use of contingent workers. Concerns about these work arrangements stem from the apprehension that companies provide lower levels of pay, benefits, and working conditions for contingent workers than they do for their regular employees. This means that contingent workers experience a lower standard of living than regular employees and studies on contingent work arrangements tend to support these ideas. However, researchers have not yet considered the potential impact contingent work arrangements may have on other aspects of work (Pfeffer & Baron, 1988). To broaden our understanding of this trend, the research presented here addresses the use of contingent workers from the perspective of employees in regular/long-term employment relationships. While contingent workers appear to directly suffer from lower working conditions, this research examines whether or not the working conditions of regular employees are indirectly impacted by the use of contingent workers. Further, this research examines if this impact varies for regular employees performing different types of work.

The regular work relationship in the United States is one where employers and employees implicitly agree to continue their association over multiple time periods (Wachter, 1990; Doeringer & Piore, 1971; Cordova, 1986). Employers provide their workers with ongoing employment and career advancement opportunities, unless they behave with gross negligence. In addition, employees are provided with other benefits such as healthcare and retirement insurance. These work arrangements protect employees from swings in external labor market conditions. Employees have a sense of

job security and are encouraged to learn firm-specific skills which would be less valuable to them in other firms. This regular work relationship is called an Internal Labor Market (ILM) (Doeringer & Piore, 1971).

Contingent work relationships are those which are not explicitly or implicitly long-standing and may take one of many forms including temporary, part-time, leased, self-employed, contracted out or home-based work. The key defining element of contingent work, however, is the degree of uncertainty regarding the continuance of the work arrangements with the hiring organizations (Polivka, 1996).

The research in this paper studies the impact that the presence of these contingent workers has on the regular employees still "protected" by traditional ILMs. Because work outcomes are not determined by single, independent events, but rather by many intermingled events, companies' use of contingent workers should be expected to change the terms of work arrangements between employers and employees. Employers using contingent workers will have access to potential employees while incurring only minimal recruiting expenses. They will have previewed these employees' work habits and know more about them than they would a typical job applicant. These employers are likely to be more aware of the availability of workers outside their firms than employers not using contractors. Similarly, regular employees working with contingent workers will have more exposure to the external labor market than employees, who do not work with contingent workers. They will be more aware of favorability or unfavorability of the external employment opportunities for their jobs. All of these factors should effect the demand and supply of labor, which in turn will effect employee wages and other work arrangements.

Prior research on contingent work arrangements has discussed the myriad implications these temporary work arrangements have for the contingent workers. Researchers have looked at the demographics of these workers, their hours of work, and their pay levels in comparison with regular employees. Additionally, there has been extensive debate in the United States about the lower level of health and retirement benefits available to the contingent labor force, because private employers through long-term employment are the normal delivery mechanism for these benefits (Cordova, 1986; Christensen, 1988; Loveman, 1988). Most of the prior research concludes that contingent workers have lower pay, benefits, and working conditions.

This study attempts to clarify that the problems associated with contingent workers effect not only the contingent workers, but also the regular employees working with them. If contingent workers are used in companies, then their terms of employment should be anticipated to have some impact on the terms of employment for regular workers. This impact may occur despite or because of the fact that contingent workers are only hired for a specific, limited period of time and consequently they have no long-term commitment to the hiring organizations. It is hypothesized here that contingent workers' presence will change the way organizations treat their regular employees with respect to compensation level and mix, as well as, promotion opportunities. Further, changes in companies' pay philosophies or internal labor markets with respect to their regular employees may differ depending on the types of work being performed (i.e., craft or enterprise).

This research examines the effect that contingent workers in the Information Technology (IT) profession have on the wages and other ILM conditions of regular, IT

workers. Information technology is one of the largest and fastest growing segments of contingent work. Kosters (1997) reports a 300% growth in IT contracting since 1982. Sharpe (1997) claims that 40% of contracted work in the United States during 1996 was in IT services and that this is the largest single type of contracted work. Because of IT's large presence in the contingent work arena, it is interesting to study the impact Information Technology Contingent Staff (ITCS) may have on the work relationships of regular IT employees as these findings effect a large group of workers. Also, it is possible that the findings for IT workers are applicable to other types of workers, which would increase the value of these results.

In this research it is hypothesized that the effect of the use of ITCS on the wages and other ILM conditions of regular, IT employees is different when they work in job families that belong to two types of ILMs: craft and enterprise. Craft employees generally, have a status of independent professionals (Doeringer & Piore, 1971; Osterman, 1983). They are assumed to have a substantial body of knowledge before being hired by a company and are most likely to be responsible for their own continuing education. The hypotheses predict that the presence of ITCS will be favorable for regular, craft IT employees. The second group of hypotheses addresses the impact ITCS have on enterprise IT employees. Enterprise IT employees are not required to have skills when hired into an organization. They are most likely to be trained on the job and do not require additional skills beyond those learned at the beginning of employment (Doeringer & Piore, 1971; Osterman, 1983). The hypotheses predict that the presence of ITCS will have an unfavorable impact on the work relationships of these enterprise, IT employees.

The data used in this research are from employee compensation surveys conducted in 1998 and 1999. The data from these two surveys are combined into one data set to increase the sample size and thereby increase the potential for finding effects should they be present. Most of the analyses will include control variables for company size, industry and general labor market conditions to avoid conclusions based upon spurious relationships.

This research attempts to increase our understanding of how using contingent work is changing our traditional Internal Labor Markets. Prior research on contingent workers is interesting and necessary, however, we should start considering that there are potentially many more employees, whose work lives are being changed by this phenomena. Employees, who have done nothing to alter any part of their work relationships, may now be finding themselves facing employers with new ideas regarding the worth of their jobs and the security of the implicit long-term employment contract many believed they enjoyed. These regular employees, who work side-by-side with contingent workers, are the main focus of this research. It is hoped that this study will increase our understanding of the workings of ILMs and draw attention to a different perspective of the contingent work debate, that has so far been left unmentioned.

CHAPTER 2 – LITERATURE REVIEW

This chapter reviews three literature streams. The first literature reviewed is that on contingent labor. Researchers doing studies in this area have struggled with quantifying the magnitude of these work arrangements and who these workers are. These efforts have been and continue to be confounded by problems of definitional clarity. Other researchers have studied the reasons for these arrangements to exist from both the employers' and the employees' perspectives, as well as, the disadvantages of these arrangements. Research on the use of contingent workers in Information Technology (IT) jobs is specifically addressed. The next literature is on Internal Labor Markets (ILMs) and the role that neoclassical Economics has within this framework. Doeringer and Piore's (1971) idea of the Internal Labor Market (ILM) plays an important role in many human resource systems. ILMs shield many employees from the vagaries of the external labor market through policies and rules for pay and promotion. Economic theories work within these systems and as employees look outside their firms for other opportunities. The research reviewing herein describes the advantages and disadvantages of these systems, the level of analysis for ILMs, and how neoclassical economic theories integrate with these systems. Finally, the third literature reviewed which looks at the interaction of ILMs and external labor markets and the co-existence of regular employees and contingent workers. This third section presents research most similar to this study because it shows how aspects of the labor market internal and external to the organization are interrelated. Pfeffer and Baron's (1988) discussion provides interesting directions for

future research on internal changes related to the externalization of work. Some of which are incorporated in this study.

Contingent Work Arrangements

A growing number of researchers and public policy makers have become concerned with the phenomena of "flexibility" in the workplace. Striving to be more flexible has occurred in many countries and in almost every industry (Cohany, 1996; Polivka, 1996b). Researchers have begun to study the wide range of practices, which result in flexibility. At one extreme, firms may become more flexible by moving their operations to locations with more attractive business legislation and labor markets. In a more moderate approach, firms may strive to achieve flexibility by having a workforce that is functionally flexible or a workforce that is numerically flexible (Pollert, 1991). Functional flexibility refers to a workforce that can be easily reallocated to different tasks to meet the changing skill needs of a firm. Numerical flexibility is a workforce that can grow and shrink as workload varies. This research focuses on implications of numerical flexibility through the use of contingent labor.

Ideally, numerical flexibility would allow firms to change their employee headcount rapidly and with a minimum of disruption to company operations. Longer-term work arrangements, as exemplified by Internal Labor Markets (ILMs), are discussed in the next section, but generally are typified by employees and companies have an implicit agreement to sustain their employment relationship for multiple time periods. This type of work arrangement complicates firms' usage of numerical flexibility as a

staffing technique because the continuing employment agreement conflicts with changing headcount.

The key characteristics of contingent workers are that they are not recognized as regular employees of the firms, who are protected by the standard work arrangements mentioned above, and as such they do not have any agreement with the user firms for employment in future time periods. Their future employment with user firms is *contingent* upon these firms' labor needs in the next time periods. Contingent work arrangements afford workers very little job security and force these workers to be continuously searching the labor market for new employment situations. Throughout this paper the term contingent work arrangements will by synonymous with a work relationship between a firm and a worker that is conditional upon the firm's labor needs in future time periods.

Contingent work arrangements may take many forms. These "new" work arrangements may include any derivations of temporary/leased and self-employed/contracted employees (Polivka & Nardone, 1989). Independent contractors and self-employed workers are hired on a project basis and their employment with the firm often ends when the project is completed. Temporary and leased employees are typically employees of another firm and are essentially rented out to the hiring firm. All of these work arrangements are often considered contingent, but for purposes of this research they will only be contingent if there is substantial insecurity about future employment.

Contingent work arrangements are difficult to study because there is no single definition that stipulates which workers have contingent status. Polivka (1996a) used

BLS data and three different definitions of contingent worker to estimate the prevalence of these work arrangements. These definitions of contingent workers Polivka used ranged from people working for firms, where their work relationships are expected to last less than a year, to any workers, whose their current employment is not considered permanent. Using this spectrum, in 1999 contingent workers represented anywhere from 1.9% or 2.5 million workers of the American workforce to 4.3% or 5.6 million workers (Bureau of Labor Statistics, 1999c). Further, this study found that 8.2 million workers or 6.3% of the American workforce are considered to be independent contractors.

This wide range of estimates shows how important it is that researchers clearly define what is meant by a contingent worker. Polivka and Nardone (1989) use the stability of a job to create a distinction between contingent and non-contingent workers. These authors state that many contingent work arrangements (e.g., leased, self-employed, or contracted workers) may be long lasting and steady work relationships. When these work arrangements exist over long periods of time, they should not be considered contingent because they are probably not jobs that employers would eliminate if faced with decreased workloads. Only those work arrangements with little or no job security should be counted as part of the contingent labor market. Polivka and Nardone define contingent work as, "Any job in which an individual does not have explicit or implicit contract for long-term employment or one in which the minimum hours worked can vary in a nonsystematic manner" (1989, p. 11).

Other research uses more legalistic definitions of contingent/contract work. Christensen (1988) describes how the BLS definition of contingent is different from the IRS definition of contract workers. BLS defines three categories of contingent workers:

1) wage and salary workers whose jobs will not last more than two years; 2) wage and salary earners, self-employed, and independent contractors whose jobs will not last more than two years; and 3) workers who do not expect their current jobs to last for an additional year (BLS, 1999c). Contractors would be included in the self-employed category, but certainly do not constitute this entire group. The IRS has outlined several working conditions that must be satisfied for a worker to be classified as an independent contractor (Wells, 1987). An independent contractor, according to the IRS, must have: 1) some degree of control over his/her work, 2) an opportunity for profit or loss, 3) an investment in facilities, 4) a non-permanent relationship with the contracting company, and 5) the skills required to complete the work contracted without assistance from the hiring company. All of these conditions are meant to determine the degree of independence a contractor has from the hiring company and ensure that the contracting relationship is more than an accounting tool to lower the employer's liability. These definitions focus on different facets of work from Nardone and Polivka's (1996a) definition, thereby illustrating how common terms (e.g., contractor) for work arrangements can mean very different things. Definitional consensus on terms continues to elude researchers, making research efforts inconsistent.

Shifts in Employment Arrangements and Demographics Over Time

Researchers' interest in contingent work arrangements has been increasing because these work arrangements cover a significant portion of our workforce and little is known about them. Some evidence has shown that these work arrangements have not fostered growth in workforce productivity and that the difference in pay and productivity

between high and low paying jobs is growing. These findings have led some researchers to think these contingent work arrangements have created "bad" jobs (Loveman & Tilly, 1988). While Loveman and Tilly (1988) does not provide evidence that the growth of wage differences is the result of contingent work arrangements, they have suggested it as one potential cause. Further many of our economic models are based on a traditional work arrangement with one employer providing steady employment over a worker's lifetime. Under contingent work arrangements, the economic predictions based on traditional employment standards will not accurately portray labor market outcomes and social policies enacted to support traditional work arrangements will lose their effectiveness (duRivage, 1992, Cordova, 1986). The predictions and policies necessary to accurately portray and protect contingent workers may vary depending on the type of work being performed (i.e., professional, managerial, clerical, etc.) as the contingent work relationships for these different work types may vary.

Two approaches to determine if the shift away from lifetime employment is really happening are to measure changes in employees' tenure or to measure changes in the prevalence of contingent work arrangements. Studying changes in both is necessary to accurately isolate shifts in employment practices because an increase or decrease in either lifetime employment or contingent work arrangements may occur for many reasons like the growing or shrinking of the labor supply. Measuring both simultaneously would allow researchers to identify actual shifts in employment trends over time.

A decline in overall employee tenure indicates a less stable labor market, where moving from one job to another is more acceptable. This type of environment may make the use of contingent workers more common as employers and employees become more

accustomed to shorter-term employment relationships. Estimates of changes in the level of long-term employment in the United States have been attempted by several researchers. Carter (1988) calculated the change in lifetime employment rates by comparing the rates of workers in San Francisco in the 1890's to the American labor force in 1978. Her results indicated that lifetime employment was more common the 1970's than it was late in the last century. More recent investigations of this phenomena have focused on shorter time spans (Diebold, Neumark & Polsky 1997; Swinnerton & Wial, 1995). Both Diebold et al. (1997) and Swinnerton and Wial (1995) studied job tenure from the 1970's into the 1990's. Diebold et al. (1997) found little evidence of declining job tenure overall, but did find evidence of a decline for a certain segment of the labor force. Specifically, workers with a high school diploma or less experienced lower job tenure than more educated workers. Swinnerton and Wial (1995) found a curvilinear trend in job tenure over these years with higher retention occurring between 1983-87 and lower job retention in the early and late 80's. Given the economic prosperity during this middle time range, the authors conclude that the job tenure of the middle time period is a result of higher employer demand rather than employee preferences.

The second approach to studying changes in work arrangements is to directly measure the prevalence of contingent work arrangements. Much research has focused on the development of the temporary help industry because it is an easily identifiable contingent work arrangement (Gonos, 1997; Mangum, Mayall & Nelson, 1985; Moore, 1965). This research shows that temporary help agencies have been in existence since World War II and are not new (Gonos, 1997; Moore, 1965), but that they are one of the

fastest growing industries in the United States. The type of work performed by temporary workers is changing as this segment of the work force grows. Temporary workers have traditionally performed clerical work, but temporary help firms have expanded into manual labor, as well as, more professional job categories such as drafters, engineers, and information technology professionals such as computer programmers (Mangum et al., 1985). The need for these new skills is especially apparent with respect to computer related jobs, where evolving technology requires workers to constantly learn new languages and skills. Kosters (1997) has noted a 300% increase in computer related contingent employment since 1982. Also, temporary agencies tend to specialize in a specific type of temporary worker such as clerical, industrial, medical or engineering/technical employees (Carey & Hazelbaker, 1986) giving them a more complete knowledge of their industries/professions. The relationships with client firms differ for each type of temporary from the daily outsourcing of clerical employees to engineering temporary firms where assignments may last up to two years or more. Carey and Hazelbaker (1986) predict that the use of technical temporaries will continue to increase because many technical skills are not firm-specific and are easily transferable to many companies.

In addition to simply looking at changes in work arrangements, there has been much research on the demographic makeup of employees working under these non-standard arrangements. The demographics of contingent workers vary by the type of work arrangement.

Self-employed workers make up a small portion of the contingent work group. They are more likely to be men (Casey, 1991; Fain, 1980; Rothstein, 1996), but women

comprise the fastest growing segment of self-employed workers (Becker, 1984). Self-employed men work longer work weeks than wage workers, and typically earn more than their wage earning counterparts (Fain, 1980). Self-employed women tend to work fewer hours and earn less than their wage earning counterparts. These trends may reflect a pattern of self-employed men working in management and professional jobs and self-employed women working in low-paying sales and service jobs (Becker, 1984). While trend data on the level of self-employed workers in the United States show mixed results, it appears as though this group has grown in overall size, but not as a proportion of the total workforce (Bregger, 1963; Bregger, 1996). There is some research suggesting that the level of self-employment in a country may be positvely related to governmental policies, which encourage self-employment (Staber & Bogenhold, 1993, Ray, 1975).

Independent contractors, a group which may include both part-time and self-employed individuals, tend to work in highly skilled fields and often work alone (Cohany, 1996). This group is comprised of more college-educated, older men. They tend to work in service industries, which require less capital investment. The majority of people in this group seem to prefer working in their current alternative arrangements rather than in a traditional work arrangement.

Advantages to Contingent Work Arrangements

Most companies use contingent employees for one or more of four reasons. One of the main reasons for using contingent workers is to lower the labor costs of the firm (Abraham, 1990; Belous, 1989). Contingent workers rarely receive healthcare or retirement benefits, which are a significant portion of total labor costs, therefore,

contingent workers save firms substantially through lower benefit costs. Also, contingent workers are frequently paid different rates than permanent employees because they are not paid efficiency wages, which are set higher than market clearing wages, but allow employers to reduce supervision costs (Abraham & Taylor, 1996). Contingent workers also allow employers, whose pay levels target paying regular employees above/below market, the ability to use contingent workers for non-value adding jobs and pay them at or below/above market (Abraham, 1990). These firms are not thought to suffer adverse effects of internal equity since these contingent workers are not regular employees of the company. For example, firms targeting their regular employee population's compensation level below market, using contingent workers, where it is a necessity to pay at least market, should save these firms from having to pay all of their regular employees at the higher market rate.

The second reason to use contingent workers is to focus the company's efforts on its core competencies (Belous, 1989; Deavers, 1997; Sharpe, 1997). Core competencies are those activities that are central to the value adding operations of the firm. By shifting the responsibility for support functions such as information technology, human resources or marketing outside of the company, employees can focus on the firm's core competencies that are critical for the company to succeed such as product development or quality assurance. Further, many companies that are doing this contingent work have these functions as part of their own core competencies. Therefore, in addition to being centered on those activities that will further grow the company, non-core activities are being performed by firms which specializes in such actions. These activities may not be core competencies of the user firm, but they are the core competencies of the supplier

firms. Therefore the supplier firms can achieve better outcomes than user firms would because they have value adding knowledge in these areas that the user firms don't possess.

The third reason for contingent workers is to acquire specialized skills. Many firms would prefer to purchase skills unavailable in their own workforces, rather than spend the time and training money to develop those skills in their current employees (Abraham, 1990; Belous, 1989; Segal & Sullivan, 1995). This may be particularly true for those skills the firm will only need for a limited time. Information technology skills are a good example as they take time to learn, change rapidly and are difficult to attain. If employers wanted to develop these skills in their current workforce, they would be constantly investing resources in training them. Purchasing these skills through contractors requires less of a time commitment and potentially may be cost saving. For this reason information technology skills are the largest segment of contingent work (Sharpe, 1997) and IT contingent workers are continuing to rapidly grow as a portion of outsourced labor (Kosters, 1997).

Finally firms may use contingent work arrangements as part of a hiring strategy. By employing a person as a contingent worker, firms may get a chance to preview a worker's abilities and work habits before committing a regular position to the employee (Segal & Sullivan, 1995). Hiring a regular employee endows that worker with certain legal rights and typically gives them access to costly benefits. Contingent workers, who prove themselves to be good workers, may be hired into the company as regular employees and contingent workers, who do not prove themselves to be good workers, may be let go at the end of their assignment without entangling the employer in benefits'

continuation or other possible complications. Hiring contingent workers on as regular employees is so common that most temporary help firms charge companies a "liquidation" fee if a temporary employee is hired to help them recover some of their training investment in that employee (Carey & Hazelbaker, 1986).

Disadvantages to Contingent Work Arrangements

Despite the added potential competitive advantages of contracting out work, there are problems associated with these practices. Workers and public policy makers have reason to be concerned about these arrangements. Research has shown that contingent workers earn less than regular, full-time workers and are less likely to receive benefits such as healthcare and retirement (duRivage, 1992; Loveman & Tilly, 1988; Rothstein, 1996; Tilly, 1992). As discussed earlier, contingent work is a significant portion of the labor force. Therefore the lower wages and lack of benefits in this group effects a sizable portion of American workers. Because healthcare and retirement are provided through private employers in the United States, contingent employees assume much of the risk of unemployment even while they are employed. Contingent employees need to provide themselves with health insurance which often will cost an individual much more than if it were purchased as part of a large group of employees. Also their retirement funds and usually the "employer's" share of income taxes (e.g., Social Security and Medicare) must be paid by these employees. All of these costs make employment a more expensive prospect for a contractor than a regular employee. Many contractors are able to set their rates higher to offset these costs, but research does show that most contingent workers earn less than regular employees with the exception of the self-employed (Loveman &

Tilly, 1988; Tilly, 1992). Additionally, since there is no implicit or explicit guarantee of long-term employment, as is frequently present in regular employment settings, contractors face added risk of losing their healthcare or retirement funds at the end of a work assignment because they cannot afford the premiums and don't have the COBRA protection of regular employees.

The financial risks of contingent arrangements are only some of the problems contingent workers face. Researchers have found that contingent workers are more likely to be involved in accidents in the workplace (Rebitzer, 1998; Rousseau & Libuser, 1997). Because the user firm is not technically the contingent workers' employer, the firm is not legally responsible for the safety training of these workers. The contingent workers may never receive such training because they are self-employed and do not have access to safety training or because their employer does not provide such training. Contingent employees typically spend less time at a job site than regular employees. Consequently, they may be less familiar with the site and unaware of some of the safety risks present.

They also probably have less thorough communication and familiarity with the permanent workers, which may result in lower productivity (Goodman & Leyden, 1991). Goodman and Leyden (1991) have shown that specific knowledge with the job, the work environment, and co-workers can lead to higher productivity. This lack of familiarity and communication may be exacerbated by their status as contingent workers. Rogers' (1995) research of clerical temporaries shows that temporaries often feel alienated from workers at the hiring firm, from the work they are doing, and from their own work ambitions. Being a temporary employee connotes to others a secondary status of being not as important as regular employees. As such these contingent employees are not

afforde

employ

work be

1992). R

sound lor

from thes

necessary

loses contr

the future

good grasp

as is neces

is a potenti

to enter the

For

the contract

the contract

firm will no

firm in jeop

possibility a

1986). The

minimally, e

rebounds.

afforded the same courtesy, acceptance, and information at the workplace as other employees.

From the hiring firm's perspective, outsourcing work may pose problems, if the work being outsourced is part of the firm's core competencies (Bettis, Bradley & Hamel, 1992). Researchers typically agree that outsourcing a core competency is not part of a sound long-term strategy, but firms may still choose to do this to reap short-term benefits from these arrangements. In these cases, firms must be careful not to let go skills that are necessary for the production or technical development of its products. If the company loses control over these important aspects of its business it is likely to lose control over the future direction and abilities of the company. The company may no longer have a good grasp on evolving products in its industry and won't be able to react to the market as is necessary to compete. This situation is even more sensitive if the outsourcing firm is a potential competitor, who may eventually use the knowledge learned by contracting to enter the product market itself and compete directly against the hiring firm.

For the firm that is outsourcing non-critical work, there are still other concerns. If the contracting firm is small and relies upon the hiring firm for revenue, then only using the contracting firm when there is increased product demand may mean the contracting firm will not be working some of the time. This shortage of work puts the contracting firm in jeopardy of going out of business. The hiring firm must be aware of this possibility and protect itself against not having a contractor when it is needed (Imrie, 1986). The hiring firm may have to continue using the contracting firm's time, at least minimally, even during low product demand to ensure it is around when product demand rebounds.

Information Technology Contingent Work

The focus of the research presented in this study is on the effects of using Information Technology (IT) contingent workers in the workplace. As mentioned before, IT is one of the largest and fastest growing segments of contingent labor (Kosters, 1997; Sharpe, 1997). IT contractors are also one of the better paying contracting professions (Williams, 1989). In 1987, contracted engineers earned on average $24.74 per hour, systems analysts earned $18.17, and computer programmers earned $15.96. This high wage rate implies that the opportunity costs for IT workers wishing to leave traditional employment is lower than most other occupations. Also the high wages suggest that it should be easier for computer people to find contingent work arrangements because there is a high demand for their expertise.

There is a wide range of IT skills that may be contracted out by firms. Because most IT skills are non-firm specific almost anything can be done with contingent labor. Lesser-skilled IT work, such as data entry, is just as easily completed by contingent workers as higher-skilled IT jobs, such as software systems engineers, programmers, or analysts. Firms that use contingent workers will need to assess their own situations to determine what types of IT work are best suited for contingent labor.

In the previous section four reasons for hiring contractors in general were discussed: different pay rates, focusing on core competencies, acquiring specialized skills, and as part of a hiring strategy. The relatively higher wages of professional computer contractors (Williams, 1989) appears to confirm the first reason, of differing pay levels between contingent and regular workers. IT contractors are often being paid

more than regular IT employees doing the same or similar jobs are being paid. However, benefits, such as healthcare and retirement, represent a significant portion of total remuneration costs, thereby making professional IT contractors with their higher pay rates, in most cases, still more economically efficient than hiring regular employees.

The second reason for hiring contractors was to allow a firm's regular employees to focus on core competencies. IT services are typically part of a company's support function and not directly related to the main processes of the company. This being the case, many firms may opt to contract out their IT function to firms that specialize in these services. In fact IT functions may be one of the first areas firms look to contract out, when trying to save money because it is considered an ancillary function and not a profit center.

Contracting is especially beneficial for the higher level IT functions from the perspective of the third reason of acquiring specialized skills. IT skills are very complex and change rapidly. IT firms typically already possess the skills and capabilities that other non-IT firms may be unwilling to invest training dollars to acquire. With the current, fast pace of technological developments, technical obsolescence is a real concern for IT professionals and firms (Lee, Trauth & Farwell, 1995), many firms find it advantageous to contract their IT function out to avoid the need for extensive, on-going training of IT workers required just to keep up-to-date. This reasoning will be more applicable to the complex IT skills, such as programming and development (craft), than to the lower skill IT functions such as data entry (enterprise). Further, most complex IT skills are non-firm specific making them easily transferable from one company to another (Applebaum, 1989). This transferability is another reason why firms may choose not to

invest in training for complex IT skills. IT workers are more marketable with these skills and employers investing in IT training may be likely to lose these investment costs to other employers once the employee has acquired these new skills.

Using contracting as part of a strategy for hiring IT workers may not be as successful as it is for other professions. The unusually high demand and low supply of IT professionals with complex IT skills is a partial explanation for the higher salaries IT contractors receive. Since all IT professionals have the possibility of making these high wages, it is less likely that they will be interested in regular employment without some other non-pecuniary inducements. Workers in other professions, which are not facing such extreme labor shortages, might be more interested in finding stable employment through regular employment rather than work in the relative insecurity of a contracting relationship. Again this reason may be more applicable to professionals with complex IT skills rather than the simpler functions, where extensive training is not required and a labor shortage is not as evident.

The disadvantages to contracting discussed previously tend to be less important for IT contracting. Lower wages for these employees is often not a reality, especially if the contractor has access to healthcare benefits through other sources, such as a spouse. Lower training for contractors does not seem to be a concern as higher level IT professionals are part of a craft and typically take responsibility for the majority of their training rather than relying on a company to provide training. Training, however, may be a larger issues for clerical IT functions. Employer fears of lower productivity may not be realized either as most IT skills are non-firm specific (Applebaum, 1989). IT contractors may be equally productive in any firm because the computer language and general

approach to IT work does not change from one computer system to another. Since IT functions are typically support functions, firms need not be concerned with outsourcing critical functions which may endanger the health of the organization in the long-run.

Overall, contracting IT workers should in theory allow companies to benefit from many of the positive aspects of contracting and gain much flexibility without having to suffer through the normal consequences of contracting. Firms may not gain as much in lower salaries for IT contractors as they would for other professions, but they don't suffer from as many side effects by letting go of critical function or of lower productivity from contingent workers. Plus firms that contract IT skills save significantly on lower training costs. The benefits of contracting, however, may be greater for the more complex IT functions such as programming, analysis and systems engineering than for the more clerical tasks like data entry. These more complex skills require more training and change more rapidly than data entry jobs, therefore firms would realize greater savings in training costs and acquire more up-to-date skills by contracting out their complex IT functions rather than the simpler functions. For these reasons, it is anticipated that IT contracting will continue to grow and will impact employers' relationships with their regular IT employees, who work under an ILM structure. It is also anticipated that this impact will vary with the type of IT work being contracted out.

Internal Labor Markets

Compensation of regular employees is determined by many factors both internal and external to the organizations in which they work. Internal factors are often determined by the presence of an Internal Labor Market (ILM), while external factors are

controlled by neoclassical wage setting models. Internal Labor Markets were initially described and studied by Doeringer and Piore (1971) as systems that firms use to administer pay and promotions and protect themselves from the fluctuations of labor supply. Neoclassical wage setting models explain how compensation is determined for workers across all firms hiring their skills. The literature reviewed herein describes the basic elements of ILMs, the distinction between craft and enterprise ILMs, the advantages and disadvantages of ILMs, and how the neoclassical models interact with ILMs to determine wages.

Basic Structure of ILMs

Internal Labor Markets were initially described and studied by Doeringer and Piore (1971). They represent one of the most common work systems in the United States. Many of the research articles reviewed this paper followed closely after Doeringer and Prioe's first writings. These research efforts were extensive and are still applicable today even though ILMs as a research topic became less popular by the 1990's.

Doeringer and Piore (1971) described the main elements of an ILM as limited ports of entry at the bottom of defined career ladders, promotion from these ports of entry up the career ladders over time, and an overall protection from the vagaries of the external labor market as a result of internal promotion policies. ILMs provide more continuity of work arrangements from one time period to the next. This long-term approach distinguishes ILMs from the neoclassical approaches discussed later that rely on firms and workers to renegotiate their work arrangements every time period.

Doeringer and Piore (1971) identified two different types of ILMs: a craft based ILM and an enterprise-wide ILM. Craft ILMs focus mostly on general human capital, skill set, which is not dependent upon the hiring firm. The labor supply for this craft in a local or regional area feeds this kind of ILM. Entry into the field is determined by knowledge of a craft or skill, which may be monitored by a union or naturally through a training/selection process that eliminates those workers not having the required skills. It is usually the responsibility of the worker to obtain these skills. The craft or skill requires knowledge that typically is not specific to a single firm, which facilitates the entry into a firm at all levels. Entry into a firm may occur at almost any level, but promotion within a firm for employees in a craft system may be based on a combination of seniority and ability. The craft ILM model provides a good approximation of the work arrangements for highly skilled IT professionals.

Enterprise ILMs focus on firm-specific human capital. The firm's current work force feeds this kind of ILM because the skills required are mostly firm specific. Employees working in these systems may be in any part of the company, but entry is limited to lower level/lower skill jobs, employees are trained internally. There are few, if any, skill requirements for hiring. Promotions are determined mostly by seniority. Although descriptions of enterprise ILMs have been developed primarily from blue collar systems, enterprise ILMs are good models for the work arrangements of clerical IT employees.

Generally, craft systems rely more on the external labor market than enterprise systems because of the external training requirements of craft workers. The distinction between craft and enterprise ILMs shows that some ILMs are more open to external

influence than others. Craft ILMs' practices fall somewhere between the completely external labor market approach of the contingent model and the solely internal focus of enterprise ILMs. It, however, should be stressed that while craft ILMs do tend to admit more employees from outside of the firm at all levels, internal promotion policies and internal equity in wage determinations are the predominant forces in both types of ILMs.

Other research on labor relation strategies have resulted in similar classification systems (Osterman, 1983 and Osterman, 1984a). Osterman (1983 & 1984a) described three labor/employer relationships: industrial, craft, and secondary. Industrial relationships mimic the enterprise category described above. Craft work relationships are characterized by lower job security than the industrial category, but these workers possess complex, non-firm specific skills and therefore have more bargaining power with employers. This category is similar to the craft ILM defined by Doeringer and Piore (1971). Training in the craft relationship is the responsibility of the worker. Firms hiring craft workers assume the workers' have a minimum level of knowledge at the beginning of the work relationship. Firms hiring craft workers seldom provide training for these employees. The craft category may be preferable to workers, who can easily leave one organization for another because their skills are general and very marketable. Firms may not prefer the craft system because they have less control over the cost of labor in these situations. Computer programmers represent a good example of jobs that fit into this kind of craft system. Osterman's secondary group has low job security and low skills leaving these workers with little bargaining power against employers. In a later article, Osterman (1987) adds a fourth category, salaried, to his typology of employment systems. The salaried system is similar to the industrial system because it provides

workers with higher wages and job security, but the jobs are broader and individuals' abilities may play a greater role in determining wages and promotions in the salaried systems than in the industrial systems.

Because the craft and enterprise ILMs have been found by multiple researchers (Doeringer and Piore, 1971, Osterman, 1983, 1984a, 1987), this research will focus exclusively on them. It will not use the additional secondary and salaried categories described by Osterman (1987). The craft and enterprise ILMs are easily distinguished from each other and are conceptually appealing for classifying the IT job families included in this research, which will be described later.

Reasons for ILMs

There are many reasons a firm would adopt a craft or an enterprise ILM. Generally the less a firm wants to be dependent on market forces or the more it wants to be responsible for training, the more likely it is to develop an enterprise ILM. Craft ILMs anticipate that employees will have a minimum level of general skills before arriving on the job and they are more reliant on external forces to supply skilled labor than enterprise ILMs. Piore and Sabel (1984) suggest that craft ILMs may be more appropriate when firms are producing specialized goods, while enterprise ILMs may be better suited for the production of standardized goods. With respect to the relative openess of a human resource system to external labor market forces, craft ILMs may be considered an intermediary step between a predominantly internally focused enterprise ILM and a predominantly externally focused contingent work arrangements. Therefore the reasons for developing a craft or an enterprise ILM are similar. However, these reasons may play

a larger role in the development of an enterprise ILM than a craft ILM because the enterprise ILM limits talent contributions from external labor sources to entry level jobs, while the craft ILM has an option to acquire talents at all levels. This practice allows craft ILMs to acquire talent when and where it is needed without a lengthy employer-paid training period. It should, however, be remembered that while the craft ILM is more open to employee entry from the external market at all levels, organizations with these work arrangements are still interested in maintaining longer-term work relationships with their employees than would be expected in contingent work relationships. Long-term work relationships will allow these organizations to keep the institutional and firm specific knowledge that come with employee tenure.

Firm specific skills are one reason that employers are motivated to develop ILMs. If an employer's technology is extremely specific to the firm, then the skills required to perform tasks, such as programming computers, are unique to the organization. In the case of computer skills, this may be applicable when legacy systems (i.e., old computer systems that have been modified over the years to uniquely meet firms' needs) or exceptionally complex systems, which are highly interwoven with all aspects of the firm's business, need to be modified and/or maintained. The employer will have difficulty finding these skills in the labor market and will need to invest resources to train employees on these skills (Becker, 1993). Employees will need to invest time and effort to learn these skills. Additionally, these skills will not be helpful to the employees in any other organizations. The mutual investment of employer and employees creates an incentive to maintain their employment arrangement over a longer period of time than if this investment did not exist. Firms will want to recoup their training investment, which

may not be possible if employees quit shortly after training. Employees will probably not be able to receive higher pay from other employers for having these skills as their firm specific nature makes them ineffective for other firms. These employees will most likely want to remain with the company where they will earn more because of their new skills.

Enterprise ILMs often develop when retention of employees for on-the-job training is needed (Osterman, 1995). On-the-job training is especially important for a company with many firm-specific skills because these cannot be learned outside the organization. To train new workers, firms rely heavily on experienced employees to work with new employees and share their expertise. These long-tenured employees are the only people with enough knowledge about the firm-specific skills to teach new workers. It is in the firm's best interest to retain these workers as a source of instructors. Even for more general, non-firm specific skills, on-the-job training is often less expensive than formal training. An ILM is one method of retaining employees to gain this experience.

For companies with many firm-specific skills, constantly training new employees will increase costs. To the extent that internal hiring practices are efficient, an ILM may prove a good way for a company to effectively screen applicants. Because most hires/promotions are from within the firm, management should know enough about the employees' abilities, interests, and work habits to make an informed decision about which employees should be promoted or transferred. Further there will be a minimum amount of training needed for these promoted employees since they are already familiar with much of the employer's operation. Some research has shown that employees with firm-specific skills are more likely to be promoted (Scoones & Bernhardt, 1998).

The costs of hiring for a firm may also contribute to developing an ILM. The transaction costs associated with turnover and external hiring may be substantial for a company. Turnover may be quite expensive if a company has a high percentage of its workforce leaving and/or the costs of finding replacement employees are high. Termination costs associated with turnover may be significant when both legislated continuation of benefits and company offered severance packages are considered. Recruiting costs may be significant if labor supply is lower than demand, as is the case with IT workers.

Higher recruiting costs may also be a problem for firms with ILMs, but this is probably because research has shown that these firms engage in more selection procedures than firms without ILMs (Cohen & Pfeffer, 1986). Firms with ILMs may have lower turnover, but they spend more than firms without ILMs on selection procedures. These multi-faceted selection processes are probably because companies with ILMs expect to have employees stay for a longer time and therefore are more careful in their screening techniques. Administering tests, and having more elaborate screening and interviewing methods, however, will increase the costs of hiring.

Unexpectedly, if a firm's technology changes rapidly there may be reason to develop an ILM (Pfeffer & Cohen, 1984). If job requirements are changing quickly due to changes in technology, as is perpetually the case with information technology, employers may want to train employees internally rather than constantly searching for new employees. The company's current employees possess institutional knowledge that will carry over to the new technology and would be lost if new employees were hired. The value of this knowledge must be weighed against training costs when deciding on a

strategy for staffing new equipment and processes. Additionally, recruiting costs incurred when employers continuously replenish their workforces may become burdensome. If internal training costs are less than the costs of searching for, recruiting and socialization of new hires plus the termination costs of old employees, then internal training would be the preferable course of action. For this reason, firms may actively recruit and hire employees, who possess a higher ability to learn new technologies as a means of further lowering training costs (Kalaitzidakis, 1997). If training costs for new skills are too high firms may choose to buy talent in the external labor market (Piore & Sabel, 1984). This reason for developing an ILM may be more applicable to a craft rather than an enterprise ILM.

From the employees' perspectives, an ILM is attractive because it should reduce search costs and the risks associated with being unemployed. Without an ILM, most employees need to look for new work every time their immediate job is finished or when their skills improve enough for them to find a better job. An ILM allows employees to continue growing within one company. Employees under these systems enjoy better job security and the possibility to continue acquiring new skills and promotions. As part of the strategy for long-term retention of employees, companies may choose to weight the compensation of their workers more heavily toward the end of their careers as an incentive for long service (Wachter & Wright, 1990). Workers may be paid less than their marginal productivity in the early years of their careers, but be compensated more than their marginal productivity in their later years with the company. This type of compensation scheme is another reason for employees to remain with a company to earn back deferred wages.

Research has shown some organizational factors are related to the development of ILMs (Baron, Davis-Blake & Bielby, 1984). Larger organizations are more likely to have an ILM. The presence of human resources departments is positively related to having ILMs (Pfeffer & Cohen, 1984). Pfeffer and Cohen (1984) also showed that non-manufacturing firms were more likely than manufacturing firms to have ILMs. Since initial research on ILMs focused on the blue-collar manufacturing environment, this finding is somewhat surprising (Pfeffer & Cohen, 1984). Pfeffer and Cohen (1984) suggest one reason for this finding is that manufacturing firms may be better able to control workers through manufacturing technology than non-manufacturing firms which must rely on bureaucracy.

The use of ILMs was originally believed to be present only in "core" firms. "Core" firms are large entities that have oligopolistic power in their industries while "peripheral" firms are smaller and have more volatile product demand (Beck et al., 1978; Tolbert, Horan & Beck, 1980; Averitt, 1968). The volatility of the peripheral firms' environments makes it difficult for these firms to supply the benefits of an ILM to their employees because ILMs require significant resources that would need to be sustained through difficult times. The oligopolistic nature of "core" firms allow them to more accurately predict their product demand and their need for labor. This enables the firms to more easily sustain an ILM over time.

Compensation in ILMs

Wages in an ILM are typically set to incorporate both internal equity and external labor market conditions. Compensation professionals spend time allocating wage dollars

based on the jobs' relative contributions to the organization and their worth in the open, external labor market (Livernash, 1951). Jobs are ranked in order of importance to the firm based upon criteria established in a job evaluation program (e.g., skill, supervisory responsibility, etc.). Similar jobs are grouped into salary grades and a dollar range is attached to that range. The value of the range may be determined through the use of compensation surveys and through recruiting experiences. Compensation surveys are used to estimate the going (external labor) "market" rates for jobs among the firm's external labor market competitors. Recruiting at entry level jobs for enterprise ILMs and at all levels for craft ILMs will give firms another source of data regarding the current market rate for jobs. These recruiting data are likely to be more precise in a craft ILM, where more levels of compensation data are collected. By combining the internal equity established with a point factor plan and the external equity established by compensation surveys and recruiting information, a firm will be able to meet the market rate in most cases, while maintaining internal equity (Osterman, 1984a).

Internal equity is important in an ILM environment where workers will be together over an extended period of time and will be looking at the relative contributions of their jobs to gauge what their compensation "should" be. Further, by lengthening the employment relationship, employers and employees are no longer as concerned about wages matching marginal productivity during every time period. Rather they may be more attentive to ensuring that wages match marginal productivity over the length of the employment relationship. As such, employers will not have to adjust their wage structures for every minute change in the labor market. These small fluctuations are expected to be accounted for in wages over time (Groshen, 1991).

ILM Level of Administration

Initially, all ILM research was conducted at the company level of analysis. It was assumed that companies used the same human resource policies for all employees and all jobs. Some researchers, however, think that ILMs are not uniform across a company and that other levels of analyses may provide a new perspective on traditional research questions (Lazear, 1995). These researchers think that a company may choose to implement such policies at the job family level (Baron et al., 1986; Osterman, 1984a; Spilerman, 1977). Baron et al. (1986) found that organizational measures of ILMs showed great variance that was better explained when the ILM characteristics were measured at the job family level instead of at the firm level. They found that professional and technical jobs were less likely than blue collar jobs to be in career ladders, managerial jobs were difficult to enter from outside the organization, and jobs with more incumbents were more likely to be in a ladder, as were jobs typically held by men. This research confirms that companies have the ability to determine which job families would benefit most from the different work relationships present in craft and enterprise ILMs and that companies can structure their human resource programs accordingly.

Why would a firm choose to treat some job families with the added protection from the external labor market that exists in an enterprise ILM and offer a somewhat reduced level of security that is present in a craft ILM to other job families? A firm may want to capitalize on a better trained external supply of professionals through a craft ILM that allows for external entry at all levels in jobs where skills are a critical part of performance. In jobs where the skill requirements are relatively low, firms may find it

more beneficial to rely on internal training and promotions to retain as much institutional knowledge as possible.

The simultaneous use of craft and enterprise ILMs means multiple work relationships exist within one firm. If firms employ workers under both craft and enterprise ILMs, then some of their employees enjoy the greater employment security and wage stability, although not necessarily the going market wages, of an enterprise ILM. Employees under the craft ILM may have fewer promotional opportunities, but are more likely to be paid market clearing rates. These conflicting policies may or may not preserve internal equity amongst all employees. Firms that choose to use multiple employment systems must find a way to integrate two or more pay systems that have different goals. Enterprise ILMs focus the pay relationship on internal equity with only general pay levels dictated by market rates. Craft ILMs' goals are more focused on external competitiveness due to external hiring at all levels and the need to acquire a minimum level of skill in new hires, that will demand a premium.

This research uses craft and enterprise ILMs as models of the employment systems existing for highly skilled and less skilled computer professionals, respectively. Highly skilled computer professionals generally fall into the craft ILM category because they are typically responsible for their own training and have more bargaining power with employers. Less skilled IT professions, such as data entry, are more likely to be part of an enterprise ILM as this type of work arrangement is more common for blue collar/clerical work.

IT Professionals in Internal Labor Markets

The IT profession covers a wide range of skill levels and a variety of technical areas. When considering whether an IT job family would be part of a craft or enterprise ILM, it is important to look at the specific duties and responsibilities of each family separately. Some IT job families may be better suited for a Craft ILM, while other IT job families may be more appropriate in an Enterprise ILM.

Highly skilled families such as software systems engineering or programming/analysts are more likely to be part of Craft ILMs. These job families require significant amounts of knowledge before employees may be productive. Software systems engineers create programs that allow computer operating systems to function. These professionals are responsible for ensuring the continued operation of a computer network or telecommunications network. They work with hardware changes and multiple operating systems to provide end-users with continuous access to software applications. Applications analysts and programmers design software applications based upon end-user requirements. These professionals write, test, and debug the coding to create these applications. These coding structures can quickly become complicated and the computer languages involved in these jobs may change rapidly. The skills required to perform in either a software systems engineering or an applications programmer/analyst job family are complex and take time to learn.

Employees working in these capacities are likely to have learned their trade before going to work at an organization. Because the skills change so quickly, firms are unlikely to want to provide internal training on them. Also, since computer languages and hardware are not firm-specific there is no benefit to the firm for training these

employees (Becker, 1993). They can easily take these skills to other employers and the original firm would lose the training investments. Professionals skills learned by the individual are one characteristic of a craft ILM.

Further, internal promotion policies in these families may be less beneficial to the firm. As the skills sets change with new technological advances, employers may wish to find new employees with newer skills. If the company relied solely on internal promotions, external sources of new skills would be very limited. A craft ILM allows firms to hire higher level professionals from outside of the firm.

Other less skilled IT professions, such as data entry operations, may be more appropriate in an Enterprise ILM. Data entry operations are responsible for keying information into databases or other organizational systems that track and use data. Employees seeking work in this field do not need any foreknowledge of data entry. All of these skills may be taught shortly after beginning work through on-the-job training. Firms may choose to include data entry in an Enterprise ILM because there is little to be gained from purchasing specialized data entry skills in the external market. The internal promotion policies of enterprise ILMs may be beneficial for data entry operations because there is usually institutional knowledge acquired over time that would be helpful to the organization to retain.

Neoclassical Economic Models in ILMs

Traditional, neoclassical economics asserts that differences in pay, across firms, for individuals participating in the same external labor market can be explained by considering the interplay between labor supply and demand in competitive (external)

labor markets. Neoclassical economics predicts workers and companies will renegotiate their work relationships every time period. Perfect information allows both parties to know the "market" rate for a job and the goodness of fit between a potential employee and a job. This is in direct contrast with ILMs that are systems, which protect employees from the vagaries of the external labor market. ILMs provide more continuity of work arrangements from time period to time period rather than the market mediated work systems described in neoclassical economics.

While the current study uses primarily ILM theory to discuss wages and promotional opportunities of employees, economic theories must be considered as they introduce the external labor market into the wage setting process for employees who participate in the same external labor market. Specifically, three economic wage theories that will be addressed here are compensating wage differentials, efficiency wage theory, and human capital theory. These theories co-exist with the ILMs and will be integrated with ILM theory as acting forces throughout all of the pay relationships discussed in this paper.

Compensating Wage Differential theory predicts that some firms, whose terms and/or conditions of employment are less agreeable, will need to pay their employees more than other firms pay, that is, above the market clearing rate (Rosen, 1986). The negative work characteristics related to compensating pay differentials may be anything that would make the job unattractive to people at the regular market rate such as safety concerns, unusual hours, or a higher risk of unemployment. The worse the working conditions of a job the higher the compensating wage differential will need to be to create a labor supply. Firms may choose to offset these negative conditions through purchasing

better technology to alleviate the problems for workers or through higher wages. The higher the compensating wage differential is for a particular negativity, the more people will be willing to do the job. Employers will then pay a differential high enough to create an adequate supply of workers. In the context of this study, the theory of compensating wage differentials predicts higher pay rates for ITCS, than for comparable regular employees because of their higher unemployment risks and/or the lack of non-pay benefits. Further, regular employees in ILMs would probably not receive compensating wage differentials, but the hypotheses presented in the next chapter will suggest that the introduction of ITCS may create a need for firms to pay such a differential.

Efficiency Wage theory predicts that some firms will pay above market clearing rate, that is more than the rest of their (external) labor market competitors, in order to achieve other objectives such as lower turnover, lower shirking, and/or higher productivity (Akerlof & Yellen, 1986). Under this theory employees will recognize that their wages are higher than they would receive in other firms. They will not want to voluntarily leave these jobs because they couldn't earn equal money in other firms. The potential threat of losing a high paying job creates a self-enforcing contract, where employees have little incentive to shirk (Carmichael, 1989). Further Akerlof (1982) has developed a sociological model that predicts firms paying higher wages can induce higher productivity in workers. Lower turnover is key in the IT profession, where labor supply is short of demand. Generally, efficiency wage theory predicts higher pay rates for regular IT employees than for comparable ITCS because firms are interested in long-term retention and motivation for regular employees but not for contingent workers. As explained in the next chapter, this study suggests that there may be less need for an

efficiency wage for regular employees in enterprise ILMs when firms are using comparable ITCS.

Human capital theory (Becker, 1993; Hutchens, 1989) predicts that peoples' wages will differ due to differing education and work experience among individuals. Higher wages for more complex skills should motivate individuals to expend time, effort, and/or money to acquire skills with greater value in the labor market. Human capital theory, however, distinguishes between general and firm-specific skills. General skills are equally applicable in any firm and will consequently be equally valuable for employees in any place of employment. Employers will not be inclined to provide training for general skills unless employees' wages can be lowered to offset the costs of this training. In contrast, firm-specific training provides employees with skills that will only be valuable in the firm that is providing the training. Employers will be more likely to cover the costs of firm-specific training as these skills will not be available in the external workforce. Further, firms may pay employees trained in firm-specific skills more than employees without these skills as a means of retaining them and not losing their training investments. In the context of this study, Human Capital theory helps explain why some IT job families are in enterprise or craft ILMs. Human Capital theory also helps explain why regular employees in all job families may be paid more than comparable ITCS for their firm-specific and institutional knowledge.

Each of these three theories provides reasons why firms would pay some employees more than other comparable employees/ITCS. However, they all focus on a unique factor of the work relationship. It is important to recognize that all of these factors are working simultaneously when work arrangements are determined. Therefore,

these theories by themselves may be limiting. As described in the previous sections, the ILM framework used in the current research encompasses many factors internal to firms and may be combined with these economic theories to provide a more complete explanation of how work relationships are created. The next section describes some research, which combines both the internal and external labor market factors.

External Labor Market's Impact on Internal Labor Markets

Organizations do not operate in a vacuum and even the most sheltered employee is aware of major changes in the employment environment. Companies that have implemented extensive ILMs insulating employees from market forces will still be impacted by changes in the supply of labor outside their firms and other factors effecting the health of their firms. Several researchers have studied the effects of the external labor markets on firms' employment practices and employees' wages and job security (Bills, 1987; Fay & Medoff, 1985; Grimshaw & Rubery, 1998; Moss Kanter, 1984; Pfeffer & Baron, 1988; Rebitzer & Taylor, 1991).

This study builds on the discussions of Pfeffer and Baron (1988), who suggested that the externalization of work through contingent workers will have multiple implications for the regular employees of the organization. First, for those employees managing the contingent workers there will be a new set of skills required to effectively use these workers to the benefit of the firm. They will have to coordinate and integrate the efforts of the contractors and the regular employees. Because the mechanisms of control are different for these two groups the managers' skills will need to expand and

adapt to meet the requirements of the additional complexity associated with multiple work arrangements. Second, the regular employees will be continually exposed to external labor markets. In a traditional ILM, employees are only confronted with the external labor market at ports of entry. With employees constantly working with contractors, they will be continuously reminded of the external labor market. Research evidence exists to show that these reminders and contacts in the outside world make employees more likely to leave their current employer for other opportunities (Granovetter, 1986). This potential to leave should force employers, who are using contingent labor, to treat their employees more carefully. Also there is potential for the presence of these contracted "outsiders" to alter the balance of wages, power, and privilege in the organization (Pfeffer & Baron, 1988) because they are paid on a different scale and have different motivations than regular employees. As regular employees become aware of these alternative arrangements they may have second thoughts about their own work arrangements. Therefore the interaction of regular employees and contractors may result in a reduction in regular employee satisfaction or a change in the firms' pay levels in acknowledgements of the dichotomous work arrangements.

Bills (1987) studied three organizations that had craft ILMs. Two of the companies had significant commitments to training. The first, a manufacturing firm, paid below market wages, but had an extensive training program taking entry level employees to a journeyman level in a craft. It had significant turnover at the journeyman level because of the lower wages. This company recognized it had high turnover, but accepted this as the trade for lower payroll costs. The second firm, a hospital, allowed new nurses to rotate through all of the hospital's areas to help them decide on an area of

specialization. The third, an engineering firm, relied primarily on increasing the employees' professional status as they became more proficient in their areas of expertise. When these companies faced economic distress the manufacturing firm and the hospital had to reduce the amount of training offered, while the engineering firm was able to maintain its relatively lower cost policies. This finding confirms that ILMs are expensive commitments to employees and should be balanced with the external labor market needs of the firm. If the external labor market has a large supply of workers for a job, there may not be as great a need for an ILM than if the external labor market supply is tight. Firms must be able to determine for themselves if the costs of their ILM are worthwhile given the current and probable future external labor market supply.

Another external factor impacting the operations of an ILM is the level and variability of product demand. Lower product demand, not surprisingly, will force most companies to lower their employment levels. Fay and Medoff (1985) found that lower product demand does result in a lower employment level. However, the level of employment during the economic "trough" is not as low as would be predicted by the production needs of the organization. In fact, they found that most companies hoard some workers through these difficult periods to retain company knowledge. IT workloads will also vary over the course of a company's business cycle. Similar to lower production staff during times of peak product demand, companies may lower IT staff during periods with low demand for IT work.

Rebitzer and Taylor (1991) developed an economic model relating product demand to the simultaneous use of primary and contingent workers. Primary employees are paid at higher wages to incent them to put forth significant work effort and not shirk.

Theoretically the higher wage will make it sufficiently unattractive to them to lose their jobs that they will work harder to avoid being fired. The size of this "no-shirking" premium will increase as the probability of being laid off in the next time period increases. The model predicts that firms will attempt to employ enough primary workers to cover their production needs during times of low product demand. However, firms will be better off using contingent staff to supplement these primary workers when product demand is higher because the premium for contingent labor is smaller than that of primary workers facing the potential for a layoff in the next time period. If product demand was highly variable or unpredictable companies would probably be more likely to keep the level of primary employment lower throughout the business cycle and increase the use of contingent labor as needed. Their conclusion is that firms facing moderate to high product demand will employ a combination of primary and contingent workers simultaneously. Unfortunately, Rebitzer and Taylor's (1985) model does not indicate which jobs will be held by the primary and contingent workers. This model may apply to IT workers in the sense that some IT functions are more critical to the firm's operations than others. Daily operations such as accounting programs, production control, and inventory management require constant attention from IT professionals. Other IT work such as data warehousing activities, which do not directly effect daily operations may be expendable when human resources are in short supply. IT professionals, who work on the critical IT functions of a company, may be hired as primary workers, who will be carried on as employees even through times of low demand for IT work. Contingent IT workers, who are working on special projects or during

periods of high demand for IT work, may be hired during times of high demand, but will be let go when such increased demand for IT work declines.

Another pair of researchers, Grimshaw and Rubery (1998) have speculated on the interaction of the skill specificity required for a job and the bargaining power of the employees as determining factors in the development of an ILM. These authors conclude that when a job group has high skill specificity and a low supply of potential workers in the external labor market, as is the case currently with computer programmers, employers will implement ILMs as a means of retaining employees through higher wages, promotion opportunities and training. When a job group requires highly firm specific skills and the external labor supply is high, both employers and employees try to develop an ILM that will make sense to both parties. In cases of low skill specificity, employers are less likely to develop an ILM, but if the employees have more bargaining power, as is the case when the labor market is tight, they may force the company into an ILM. The model created by Grimshaw and Rubery also suggests that an ILM is shaped by the performance of the organization, through its ability to provide an ILM, and by firm customs and practices, which may or may not support an ILM. The implication here is that firms must be aware of their environment and that these external factors will indirectly and possibly directly bring about changes in the employment relationships between themselves and their employees.

Pfeffer and Baron (1988) alluded to these potential effects of using contractors simultaneously with permanent workers over ten years ago and as of yet there have been little or no research efforts to measure these changes. Popular literature has discussed the plights of contingent workers, but at the same time very little has been said about the

potential problems or benefits these contingent workers may impart on regular employees in terms wages and career opportunities. The hypotheses and data presented in the next chapters look specifically at possible changes in wages and promotion opportunities for permanent employees as a result of the concurrent use of contract and permanent workers.

CHAPTER 3 - HYPOTHESES

The hypotheses presented in this chapter study the impact Information Technology Contingent Staff (ITCS) have on the wages and internal labor market conditions of the regular, IT workers. Since ITCS are a large portion of the contingent workforce, they are a good group to study to gain understanding of the possible ramifications of these contingent work arrangements.

These research questions will examine the impact using ITCS has on the compensation, salary structures, and promotions of regular Information Technology (IT) employees in Internal Labor Markets (ILMs). Throughout this chapter, each hypothesis is explained from the perspective of the anticipated impact the presence of ITCS will have on employees in craft or enterprise ILMs. The contrast between craft and enterprise ILMs is descriptive of the differences in the rules and norms that govern compensation and promotions for the various IT job families studied here. The first six hypotheses sets presented here focus on compensation for IT employees. These six hypotheses sets incorporate the perspectives of compensating wage differential and efficiency wage theories in addition to the ideas of ILM theory. The last two sets of hypotheses, which deal with promotions and salary structure, respectively, are based exclusively on ILM theory.

Most researchers in the area of contingent work arrangements have discussed how these work arrangements effect the ITCS workers themselves. The literature presented in the previous chapter shows that IT contingent workers typically earn a higher rate of pay than most contingent workers, but they have lower job security than regular employees

(Williams, 1989). ITCS are faced with additional costs because they rarely receive healthcare or retirement benefits. When companies use contingent workers, however, it is not just the status of the contingent workers that is altered. Regular, IT employees are expected to work together with ITCS to achieve company goals. To understand how the work place and work relationships are changing as a results of contingent arrangements, therefore the situations of both the contingent staff and the regular employees working with them should be studied. The following hypotheses have been developed to increase our knowledge about the effects of using ITCS on the careers of the regular, IT employees of the company and how the type of ILM, craft or enterprise, in which the regular employee belongs, may cause differences in these ITCS effects.

There is a range of job families involved in Information Technology work. The training and knowledge required for work in these job families varies widely in terms of complexity and rate of technologically-driven change. Jobs such as those involved in data entry represent the low end of complexity and rate of technological change in IT work. Skills for these jobs require less training and change more slowly. Firms may benefit from enterprise ILMs for these low-complexity IT jobs because enterprise ILMs may help firms protect their investment in firm-specific human capital: the institutional knowledge employees gain through on-the-job experience.

In contrast, jobs that involve developing, modifying, and maintaining computer systems and/or applications represent the high end of complexity and rate of technological change in IT work. The skills required for these jobs represent general human capital and firm-specific, institutional knowledge. The attainment of the general human capital skills is probably the responsibility of the professional, as firms are not

likely to invest in general (transferable) human capital (Becker, 1993). These skills also change rapidly as a result of the myriad technological innovations in IT such as the shift from mainframe to client/server systems and the advent of fifth generation programming languages. Firms may benefit from craft ILMs for these high-complexity IT jobs because craft ILMs may allow firms to retain a base of regular IT employees with a blend of general human capital (IT technological knowledge) and firm-specific human capital (institutional knowledge), while having the ability to attract employees with current, state-of-the-art general human capital (IT knowledge).

As explained below, the impact that using ITCS has on compensation, salary structures and promotions of regular IT employees is predicted to differ for craft and enterprise ILMs.

IT Contingent Staff are often singled out as a special category of workers because their unique skills give them an advantage in the labor market that traditional temporary workers (i.e., clerical workers) do not enjoy. ITCS often possess more bargaining power with employers than other contingent workers because their skills are not easily learned or developed in-house (Abraham, 1990). Firms' decisions to "buy" rather than "make" these skills may result from a combination of the expense to "make" them and that rapidly changing technology may quickly render these skills obsolete (Deavers, 1997). These conditions may cause firms, which choose to internally train their workers, to get less payoff for their training investments. Since the costs of "making" IT talent are high and the payoff period relatively short in comparison with other types of jobs, firms are more likely to "buy" IT talent than other skills. ITCS is one source to "buy" IT talent and

its use should then be expected to rise at least as quickly or possibly quicker than contingent work arrangements for other jobs.

Hypothesis Set 1: The pay differential between ITCS and regular IT employees

Wages are one of the main means employers have to attract and retain employees and it is commonly believed that ITCS are paid more than regular, IT employees. The theory of compensating wage differentials predicts higher wages for ITCS than for regular, IT employees because a premium must be paid to these IT professionals to offset the greater job insecurity and fewer healthcare and retirement benefits. Most regular employees in ILMs have healthcare and retirement benefits, a variety of employee welfare benefits (e.g., paid time-off, child care, etc.), and a virtual guarantee of a job in the next period. As firms offer more of these non-cash benefits to their regular employees, they may be allowed to pay their workforce at or even below market-clearing wage levels. These factors lead to the expectation that employers will need to pay a premium to compensate for all of the differences in the work relationships for their ITCS or lose them to another firm.

However, the relationship between the wages of the ITCS and the regular employees may vary depending on whether their job classification is part of a craft or enterprise ILM. The compensating wage differential for craft ILM employees should be greater than it is for enterprise ILM employees. Craft ITCS have a higher skills, which provide them with more bargaining power with employees. In contrast, there is a relatively ample supply of people, who can be readily trained on-the-job for the work in an enterprise ILM. Additionally, efficiency wage theory predicts that firms will pay a

premium to the regular employees in an enterprise ILM to protect their investment in firm-specific training. The combination of these factors suggests that the differential between regular employees and ITCS will be greater for craft job families than enterprise job families.

Hypotheses 1a, 1b, and 1c test for differences in the cash pay premiums for ITCS in craft and enterprise ILMs.

H1a: The wages of ITCS in craft job families are greater than the wages of regular, IT job families in craft ILMs.

H1b: The wages of ITCS in enterprise job families are greater than the wages of regular, IT job families in enterprise ILMs.

H1c: The premium for craft ITCS will be greater than the premium for enterprise ITCS.

The remaining hypotheses focus on how the actual ILM practices imposed on regular, IT workers change with the use of ITCS.

Hypothesis Set 2: Regular employee pay differences between firms using ITCS and firms not using ITCS.

ILMs have been characterized by wage structures determined by internal equity and internal job promotions with less emphasis on external labor market forces and by internal job promotions (Doeringer & Piore, 1971). Enterprise and craft ILM wage policies and structures are developed to maintain internal equity among employees. The external labor market is given consideration during the hiring, salary budgeting and structure development processes, but it is not as important as ensuring that all employees are paid relatively fairly for their contributions to the organization. This policy implies

that wages will generally reflect the open market, but will not be directly tied to it. Furthermore employees in an ILM are afforded many non-cash benefits. The more notable of these benefits are an implicit promise of employment during the next time period and healthcare and retirement benefits. The amount of such non-cash offerings may be negatively related to the cash wages firms must pay to employees. Firms that offer rich benefits' packages may pay their employees less than market wages as part of the trade for increased job security and other non-pecuniary benefits.

The introduction of ITCS into the workplace may alter the relative importance of internal equity in wage determination. Pay practices for ITCS are based more directly on external market forces than ILMs' pay practices. ITCS' pay will need to start at the market-clearing rate for the job and risk-related premiums may be added to this rate. As stated in the previous section, these premiums would compensate the ITCS for the extra risks associated with being contingent, such as not receiving healthcare or retirement benefits, and the higher risk of unemployment.

ILM systems rely on internal equity and the use of ITCS, who are being paid more than the regular employees, may pose problems for maintaining equity in wages among the regular employees. This may be especially bothersome in companies employing ITCS for the same tasks as their regular employees. In order to maintain equity, organizations employing ITCS may need to adjust their regular employees' wages to more clearly reflect market levels.

Because internal labor market policies may vary by job family (Baron, Davis-Blake & Bielby, 1986; Osterman, 1984; Spilerman, 1977), it's plausible that the impact of ITCS on permanent employees' pay will also differ by job family. Internal labor

market theory predicts companies will want to retain employees in craft and enterprise job families over multiple time periods. Employees in jobs that require significant skill, initial training to be productive, or can provide training to others are typical of craft ILM jobs. Employees in jobs that require significant firm-specific and institutional knowledge but little or no skills upon entry in the company are typical of enterprise ILM jobs. Both of these job types may be covered by an ILM, where long-term work relationships are a goal. However, because the skill sets of people entering enterprise ILMs are minimal, there is a larger potential applicant pool, making these employees easier to find and less costly to replace, the security of these employment relationships over multiple time periods may be diminished. Therefore, firms' reactions to the ITCS influence may be different for craft and enterprise ILM employees.

If a company is going to maintain a sense of equity for its craft employees, then the pay rates of the ITCS must be factored into the wage setting processes. ILMs' wages are focused on internal equity, but if employees work side by side with ITCS, doing the same job and are paid less than the ITCS, the importance of internal equity will be diminished. If ITCS in craft jobs are paid significantly higher due to compensating pay differentials for greater unemployment risks and lower benefits, then permanent employees may become dissatisfied with their situation and demand similar wages or leave the organization to pursue higher paying contracting options on their own. Leaving the organization is an easier option for most craft workers because this work is characterized by a substantial level of general human capital, which is valuable to many firms. Since craft employees also possess significant firm specific knowledge not held by ITCS, companies should want to retain them over a long period of time, it is important

for companies using ITCS to address the inequity concerns of these craft workers. The introduction of craft, ITCS workers has increased the exposure of regular, craft, IT workers to external labor market conditions. Efficiency wage theory, which focuses on paying above market to reduce turnover, supervisory costs and shirking risk for the firm, would predict an increase in pay for regular craft workers because they are in the long-term relationship of the ILM. The expectation then for craft job classifications would be for employers to increase pay rates for regular employees to closer approximate, although probably not completely matching the ITCS' rates. This may be a more cost effective option than paying the transaction costs of continually replacing highly skilled workers, who have substantial levels of general human capital, and investing in the firm specific training of these new hires.

For employees in enterprise job classifications working side by side with ITCS, companies may choose a different approach. While enterprise employees have firm-specific knowledge, they may not possess much professional knowledge (general human capital), which requires external training. In addition, internal training costs for these employees are minimal because of the simplicity of the job. Generally, employers are less concerned with maintaining a continuous employment relationship for these job classifications. Therefore increasing the pay rate for regular employees in an enterprise ILM to simulate the ITCS' rates may not be necessary. Many organizations may decide for enterprise jobs to pay a wage more consistent with internal equity regardless of the ITCS' wages. The cost of replacing these workers, if they decide to leave the organization, will be less than the cost of paying them higher wages. Further, regular enterprise employees in firms, which use ITCS for enterprise jobs, may face an added

disadvantage in that their replacements are readily available in the existing ITCS pool of labor. The ready labor supply may even induce firms to lower the wages of their enterprise employees below the wage levels required for internal equity. These enterprise employees may not be aware of the ITCS' wages, but should they find out about them and decide to leave, employers will probably be able to quickly replace them with an ITCS. As long as there exists an adequate supply of ITCS, firms have a motivation to lower regular wages as much as possible until their supply of replacements dwindles.

H2a: The pay level of regular, craft, IT job families will be higher in companies that use ITCS for some of their craft work, than the pay of regular, craft, IT job families in companies that don't use ITCS for any of these services.

H2b: The pay level of regular, enterprise, IT job families will be lower in companies that use ITCS for some of their enterprise work, than the pay of regular, enterprise, IT job families in companies that don't use ITCS for any of these services.

Hypothesis Set 3: The extent of ITCS use and regular employee pay.

Hypotheses 2a and 2b concern the differences between firms that use and firms that do not use ITCS. This approach assumes that the mere exposure to external labor market conditions, through the hiring of at least one contingent worker, may be enough to motivate firms to adjust the pay rates of regular employees. It is also possible that the extent to which firm use ITCS will be related to any change in regular employees' pay rates. If this is true, then using ITCS can be considered a continuous variable ranging from 0% for companies that do not use any ITCS in a particular area to 99% for companies that use ITCS for almost all of an IT work area. For companies that contract

out 100% of an area of IT work, the impact these contractors have on regular employee pay is a moot point. The following hypotheses test the continuous variable approach for ITCS on permanent employees' wages.

H3a: The extent of a company's craft work completed by ITCS will be positively related to the pay level of its regular, craft, IT job families.

H3b: The extent of a company's enterprise work completed by ITCS will be negatively related to the pay level of its regular, enterprise, IT job families.

Hypothesis 4: ITCS use and regular employee pay variability.

One of the features of ILMs is an emphasis on internal equity. As explained in the literature review, the presence of ITCS is likely to reduce the importance of internal equity in pay administration. By enforcing a policy of internal equity, employees performing the same duties and responsibilities are paid similarly. When ITCS are part of firms' strategy, their attention to internal equity is likely to be reduced. Therefore it is anticipated that the variance in pay within job families will be greater in firms with ITCS than in firms without ITCS.

H4: The variation in pay for regular IT job families will be greater in companies that use ITCS than in companies that do not use ITCS.

Hypothesis Set 5: Difference between "core" and "periphery" industries in the pay consequences of ITCS use.

Another factor, which may contribute to the impact ITCS wages have on regular employees' pay is the industry of the employer. By changing the level of analysis from

the industry level to the job family level as is being done in this research, the impact of industry membership is not explicitly considered. While the majority of ILM explanatory power may lie at the job family level, the industry segment of a firm may still have significant impact on ILM policies and labor relationships in general.

Initial research on ILMs assumed that these human resource systems were only applicable in "core" industries (Baron, 1984; Beck, Horan & Tolbert, 1978; Doeringer & Piore, 1971). "Core" industries are characterized by larger firms, more stable product demand, and a less competitive market than "peripheral" industries. "Peripheral" industries face more volatile competition and product demand, making it difficult for firms to accurately predict labor needs. ILMs are costly to maintain and may be an extraneous expense for firms in "peripheral" industries.

This "core/peripery" distinction is helpful in assessing industry impact on a variety of outcomes. For purposes of this research it may be more useful to tailor the core/periphery distinctions with a specific focus on the roles that IT skills have in each industry. Industries will be defined as "core" if IT skills are central to their profit producing operations. For example, communications, and manufacturing of control devices and medical instruments are industries that can be considered as core from the standpoint of IT work. Industries will be defined as "periphery" industries if they use IT skills, but they are not critical to the main operations of these industries. For example, trade contractors and agricultural services are industries that can be considered as "peripheral" from the standpoint of IT work.

"Core" industries' more stable IT demand may give companies the ability to predict more accurately the number of IT workers needed. Because "core" industry firms

have more stable IT labor needs, they should be able to protect themselves from changes in the supply of IT labor better than "peripheral" industry firms, which are unable to predict with accuracy their future IT labor needs. Further, "core" industry firms may offer higher job security and more of an emphasis on long-term employment than "peripheral" industry firms. This greater stability and ability to predict future IT labor needs should reduce the necessity of hiring ITCS, especially on short notice to meet unexpected workload demands. Therefore, core industry firms then are less likely to use ITCS, which means that the higher regular employees' pay rates that are predicted in Hypotheses 2a and 3a by compensating wage differential theory will be less necessary.

For craft, IT workers in "core" industries, higher job security means that the compensating wage differential for the higher job risk of working with ITCS will be reduced, but an efficiency wage premium to reduce supervisory costs and/or shirking behaviors may be more common due to the long-term focus of the work relationship. Craft, IT workers in "peripheral" industries may have lower job security because of "peripheral" industries' greater variability in IT demand. This volatility may result in a greater use of ITCS and therefore more interaction of their employees with ITCS. The "peripheral" craft, IT employees will be more aware of ITCS opportunities and may be more likely to take advantage of them (Granovetter, 1986). "Peripheral" industries will probably need to address craft, IT employees' higher risks of unemployment and desires to leave by paying compensating wage differentials more than "core" industries. Efficiency wage premiums, however, may not be feasible in "peripheral" industries because the higher wages may impose prohibitive cost on an already volatile IT demand. Any difference in wages for craft, IT employees in "core" or "peripheral" industries

should indicate that the magnitude of either the compensating wage differentials in "peripheral" industries or the efficiency wage premium present in "core" industries is greater.

For enterprise workers in "core" industries, there will be little need for a compensating wage differential as the risk of unemployment is low. The use of efficiency wage strategies may also be unnecessary because supervising this group is simpler than craft workers, making it unnecessary to pay these enterprise employees more to avoid shirking. In "peripheral" industries using ITCS for enterprise work, the compensating wage differential paid the regular enterprise employees may be minimal since long-term retention, while valued, is not critical. Efficiency wage premiums are probably not necessary for enterprise employees in "peripheral" industries because supervisory costs are minimal for this group. It is predicted that for enterprise workers the compensating wage differential of the "peripheral" industries will cause the wages of enterprise, IT employees in the "peripheral" industries to earn more than enterprise, IT employees in "core" industries.

H5a: Peripheral industries will have a higher usage of ITCS than core industries, causing wages for craft, IT job families in peripheral industries to be higher than the wages of craft IF job families in core industries.

H5b: Peripheral industries will have a higher usage of ITCS then core industries causing companies using ITCS in peripheral industries will pay their regular, enterprise, IT job families more than companies using ITCS in core industries.

Hypothesis Set 6: ITCS use and long-term incentive for regular employees.

Wages are not the only tool used by employers to retain and motivate employees. Long-term incentives (LTI) may be used as a means of linking employees' interests with those of the firm. LTI plans pay employees for company performance over a three to five year period. This long-term measurement period encourages employees to engage in behaviors good for the long-term health of the firm instead of focusing activities on short-term gains that may prove detrimental over a longer time period. LTI may be paid in company stock or deferred compensation. By delivering the incentive in stock, companies can further tie the employees' interests to those of the company because the value of the stock is dependent on firm performance where deferred cash payouts have no tie to future firm performance. LTI awards frequently have a vesting period, which requires the employee to remain with the firm for a pre-specified number of years before receiving the award. This feature makes LTI awards a particularly effective retention tool.

The use of ITCS may impact the firm's use of long-term incentives. If permanent employees are continually interacting with ITCS, then they may be more inclined to see the benefits of contingent work (i.e., more flexible hours, higher wages, etc.) and decide to leave the company. As part of an efficiency wage strategy to reduce turnover, firms using ITCS may be more likely to use long-term incentives. An employee eligible for a LTI that is not payable until some specified time in the future will have an added reason to stay with the company than an employee not eligible for LTIs. As explained above, the use of ITCS may increase significantly the risks of turnover among regular employees in craft IT jobs because of their substantial level of general human capital. Consequently,

it is anticipated that more craft job families in firms using ITCS will be eligible for LTIs than craft job families in firms not using ITCS. In contrast, the risk and impact of turnover by regular IT employees in enterprise IT job is not as great when they are exposed to ITCS. Therefore, no increase in LTI eligibility is expected for enterprise job families in firms using ITCS. Offering LTI at the level of enterprise job families may be the result of a firm-wide philosophy of equality that the use of ITCS will not change.

H6a: Companies that use ITCS for craft, IT work will be more likely to offer long-term incentives to regular, craft, IT job families than companies that do not use ITCS for craft, IT work.

H6b: Companies that use ITCS for enterprise, IT work will be equally likely to offer long-term incentives to regular, enterprise, IT job families than companies that do not use ITCS for enterprise, IT work.

Hypothesis Set 7: ITCS use and promotion for regular employees.

In addition to wages and LTI, which are "protected" from the external labor market, firms with ILMs have policies that give preferential treatment to internal promotions over hiring from external sources (Doeringer & Piore, 1971). The benefit for employees is that promotion decisions are restricted to the possible candidates inside the company and employees are not competing against external candidates, thereby narrowing the field of possible applicants. Most companies promote employees up a career ladder based upon some predetermined criteria (e.g., performance or seniority). This internal promotion policy ensures that managerial employees have a base of firm specific knowledge (Osterman, 1987). Therefore managers in these firms are more likely

to understand the impact of company-wide objectives on their areas and how their work effects processes in other parts of the company.

When companies use ITCS, they have direct access to other IT workers capable of performing the tasks of their regular, IT employees. They may choose to hire these ITCS into higher level positions instead of promoting their regular employees while still incurring a minimum of transaction costs and training time. For craft jobs, there are high costs associated with hiring unqualified, non-entry level employees, firms could be expected to hire the most qualified workers regardless of whether they were regular employees or ITCS. Further since the skills associated with craft IT jobs change rapidly with new technological developments, external sources of employees may offer companies more up-to-date skills than internal promotions. Hiring from ITCS would allow companies to acquire up-to-date skills without investing in expensive recruiting and training efforts. Therefore companies that use ITCS may hire IT professionals from outside instead of promoting from within to get the newest skills. Because these firms are hiring ITCS, there will be fewer promotion opportunities for regular employees. In firms that do not use ITCS more of the promotion opportunities will be available for internal hires because there is not a ready supply of replacements. Therefore the average promotion rate of companies using ITCS for craft IT job families should be slower than in companies not using ITCS.

Regular employees in enterprise job classifications typically are covered by the internal promotion policies of ILMs that are even more exclusive than craft ILM policies. However, if a firm wanted to hire an ITCS, the transaction costs would be lower than if it had to find a worker with no leads. Companies using ITCS for a portion of their

enterprise jobs may consider both regular workers and ITCS for the position because they are easy to inform about the position and these employers already have information about the work habits of both groups of people. Training for these jobs are minimal making the firm indifferent to promoting an employee or ITCS into an open position. The lower real and potential costs associated with ITCS do pose a threat to the exclusivity of a traditional enterprise ILM promotion policy. However, firm specific and institutional knowledge will most likely be greater in the regular employees, leading companies to be theoretically inclined to promote regular employees rather than hire ITCS. By having ITCS working on enterprise tasks, firms will have hired fewer regular, IT employees and thus the pool of potential applicants will be smaller thereby increasing the chances of a regular employee to be promoted.

H7a: The extent of using ITCS for craft, IT work will be positively related to the average number of years until promotion for employees in regular, craft, IT job families.

H7b: The extent of using ITCS for enterprise, IT work will be negatively related to the average number of years until promotion for employees in regular, enterprise, IT job families.

Hypothesis Set 8: Extent of ITCS use and salary structure range overlap for regular employees.

Employees, who are promoted, usually receive significant increases in their wages to compensate for the higher level of responsibility that comes with their new jobs. The wages for both the old and new jobs of the employees are based upon guidelines established as part of salary structures. Firms measure the internal and external equity of

jobs and determine ranges, which indicate the minimum and maximum they are willing to pay for jobs in order to best balance the demands of both types of equity. Jobs that differ in responsibility and scope will belong in different ranges. Jobs that are sequential to each other in a career progression will often belong in adjacent pay ranges for which there will probably exist some overlap from the minimum of the higher range and the maximum of the lower range. More overlap in adjacent ranges means that employees in the lower range have greater potential to earn the same or more than employees in the higher range. The higher wage rates given for promotions are supposed to act as an incentive to take on the added responsibility of the promotions. However, if the overlap between adjacent grades is significant, then employees in the adjacent grades may be paid close to each other and the raise earned for promotion will not be as great, diminishing the incentive for promotion. In situations where employees are less likely to be promoted, it may be good strategy of firms to design their pay structures to minimize the benefits of promotion. Conversely, in situations where employees are more likely to be promoted, it may be good strategy of firms to design their pay structures to maximize the benefits of promotion. Because of the reasons described in the Hypotheses 7a and 7b, craft employees may be less likely to be promoted and this means that firms should create salary structures for these job families with significant overlap. Enterprise employees may be more likely to be promoted, which means firms should create salary structures for these job families with less overlap.

H8a: The extent of using ITCS for craft, IT work will be positively related to the amount of overlap between adjacent salary ranges for craft IT job families.

H8b: The extent of using ITCS for enterprise, IT work will be negatively related to the amount of overlap between adjacent salary ranges for enterprise IT job families.

These hypotheses study the relationships that using contingent IT workers has on the pay and promotions of regular IT employees in an organization. They are designed to more closely examine the relationship between contingent staff, employees, and organizations at the job family level, which research indicates is a more appropriate level to measure companies' ILM policies and practices (Baron et al., 1986; Osterman, 1984; Spilerman, 1977). Further, the theoretical ideas associated with ILMs, in combination with Compensating Wage Differential Theory, Efficiency Wage Theory, and Human Capital Theory suggests that ITCS may have differing impacts on craft and enterprise jobs. The hypotheses presented here are developed to test the these theories and to assess how they adapt to the introduction of the external labor market in the form of ITCS. The next chapter will detail the data and methodology for testing these hypotheses.

CHAPTER 4 – DATA AND METHODOLOGY

Data

The data for these analyses come from an employee compensation survey administered to companies in 1998 and 1999 by William M. Mercer, Incorporated. The 1998 sample consisted of 994 firms reporting on the pay practices for 2,829 job families with 92,163 incumbents. The 1999 sample consisted of 961 firms reporting on the pay practices for 2,197 job families with 96,136 incumbents. 598 firms participated in both the 1998 and 1999 surveys. Once the data had been collected and analysis begun, it was necessary to combine the two waves of survey data to achieve the needed variance in the variables to ensure finding an effect if one existed. This combined sample consists of 1,357 firms with 3,780 within-firm job families and 132, 925 employees. All of the data was screened for accuracy by phone calls from William M. Mercer's survey administration team.

Human Resource professionals completed the questionnaires, which asked about their companies' pay practices and actual pay levels for information technology employees. Pay practices questions asked about the use of IT contingent staff. Specifically, companies supplied the percentage of total hours worked by IT contingent staff and the percentage of contingent pay with respect to in-house employees for five information technology job families: applications systems analysis and programming, applications systems analysis, applications programming, software systems engineering and data entry jobs. For regular employees, data were collected, at the incumbent level, about annual base pay and short-term incentive amounts. At the job level, data were

collected regarding the eligibility for long term incentives, such as stock options, as well as, average promotion rates and pay ranges, which can be used to assess the internal labor markets of these job families. (See Appendix A for actual survey questions.)

The five job families included in this study have been segmented into either craft or enterprise labor markets, based upon their major duties, responsibilities, and knowledge requirements. Generally, the families classified into craft ILMs require substantial knowledge of a specific craft/profession which may take a substantial time to acquire, training is done externally of the firm, and these skills are not specific to any one firm. Families in enterprise ILMs do not require employees to possess any knowledge before they begin work. Training is accomplished in-house and is largely firm-specific. Of the five job families covered in this study job in four of them, Applications Systems Analysis and Programming, Applications Systems Analysis, Applications Systems Programming, and Software Systems Engineering, are classified as craft jobs and jobs in the fifth family, Data Entry, are classified as enterprise jobs. The craft families require incumbents to know programming languages, principles of logic and coding, and/or information system requirements and limitations. These skills are typically acquired through undergraduate studies in computer science and continuing training on new languages and innovations in the information technology arena. The enterprise family requires incumbents to operate data entry devices, such as computers, and verify data already entered into these devices. These duties may be taught easily on the first day of employment and require no foreknowledge of the company's data entry operations. (See Appendix B for the complete job descriptions.)

To assess wages at the job family level two pay indices are calculated. The base salary index is the average of the ratios of a firm's average base pay to the average base pay of the entire data sample for all of the firm's jobs in a given job family. A second ratio is calculated similarly using total cash compensation, which is the sum of base pay and short-term incentive payments. This ratio approach eliminates problems with units that may occur when firms have reported different job levels within a family. Also, the pay indices are easy to understand as values greater than 1 indicate a job family is paid above the market average and values less than 1 indicate a job family is paid below the market average.

The findings of this study may be applicable to only the firms and job families captured in these samples or may generalize to a larger population of firms and job families depending on the representativeness of the sample database. The ability to generalize findings to a larger population depends on the external validity of the sample (Cook & Campbell, 1979). The results of this study may be applicable to many types of firms or job families, but because the hypotheses are only tested on a subset of firms or job families, the samples external validity must be tested before such generalizations should occur. One threat to external validity is possible selection bias in the sample. This bias may occur when the companies in the sample are not representative of the companies in the population to which the results are intended to be generalized. To test for selection bias, sample was compared to national statistics regarding geographical distribution, industry distribution, and company size.

The geographic distributions of the sample was similar to the total geographic distribution as determined by the Bureau of Labor Statistics with the exception that the

data sample has fewer employees on the West Coast, specifically California, than the whole employee population (BLS, 1999a). California may be argued to have a proportionately higher population of IT employees and ITCS because of the high concentration of IT work in Silicon Valley. The study sample therefore may have a lower population of employees that are being exposed to ITCS than is apparent in the larger population. This fact should lower the possibility of finding a relationship between ITCS and IT employee work relationships. If the hypotheses are confirmed, then it will be despite the fact that the samples do not contain a realistic representation of Silicon Valley firms that, at least anecdotally, are the most prolific users of IT contractors.

Industry distribution may be another threat to external validity. If the distribution of industries present in the data sample differs from the distribution of industries in the nation, it will make it difficult to generalize to this larger population of employees and not just to the subset of industries present in the sample. Generally, sample contained employees from all of the non-farm, two-digit SIC codes. The sample had proportionately more employees in the durable manufacturing and services industries than is present in the national population of employees and a smaller proportion of wholesale/retail trade and public administration employees (BLS, 1999b). Industry segment is used as a control variable in these analyses and therefore the disproportionate industry representation should not effect the results of the research, but some care should be taken before assuming that the results from this research are applicable to the country as a whole.

The size of the organizations in which the sample employees work may also differ from the national distribution of company sizes. The survey from which these data are

extracted is extremely complex. It is customary for a compensation professional to complete the survey and therefore the set of companies adequately staffed to participate will be generally those companies with fully formed human resource departments. Further, the cost to companies to participate in this survey is relatively high, which may discourage smaller firms that do not have a large budget for salary surveys. It is assumed from these two circumstances that the firms in this data sample are on average larger than the typical company in the United States. Therefore the results of these hypotheses should only be generalized to employees working at larger firms.

Another possible source of selection bias is in the job families being used for the study. This study focuses on five job families in the Information Technology profession: Applications Systems Analysis and Programming, Applications Systems Analysis, Applications Systems Programming, Software Systems Engineering, and Data Entry. While these families cover a broad range of duties within the Information Technology field, there are other parts of the Information Technology that are not part of these families. These families represent only the software portion of Information Technology job families and do not include any families that are responsible for hardware requirements, such as network operations. There does not appear to be theoretical reason why the results of this research would not be applicable to IT job families focusing on hardware, however, generalization to the entire spectrum of IT or non-IT job families should only be done with a cautionary note to the reader regarding the original sample.

In addition to selection bias, variables present in the organizations studied may pose threats to external validity because they may influence pay and promotion relationships, but they are not variables of contracting use. Company size, industry, and

unemployment rates may all confound the study's results. Industry effects on ITCS may be different in high technology industries where the IT job families are more central to the operations and profitability of the organization. This effect will be tested for in Hypotheses 5a and 5b. Organization size has been shown to impact pay levels, regardless of contracting practices (Baron, 1984) and unemployment should directly impact wages through market forces (Pfeffer and Cohen, 1984). Industry segment, organizational size, and state unemployment rates will be used as control variables in this study to isolate their impact of these factors.

Another threat to external validity is the potential for the point in time when the questionnaire was completed to impact the relationships found. Each of the samples in this study was achieved through mail in questionnaires making the actual time of completion vary by organization, although there is a common effective date on the questionnaires to ensure all of the data represents the same point in time. The questionnaire is extremely lengthy requiring one day at a minimum for completion. It is unlikely that there would be any one specific event that would effect all of the participants in such a way that would skew the study outcomes. Further, by using combining the samples from 1998 and 1999, any time specific events that might impact one of the samples would not be likely to have an impact on the other sample.

The internal validity of this study also needs to be addressed. Internal validity refers to ability of the study to correctly infer that the predicted relationships between the studied variables does or does not exist. To eliminate possible threats to internal validity, the sample was examined for differences between the contracting and non-contracting firms on the control variables that have potential to cause similar differences in pay

policies to those predicted in the study's hypotheses. Using t-tests on all of the control variables it was found that there are proportionately fewer services firms in the contracting group for the Applications Systems Analysis job families. The contracting firms in the Applications Systems Analysis and Programming family has proportionately fewer services firms, but more transportation firms. Finally, the Software Systems Engineering job family has proportionately more transportation firms than the non-contracting firms. Consequently, industry variables are put into the tests of these hypotheses as control variables to ensure the effects of these differences are measured separately from the effects of the study contracting variables.

Methods

Throughout the testing of these hypotheses the level of analysis will be the job family. For each hypothesis set the number of cases in the analysis changes because either the hypothesis itself resticts which cases from the sample should be included in the analysis or because survey participants were unable to provide information on a specific dependent variable. For example, Hypothesis Set 1 examines the differences between regular employees' pay rates and the pay rates of ITCS in the same firm. Therefore only firms that reported the pay rates of their ITCS are included in these analyses. However, Hypotheses Set 2 and 3 include all firms that reported regular employee wage rates for a job family, so the sample sizes in these hypotheses will be much larger. More specific detail about the samples for each hypothesis are described below. Another factor that affects the sample sizes is missing data. For Hypotheses Set 6, 7, and 8, not all participants were able to provide information on their LTI practices, promotion rates or

salary ranges. When data was not provided for a dependent variable the firm was excluded from the analysis. These missing data will also effect sample sizes.

Hypothesis Set 1: The pay differential between ITCS and regular IT employees

Hypotheses 1a, 1b, and 1c test the relative pay levels of ITCS versus regular IT employees. It is hypothesized that ITCS in both craft and enterprise job families will be paid more than regular IT employees, but that this differential will be greater for the craft job families. The dependent variable for these hypotheses is ITCS' pay rates as a percentage of the companies' regular, IT workers base pay. Participants reported the relative pay for ITCS in comparison with their regular employees. For example if ITCS are paid twice as much as the regular employees, participants reported 200%. (See Appendix for survey questions.) The comparisons are made using a t-test to estimate the significance of the difference in the means between the ITCS and the regular employees pay rates. If the ITCS rates are significantly higher than 100%, which is the regular employees' pay rate, then Hypotheses 1a and 1b should be considered confirmed. If the t-value generated by the difference between the enterprise and craft contractor pay rates is significant, then Hypothesis 1c will be confirmed. To test Hypotheses 1a and 1b only those firms that reported the pay rates of their ITCS in a job family are included. The pay rates of their regular employees were defaulted to 100% because the survey question asked for a percentage of pay based upon the regular employees' pay rates. To test Hypothesis 1c, the sample included only those firms that reported the pay rates of their ITCS in both the craft and enterprise job families.

Hypothesis Set 2: Regular employee pay differences between firms using ITCS and firms not using ITCS

Employee pay can be defined by two methods. Base pay is the minimum salary paid to an employee for completing a job. Total cash compensation is all of the cash paid to an employee over the course of a year for all services. The difference between base salary and total cash compensation may include bonus payments made in addition to regular wages, overtime payments, or any other cash given to an employee in exchange for work. In testing Hypotheses 2a and 2b indices derived from employees base pay and total cash compensation were created. These base pay and total cash pay indices were developed at the job family level. They represent the employee weighted average of the ratios for all of the jobs in a job family of a firm's average pay in a job to the market average pay for that job. The base pay indices should be similar to the total cash indices, except that the total cash indices should reflect any variable pay components of wages. Difference in the results of these tests should give an indication that ITCS may be impacting the use of variable pay.

Hypotheses 2a and 2b are tested using a moderated regression analyses. The moderated regression approach enters all variables simultaneously including control variables, dummy variables, for each of the five job fmailies except the Software Systems Engineering, the dichotomous variable, ITCSDICH, and the interaction terms, which are the cross product of the job family dummy variables and ITCSDICH (Cohen & Cohen, 1983). Both the base salary and total cash compensation indices are used as dependent variables. The sample includes all firms that reported regular employees in a job family. Two regression models are performed to test both of these dependent variables.

Control variables in this study include industry segment (dummy coded with the wholesale trade omitted), firm size (computed as the logarithm of total employees), and state unemployment rates. Industry is used as a control variable because prior research indicates that industry has a significant effect on wage levels in firms. Industry segments are coded using the two-digit SIC codes. These codes are used because they are readily available and cover all possible industries in the sample. Firm size is used as a control variable because prior research indicates that larger firms typically pay ore than smaller firms. It is necessary to pull this effect out of the variance before measuring for the impact of ITCS on wages. The logarithm transformation is used because the scale of the total employees responses is much greater than other scales being used in these analyses. The logarithm transformation will reduce the amount of influence this firm size variable has simply due to scale. State unemployment rates are also used as a control variable in these analyses. Unemployment rates have been shown to be related to wages. Controlling for the wage effect of unemployment seems appropriate when trying to isolate the effects of other variables on wages. State unemployment rates are used because the jobs in this study are probably subject to regional recruiting areas, not national recruiting areas and state unemployment rates are a better proxy of the labor market environment regionally than using a national unemployment rate.

Model 1 with Base Salary Index as Dependent Variable:

$$\textit{Base Salary Index} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSDICH}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSDICHxASB}) + \beta_{18}$$

(ITCSDICHxASA) + β_{19} (ITCSDICHxASP) + β_{20} (ITCSDICHxDE) + Error

Model 2 with Total Cash Compensation Index as Dependent Variable:

Total Cash Compensation Index = β_0 + β_1 (ln(Total Employment) + β_2 (Unemp) + β_3(Mining) + β_4 (Construction) + β_5 (Mfg-Durable) + β_6 (Mfg-NonDurable) + β_7 (Transportation) + β_8 (Retail) + β_9 (Finance) + β_{10} (Services) + β_{11} (Public Administration) + β_{12} (ITCSDICH) + β_{13} (ASP) + β_{14} (ASB) + β_{15} (ASA) + β_{16} (DE) + β_{17} (ITCSDICHxASB) + β_{18} (ITCSDICHxASA) + β_{19} (ITCSDICHxASP) + β_{20} (ITCSDICHxDE) + Error

The same results are anticipated with both models, but should there be differences it may indicate that firms are attempting to alleviate market pressures from ITCS through the use of variable pay. Significant, positive regression coefficients on the ITCS variable for the craft job families will confirm Hypothesis 2a. Significant, negative regression coefficients on the ITCS variable for enterprise job family will confirm Hypothesis 2b.

Hypothesis Set 3: The extent of ITCS use and regular employee pay

Hypotheses 3a and 3b are tested using the same dependent variables and moderated regression model as is used for Hypotheses 2a and 2b. However, the ITCS variable entered is the continuous variable ITCSCONT defined as the percentage of work completed by contractors. This continuous variable measures the extent to which ITCS are used in the workplace. The dependent variables base salary index and total cash compensation index are analyzed in two separate regressions. The sample includes all firms that reported regular employees in a job family. The results of this test delve deeper into the ITCS effect to determine if merely the presence of ITCS will cause a

change in employee pay rates or if there actually needs to be some critical amount of contracting actually occurring before employees' pay levels are changed.

Model 1 with Base Salary Index as Dependent Variable:

$$\textit{Base Salary Index} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

Model 2 with Total Cash Compensation Index as Dependent Variable:

$$\textit{Total Cash Compensation Index} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

Significant, positive regression coefficients on the contracting variable for the craft job families will confirm Hypothesis 3a. Significant, negative regression coefficients on the contracting variables for the enterprise job families will confirm Hypothesis 3b.

Hypothesis 4: ITCS use and regular employee pay variability

Hypothesis 4 examines the variation in regular employees pay resulting from the presence of ITCS. To test this variance hypothesis, two moderated regression models are used, where the dependent variables measure the variability (range) in base pay and total

cash compensation within a job family. The regression models include control variables of industry segments, total employees (logarithmic transformation) and state unemployment rates. The sample includes any firms that reported multiple employees in at least one job of a job family. The continuous ITCS variable, ITCSCONT, from Hypotheses 3a and 3b is used as the ITCS variable.

Model 1 with Base Pay Range as Dependent Variable:

$$\textit{Base Salary Index} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

Model 2 with Total Cash Compensation Pay Range as Dependent Variable:

$$\textit{TCC Pay Range} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

A significant, positive regression coefficient on the contracting variable would confirm Hypothesis 4.

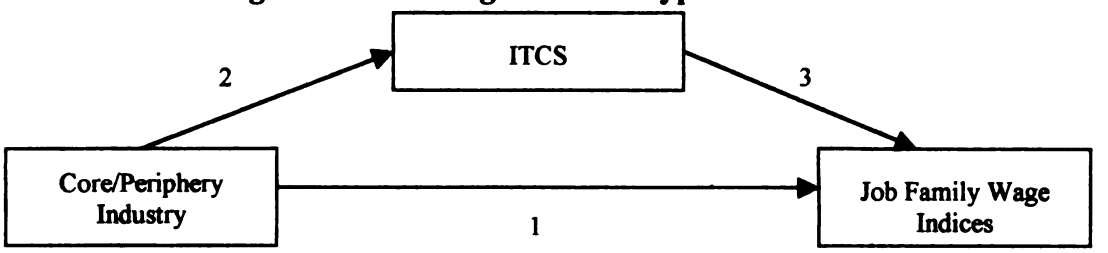
Hypothesis Set 5: Difference between "core" and "periphery" industries in the pay consequences of ITCS use

Hypotheses 5a and 5b look more closely at the possible industry effects on employee pay with contractors. The dependent variables for testing these hypotheses are the base pay and total cash compensation indices used in Hypotheses Sets 2 and 3. To

test the core/periphery arguments presented in the previous chapter, subsets of the databases including only those job family/firm combinations hiring contingent staff are used in these analyses. Firms will be classified on a core/peripheral continuum based upon the percentage of IT employees in their industries as determine by national Occupational Employment Statistics (BLS, 1998). These OES statistics measure the percent of employees within an industry that work in IT jobs. It is assumed for the purposes of this study that a higher percentage of IT employees in an industry correlates to a more central role for IT tasks within that industry. If firms need more IT workers to complete their work, then it should mean that IT workers are more important or central to the operation of the firms.

These hypotheses are tested using the mediating regression model illustrated below:

Figure 1: Mediating Model of Hypotheses 5a and 5b



Using the methods described by Baron and Kenny (1986), this model is tested by examining the regression weights of four regression equations. First, the independent variable, core/periphery, is regressed directly on the base salary/TCC index used in hypotheses 2 and 3 (link1). Second the core/periphery variable is regression on the continuous ITCS variable used in Hypotheses 3a and 3b (link 2). The third regression estimates the relationship of the continuous ITCS variable on

the base salary/TCC index (link 3). If all of these regression relationships exist, then the core/periphery variable is regressed on the base salary/TCC index holding the ITCS variable constant (links 2 and 3). For the mediating model to hold, the relationship between the core/periphery and the base salary/TCC index in the last regression model should be smaller than the relationship in the first regression model. Throughout all of the these regression models the effects of unemployment and organizational size (ln(total employment)) are controlled for.

Significant, regression coefficients on the core/peripheral variable for the craft job families would indicate the one of the compensating wage differential or the efficiency wage premium is greater than the other. Significant, positive regression coefficients on the core/periphery variable for the enterprise job families will confirm Hypothesis 5b.

Hypothesis Set 6: ITCS use and long-term incentives for regular employees

Hypotheses 6a and 6b predict the impact ITCS has on the retention practice of long-term incentives. The dependent variable, eligibility for long-term incentives, is calculated as the percentage of employees in a job family eligible for LTI. Again, a moderated regression model is used with total employment (logarithmic transformation) as a control variable. The sample used to test these hypotheses consists of job families from firms that were able to report on the eligibility of its employees in a job family for LTI. Firms that were unable to report on LTI eligibility were excluded from the analysis. Model with Percent Eligible for LTI as Dependent Variable:

$$\textit{Percent Eligible for LTI} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-}$$

NonDurable) + β_7(Transportation) + β_8(Retail) + β_9(Finance) + β_{10} (Services) + β_{11}(Public Administration) + β_{12}(ITCSCONT) + β_{13}(ASP) + β_{14}(ASB) + β_{15}(ASA) + β_{16}(DE) + β_{17}(ITCSCONTxASB) + β_{18} (ITCSCONTxASA) + β_{19}(ITCSCONTxASP) + β_{20}(ITCSCONTxDE) + Error

Significant, positive regression coefficients on the contracting variable will confirm Hypothesis 6a. Non-significant regression coefficients on the contracting variable will lend support to Hypothesis 6b.

Hypothesis Set 7: ITCS use and promotion for regular employees

Hypotheses 7a and 7b predict the impact of ITCS on the ILM practice of internal promotions. The moderated regression model presented for Hypotheses 6a and 6b is used, but the dependent variable is the average number of years until promotion within a job family. Firms were asked to report the average number of years it takes employees to be promoted for each job in a job family. The employee weighted average of these numbers of years for all of the jobs in a family is the dependent variable in these analyses. The sample used for these hypotheses is those firms reporting the average number of years until promotion for at least one job in a job family. Firms that were unable to provide information on promotion rates were excluded from these analyses.

Model with Average Years for Promotion as Dependent Variable:

Avg Years to Promotion = β_0 + β_1(ln(Total Employment) + β_2 (Unemp) + β_3(Mining) + β_4(Construction) + β_5(Mfg-Durable) + β_6(Mfg-NonDurable) + β_7(Transportation) + β_8(Retail) + β_9(Finance) + β_{10} (Services) + β_{11}(Public Administration) + β_{12}(ITCSCONT) + β_{13}(ASP) + β_{14}(ASB) + β_{15}(ASA) + β_{16}(DE) + β_{17}(ITCSCONTxASB) + β_{18} (ITCSCONTxASA) + β_{19}(ITCSCONTxASP) + β_{20}(ITCSCONTxDE) + Error

Significant, positive regression coefficients on the contracting variable for the craft job families would confirm Hypothesis 7a. Significant, negative regression coefficients on the contracting variable for the enterprise job families would confirm Hypothesis 7b.

Hypothesis Set 8: Extent of ITCS use and salary structure range overlap for regular employees

Hypotheses 8a and 8b predict the differences exists in the amount of salary range overlap that exists if a company employs ITCS or not. Salary range overlap is defined as the percent of the salary structure range that overlaps with the next higher salary structure range. The dependent variable in these analyses is the average percent of overlap for all jobs in a job family. The sample includes those firms that provided information regarding their salary structures. Firms that were unable to provide salary structure range information were excluded from the analysis. Again, the moderated regression model presented for Hypotheses 6a and 6b is used, but the dependent variable is the average percent of overlap for a job family.

Model with Average Percent of Overlap as Dependent Variable:

$$\textit{Avg Percent of Overlap} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

Significant, positive regression coefficients on the contracting variable for the craft job families will confirm Hypothesis 8a. Significant, negative regression

coefficients on the contracting variables for the enterprise job families will confirm Hypothesis 8b.

CHAPTER 5 - RESULTS

The data used to test the hypotheses presented in the previous chapter come from two years of the Compensation Survey of Information Technology Professionals conducted by William M. Mercer, Inc. The data were collected for this survey in April 1998 and April 1999. These data were submitted by human resources professionals and covered the wages paid to their companies' regular information technology employees, salary structure ranges, long-term incentive eligibility, the average number of years until promotion, and the use of ITCS in a variety of information technology areas.

The survey collects data about five job families. The first family, Data Entry jobs, is an example of IT work organized in an enterprise ILM. The other four job families, Software Systems Engineering, Applications Systems Programming, Applications Systems Analysis, and Applications Systems Analysis and Programming, are examples of IT work organized in craft ILMs.

The data sets from the 1998 and 1999 surveys were combined into one sample to ensure there is an adequate sample size to capture the effects of all the variables in question and any effect of ITCS that may be present will be apparent in the results. The combined data set contains data on 132,925 employees in 3,780 job families from 1,357 organizations. As all of the hypotheses have been stated at the job family level, we will focus on the 3,780 job families as the unit of analysis. The term "job family" will be used to designate a set of positions, from one of the five job families listed above, within a particular firm.

The sample analyzed here is generally representative of the US population of organizations. The geographic distribution is relatively similar to that of the US employee population (BLS, 1999a). The industry representation of the sample companies is also similar to the US industry distribution, however, it does have a slightly larger percentage of durable manufacturing and services firms and a smaller percentage of public administration and retail/wholesale trade firms than are present in the US (BLS, 1999b). (See Appendix C for more detail on the industry and geographic distributions.) One difference from the US population is that the companies submitting data for these job families are assumed to be larger than the US population of companies. Given these demographics, the results of these analyses may be applicable to a larger population than the firms in this sample. However, caution should be employed before applying these results to jobs other than those in the Information Technology field or to smaller organizations.

The survey questions used to test these hypotheses included policy data on the amount of work completed by ITCS and the relative pay rates of ITCS for each type of job family, job level questions about salary structure ranges, average promotion rates, and the use of long-term incentives. For regular IT employees, data were submitted for their base pay and any short-term incentives paid in the last 12 months to them. Descriptive statistics for all of the variables used in these analyses are presented on the following pages.

Table 1: Descriptive Statistics and Correlations

Variable	Mean	sd	ln(Total Employees)	Unemployment	Mining	Construction	Manufacturing - Nondurable	Manufacturing - Durable	Wholedale Trade	Retail Trade	Finance	Services	Public Administration	Transportation	ITCSDICH	ITCSCONT	Contract Pay	ASP	ASB	ASA
ln (Total Employees)	8.101	1.454																		
Unemployment	4.040	1.052	-.009																	
Mining	.015	.120	-.046**	.047**																
Construction	.001	.028	-.019	-.026	-.003															
Manufacturing - Nondurable	.097	.296	.070***	-.015	-.040*	-.009														
Manufacturing - Durable	.055	.228	-.009	-.070***	-.029	-.007	-.079***													
Wholesale Trade	.023	.149	-.029	.061***	-.019	-.004	-.050**	-.037**												
Retail Trade	.059	.236	.230***	.006	-.030*	-.007	-.082***	-.060***	-.038**											
Finance	.238	.426	-.135***	.015	-.068***	-.016	-.183***	-.135***	-.085***	-.140***										
Services	.393	.488	.004	.009	.098***	-.023	-.264***	-.194***	-.123***	-.201***	-.449***									
Public Administration	.040	.200	-.098***	-.030*	-.025	-.006	-.067***	-.049**	-.031*	-.051**	-.114***	-.163***								
Transportation	.080	.272	.044**	-.001	-.036**	-.008	-.097***	-.071***	-.045**	-.074***	-.165***	-.238***	-.060***							
ITCSDICH	.176	.381	-.044**	-.020	.025	-.013	.0058	.019	-.005	.029*	.007	-.092***	.027*	.080***						
ITCSCONT	3.778	11.934	-.032**	-.021	.027*	-.009	.001	.006	.027	.020	-.031	-.062***	.018	.098***	.685***					
Contract Pay	30.497	81.060	-.032	-.041**	-.004	-.011	.006	.025	-.007	.023	.002	-.054**	.023	.034**	.814***	.553***				
ASP	.145	.352	-.011	-.014	-.019	-.012	.002	.006	.018	.012	.022	-.034**	.020	-.006	.023	.013	.015			
ASB	.403	.490	-.045**	.026	.004	-.004	.022	.015	.001	-.007	-.008	-.0034	-.012	-.005	.171***	.135***	.147***	-.338***		
ASA	.159	.366	.011	.011	.014	.039**	.016	-.007	-.028	-.011	-.012	.004	.000	.015	-.055***	-.047**	-.056**	-.179***	-.358***		
SSE	.216	.412	.046**	-.031*	.017	-.015	-.018	-.011	.006	.002	.025	-.022	-.018	.029*	-.103***	-.080**	-.080***	-.216***	-.431***	-.228***
DE	.077	.267	.010	.005	-.027*	-.008	-.038**	-.009	.003	.008	-.036**	.079***	.023	-.049**	-.110***	-.076**	-.091***	-.119***	-.237***	-.126***
ITCSxASP	.601	4.884	-.044	.002	-.007	-.003	.001	-.012	.011	.008	.004	-.026	.014	.031*	.266***	.377***	.195***	.299***	-.101***	-.054**
ITCSxASB	2.310	9.542	-.055**	-.019	.033**	-.007	-.010	.020	.032**	.012	-.014	-.055**	.012	.066***	.524***	.770***	.459***	-.100***	.295***	-.105***
ITCSxASA	.396	3.968	.013	-.010	.026	-.003	.028*	.012	-.016	-.009	-.027*	-.012	.016	.018	.222***	.295***	.122***	-.042***	-.084***	.235***
ITCSxSSE	0.422	4.366	0.025	-.007	-.012	-.003	.002	-.022	.006	.010	-.027	-.011	-.007	.077***	.209***	.339***	.167***	-.040**	-.080***	-3042**
ITCSxDE	0.048	1.312	-0.003	-.008	-.004	-.001	-.012	-.009	-.006	.059***	-.020	.008	.003	-.011	.079***	.09***	.018**	-.015	-.030*	-.016
Base Ratio	0.975	0.194	0.029	.129***	.043**	-.040**	.045**	.007	.011	.027	-.001	-.054**	-.023	.016	-.010	.013	-.019	-.026	.018	-.187***
TCC Ratio	0.968	0.204	.037**	.128***	.052**	-.037**	.049**	.004	.006	.037**	.022	-.085***	-.040**	.037**	-.010	.015	-.020	-.012	.001	-.174***
Base Range	34.164	29.667	.244***	.001	-.030	--	-.039	.054**	-.049*	-.058**	.014	.069**	-.038	-.037	-.021	-.012	-.032	-.075**	.194***	-.055**
TCC Range	35.55	31.826	.247***	.007	-.030	--	-.029	.052**	-.052**	-.061**	.044*	.042	-.044*	-.036	-.022	-.012	-.032	-.076**	.189***	-.057**
Core/Peri	4.592	4.295	-.168***	-.036**	-.103***	-.029*	-.298***	.034**	-.036**	-.247***	.289***	.180***	-.115***	-.116***	-.125***	-.097***	-.116***	-.017	.056**	-.033**
LTI Percent	0.123	0.311	.111***	.024	.005	-.009	-.006	.068***	.010	.098***	-.036**	-.022	-.072***	.001	.004	.015	-.015	-.020	.035**	-.024
YrsProm	2.6	2.134	-.022	.075**	.052*	-.042	-.039	-.083**	-.074**	-.062**	.025	.077**	.036	.002	-.099***	-.065**	-.079**	-.0166**	-.045	.048*
Overlap	0.618	0.227	.021	-.037	.029	.056**	-.042*	.032	.000	-.010	.071**	-.058**	-.004	-.004	-.021	-.026	.000	.030	-.057**	.052**

N = 3,780 * p < .05 ** p < .01 *** p < .001

Table 1: Descriptive Statistics and Correlations (Cont'd).

Variable	SSE	DE	ITCSxASP	ITCSxASB	ITCSxASA	ITCSxSSE	ITCSxDE	Base Ratio	TCC Ratio	Base Range	TCC Range	Core/Peri	LTI Percent	YrsProm	Overlap
ln (Total Employees)															
Unemployment															
Mining															
Construction															
Manufacturing - Nondurable															
Manufacturing - Durable															
Wholesale Trade															
Retail Trade															
Finance															
Services															
Public Administration															
Transportation															
ITCSDICH															
ITCSCONT															
Contract Pay															
ASP															
ASB															
ASA															
SSE															
DE	-.152***														
ITCSxASP	-.065***	-.026**													
ITCSxASB	-.127***	-.070***	-.030*												
ITCSxASA	-.054**	-.030*	-.013	-.025											
ITCSxSSE	.185***	-.028*	-.012	-.023	-.010										
ITCSxDE	-.019	.127***	-.005	-.009	-.004	-.004									
Base Ratio	.014	.238***	.021	.019	-.061***	.013	.037**								
TCC Ratio	.010	.236***	.024	.018	-.059***	.016	.036**	.977***							
Base Range	-.078**	-3058**	-.021	.008	.003	-.021	-..025	.047**	.053**						
TCC Range	-.062**	-.067**	-.020	.006	.001	--.015	-.024	.059**	.075**	.976***					
Core/Peri	-.034**	.017	-.045**	-.052**	-.058***	-.040**	-.032**	.036**	.045**	.195***	.191***				
LTI Percent	.054**	-.088***	-.011	.025	-.009	.013	-.014	.026	.056**	.161***	.159***	.002			
YrsProm	.060**	.018	.000	-.089**	-.002	.027	-.030	.121***	.109***	.096**	.085*	.094**	-.070**		
Overlap	.028	-.043*	-.036	-.020	-.013	.018	.007	.009	.013	-.051	-.039	.008	-.022	.047	

N = 3,780 * p < .05 ** p < .01 *** p < .001

The correlation matrix reveals some interesting relationships. The use of ITCS as measured by ITCSDICH and ITCSCONT is significantly, positively related to ITCS pay rate. This correlation implies that as firms use more ITCS, they tend to pay them higher rates. The Core/Periphery variable is negatively, significantly related to ITCS pay rate, suggesting that as firms move toward the core they pay less to their ITCS. The Core/Periphery variable is also negatively related to ITCSDICH and ITCSCONT, which implies that core firms do not use ITCS as much as periphery firms. This finding corroborates part of the rationale behind Hypotheses 5a and 5b. Total employment is positively related to the total cash compensation range index and the LTI percent variable. This finding would imply that as firms grow they have less internal consistency in total cash compensation. Larger firms would typically have more employees in a job and administering pay among a larger number of people would make it more difficult to be consistent, thereby increasing the range of pay being offered to employees. Also larger firms may be more stable providing them an opportunity to create long-term performance plans that would be presumptuous in smaller, less stable firms. Unemployment is positively related to the base pay and total cash pay indices. This finding is counterintuitive and is consistent throughout the analyses, but may reflect the non-IT specific nature of these unemployment rates. Finally, many of the industry variables are related to the base pay and total cash compensation indices as is predicted by much prior research. These relationships between industry and pay have been well documented and explain why industry segment variables are used as control variables throughout these analyses. Although some of the correlations between the interaction terms and their components, ITCSCONT and the dummy job family variables are fairly

high, none of the correlations between the independent variables is close to approaching 1.00, therefore problems with multi-collinearity will be minimal.

As discussed in the Data and Methodology chapter, the samples used to test each hypothesis vary in size because of the focus of the hypothesis and the number of valid responses to the survey questions. The focus of the hypotheses means that the hypotheses are stated in such a way that in for some of them (H1a, H1b, H1c, H4, and H5) it is appropriate to test the hypotheses on a subset of the whole sample. These hypotheses are predicated on companies using contractors (H1a, H1b, H1c, H5) or having multiple employees in a job classification (H4). As such, the sample was segmented to include only those companies that fit these criteria. The second reason for the changing numbers of cases is related to the level of detail required to complete the complex questionnaire. Some companies were unable to provide all of the information regarding their policies with respect to their contractors or for the salary structure, long-term incentive eligibility, and promotion policies associated with their employees (H6, H7, H8). In each hypothesis, the subset of companies that were able to provide these data were included and companies that did not provide information on the required variable were excluded. This ensures that the hypotheses are tested on cleaner data than would be used if missing data were replaced with the mean of the sample.

Hypothesis Set 1: The pay differential between ITCS and regular IT employees.

Hypotheses 1a and 1b predict that the wages of ITCS in both craft and enterprise IT job families will be higher than the wages of the regular employees in these job families. ITCS relative wages were reported by companies using ITCS in each of the five

job families, as a percentage the regular, IT employees' wages in the same family. For example, if ITCS were paid twice the hourly rate of regular employees in that job family, then a value of 200% was reported as the ITCS relative wages. Hypotheses 1a and 1b were tested using paired t-tests to compare the ITCS relative wage to 100%, which is the corresponding firm rate for the regular employees in a job family. Sample sizes for these paired t-tests are smaller because the sample is limited to those companies that reported ITCS relative wages and regular employees' wages for the same job family. The table below shows the results of these tests, which confirm the predictions of Hypotheses 1a and 1b. As predicted, the ITCS relative pay rates are significantly higher than 100%. This means that both craft and enterprise ITCS are paid significantly higher than regular, IT employees within the same job families.

Table 2: Paired t-test Results of Hypotheses 1a and 1b

Job Family	Mean ITCS Pay Rate	N	T
Applications Systems Analysis & Programming (Craft)	196.46	349	17.354**
Applications Systems Analysis (Craft)	198.87	61	7.600**
Applications Systems Programming (Craft)	187.40	98	10.405**
Software Systems Engineering (Craft)	199.58	74	8.533**
Data Entry (Enterprise)	181.25	8	3.303*

** $p < .001$
* $p < .05$

Hypothesis 1c predicts that the wage premiums above the regular, IT employees' wages paid to ITCS in craft job families will be higher than the premiums paid to ITCS in enterprise job families. To test this hypothesis a paired t-test was again used to compare the premiums for craft ITCS to the premium for the enterprise ITCS. The samples for

these tests were limited to companies reporting pay rates for the craft and enterprise ITCS being compared. These companies may not have reported regular employees in these job families. Using a paired t-test controls for the general wage levels within the firms. The table below shows the results of this analysis. The results are only significant for the Applications Systems Analysis & Programming giving only limited support for Hypothesis 1c.

Table 3: Paired t-test Results of Hypothesis 1c

Job Family	Mean Craft ITCS Pay Rate	Mean Enterprise ITCS Pay Rate	N	T
Applications Systems Analysis & Programming (Craft)	236.33	159.54	24	4.023*
Applications Systems Analysis (Craft)	--	--	--	--
Applications Systems Programming (Craft)	156.25	124.25	4	1.355
Software Systems Engineering (Craft)	207.75	179.00	8	1.565

* $p < .001$
– insufficient data

Hypothesis Set 2: Regular employee pay differences between firms using ITCS and firms not using ITCS.

Hypotheses 2a and 2b examine the differences in pay for regular, IT employees' between firms with and without ITCS. A dummy variable, labeled ITCSDICH is used to represent the presence (ITCSDICH=1) or absence (ITCSDICH=0) of ITCS for a particular job family. It is predicted that regular, IT employees in craft families will have higher wages when ITCS are present than when they are not present in their job family and organization. However, it is predicted that the wages of regular, IT employees in enterprise families will be lower when ITCS are present in their job family. All of the

companies that submitted data for a job family, whether or not they use ITCS, are included in these analyses.

These hypotheses are tested using moderated regression model to isolate the effect of the presence of ITCS (represented by ITCSDICH) by job family while controlling for company size, industry, and unemployment conditions in the state. Company size is measured as the natural log of total employees. The natural log is used to eliminate the impact that the larger scale of the total employee variable may have the dependent variables. Industry is coded using dummy variables for mining, construction, manufacturing-durable, manufacturing-nondurable, transportation and utilities, retail trade, wholesale trade, financial, insurance, and real estate services, services, and public administration with wholesale trade omitted from the analysis. Unemployment is measured by the state unemployment rate from BLS statistics during the month the compensation survey data is effective (BLS, 1999a). The ITCS variable (ITCSDICH) is dichotomous, equal to 1 if a company uses ITCS in a job family or equal to 0 if the company does not use ITCS in that job family. Four of the job families are coded using dummy codes with the Software Systems Engineering family omitted for the analysis. The interaction term is calculated as the product of the ITCSDICH variable and the dummy code for each job family.

Two regression models are tested. Model 1 utilizes a base salary index as the dependent variable. Model 2 utilizes a total cash compensation (TCC) index as the dependent variable. These two models are studied to determine whether variable pay plays a role in creating these pay differentials for regular employees when ITCS are used.

In both the base salary and TCC models, a pay index for each company, including those that use ITCS and those that do not use ITCS, reporting data in a job family was calculated. For each job in a family, the company's average pay is divided by the average pay for all employees reported in that job for the whole sample. Then an employee weighted average of all these ratios for the job family is calculated to create the job family pay index. An employee weighted average is used instead of a straight average to ensure the index reflects the actual base pay practices of the companies. In cases where a company has many employees in one job and only a few at other levels in a job family, an employee weighted index will more accurately portray how companies are paying their employees. This index indicates how companies pay in relation to the market. A value greater than one means companies pay that particular family above the market rate and a value less than one means companies pay that family below the market.

The model includes the company size, industry, unemployment rates, the dichotomous ITCSDICH variable, the dummy variables for job families and the interaction terms of the ITCSDICH x the dummy job family variables as independent variables and the base salary index as the dependent variable. The regression model is as follows:

$$\textit{Base Salary Index} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSDICH}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSDICHxASB}) + \beta_{18}(\text{ITCSDICHxASA}) + \beta_{19}(\text{ITCSDICHxASP}) + \beta_{20}(\text{ITCSDICHxDE}) + \text{Error}$$

Table 4: Moderated Regression Results for Hypothesis Set 2

Variable	Base Salary Index	TCC Index
Constant	.861***	.834***
	(.030)	(.031)
ln(Total Ees)	.003	.004*
	(.002)	(.002)
Unemployment	.024***	.024***
	(.003)	(.003)
Mining	.073**	.100**
	(.032)	(.033)
Construction	-.197*	-.183
	(.108)	(.113)
Mfg-NonDurable	.035	.045*
	(.022)	(.023)
Mfg-Durable	.016	.020
	(.024)	(.025)
Transportation	.020	.041*
	(.022)	(.024)
Retail	.016	.030
	(.024)	(.025)
Finance	.003	.018
	(.021)	(.022)
Services	-.017	-.020
	(.020)	(.021)
Public Administration	-.020	-.032
	(.025)	(.026)
ITCSDICH	.011	.013
	(.021)	(.022)
ASP	-.024**	-.015
	(.011)	(.012)
ASB	.001	-.001
	(.009)	(.009)
ASA	-.085***	-.081***
	(.011)	(.011)
DE	.160***	.173***
	(.013)	(.014)
ITCSDICHxASP	.029	.024
	(.029)	(.031)
ITCSDICHxASB	-.018	-.020
	(.024)	(.025)
ITCSDICHxASA	-.034	-.044
	(.031)	(.032)
ITCSDICHxDE	-.017	-.019
	(.066)	(.069)
R^2	.112	.114
F – ratio	23.736***	24.282***

N = 3,769
* $p < .10$
** $p < .05$
*** $p < .001$

Model 2 follows the same regression process but uses the TCC index as the dependent variable. Table 4 shows the unstandardized weights with the standard error in parentheses below it for each independent variable. The results are report no significant regression weights for the interaction terms. Since the interaction terms and the ITCSDICH regression weights are non-significant, the interpretation has to be that there is no support for Hypotheses 2a and 2b. Some of the control variables are significant in both models including unemployment, mining, ASA, and DE. Unemployment is positively and significantly related to wages in both models. This is inconsistent with conventional beliefs that higher unemployment would have a dampening effect on wages. However, this unemployment rate is for the whole state at the times of the surveys and is not specific to IT employment. IT employment constitutes a relatively small portion of a total statewide labor force. The level of IT unemployment may not be reflected in the statewide numbers. Being in the mining industry is significantly, positively related to wages. The Applications Systems Analysis Family is paid relatively lower than Software Systems Engineering family and the Data Entry family is paid higher than the Software Systems Engineering family, but these relationship are not related to ITCS use.

Hypothesis Set 3: The extent of ITCS use and regular employee pay.

Hypotheses 3a and 3b are similar to Hypotheses 2a and 2b, except they take a finer measure of ITCS use in companies. Instead of using a dichotomous variable that firms either use ITCS or they do not, Hypotheses 3a and 3b use a continuous ITCS variable (ITCSCONT), which measures the percentage of work completed by ITCS. This variable measures the extent to which a firm uses ITCS. The dependent variables are the

Base Salary index and the Total Cash Compensation index created for Hypotheses 2a and 2b. The sample is also identical to those used in Hypotheses 2a and 2b. The results of the regression models should indicate whether the degree to which ITCS are used effects these pay outcomes. Hypotheses 3a and 3b predict that wages will be higher for regular, IT employees in craft job families as firms use more ITCS in these job families and the wages will be lower for regular, IT employees in enterprise job families as firms use more ITCS in these job families. Table 5 shows the results of the regression analysis for the base salary index and the TCC index. The unstandardized regression weights are shown as well as the standard error in parentheses under the regression weights.

As with Hypotheses 2a and 2b, the results do not support these predictions. There are no significant interaction regression weights in either model. As with Hypotheses 2a and 2b the mining industry control variable is significant. Unemployment continues to contribute significantly and positively to wages and the Applications Systems Analysis and Data Entry families are still paid significantly differently from the other job families in this study. These findings suggest that employers have really done very little with pay to acknowledge the external labor market forces that they are bringing into their workplaces by hiring ITCS.

Table 5: Moderated Regression Results for Hypothesis Set 3

Variable	Base Salary Index	TCC Index
Constant	.858***	.831***
	(.030)	(.031)
ln(Total Ees)	.003	.004*
	(.002)	(.002)
Unemployment	.024***	.025***
	(.003)	(.003)
Mining	.074**	.101**
	(.032)	(.033)
Construction	-.195*	-.179
	(.108)	(.113)
Mfg-NonDurable	.036	.046**
	(.022)	(.023)
Mfg-Durable	.016	.021
	(.024)	(.025)
Transportation	.020	.040*
	(.022)	(.024)
Retail	.015	.029
	(.024)	(.025)
Finance	.004	.019
	(.021)	(.022)
Services	-.015	-.018
	(.020)	(.021)
Public Administration	-.014	-.030
	(.025)	(.026)
ITCSCONT	.000	.001
	(.001)	(.001)
ASP	-.021**	-.013
	(.011)	(.011)
ASB	-.003	-.005
	(.008)	(.009)
ASA	-.086***	-.082***
	(.010)	(.011)
DE	.159***	.171***
	(.013)	(.013)
ITCSCONTxASP	.001	.001
	(.001)	(.001)
ITCSCONTxASB	.000	.000
	(.001)	(.001)
ITCSCONTxASA	-.001	-.002
	(.001)	(.001)
ITCSCONTxDE	.001	.001
	(.002)	(.003)
R^2	.112	.115
F – ratio	23.160***	24.335***

N = 3,769

* $p < .10$

** $p < .05$

*** $p < .001$

Hypothesis 4: ITCS use and regular employee pay variability.

Hypothesis 4 looked at the variability of pay resulting from using ITCS. The prediction is that using ITCS will lessen the importance of internal equity such that the range of pay within job families for companies using ITCS will be greater than the range of pay within job families of firms not using ITCS. To test this hypothesis a pay range index was created for each job family. This index equals the employee weighted average of the percent range of pay for each job in a family. For each job in a job family with multiple employees, the percent range of pay was calculated by subtracting the minimum wage from the maximum wage and dividing the difference by the minimum wage paid for the job. These percents for all the jobs in each job family were then used to create an employee weighted average that is the range index. Given the nature of the range calculation only those firms that had multiple employees in at least one job category in a family are included in this analysis. Using an employee weighted average gives a better approximation of the pay practices for an organization than a straight average, especially if the distribution of employees is uneven across jobs in a family. A larger index means that there is more variability in pay. This index was calculated for both the base salary and TCC in a job family. The use of both indices is important for this analysis because typically the range of variable pay awarded to employees is greater than the range of pay offered in base salaries. It is likely that a difference in the range of pay will be found for the TCC index, but not for the base salary index because delivering anomalies in pay through variable pay easier than adding them into base pay.

These range indices were the dependent variable in a moderated regression model. Company size (ln(total employees)), unemployment, industry, and the dummy job family

variables were entered as control variables. The continuous ITCSCONT variable, representing the percent of work completed by ITCS, was entered to measure the effects of ITCS on these pay ranges indices. ITCSCONT is used for this hypothesis and all subsequent hypotheses because the continuous nature of the variable provides better information about ITCS usage than the dichotomous variable. Additionally, the interaction terms, used in Hypotheses 3a and 3b, were entered to capture any differences in variability due to the combination of ITCS and job family.

The sample for this hypothesis set consists of job families, where companies employed multiple regular employees in at least one level of the job family. The sample is smaller than that used in Hypotheses 2 and 3 because some smaller companies reporting data only employed one worker in a job level, making it irrelevant to determine the range of pay for that job.

Table 6 summarizes the results of these moderated regressions. The unstandardized regression weights are shown with the standard error in parentheses below them. None of the regression weights on the ITCSCONT variable or the interaction variables are significant, giving no support to Hypothesis 4. Some of the industry control variables, manufacturing durable, finance and services, are significantly related to an increase of variability in wages. The Applications Systems Analysis and Programming family has more variability of wages than the other job families.

Table 6: Moderated Regression Results for Hypothesis Set 4

Variable	Base Salary Range	TCC Range
Constant	-29.503*** (7.107)	-34.032*** (7.632)
ln(Total Ees)	5.924*** (.511)	6.459*** (.549)
Unemployment	.058 (.662)	.264 (.711)
Mining	-3.096 (8.985)	-2.852 (9.638)
Construction	–	–
Mfg-NonDurable	2.097 (5.201)	4.087 (5.578)
Mfg-Durable	15.648** (5.419)	17.401** (5.813)
Transportation	3.305 (5.149)	4.233 (5.497)
Retail	-7.668 (5.427)	-7.908 (5.822)
Finance	10.615** (4.787)	13.785** (5.134)
Services	11.136** (4.743)	11.625** (5.087)
Public Administration	4.609 (5.937)	4.920 (6.369)
ITCSCONT	-.088 (.205)	-.075 (.220)
ASP	1.875 (2.520)	.557 (2.703)
ASB	13.474*** (2.128)	13.040*** (2.282)
ASA	2.348 (2.350)	1.246 (2.521)
DE	-1.077 (3.160)	-3.121 (3.390)
ITCSCONTxASP	.115 (.248)	.112 (.266)
ITCSCONTxASB	-.015 (.221)	-.040 (.237)
ITCSCONTxASA	.198 (.271)	.173 (.291)
ITCSCONTxDE	-.087 (.588)	-.073 (.631)
R^2	.132	.132
F – ratio	12.631***	12.656***

N = 3,769
* p < .10
** p < .05
*** p < .001

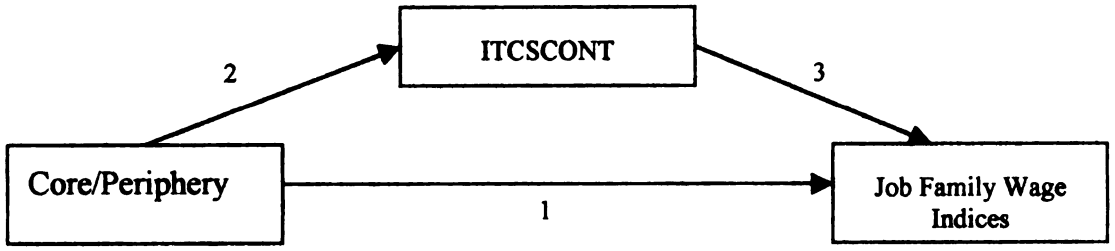
The size of the companies, as measured with the ln(total employment), was positively significant to more variability in pay. Company size may be related to variability in pay because larger firms will have more employees in a job category and this will make it more difficult to administer pay similarly for all employees.

Hypothesis Set 5: Difference between "core" and "periphery" industries and the pay consequences of ITCS use.

Hypotheses 5a and 5b investigate the role industry plays in the use of ITCS and consequently in the wages of regular, IT employees. Specifically, core companies, those that use IT services as a central part of their operations, are expected to use fewer ITCS and consequently pay a smaller premium to their regular, craft and enterprise, IT job families than peripheral industries, which are predicted to use more ITCS and will need to pay their regular, craft and enterprise employees a greater premium. Because these hypotheses focus on regular, employee wages when ITCS are employed under different levels of IT centrality to companies' operations, the sample is restricted to only those companies that reported using ITCS in a job family. The number of cases included because of this restriction is smaller than those in Hypotheses 2 and 3.

The test of these hypotheses is through a mediated regression model as shown below. The ITCSCONT variable has a mediating role in this model because it is anticipated that companies' position towards the core or periphery will have an impact on their use of ITCS, which in turn will impact their regular, employees' wages.

Figure 1: Mediating Model of Hypotheses 5a and 5b



Using the methods described by Baron and Kenny (1986), the above model is tested by examining the regression weights of four regression equations. First, the independent variable, core/periphery, is regressed directly on the Base Salary/TCC index used in hypotheses 2 and 3 (link1). Second the core/periphery variable is regressed on the continuous ITCS variable used in Hypotheses 3a and 3b (link 2). The third regression estimates the relationship of the continuous ITCS variable on the Base Salary/TCC index (link 3). If all of these regression relationships exist, then the core/periphery variable is regressed on the base salary/TCC index holding the ITCS variable constant (links 2 and 3). For the mediating model to hold, the relationship between the core/periphery and the base salary/TCC index in the last regression model should be smaller than the relationship in the first regression model.

Throughout all of the these regression models the effects of unemployment and company size (ln(total employment)) are controlled. Industry variables are not entered into these models because their high correlation with the core/periphery variable would make their entry redundant. The core/periphery variable is a continuous variable that is the percent of IT employment by industry as measured by the Occupational Employment Statistics of 1998 (Bureau of Labor Statistics, 1998; See Appendix for details.). This variable can range from 0-100% and represents the total employment in an industry that

consists of IT professionals. It is assumed that higher percentages of IT workers put an industry closer to the core because more of this industry's work is accomplished by IT workers. Lower percentages of IT professionals put an industry closer to the periphery because a smaller amount of the work needed to for companies to operate is done by IT workers. The table on the following page has the results of these regression models. The table shows the unstandardized regression weights with the standard error in parentheses below them.

Table 7 does show some evidence suggesting support for Hypotheses 5a and 5b. The Core/periphery variable is significant in all of the regression models. Although the regression weight does not decrease in the complete model the amount of variance explained for the Base and TCC models is the greatest in the full model regression. This implies that some relationship exists among the core/periphery, the ITCS variables and regular, employees' pay. Link 2 shows that firms in the Core do tend to use fewer ITCS. This confirms part of reasoning behind Hypothesis Set 5 that Core industries will have a smaller need for ITCS because they can better predict their IT workload and employ an adequate number of regular employees to complete all of their work. Further Link 2 shows that unemployment is negatively related to the use of ITCS. This implies that firms use ITCS when regular employees are not available in the labor market. While high unemployment was not cited as one of the reasons to use ITCS, it is understandable that firms would seek to use ITCS to cover needed work, when regular employees were not available. None of the interaction terms were significant, which means the limited results found here are not differentiated by job family. Despite some evidence in favor of these hypotheses the required relationship for the mediating model are not present.

Therefore, no support is found for Hypotheses 5a and 5b. More research is needed to determine the exact relationship between core/periphery industries, ITCS use and regular employees' wages.

Table 7: Mediating Regression Results for – Hypothesis Set 5

	Base Pay Index				TCC Index			
Variable	Link 1	Link 2	Link 3	Full Model	Link 1	Link 2	Link 3	Full Model
Dependent Variable	Base Pay Index	ITCS	Base Pay Index	Base Pay Index	TCC Index	ITCS	TCC Index	TCC Index
Constant	.838*** (.022)	7.526*** (1.426)	.857*** (.021)	.834*** (.022)	.809*** (.024)	7.526*** (1.426)	.827*** (.023)	.804*** (.024)
ln(Total Ees)	.005** (.002)	-.357** (.133)	.004** (.002)	.005** (.002)	.006** (.002)	-.357** (.133)	.005** (.002)	.007** (.002)
Unemployment	.024*** (.003)	-.325* (.182)	.024*** (.003)	.024*** (.003)	.025*** (.003)	-.325* (.182)	.025*** (.003)	.026*** (.003)
Core/Periphery	.002** (.001)	-.311*** (.045)		.002** (.001)	.002** (.001)	-.311*** (.045)		.002** (.001)
ITCSCONT			.000 (.001)	.001 (.001)			.001 (.001)	.001 (.001)
ASP	-.017* (.010)	2.170** (.648)	-.021** (.011)	-.022** (.011)	-.010 (.011)	2.170** (.648)	-.013 (.011)	-.014 (.011)
ASB	-.003 (.008)	3.910*** (.510)	-.003 (.008)	-.005 (.008)	-.006 (.008)	3.910*** (.510)	-.007 (.009)	-.008 (.009)
ASA	-.090*** (.010)	.510 (.630)	-.087*** (.010)	-.087*** (.010)	-.087*** (.010)	.510 (.630)	-.084*** (.011)	-.084*** (.011)
DE	.152*** (.013)	-1.168 (.801)	.153*** (.013)	.152*** (.013)	.160*** (.013)	-1.168 (.801)	.162*** (.013)	.160*** (.013)
ITCSCONTxASP			.001 (.001)	.001 (.001)			.001 (.001)	.001 (.001)
ITCSCONTxASB			.000 (.001)	.000 (.001)			.000 (.001)	.000 (.001)
ITCSCONTxASA			-.001 (.001)	-.001 (.001)			-.002 (.001)	-.002 (.001)
ITCSCONTxDE			.001 (.002)	.001 (.002)			.000 (.003)	.001 (.003)
R^2	.102	.037	.102	.103	.097	.037	.097	.099
F – ratio	60.87***	20.43***	38.81***	36.18***	57.88***	20.43***	36.63***	34.58***

N = 3,756 * p < .10 ** p < .05 *** p < .001

Hypotheses Set 6: ITCS use and long-term incentives for regular employees.

Hypotheses 6a and 6b predict that companies using ITCS will offer more long-term incentives to their Craft job families, but make no changes in their LTI offerings for Enterprise job families. These hypotheses are tested using a moderated regression model. The LTI variable is measured as the percentage of employees in a job family eligible to receive long-term incentives, regardless of whether or not they were granted these

incentives. Participants responded whether each job in a family was eligible to receive LTI grants (0=No, 1=Yes) and this was multiplied by the number of employees in each job. The sum of these products was divided by the total number of employees in the family to determine the percent of employees in the family eligible to receive these benefits, which is the dependent variable, LTI Percentage.

The control variables are organizational size (ln(total employment)), industry, unemployment, and job family. The size of the organization as measured by the natural log of the total employment of the firm is used as a control variable because larger firms are more likely to be public and therefore have stock that could be awarded in LTI grants. Further, offering LTI in a larger, more established firm is not as risky as it may be with smaller companies, where LTI grants of stock or cash may be too risky for employees to accept. Industry is used as a control variable because some industries may be more or less likely to offer LTI grants. For example, the public administration industry is probably less likely to offer LTI because these organizations are typically not-for-profit and not publicly traded. Unemployment may be related as low unemployment may induce companies to implement more retention techniques such as LTI grants.

The moderated model is as follows:

$$\textit{LTI Percentage} = \beta_0 + \beta_1(\ln(\text{Total Employment}) + \beta_2(\text{Unemp}) + \beta_3(\text{Mining}) + \beta_4(\text{Construction}) + \beta_5(\text{Mfg-Durable}) + \beta_6(\text{Mfg-NonDurable}) + \beta_7(\text{Transportation}) + \beta_8(\text{Retail}) + \beta_9(\text{Finance}) + \beta_{10}(\text{Services}) + \beta_{11}(\text{Public Administration}) + \beta_{12}(\text{ITCSCONT}) + \beta_{13}(\text{ASP}) + \beta_{14}(\text{ASB}) + \beta_{15}(\text{ASA}) + \beta_{16}(\text{DE}) + \beta_{17}(\text{ITCSCONTxASB}) + \beta_{18}(\text{ITCSCONTxASA}) + \beta_{19}(\text{ITCSCONTxASP}) + \beta_{20}(\text{ITCSCONTxDE}) + \text{Error}$$

Table 8: Moderated Regression Results for Hypothesis Set 6

Variable	LTI Percent
Constant	-.015 (.055)
ln(Total Ees)	.020*** (.004)
Unemployment	.008 (.005)
Mining	-.009 (.059)
Construction	-.125 (.233)
Mfg-NonDurable	-.039 (.041)
Mfg-Durable	.072 (.044)
Transportation	-.034 (.041)
Retail	.075* (.044)
Finance	-.041 (.038)
Services	-.031 (.038)
Public Administration	-.127** (.047)
ITCSCONT	.000 (.001)
ASP	-.046** (.020)
ASB	-.021 (.016)
ASA	-.050** (.019)
DE	-.130*** (.024)
ITCSCONTxASP	.000 (.002)
ITCSCONTxASB	.000 (.001)
ITCSCONTxASA	-.001 (.002)
ITCSCONTxDE	-.002 (.004)
R^2	.039
F – ratio	6.733***

N = 3,370
* p < .10
** p < .05
*** p < .001

Table 8 summarizes the results of this regression model. The results show no support for Hypotheses 6a and 6b, which predicted higher LTI for Craft job families. The ITCSCONT variable's regression weight is not significant nor are any of the interaction terms significant. The control variables showed some significant relationships with LTI eligibility. Organizational size was positively related to LTI eligibility, which should be expected as larger firms are more likely to survive and have an opportunity for LTI grants to be meaningful to employees. The public administration industry variable was negative, which confirms the thought that public employers do not offer LTI grants, probably because they do not have stock as a possible payout mechanism. Applications Systems Analysis, Applications Systems Programming, and Data Entry families were less likely to be eligible for LTI grants than the other families.

Hypothesis Set 7: ITCS use and promotion for regular employees.

Hypotheses 7a and 7b predict a relationship between the use of ITCS and years until promotion in Craft and Enterprise job families. Hypothesis 7a predicts that for companies using ITCS in Craft families, the number of years to promotion will be longer than for Craft families in companies that do not use ITCS. The reasoning for this prediction is that companies hiring for Craft jobs will be more interested in obtaining the most knowledge from their workers on up-to-date skills that may be more readily available in the external marketplace. This means that external hires from available ITCS may be more likely therefore making the pool of potential applicants for a job greater. In the case of Enterprise families, Hypothesis 7b predicted that the number of years to promotion will be shorter in companies using ITCS than in companies that do

not use ITCS. In the Enterprise families, it is reasoned that the most valuable skills of these employees are their firm-specific knowledge that will limit the pool of applicants to existing employees. In companies that use ITCS, the headcount of Enterprise employees should be smaller, therefore making the possibility of promotion greater.

These hypotheses are tested using moderated regression similar to Hypotheses 6a and 6b. The dependent variable is the average number of years to promotion for employees in these job families as reported by the human resources professionals, who completed the survey. Participants reported the average number of years to be promoted from each job in a job family. The employee weighted average of this figure for all jobs in a family is the calculated Average Years to Promotion variable. The weighted average is used instead of a straight average to account for the possibility that uneven distributions of employees in certain job categories might be under represented in a straight average. The main independent variables are the continuous ITCSCONT variable and the interaction variables of job family x ITCSCONT. Company size (ln(total employment)), unemployment, industry, and job family variables are controlled for in the first step. Company size is used as a control variable because larger firms will have more employees to promote and possible more opportunities to promote than smaller companies. Unemployment is used as a measure of the labor market conditions, which may impact companies' decisions to promote from within or hire a new employee from outside.

Table 9: Moderated Regression Results for Hypothesis Set 7

Variable	Years to Promotion
Constant	1.479** (.528)
ln(Total Ees)	-.009 (.040)
Unemployment	.134** (.056)
Mining	1.614** (.517)
Construction	-1.331 (1.527)
Mfg-NonDurable	.647* (.382)
Mfg-Durable	.252 (.409)
Transportation	.955** (.383)
Retail	.398 (.426)
Finance	.962** (.357)
Services	1.133** (.355)
Public Administration	1.349** (.457)
ITCSCONT	.006 (.015)
ASP	-.585** (.201)
ASB	-.215 (.166)
ASA	-.017 (.196)
DE	-.026 (.284)
ITCSCONTxASP	.000 (.018)
ITCSCONTxASB	-.024 (.016)
ITCSCONTxASA	-.015 (.020)
ITCSCONTxDE	-.067 (.061)
R^2	.049
F – ratio	3.313***

N = 1,325
* $p < .10$
** $p < .05$
*** $p < .001$

Years to Promotion = β_0 + β_1 (ln(Total Employment) + β_2 (Unemp) + β_3(Mining) + β_4 (Construction) + β_5 (Mfg-Durable) + β_6 (Mfg-NonDurable) + β_7 (Transportation) + β_8 (Retail) + β_9 (Finance) + β_{10} (Services) + β_{11} (Public Administration) + β_{12} (ITCSCONT) + β_{13} (ASP) + β_{14} (ASB) + β_{15} (ASA) + β_{16} (DE) + β_{17} (ITCSCONTxASB) + β_{18} (ITCSCONTxASA) + β_{19} (ITCSCONTxASP) + β_{20} (ITCSCONTxDE) + Error

Tables 9 summarizes the results of this regressions. The tables include unstandardized regression weights and the standard errors associated with them in parentheses below. The results do not show any support for Hypothesis Set 7. None of the interaction terms were significant nor did the ITCSCONT variable contribute significantly to the Years to Promotion variable. In the control variables, Unemployment was positively related to Years to Promotion suggesting that higher unemployment causes employers to slow their promotion rates, perhaps because they will not be as likely to find a replacement for the promoted employee. Also the mining, manufacturing non-durable, finance, services, and public administration industries have significant positive regression weights suggesting that it takes longer to be promoted in these industries than other industries.

Hypothesis Set 8: Extent of ITCS use and salary structure range overlap for regular employees.

Hypotheses 8a and 8b relate to the use of salary structures as part of employees' compensation package. These hypotheses predict that characteristics of a salary structure such as range overlap may be motivators for employee behaviors. Specifically the amount of range overlap or lack of overlap between adjacent salary grades may encourage employees to perform their jobs in such a way that they could be promoted. If

promotion is a reasonable goal, companies will want to encourage this type of behavior and design their salary structure with little overlap between grades. If promotion is not a reasonable goal, companies will not want to encourage these behaviors and will design salary structures with much overlap between adjacent grades. In the case of Hypothesis 8a, more overlap between grades is predicted for Craft families when companies employ ITCS. Hypothesis 8b predicts that less overlap will exist in Enterprise families, when companies employ ITCS.

These hypotheses were tested using moderated regression models. The dependent variable was the average overlap between adjacent grades for a job family, where overlap is defined as:

> Overlap = (Maximum of lower range – Minimum of higher range) / (Maximum of higher range – Minimum of higher range)

The independent variables include dummy variables for each job family, the continuous ITCSCONT variable, and interaction variables of job family x ITCSCONT. Company size (ln(total employment)), unemployment, and industry variables are used as control variables. Company size is included because larger companies may be more likely to have human resource departments (Cohen & Pfeffer, 1986), that may have designed their salary structures to match their compensation strategy. Unemployment is a general indicator of the status of the external labor market, which may have and impact on company policies. Table 10 shows the results of this regression.

Table 10: Moderated Regression Results for Hypothesis Set 8

Variable	Range Overlap
Constant	.608*** (.056)
ln(Total Ees)	.058* (.004)
Unemployment	-.007* (.005)
Mining	.059 (.060)
Construction	.365** (.164)
Mfg-NonDurable	-.030 (.041)
Mfg-Durable	.028 (.043)
Transportation	-.002 (.043)
Retail	-.017 (.043)
Finance	.030 (.039)
Services	-.016 (.038)
Public Administration	.003 (.046)
ITCSCONT	.001 (.001)
ASP	.017 (.020)
ASB	-.020 (.015)
ASA	.024 (.019)
DE	-.049* (.026)
ITCSCONTxASP	-.004* (.002)
ITCSCONTxASB	-.001 (.001)
ITCSCONTxASA	-.003 (.002)
ITCSCONTxDE	.005 (.011)
R^2	.024
F – ratio	2.207***

N = 1,325
* p < .10
** p < .05
*** p < .001

This regression shows no support for Hypotheses 8a and 8b. In contrast, the interaction term for the Applications & Systems is negatively significant. This finding reflects less overlap for a craft family when ITCS are being used in a firm. Possible firms using ITCS for craft families are choosing to promote from within to keep institutional knowledge. There is no support for Hypothesis 8b. The unemployment variable has a significantly negative weight.

Overall, the results of the hypotheses proposed in this research do not provide overwhelming evidence of any change in compensation practice or policies due to the introduction of ITCS. While the confirmatory outcomes of Hypotheses 1a, 1b, and 1c indicate that companies certainly pay ITCS more than their regular employees, the rest of the results show no subsequent change in behavior towards their regular employees. The following table summarizes the results of all of the Hypotheses:

Table 11: Summary of Results for all Hypotheses

Hypothesis 1a	Supported
Hypothesis 1b	Supported
Hypothesis 1c	Partially Supported
Hypothesis 2a	Not Supported
Hypothesis 2b	Not Supported
Hypothesis 3a	Not Supported
Hypothesis 3b	Not Supported
Hypothesis 4	Not Supported
Hypothesis 5a	Not Supported
Hypothesis 5b	Not Supported
Hypothesis 6a	Not Supported
Hypothesis 6b	Not Supported
Hypothesis 7a	Not Supported
Hypothesis 7b	Not Supported
Hypothesis 8a	Not Supported
Hypothesis 8b	Not Supported

Table 11 summarizes the results of all the hypotheses tested. It shows that most of the hypotheses received no support for the relationships predicted. The next chapter will discuss possible reasons for these findings.

CHAPTER 6 - CONCLUSION

The hypotheses, data, and methods outlined in this paper are intended to quantitatively test for changes in the employment relationship between companies and regular, IT workers as a result of ITCS use. Previous research in the areas of contingent workers and ILMs are combined to develop a variety of potential organizational reactions with respect to their IT employees' wages and pay practices in the presence of ITCS. Researchers-to-date have focused on the work relationships of the ITCS and have not closely examined the impact ITCS may have on the regular employees. This research attempts to fill that gap.

Workers do not negotiate work relationships in a vacuum. They are at least minimally aware of labor market conditions when discussing the terms and conditions of work with their employers. This may be especially true for IT workers because the shortage of workers in this field has been a popular news topic for many years. Few if any IT professionals can be ignorant of their advantageous bargaining positions due to the current labor shortage. The relative ease with which most IT employees could become contingent staff must be taken into account by both employees and companies when agreeing to terms and conditions of work. This research was developed to answer some of the questions about how this factor, ITCS, in the labor market is effecting the work relationships of non-contingent IT workers.

The data were taken from the 1998 and 1999 Compensation Survey of IT Professionals conducted by William M. Mercer, Inc. These surveys collected data on the prevalence of ITCS, pay policies for IT employees in these organizations and the actual

base and total cash compensation for all of the organizations' IT employees. Data from five job families in the survey were used: Applications Systems Analysis and Programming, Applications Systems Analysis, Applications Systems Programming, Software Systems Engineering, and Data Entry.

Each of these job families were classified as part of a craft (Applications Systems Programming, Applications Systems Analysis, Applications Systems Analysis and Programming, and Software Systems Engineering) or an enterprise (Data Entry) ILM. The hypotheses were posed and tested at the job family level because previous research suggests this is the most appropriate level of analysis (Osterman, 1983). Different outcomes were predicted for job families based on inclusion in a craft or enterprise ILM. The results, however, do not show support for any differentiation based on this craft or enterprise distinction.

Summary of Results

The first group of hypotheses (1a, 1b, 1c, 2a, 2b, 3a, 3b, and 4) focused on the actual wages paid to ITCS and regular, IT employees. The results confirmed that ITCS are generally paid more than regular employees in the same job families (1a and 1b). With the ITCS premium established, the focus turned to how organizations with ITCS compensate their regular employees to address potential equity issues generated by the presence of ITCS. Hypotheses sets 2 and 3 looked at the wages of the regular employees in firms with ITCS in comparison to firms without ITCS. None of the ITCS variables in H2 or H3 had any significant findings. This suggests that employers have not recognized the impact that ITCS may have on their work relationships with their regular employees.

Further, Hypothesis 4 looked at the variability of pay in the presence of ITCS and found no evidence of increasing ranges in pay when ITCS are present in a job family. It was predicted that a larger range of pay would be present when ITCS were hired because there would be less emphasis on internal equity. This appears not to be the case. Together Hypotheses sets 2, 3 and 4 suggest that companies have made few changes in their pay practices when they hire ITCS.

Hypotheses 5a and 5b looked for potential effects on ITCS use and employee wages due to the centrality of IT services to an industry. The predictions were that industries with high concentrations of IT workers (i.e., core industries) would hire fewer ITCS than industries with lower concentrations of IT workers (i.e., peripheral industries). For craft workers in core industries, this lower level of ITCS and higher job security would translate into an efficiency wage premium, but not a compensating wage differential premium. For craft workers in peripheral industries, higher levels of ITCS and less job security would translate into a compensating wage differential, but not an efficiency wage premium. For enterprise workers in core industries, higher ITCS will not translate into an efficiency wage strategy or a compensating wage differential premium. In peripheral industries, the enterprise workers should see a compensating wage differential premium. The results do not show any support for these wage predictions. However, there is support for the idea that core industries hire fewer ITCS then peripheral industries. This evidence suggests that further research should investigate this relationship.

Besides pay, organizations use many approaches to incent and retain their employees. The remaining hypotheses (H6a, H6b, H7a, H7b, H8a, and H8b) look at

alternatives to direct compensation that organizations may use as part of their total remuneration package and how ITCS may change the structure of these programs. The first alternative to direct compensation is long-term incentives (LTI). Companies may use LTI as a means of retaining talent through company stock or other payouts tied to long-term firm performance. The presence of ITCS was predicted to increase the LTI offerings to craft workers, but have no impact on enterprise workers. The results indicate no relationship between offering LTI grants and the presence of ITCS in a job family.

Hypotheses sets 7 and 8 address the use of promotions as a means of motivating employees. Hiring ITCS is anticipated to lower the possibility of promotions in craft families, but increase this possibility in enterprise families. The dependent variable in hypotheses 7a and 7b is the average length of time before promotion in each job family. The results show no changes to this average when ITCS are present. Companies using ITCS do not seem to be changing their promotion rates to increase or retard promotion opportunities in their organizations.

Additionally, linked to the rate of promotions should be the design of the salary structure. Salary structure design may play an important role in motivating employees to want promotions (H8a and H8b). Specifically, range overlap, which is an indicator of the salary increase associated with promotions, is predicted to be greater in enterprise job families where ITCS are present, but smaller in craft job families where ITCS are present. Again, there is no evidence in these data to support these predictions.

Throughout the analyses some of the control variables have been significant. Higher unemployment has significantly, positively contributed to wages in Hypotheses sets 2 and 3. This finding in counterintuitive, but may be because of the non-IT nature of

statewide unemployment rates. IT employment represent only a fraction of total employment and therefore, it's low levels may not be reflected in the statewide numbers.

Organizational size, as measured by total employees, significantly, positively contributed to the variability of wages in Hypothesis 4. One explanation for larger organizations having greater difficulty maintaining consistent wages is because their larger headcounts will increase the complexity of their pay practices. More employees in a job family is likely to increase the differences in formal education, skills and abilities within the job family. These differences will in most companies be reflected in varying pay rates to acknowledge different levels of contribution to the firms.

Finally, organizations in public administration seemed less likely to offer LTI grants, which is not surprising since these organizations are not publicly traded and don't have stock that can be awarded. Industry variables are significant in some models, but there is no consistent theme to which industries contribute to the dependent variables presented here. No other control variables were consistently significant in the other hypotheses.

Possible Explanations for These Findings

Overall, the evidence found in these analyses indicate that ITCS are paid significantly more than regular employees. Further and more to the point of this research, organizations appear to have done little for regular, IT employees to acknowledge these inequities. While the introduction of ITCS should have an impact on how both employers and employees view their working relationships, it seems that this impact has not resulted in actions by companies. The theories described here suggest that ITCS in

the workplace should bring the impact of the open labor market more closely to bear on the work relationships companies have with their regular employees. The data collected do not show any evidence of this impact with regard to cash compensation, non-cash programs, or salary structures.

The introduction of ITCS may not be enough of a reason to make changes to organizational practices and policies because of several reasons. First, its possible that organizations have failed to recognize the impact ITCS may have on their regular employees. These IT employees working alongside ITCS are exposed to the external labor market in a very direct manner. ITCS are doing essentially the same work as the employees, but they typically enjoy higher pay and greater flexibility in work hours and conditions. The employees should realize that they could become ITCS if they wanted and they could reap these same benefits. Organizations using ITCS would then be at a higher risk of losing employees that may be critical to their operations. The costs of turnover, however, are rarely computed in organizations and the causes of turnover are difficult to measure. Companies may not be able to concretely identify ITCS as a cause of turnover nor may they be able to capture the costs due solely to ITCS related turnover. For employees that decide to stay, there is a possibility that they would lower their productivity level that makes them feel fairly compensated for their efforts in comparison with the ITCS. Productivity levels are also difficult for organizations to measure making it nearly impossible for a company to justify changing policies to address these concerns.

Another reason that organizations may not have changed their practices or policies may be internal equity concerns across the organization. While employers may recognize the problems that hiring ITCS may create within their IT departments, they

may choose to leave their policies unchanged because of concerns for equity with other departments. The presence of ITCS may effect the work relationships of not only the IT employees, but also employees in other departments. Special treatment of IT employees because of ITCS may cause problems with employees in other departments feeling unfairly treated not because ITCS have different pay rates, but because other employees in the organization do. The potential exists for these non-IT employees to leave the organization or lower their productivity to alleviate their feelings of unfairness. This may effect all other departments in the organization, leaving the company open to the threat of even larger turnover costs.

Companies may not have changed the practices and policies for their IT employees because they have simply not had time. Changes to salary structures, incentive programs or career progressions take some time to develop and implement. Additionally, once these changes are made they do not have an immediate effect on employees' base pay and incentives. It is possible that the organizations in this sample have not been using ITCS long enough to realize these problems and to make the appropriate changes to their policies and practices.

Another explanation may be that because ITCS are not really employees of the organizations, regular employees do not compare themselves to this group. This has been an argument for using contingent staff when employers wanted to treat a group of workers different from the majority of workers (Abraham, 1990). Contingent staff pay policies and practices are typically administered separately from the pay policies of regular employees and often are controlled outside of human resource departments. These policies are so different from those of the regular employees that there may be a

distance created in employees' minds between ITCS and themselves. This distance may cause employees to not compare themselves to the contingent group as they are not really employees of the organization and therefore are not part of the equity comparisons that most employees make. If this is truly the case with most employees, then organizations will not need to adjust their pay practices and policies to acknowledge any inequities. Research is needed in this area before this assumption can be safely made.

Future Research

Although the results of this research were not as anticipated, they do raise more questions about how ITCS may be affecting regular, IT employees. It is unlikely that the presence of ITCS has no impact on regular employees' work relationships. Employees working in these organizations must realize the differences in their work relationships and those of the ITCS. After realizing these differences, it shouldn't take long for these employees to assess their own work relationships and, if necessary, make adjustments to ensure they feel fairly treated by their employers.

To understand the nature of this dynamic some additional research will be needed. A few areas of future research are discussed here, but there are undoubtedly many more. For example, do regular IT employees feel unfairly compensated in the presence of ITCS? Since the work of regular employees and ITCS is essentially the same, it is reasonable to expect that these groups would anticipate being paid comparably. Regular employees, however, are often being paid less than the ITCS in cash compensation as validated by the current research. Much of this difference is attributed to the cost of benefits, which is not being paid for the ITCS and a premium to ITCS for higher

unemployment risks. Researchers should ask if in fact employees recognize the value of their benefits and the additional job security that they enjoy over and above their cash compensation? And do they believe that these benefits make up for the difference in pay? What are the implications for organizations if employees do feel their benefits compensate them for these differences in pay or not?

Does the productivity of regular employees change when ITCS are employed? If regular employees feel that they are being under compensated in relation to ITCS, one possible reaction would be to lower their productivity to equalize the ratio of input to output with what they believe that ratio to be for ITCS. In this case, employees' will take longer to complete projects, to increase the wages required for the same level of output. Also, could possible animosity between regular, IT employees and ITCS inhibit the productivity of the organization? Such animosity could exist if the regular, IT employees feel that ITCS are taking away their opportunities to be promoted or learn new skills or if the regular employees think that high contractor rates are decreasing the amount of money available for regular employees' wages. Animosity may lead to poor communication between regular employees and ITCS, which may slow the progress of projects and productivity where their interaction is part of the process.

How are ITCS integrated with established work groups? Cooperation in the work environment is critical to the success of most businesses. Even under the best circumstances, where no animosity exists, the role of ITCS within organizations is usually unclear because they are outside the established work relationships and communication networks. How do companies integrate the skills of ITCS with the skills of regular, IT employees? Would companies benefit from putting their ITCS through a

short socialization period to help them interact with their regular, IT employees? What additional skills are required of managers in organizations with ITCS? Would it be beneficial in organizations with ITCS to put managers through some team building training to help facilitate the interaction between their regular employees and ITCS?

One reason for using ITCS is as a screening tool in the selection process. Once an ITCS is hired as a regular IT employee, it would be interesting to know how their change from contingent to regular worker differs from other new hires' entering organizations. Are ITCS, who are hired on as regular employees of organizations, accepted as members of the organization? Is their socialization period longer or shorter than employees, who did not have previous relationships with the hiring organizations? If there is animosity between regular employees and ITCS, then a longer socialization period might be anticipated. However, because the new employees, ex-ITCS, may be more knowledgeable about the organization's business because of their prior involvement, it might be anticipated to take less time for them to be socialized. In the long-run, is the practice of hiring ITCS cost effective for organizations?

What changes are there in turnover rates of regular employees? If the inequities between regular employees and ITCS are great, regular employees may be motivated to leave the organization rather then work under these conditions. Employers may be interested to know how great the level of inequity can become before there are increases in turnover rates. Further, it would be interesting to know where employees, who voluntarily leave these organizations, go? Do they become ITCS or do they go to other organizations as regular employees? Are there personality traits that would help organizations predict which employees would leave the organization under these

conditions of inequity? Could these traits also predict where they would go? For example, some people are more risk averse than other people. It's possible that this trait would give employers an idea of which employees are more likely to leave and which are more likely to stay. If employers are administering personality tests during the selection process, then they might have some foreknowledge of this situation. For companies that employ a great number of ITCS as part of their strategy, it might be helpful in the selection process to weed out applicants, who are not likely to thrive in this environment.

Conclusions

While the results of this research did not confirm the hypotheses, they are still interesting. The findings presented show that organizations in this sample have not addressed the issue of inequities when bringing in ITCS. ILM theory would predict that organizations would need to address these problems in order to preserve the internal equity necessary for ILMs to be effective. The organizations in this sample, however, have generally not changed their approaches to pay or promotion for their regular, IT employees when they use ITCS. There are many possible reasons why organizations have not made some of the predicted changes. Organizations may not clearly understand how using ITCS could effect their regular, IT employees. Companies may place a priority on preserving internal equity across departments within their organizations. Organizations may have only recently begun using ITCS, and therefore may not have had the time to alter their policies and have these new policies impact pay and promotions. Or companies may believe that by using contingent staff they are sufficiently removing these ITCS from the mental comparisons made by employees regarding the equity of the

work relationships in their organizations. Future research may begin to shed more light on these issues.

It is important to understand how the use on contingent workers affects all of the parties involved with this staffing choice. In the past researchers have looked at the ramifications of these temporary work relationship for the contingent staff, but few have acknowledge that these contingent workers bring an additional factor into the normal working relationship most employers have with their employees. This research is intended to investigate how the addition of a direct link to the external labor market through ITCS impacts the work relationships of regular employees. Contingent staff models are one of the few work relationships that truly imitate the spot market of neoclassical economics. Organizations should be interested in how this contingent staffing model interacts with the more traditional ILM approach because this knowledge could help them create staffing strategies that can take advantage of the best aspects of both staffing models. It is hoped that future research will continue to explore these relationships to create to better picture of how these models may be used to organizations' and employees' benefits.

APPENDICES

Appendix A – Survey Questions

Survey Participants were asked to supply information regarding their companies use of ITCS, policies and practices for job families, and actual pay rates for all employees in the job families included in this study. The following pages show the survey questions completed by survey participants.

Contract Staff

How many IT contractors did you employ on average over the last 12 months?__ , __ __ __

Indicate those job families or areas of expertise for which you contract outside staff. For each area indicated, calculate the percent of overall staff which is contracted (number of hours worked by contract personnel expressed as a percent of total hours worked). Also indicate the contract base salary as a percent of the in-house base salary. For example, if the per hour rate for contract personnel is twice the rate for in-house personnel, enter 200%.

Job Family or Area of Expertise	Hours Worked by Contract Personnel as Percent of Total Hours Worked	Percent Contract Pay Rate to Average In-House Base Salary Rate
Applications Systems Analysis and Programming (Job Codes 009-017)	__ %	__ __ %
Applications Systems Analysis (Job Codes 021-027)	__ %	__ __ %
Applications Programming (Job Codes 031-037)	__ %	__ __ %
Software Systems Engineering (Job Codes 040-047)	__ %	__ __ %
Data Entry (Job Codes 071-074)	__ %	__ __ %
Other (specify): _____	__ %	__ __ %

Job Family Practices

Salary Range: If a traditional salary structure is used to manage pay for this job (that is, a structure with a minimum, midpoint, and maximum and range spreads of approximately 50% - 80%), then enter the annual band minimum and maximum of the range for this job. Leave the "Broadbanding" fields blank.

Long-term Incentive : Eligibility - Enter a "Y" or "N" to indicate whether this job is eligible for a long-term incentive. This refers to an incentive plan with awards related to performance against selected criteria over a period of three years or more.

Stock Option Eligibility - If the job is eligible for a long-term incentive, enter a "Y" or "N" to indicate whether this job is eligible for stock options as a long-term incentive (e.g., not stock awards that can be immediately transferred to cash). This refers to the right to purchase a fixed number of shares of company stock at a fixed price over a specific period of time. There may be a time requirement (vesting period).

Cash Eligibility - If the job is eligible for a long-term incentive, enter a "Y" or "N" to indicate whether this job is eligible for cash as a long-term incentive.

Average Number of Years in Job Prior to Promotion to Next Level: Indicate the average time an employee spends in a job from the date of entry into the job, to the time promoted out of the job. Although promotional timing may be based on individual performance, please try to establish an average or typical time. **Do not simply report the number of years that the current employee has held the job**. This data item is collected for selected jobs only.

Employee Salaries

Base Salary: Enter the base pay of each employee you have matched to this job effective as of April 1, 1999. Report the amount prior to any voluntary pay reductions. Do not report average salaries. Do not include part-time employees or contracted staff from outside sources.

Report the data in annual, whole dollars (for example, $32,500).

Short-term Incentive: Enter the amount of incentive earned (but not necessarily paid out) in the most recently completed fiscal year. This refers to the amount earned through participation in a short-term incentive plan (e.g., an annual incentive plan or a project milestone bonus program) with awards related to performance against selected criteria over a period of typically a year or less. Exclude any non-performance based incentives such as holiday bonuses. Do not include sign-on bonuses, retention bonuses, profit sharing, or mandatory deferred compensation payments.

If the employee was eligible for an incentive, but no incentive was given, enter "0". If the employee is not incentive eligible, leave this field blank.

Report the incentive amount in annual, whole dollars.

Organizational Information

Individual Supplying Information

Name: _____

Title: _____

Telephone Number: (___)_____ Extension: _____

Fax Number: (___)_____ e-mail Address: _____

Effective Date of Data: April 1, 1999 Participation Deadline: May 14, 1999

1. **Major Type of Industry** (See page 59 of the survey guide for a detailed listing.) Circle the number indicating your primary industry area.

01 Agriculture
02 Business/Information Services
03 Chemical
04 Computer Software/Services
05 Construction
06 Consulting/Legal/Accounting
07 Diversified
08 Education
09 Energy
10 Engineering/Architectural
11 Entertainment and Media
12 Finance/Banking
13 Government
14 Healthcare
15 Hospitality/Restaurant
16 Insurance
17 Manufacturing - Aerospace
18 Mfg - Computer/Office Equipment
19 Mfg - Durable, Miscellaneous
20 Manufacturing - Electronics
21 Manufacturing - Food
22 Mfg - Nondurable, Miscellaneous
23 Mfg - Paper & Allied Products
24 Mining/Milling/Smelting
25 Nonprofit, Miscellaneous
26 Pharmaceutical
27 Real Estate
28 Research & Development
29 Retail
30 Service, Miscellaneous
31 Telecommunications
32 Transportation
33 Utilities
34 Wholesale Distribution
35 Other:

If you know the Standard Industrial Classification (SIC) code that is applicable to your organization, enter the four-digit code. _ _ _ _

2. **Type of Organization (check only one)**
   - ❑ **Parent/Stand-Alone** (The highest reporting entity with no parent organization above it. Typically management and board of directors are responsible to shareholders for overall company performance.)
   - ❑ **Subsidiary** (An independent entity with majority interest held by a parent; often has multiple business units and is responsible for all organization functions. Although a subsidiary may ultimately roll up into a parent entity, management performs all functions of a stand-alone organization and is accountable to parent company for operations and financial performance.)
   - ❑ **Division** (An independent entity accountable for all organization functions typically for a select group of product lines. Generally, a division consists of a single profit center or operating unit which is fully accountable to a parent or subsidiary.)

If your organization is a subsidiary or division, enter the name and location of your parent organization.

Parent Name: _____

Parent Location: ❑U.S. (_____ , _____)
city state

❑ Foreign (_____ , _____)
city country

Is your organization or parent organization included in the 1998 ***Fortune 1000*** ranking?..... ❑Yes..... ❑ No

3. Ownership (check only one)

❑ Publicly traded company (a for-profit entity whose stock is publicly traded on a U.S. or foreign stock exchange)

❑ Privately held company (a for-profit entity that is privately owned)

❑ Government, education, or nonprofit organization

4. Annual Dollar Volume

Check the appropriate volume measure for the annual dollar volume of the reporting entity (corporation, division, or subsidiary). Please report only one volume type per participation package.

❑ Total Revenues/Sales

❑ Premiums (for Insurance)

❑ Assets (for Banking and Financial)

❑ Operating Budget (for Nonprofit, Government, and Education)

Enter the **Annual Dollar Volume** (domestic and international) for the organization. ..... $\_\_\_,\_\_\_,\_\_\_,000$

5. Total Employment

Enter the total number of U.S. full-time equivalents (FTEs) in your reporting entity The FTEs reported should be based on the same entity represented in question 4.

___,___

Appendix B - Job Descriptions

Applications Systems Analysis and Programming Famiy

009 **Applications Systems Analysis and Programming Director** - Responsible for applications systems analysis and programming activities. Reviews systems development project requests and coordinates schedules and related departmental activities. Provides overall direction and guidance to assigned project managers. Reviews and evaluates work of subordinate staff and prepares performance reports. Prepares activity and progress reports regarding applications systems analysis and programming sections. Normally reports to the Corporate Information Systems Executive (001, 002) or Divisional Information Systems Executive (003).

010 **Applications Systems Analysis and Programming Manager** - Responsible for applications systems analysis and programming activities for a group or section. Responsible for feasibility studies, time and cost estimates, and the establishment and implementation of new or revised applications systems and programs. Assists in projecting software and hardware requirements. Assigns personnel to various projects and directs their activities; reviews and evaluates their work and prepares performance reports. Confers with and advises subordinates on administrative policies and procedures, technical problems, priorities and methods. Consults with personnel in other information systems sections to coordinate activities. Prepares activity and progress reports regarding the activities of the applications systems and programming section. Typically reports to the Corporate Information Systems Executive (002), Divisional Information Systems Manager (003), Systems Analysis and Programming Director (008, 009).

011 **Applications Systems Analysis and Programming Supervisor** - Supervises activities of all applications systems analysis and programming personnel for a major project, several smaller projects, or a small department. Responsible for quality assurance. Makes decisions on personnel actions (hiring, terminations, promotions, etc.). Controls revenues and/or expenses within an operating unit and responsible for meeting budget goals and objectives. Provides input to policy level direction regarding standards, budget constraints, etc. Typically reports to Applications Systems Analysis and Programming Manager (010), Applications Systems Analysis and Programming Director (009) or Systems Analysis and Programming Director (008).

012 **Applications Systems Analyst/Programmer - Lead** - Formulates/defines system scope and objectives for assigned projects. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Responsible for program design, coding, testing, debugging and documentation. Has full technical knowledge of all phases of applications systems analysis and programming. Has good understanding of the business or function for which applications is designed. Also has duties instructing, directing and checking the work of other systems analysis and programming personnel. Responsible for quality assurance review. Responsible for directing and monitoring the work of team members. May be responsible for project completion and user satisfaction.

013 **Applications Systems Analyst/Programmer - Staff Specialist** - Top level technical expert in one or more highly specialized areas of applications systems analysis and programming. Acts independently under general direction. Provides technical leadership on complex projects. May act as expert in business or functional area. Formulates/defines system scope and objectives. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Responsible for program design, coding, testing, debugging and documentation. Has full technical knowledge of all phases of applications systems analysis and programming. May be responsible for multiple phases of a project. May have duties instructing, directing and checking the work of other applications systems analysis and programming personnel. May have quality assurance review responsibilities.

014 **Applications Systems Analyst/Programmer - Senior** - Under general direction, formulates/defines system scope and objectives. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Designs, codes, tests, debugs and documents those programs. Competent to work at the highest technical level of all phases of applications systems analysis and programming activities. May be responsible for completion of a phase of a project. Regularly provides guidance and training to less experienced analyst/programmers.

016 **Applications Systems Analyst/Programmer - Intermediate** - Under general supervision, formulates and defines system scope and objectives through research and fact-finding to develop or modify moderately complex information systems. Prepares detailed specifications from which programs will be written. Designs, codes, tests, debugs, documents and maintains those programs. Competent to work on most phases of applications systems analysis and programming activities, but requires instruction and guidance in other phases.

017 **Applications Systems Analyst/Programmer - Associate** - Under immediate supervision, assists in research and fact-finding to develop or modify information systems. Assists in preparing detailed specifications from which programs will be written. Designs, codes, tests, debugs, documents and maintains those programs. Staffed by beginners who have had sufficient educational background and/or experience to qualify them to start in application systems analysis and programming.

Applications Systems Analysis Family

021 **Applications Systems Analysis Supervisor** - Supervises activities of applications systems analysis personnel for a major project, several smaller projects, or a small department. Responsible for quality assurance. Makes decisions on personnel actions (hiring, terminations, promotions, etc.). Controls revenues and/or expenses within operating unit and responsible for meeting budget goals and objectives. Provides input to policy level direction regarding standards, budget constraints, etc.

022 **Applications Systems Analyst - Lead** - Formulates/defines system scope and objectives based on user defined needs. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Analyzes and revises existing system logic difficulties and documentation as necessary. Has full technical knowledge of all phases of applications systems analysis. May use CASE tools. Also has duties instructing, directing and checking the work of other systems analysis personnel. Responsible for quality assurance review. Acts as project leader for projects with small budgets or limited duration.

023 **Applications Systems Analyst - Staff Specialist** - Top level technical expert in one or more highly specialized phases of applications systems analysis. Acts independently under general direction. Provides technical consulting on complex projects. Formulates/defines system scope and objectives. Often acts as business expert and assists users in defining needs. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Analyzes and revises existing system logic difficulties and documentation as necessary. Has full technical knowledge of all phases of applications systems analysis. May use CASE tools. May have duties instructing, directing and checking the work of other applications systems analysis personnel. May have quality assurance review responsibilities.

024 **Applications Systems Analyst - Senior** - Under general direction, formulates/defines system scope and objectives based on user needs. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Prepares detailed specifications from which programs will be written. Analyzes and revises existing system logic difficulties and documentation as necessary. Competent to work at the highest technical level of all phases of applications systems analysis activities. May use CASE tools.

026 **Applications Systems Analyst - Intermediate** - Under general supervision, formulates and defines system scope and objectives through research and fact-finding to develop or modify moderately complex information systems. Prepares detailed specifications from which programs will be written. Analyzes and revises existing system logic difficulties and documentation as necessary. Competent to work on most phases of applications systems analysis activities, but requires instruction and guidance in other phases. May use CASE tools.

027 **Applications Systems Analyst - Associate** - Under immediate supervision, assists in research and fact-finding to develop or modify information systems. Assists in preparing detailed specifications from which programs will be written. Analyzes and revises existing system logic difficulties and documentation as necessary. This level is staffed by beginners who have had sufficient educational background and/or experience to qualify them to start in applications systems analysis. May use CASE tools.

Applications Programming Family

031 **Applications Programming Supervisor** - Supervises activities of applications programming personnel for a major project, several smaller projects, or a small department. Responsible for quality assurance. Makes decisions on personnel actions (hiring, terminations, promotions, etc.). Controls revenues and/or expenses within operating unit and responsible for meeting budget goals and objectives. Provides input to policy level direction regarding standards, budget constraints, etc.

032 **Applications Programmer - Lead** - Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Responsible for program design, coding, testing, debugging and documentation. Has full technical knowledge of all phases of applications programming. Also has duties instructing, directing and checking the work of other programming personnel. Responsible for quality assurance review. Acts as project leader for projects with small budgets or limited duration. Responsible for directing and monitoring the work of team members. Note: This position does not perform systems analysis functions.

033 **Applications Programmer - Staff Specialist** - Top level technical expert in one or more highly specialized phases of applications programming. Acts independently under general direction. Provides technical consulting on complex projects. Devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Responsible for program design, coding, testing, debugging and documentation. Has full technical knowledge of all phases of applications programming. May have duties instructing, directing and checking the work of other applications programming personnel. May have quality assurance review responsibilities. Note: This position does not perform systems analysis functions.

034 **Applications Programmer - Senior** - Under general direction, devises or modifies procedures to solve complex problems considering computer equipment capacity and limitations, operating time and form of desired results. Designs, codes, tests, debugs and documents those programs. Competent to work at the highest technical level of all phases of applications programming activities. Note: This position does not perform systems analysis functions.

036 **Applications Programmer - Intermediate** - Under general supervision, modifies moderately complex applications programs from detailed specifications. Codes, tests, debugs, documents and maintains those programs. Competent to work on most phases of applications programming activities, but requires instruction and guidance in phases. Note: This position does not perform systems analysis functions.

037 **Applications Programmer - Associate** - Under immediate supervision, modifies applications programs from detailed specifications. Codes, tests, debugs, documents and maintains those programs. This level is staffed by beginners who have had sufficient educational background and/or experience to qualify them to start in applications programming. Note: This position does not perform systems analysis functions.

Software Systems Engineering Family

040 **Software Systems Engineering Manager** - Responsible for all software systems programming activities. Applications generally affect the overall operating system, such as sophisticated file maintenance routines, advanced scientific software, large telecommunications networks and computer accounting. Responsible for meeting budget goals and objectives. Provides input to policy level direction regarding standards, budget constraints, etc. Makes personnel decisions. Assigns personnel to projects and directs their activities. Projects software and hardware requirements in conjunction with other information systems managers. Develops standards for all software system applications and provides technical guidance to the information systems staff. Directs the interface of software systems with the hardware configuration and the applications systems. Additional areas of responsibility include: configuration/capacity planning, software products evaluation, systems performance analysis and optimization. Prepares activity and progress reports for software systems programming activities. May report to Computer Operations Manager (061) or Director of IS Operations (049).

041 **Software Systems Engineering Supervisor** - Supervises activities of all software systems programming personnel for a major project, several smaller projects, or a small department. Responsible for quality assurance. Makes decisions on personnel actions (hiring, terminations, promotions, etc.). Controls revenues and/or expenses within operating unit and responsible for meeting budget goals and objectives. Provides input to policy level direction regarding standards, budget constraints, etc.

042 **Software Systems Engineer - Lead** - Formulates/defines specifications for complex software programming applications or modifies/maintains complex existing applications using engineering releases and utilities from the manufacturer. Responsible for program design, coding, testing, debugging and documentation. Usually responsible for applications dealing with the overall operating system, such as sophisticated file maintenance routines, large telecommunications networks, computer accounting and advanced mathematical/scientific software packages. Has full technical knowledge of all phases of software systems programming applications. Also has duties instructing, directing and checking the work of other operating systems programming personnel. Responsible for quality assurance review and the evaluation of new and existing software products. Acts as project leader for projects with small budgets or limited duration.

043 **Software Systems Engineer - Staff Specialist** - Top level technical expert in one or more highly specialized phases of software systems programming. Acts independently under general direction. Provides technical consulting on complex projects. Formulates/defines specifications for complex operating software programming applications or modifies/maintains complex existing applications using engineering releases and utilities from the manufacturer. Responsible for program design, coding, testing, debugging and documentation. Usually responsible for applications dealing with the overall operating system, such as sophisticated file maintenance routines, large telecommunications networks, computer accounting and advanced mathematical/scientific software packages. Has full technical knowledge of all phases of software systems programming applications. May have duties instructing, directing and checking the work of other software systems programming personnel. May have quality assurance review and/or new and existing software product evaluation responsibilities.

044 **Software Systems Engineer - Senior** - Under general direction, formulates/defines specifications for complex operating software programming applications or modifies/maintains complex existing applications using engineering releases and utilities from the manufacturer. Designs, codes, tests, debugs and documents those programs. Usually responsible for applications dealing with the overall operating system, such as sophisticated file maintenance routines, large telecommunications networks, computer accounting and advanced mathematical/scientific software packages. Competent to work at the highest technical level on all phases of software systems programming applications. May have responsibility for the evaluation of new and existing software products. May assist other systems programmers to effectively utilize the system's technical software.

046 **Software Systems Engineer - Intermediate** - Under general supervision, works from specifications to develop or modify moderately complex software programming applications. Assists with design, coding, benchmark testing, debugging and documentation of programs. Applications generally deal with utility programs, job control language, macros, subroutines and other control modules. Competent to work on most phases of software systems programming applications, but requires instruction and guidance in other phases.

047 **Software Systems Engineer - Associate** - Under immediate supervision, works from specifications to assist in developing and modifying operating software programming applications. Assists with design, coding, benchmark testing, debugging and documentation of programs. Applications generally deal with utility programs, job control language, macros, subroutines and other control modules. May customize purchased applications and assist in maintaining program libraries and technical manuals. Staffed by beginners who have had sufficient educational background and/or experience to qualify them to start in operating systems programming.

Data Entry Family

071 **Data Entry Supervisor** - Supervises all data entry activities. Assigns work to personnel and directs their activities; reviews and evaluates their work and prepares performance reports. Normally reports to the Computer Operations Manager (061) or Production Control Supervisor (054). NOTE: If incumbent also supervises data control activities, match to Production Control Supervisor (054).

072 **Data Entry Operator - Lead** - Under general direction, has full technical knowledge of data entry devices, but has duties of instructing, directing and checking the work of other data entry operators. Assists in scheduling data entry functions.

073 **Data Entry Operator - Senior** - Under general supervision, operates data entry devices in recording a variety of data; verifies data entered; performs related clerical duties.

074 **Data Entry Operator** - Under direct supervision, operates data entry devices in recording a variety of data; verifies data entered; performs related clerical duties.

Appendix C – Geographic, Industry, Unemployment, and IT Percent of Employment Distribution Tables

Geographical Distribution of Employees

State	Data % of Employees	National % of Employees
Alaska	0.02%	0.23%
Alabama	1.26%	1.58%
Arkansas	1.68%	0.88%
Arizona	0.75%	1.63%
California	5.43%	11.87%
Colorado	1.30%	1.61%
Connecticut	2.61%	1.24%
Washington, DC	1.11%	0.20%
Delaware	0.19%	0.28%
Florida	4.32%	5.23%
Georgia	4.21%	2.94%
Hawaii	0.18%	0.44%
Iowa	1.32%	1.15%
Idaho	0.54%	0.47%
Illinois	7.71%	4.52%
Indiana	0.82%	2.26%
Kansas	0.45%	1.02%
Kentucky	0.51%	1.40%
Louisiana	0.10%	1.51%
Massachusetts	3.67%	2.38%
Maryland	1.88%	1.99%
Maine	0.11%	0.47%
Michigan	3.00%	3.63%
Minnesota	5.85%	1.95%
Missouri	2.83%	2.08%
Mississippi	0.05%	0.92%
Montana	0.09%	0.34%
North Carolina	2.82%	2.75%
North Dakota	0.02%	0.25%
Nebraska	0.25%	0.66%
New Hampshire	0.26%	0.47%
New Jersey	4.68%	3.02%
New Mexico	0.15%	0.61%
Nevada	0.02%	0.66%
New York	4.43%	6.46%
Ohio	5.99%	4.08%
Oklahoma	0.47%	1.19%
Oregon	0.97%	1.28%
Pennsylvania	4.47%	4.32%
Rhode Island	0.73%	0.36%

Geographical Distribution of Employees (cont'd).

South Carolina	0.37%	1.43%
South Dakota	0.01%	0.29%
Tennessee	1.86%	1.99%
Texas	9.88%	7.33%
Utah	0.88%	0.76%
Virginia	4.83%	2.52%
Vermont	0.10%	0.24%
Washington	1.58%	2.19%
Wisconsin	3.10%	2.14%
West Virginia	0.10%	0.58%
Wyoming	0.00%	0.19%
Total	100.00%	100.00%

Industry Distribution of Employees

Industry Segment	Data % of Employees	National % of Employees
Mining	0.08%	0.47%
Construction	0.68%	4.62%
Manufacturing - Durable	24.05%	8.97%
Manufacturing - Non-Durable	5.12%	6.06%
Transportation & Utilities	6.93%	5.22%
Wholesale Trade	0.35%	5.42%
Retail Trade	3.73%	17.53%
Finance, Insurance, and Real Estate	12.19%	5.85%
Services	42.46%	29.78%
Public Administration	4.45%	16.06%
Total	100.00%	100.00%

Unemployment Distribution of Employees

State	1998	1999
Alaska	5.8%	6.0%
Alabama	3.9%	4.2%
Arkansas	5.4%	4.1%
Arizona	3.8%	3.9%
California	5.8%	5.6%
Colorado	3.7%	2.8%
Connecticut	3.2%	3.1%
Washington, DC	8.6%	6.3%
Delaware	3.7%	3.0%
Florida	4.1%	4.0%
Georgia	3.9%	3.6%
Hawaii	6.1%	5.5%
Iowa	2.8%	2.7%
Idaho	5.4%	5.0%
Illinois	4.2%	3.8%
Indiana	3.0%	2.5%
Kansas	3.8%	3.3%
Kentucky	4.6%	4.1%
Louisiana	5.6%	4.7%
Massachusetts	3.0%	2.7%
Maryland	4.4%	3.5%
Maine	4.7%	4.0%
Michigan	3.5%	3.8%
Minnesota	2.6%	2.2%
Missouri	4.4%	3.1%
Mississippi	4.9%	4.0%
Montana	5.6%	5.4%
North Carolina	3.3%	2.6%
North Dakota	3.3%	2.7%
Nebraska	2.2%	2.0%
New Hampshire	3.2%	2.6%
New Jersey	4.5%	4.2%
New Mexico	5.8%	6.0%
Nevada	4.7%	4.1%
New York	5.6%	4.9%
Ohio	3.8%	4.0%
Oklahoma	4.4%	4.0%
Oregon	5.7%	5.4%
Pennsylvania	4.6%	4.1%
Rhode Island	4.9%	2.8%
South Carolina	3.1%	3.6%
South Dakota	2.9%	2.4%
Tennessee	4.0%	3.8%
Texas	4.4%	4.3%
Utah	3.9%	3.0%
Virginia	2.4%	2.4%

Unemployment Distribution of Employees (cont'd).

Vermont	3.5%	2.8%
Washington	4.6%	4.4%
Wisconsin	3.1%	3.3%
West Virginia	7.0%	6.9%
Wyoming	5.1%	4.8%

Information Technology Percent of Employees by Industry

Two-digit SIC	% IT Employees
07: Agricultural Services	0.11%
10: Metal Mining	0.96%
12: Coal Mining	0.27%
13: Oil and Gas Extraction	2.00%
14: Mining and Quarrying of Nonmetallic Minerals	0.32%
15: Building Construction	0.15%
16: Heavy Construction Other than Building Construction	0.18%
17: Construction Special Trade Contractors	0.06%
20: Manufacturing – Food and Kindred Products	0.51%
21: Manufacturing – Tobacco Products	5.65%
22: Manufacturing – Textile Mill Products	0.56%
23: Manufacturing – Apparel and Other Finished Products Made From Fabric	0.62%
24: Manufacturing – Lumber and Wood Products, Except Furniture	0.41%
25: Manufacturing – Furniture and Fixtures	0.75%
26: Manufacturing – Paper and Allied Products	0.80%
27: Manufacturing – Printing, Publishing, and Allied Industries	2.89%
28: Manufacturing – Chemicals and Allied Products	1.65%
29: Manufacturing – Petroleum Refining and Related Industries	1.21%
30: Manufacturing – Rubber and Misc Plastics Products	0.60%
31: Manufacturing – Leather and Leather Products	0.73%
32: Manufacturing – Stone, Clay, Glass, and Concrete Products	0.59%
33: Manufacturing – Primary Metal Industries	0.95%
34: Manufacturing – Fabricated Metal Products, Except Machinery and Transportation Equipment	0.78%
35: Manufacturing – Industrial and Commercial Machinery and Computer Equipment	4.27%
36: Manufacturing – Electronic and other Electrical Equipment and Components, Except Computer Equipment	3.83%
37: Manufacturing – Transportation Equipment	1.70%
38: Manufacturing – Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods	4.46%
39: Manufacturing – Miscellaneous Manufacturing Industries	0.98%
40: Railroad Transportation	0.64%
41: Local and Suburban Transit and Interurban Highway Passenger Transportation	0.24%
42: Motor Freight Transportation and Warehousing	0.54%
44: Water Transportation	0.73%
45: Transportation by Air	1.09%
46: Pipelines, Except Natural Gas	2.42%
47: Transportation Services	2.02%
48: Communications	4.88%
49: Electric, Gas, and Sanitary Services	2.24%
50: Wholesale Trade – Durable Goods	3.59%
51: Wholesale Trade – Non Durable Goods	1.46%
52: Retail Trade – Building Materials, Hardware, Garden Supply , and Mobile Home Dealers	0.52%
53: Retail Trade – General Merchandise Stores	0.35%
54: Retail Trade – Food Stores	0.16%
55: Retail Trade – Automotive Dealers and Gasoline Service Stations	0.085
56: Retail Trade – Apparel and Accessory Stores	0.28%
57: Retail Trade – Home Furniture, Furnishings, and Equipment Stores	2.95%
58: Retail Trade – Eating and Drinking Places	0.01%
59: Retail Trade – Miscellaneous Retail	0.74%

Information Technology Percent of Employees by Industry (cont'd).

60: Depository Institutions	4.32%
61: Non-depository Credit Institutions	3.54%
62: Security and Commodity Brokers, Dealers, Exchanges, and Services	6.01%
63: Insurance Carriers	8.31%
64: Insurance Agents, Brokers, and Services	3.55%
65: Real Estate	0.46%
67: Holding and Other Investments Offices	7.34%
70: Hotels, Rooming Houses, Camps, and Other Lodging Places	0.18%
72: Personal Services	0.21%
73: Business Services	12.15%
75: Automotive Report, Services, and Parking	0.26%
76: Miscellaneous Repair Services	0.68%
78: Motion Pictures	1.03%
79: Amusement and Recreation Services	0.29%
80: Health Services	0.82%
81: Legal Services	1.03%
82: Educational Services	0.91%
83: Social Services	0.39%
84: Museums, Art Galleries, and Botanical and Zoological Gardens	1.04%
86: Membership Organizations	1.27%
87: Engineering, Accounting, Research, Management, and Related Services	6.295
88: Private Households	4.60%
90: Public Administration	2.16%

BIBLIOGRAPHY

BIBLIOGRAPHY

Abraham, K. G. (1990). Restructuring the Employment Relationship: The Growth and Market-Mediated Work Arrangements. In K. G. Abraham, R. B. McKersie, (Eds.), New Developments in the Labor market: Toward a New Institutional Paradigm (pp. 85-120). Cambridge: MIT Press.

Abraham, K. G., Taylor, S. K. (1996). Firms' Use of Outside Contractors: Theory and Evidence. Journal of Labor Economics, 14(3), 394-424.

Akerlof, G. A. (1986) Labor Contracts as Partial Gift Exchange. In G. A. Akerlof, J. L. Yellen, (Eds.), Efficiency Wage Models of the Labor Market (66-92). Cambridge: Cambridge University Press.

Akerlof, G. A., Yellen, J. L. (1986). Introduction. In G. A. Akerlof, J. L. Yellen, (Eds.), Efficiency Wage Models of the Labor Market (1-21). Cambridge: Cambridge University Press.

Applebaum, E. (1989). The Growth of the U.S. Contingent Labor Force. In R. Drago, Perlman, Richard (Ed.), Microeconomic Issues in Labor Economics (pp. 62-82). New York: Harvester Wheatsheaf.

Baron, J. N. (1984). Organizational Perspectives on Stratification. Annual Review of Sociology, 37-69.

Baron, J. N., Davis-Blake, A., Bielby, W. T. (1986). The Structure of Opportunity: How Promotion Ladders Vary Within and Among Organzations. Administrative Science Quarterly, 31, 248-273.

Beck, E. M., Horan, P. M., Tolbert, C. (1978). Stratification in a Dual Economy: A Sectoral Model of Earnings Determination. American Sociological Review, 43(5), 704-720.

Becker, E. H. (1984). Self-Employed Workers: An Update to 1983. Monthly Labor Review, 107(7), 14-18.

Becker, G. (1993) Human Capital. Chicago: University of Chicago Press.

Belous, R. S. (1989). How Human Resource Systems Adjust to the Shift Toward Contingent Workers. Monthly Labor Review, 112(3), 7-12.

Bettis, R., Bradley, S. P., Hamel, G. (1992). Outsourcing and Industrial Decline. Academy of Management Executive, 6, 7-22.

Bills, D. B. (1987). Costs, Commitment, and Rewards: Factors Influencing the Design and Implementation of Internal Labor Markets. Administrative Schience Quarterly, 32, 202-221.

Bregger, J. E. (1963). Self-employment in the United States 1948-1962. Monthly Labor Review, 86(1), 37-43.

Bregger, J. E. (1996). Measuring Self-Employment in the United States. Monthly Labor Review, 119(1-2), 3-9.

Carey, M. L., Hazelbaker, K. L. (1986). Employment Growth in the Temporary Help Industry. Monthly Labor Review, 109(4), 37-44.

Carre, F. J. (1992). Temporary Employment in the Eighties. In V. L. duRivage (Ed.), New Policies for the Part-Time and Contingent Workforce . Armonk, NY: M. E. Sharpe.

Carter, S. (1988). The Changing Importance of Lifetime Jobs. Industrial Relations, 27(3), 287-300.

Casey, B. (1991). Survey Evidence on Trends in "Non-Standard" Employment. In A. Pollert (Ed.), Farewell to Flexibility? (pp. 179-199). Oxford: Oxford University Press.

Cohany, S. R. (1996). Workers in Alternative Employment Arrangements. Monthly Labor Review, 119(10), 31-45.

Cohen, Y., Pfeffer, J. (1986). Organizational Hiring Standards. Administrative Science Quarterly, 31, 1-24.

Cook, T. D., Campbell, D. T. (1979). Quasi-Experimentation: Design & Analysis Issues for Field Settings. Boston: Houghton Mifflin Company.

Cooper, S. (1995). The Expanding Use of Contingent Workforce in the American Economy: New Opportunities and Dangers for Employers. Employee Relations Law Journal, 20(4), 525-539.

Cordova, E. (1986). From Full-Time Wage Employment to Atypical Employment: A Major Shift in the Evolution of Labour Relations? International Labour Review, 125(6), 641-657.

Deavers, K. L. (1997). Outsourcing: A Corporate Competitiveness Strategy, Not a Search for Low Wages. Journal of Labor Research, 18(4), 504-517.

Dickens, W. T., Lang, Kevin. (1985). A Test of Dual Labor Market Theory. The American Economic Review, 75(4), 792-805.

Diebold, F. X., Neumark, D., Polsky, D. (1997). Job Stability in the United States. Journal of Labor Economics, 15(2), 206-233.

Doeringer, P. B., Piore, Michael J. (1971). Internal Labor Markets & Manpower Analysis. Lexington, MA: Heath.

Doeringer, P. B., Christensen, K., Flynn, P. M., Hall, D. J., Kapp, H. C., Keefe, J. H., Ruhm, C. J., Sum, A. M., Useem, M. (1991). The Two-Tiered Workforce in U. S. Corporations. In P. B. Doeringer (Ed.), Turbulence in the American Workplace (pp. 140-155). New York: Oxford University Press.

duRivage, V. L. (1992). New Policies for the Part-Time and Contingent Workforce. In V. L. duRivage (Ed.), New Policies for the Part-Time and Contingent Workforce (pp. 89-121). Armonk, NY: M. E. Sharpe.

Fain, T. S. (1980). Self-employed Americans: Their Number has Increased. Monthly Labor Review, 103(11), 3-8.

Fay, J. A., Medoff, J. L. (1985). Labor and Output over the Business Cycle: Some Direct Evidence. American Economic Review, 75(4), 638-55.

Golden, L., Applebaum, E. (1992). What was Driving the 1982-1988 Boom in Temporary Employment? American Journal of Economics and Sociology, 51(4), 473-493.

Gonos, G. (1997). The Contest over "Employer" Status in the Postwar United States: The Case of Temporary Help Firms. Law & Society Review, 31(1), 81-110.

Goodman, P. S., Leyden, D. P. (1991). Familiarity and Group Productivity. Journal of Applied Psychology, 76(4), 578-586.

Granovetter, M. (1986). Labor Mobility, Internal Markets, and Job Matching: A Comparison of the Sociological and Economic Approaches. Research in Social Stratification and Mobility, 5, 3-39.

Grimshaw, D., Rubery, J. (1998). Integrating the Internal and External Labour Markets. Cambridge Journal of Economics, 22, 199-220.

Groshen, E. L. (1991). Five Reasons Why Wages Vary Among Employers. Industrial Relations, 30(3), 350-381.

Imrie, R. F. (1986). Work Decentralization from Large to Small Firms: A Preliminary Analysis of Subcontracting. Environment and Planning A, 18(2), 949-965.

Kalaitzidakis, P. (1997). On-the-Job Training under Firm-Specific Innovations and Worker Heterogeneity. Industrial Relations, 36(3), 371-390.

Kosters, M. H. (1997). New Employment Relationships and the Labor Market. Journal of Labor Research, 28(4), 551-559.

Lazear, E. P. (1995). A Jobs-Based Analysis of Labor Markets. Paper presented at the AEA.

Lee, D. M. S., Trauth, E. M., Farwell, D. (1995). Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation. MIS Quarterly(September), 313-340.

Livernash, E. R. (1957). The Internal Wage Structure. In G. W. Taylor, Pierson, F. C. (Ed.), New Concepts in Wage Determination (pp. 140-172). New York: McGraw Hill.

Loveman, G. W., Tilly, C. (1988). Good Jobs or Bad Jobs: What Does the Evidence Say? New England Economic Review, January/February, 46-65.

Mangum, G., Mayall, D., Nelson, K. (1985). The Temporary Help Industry: A Response to the Dual Internal Labor Market. Industrial and Labor Relations Review, 38(4), 599-611.

McNabb, R., Psacharopoulos, G. (1979). Further Evidence of the Relevance of the Dual Labor Market Hypothesis for the U.K. The Journal of Human Resources, 16(3), 442-448.

Moore, M. A. (1965). The Temporary Help Service Industry: Historical Development, Operation and Scope. Industrial and Labor Relations Review, 18, 554-569.

Moss Kanter, R. (1984). Variations in Managerial Career Structures in High-Technology Firms: The Impact of Organizational Characteristics on Internal Labor Market Patterns. In P. Osterman (Ed.), Internal Labor Markets (pp. 109-131). Cambridge, MA: MIT Press.

Osterman, P. (1975). An Empirical Study of Labor Market Segmentation. Industrial and Labor Relations Review, 28(4), 508-523.

Osterman, P. (1983). Employment Structures Within Firms. British Journal of Industrial Relations, 20(3), 349-361.

Osterman, P. (1984a). Introduction: The Nature and Importance of Internal Labor Markets. In P. Osterman (Ed.), Internal Labor Markets (pp. 1-22). Cambridge, MA: MIT Press.

Osterman, P. (1984b). White Collar Internal Labor Markets. In P. Osterman (Ed.), Internal Labor Markets (pp. 163-189). Cambridge, MA: MIT Press.

Osterman, P. (1987). Choice of Employment Systems in Internal Labor Markets. Industrial Relations, 26(1), 46-67.

Osterman, P. (1995). Skill, Training, and Work Organization in American Establishments. Industrial Relations, 34(2), 125-146.

Pfeffer, J., Cohen, Y. (1984). Determinants of Internal Labor Markets in Organizations. Administrative Science Quarterly, 29, 550-572.

Pfeffer, J., Baron, J. (1988). Taking the Workers Back Out: Recent Trends in the Structuring of Employment. In B. Staw, Cummings, L. L. (Ed.), Research in Organizational Behavior (Vol. 10, pp. 257-304). Greenwich, CT: JAI Press.

Piore, M. J. (1975). Notes for a Theory of Labor Market Stratification. In R. C. Edwards, Reich, Michael, Gordon, Daivd M. (Ed.), Labor Market Segmentation (pp. 125-150). Lexington, MA: D.C. Heath.

Polivka, A. E., Nardone, T. (1989). On the definition of 'contingent work'. Monthly Labor Review, 112(12), 9-16.

Polivka, A. E. (1996a). Contingent and Alternative Work Arrangements, defined. Monthly Labor Review, 119, 3-9.

Polivka, A. E. (1996b). A Profile of Contingent Workers. Monthly Labor Review, 119(10), 10-21.

Pollert, A. (1991). The Orthodoxy of Flexibility. In A. Pollert (Ed.), Farewell to Flexibility? (pp. 3-31). Oxford: Blackwell Business.

Ray, R. N. (1975). A report on Self-Employed Americans in 1973. Monthly Labor Review, 98(1), 49-54.

Rebitzer, J. B., Taylor, L. J. (1991). A Model of Dual Labor Markets When Product Demand is Uncertain. Quarterly Journal of Economics, 16(4), 1373-1383.

Rebitzer, J. B. (1998). Job Safety and Contract Workers in the Petrochemical Industry. In K. Barker, Christensen, Kathleen (Ed.), Contingent Work (pp. 243-259). Ithaca, NY: ILR Press.

Rogers, J. K. (1995). Just a Temp: Experience and Structure of Alienation in Temporary Clerical Employment. Work & Occupations, 22(2), 137-166.

Rosen, S. (1986). The Theory of Equalizing Differences. In O. Ashenfelter, R. Layard (Eds.), Handbook of Labor Economics, Volume I (641-692). Amsterdam: Elsevier Science Publishers.

Rothstein, D. (1996). Entry Into and Consequences of Nonstandard Work Arrangements. Monthly Labor Review, 119(10), 75-82.

Rousseau, D. M., Libuser, C. (1997). Contingent Workers in High Risk Environments. California Management Review, 39(2), 103-123.

Scoones, D., Bernhardt, D. (1998). Promotion, Turnover, and Discretionary Human Capital Acquisition. Journal of Labor Economics, 16(1), 122-141.

Segal, L., Sullivan, D. (1995). The Temporary Labor Force. Economic Perspectives, 19(2), 2-19.

Seiler, E. (1984). Piece Rate vs. Time Rate: The Effect of Incentives on Earnings. The Review of Economics and Statistics, 66(3). 363-376.

Sharpe, M. (1997). Outsourcing, Organizational Competitiveness, and Work. Journal of Labor Research, 18(4), 535-549.

Spilerman, S. (1977). Careers, Labor Market Structure, and Socioecomonic Achievement. American Journal of Sociology, 83(3), 551-593.

Staber, U., Bogenhold, D. (1993). Self-Employment: A Study of Seventeen OECD Countries. Industrial Relations Journal, 24(2), 126-137.

Statistics, Bureau of. Labor. (1996). Civilian Labor Force and Unemployment . Washington, DC: Bureau of Labor Statistics.

Statistics, Bureau of Labor. (1999a). Civilian Labor Force and Unemployment . Washington, DC.

Statistics, Bureau of Labor. (1999b). National Employment, Hours, and Earnings. Washington, DC.

Statistics, Bureau of Labor. (1999c). Contingent and Alternative Employment Arrangements. Washington, DC.

Swinnerton, K. A., Wial, H. (1995). Is Job Stability Declining in the US Economy? Industrial and Labor Relations Review, 48(2), 293-304.

Tilly, C. (1992). Short Hours, Short Shrift: The Causes and Consequences of Part-Time Employment. In V. L. duRivage (Ed.), New Policies for the Part-Time and Contingent Workforce (pp. 15-44). Armonk, NY: M. E. Sharpe.

Tolbert, C., Horan, P. M., Beck, E. M. (1980). The Structure of Economic Segmentation: A Dual Economy Approach. American Journal of Sociology, 85, 1095-1116.

Wachter, M., Wright, R. (1990). The Economics of Internal Labor Markets. Industrial Relations, 29, 240-262.

Wells, M. J. (1987). Legal Conflict and Class Structure: The Independent Contractor-Employee Controversy in California Agriculture. Law & Society Review, 21, 49.

Williams, H. B. (1989). What Temporary Workers Earn: Findings from New BLS Survey. Monthly Labor Review, 109, 3-6.