INFORMATION TECHNOLOGY AND FOREIGN-BORN WORKERS IN CONTINGENT JOBS

July 2000

Lindsay Lowell
Director of Research
Institute for the Study of International Migration
Georgetown University, Box 579400
Washington, DC 20057-9400
LowellB@gunet.georgetown.edu

J. Edward Taylor
Professor
Department of Agricultural and Resource Economics
University of California
Davis, CA 95616
jetaylor@ucdavis.edu

* This paper was written with support from the Alfred P. Sloan Foundation. We would like to thank Bryan Paul Christian for his assistance in preparing this paper.

ABSTRACT

The information technology (IT) sector, like most others, has adopted a strategy of employing non-permanent, a.k.a., "contingent" workers. It also aggressively hires foreign-born temporary workers (visaholders with stays of 6 years or less). This paper analyzes 1995, 1997, and 1999 Current Population Survey data and finds that the average recently arrived foreign born (5 years or less) are more likely to hold contingent jobs than are natives (13 versus 5 percent). This does not appear to be an assimilation effect. Foreign born with more than five years of U.S. experience are no more likely to be contingent than natives, whereas the assimilation cross-over typically occurs only after 10 or 15 years. Further, there are no differences in earnings between otherwise similar native and foreign-born workers regardless of years in the United States. The findings indicate that recent foreign born disproportionately fill contingent jobs where the expected wage is 46 percent less than in the IT core. What is more, wages in contingent jobs have been stagnant 1995 to 1999, while core IT jobs have experienced significant wage growth (of 19 percent).

INFORMATION TECHNOLOGY AND FOREIGN-BORN WORKERS IN CONTINGENT JOBS

INTRODUCTION

The industrial and technological restructuring of past years has turned employers to new human resource models: the purchasing of businesses services from outside providers and the employment of temporary workers (Barker and Christensen, 1998). These trends cut operating costs and promote expansion. They also renew an old-fashioned hierarchy of jobs. It is taken as a given that a disproportionate share of low-skill foreign-born workers will end up in the lower-end of segmented labor markets, but how about high-skilled foreign-born workers?

The supply of high-skilled foreign-born workers has increased notably over the past three decades (Espenshade and Usdansky, 1999), reinforcing a bimodal distribution of high shares of foreign born in both low- and high-skilled occupations. Indeed, there has been strong demand for foreign-born scientists and engineers in the cutting edge occupations of the New Economy, in particular the information technology (IT) sector. This article examines the job structure of the IT labor force and the distribution of foreign- and native-born workers.

In particular, the U.S. labor force has many jobs that are short term or temporary, e.g., jobs that are *contingent* or other than a permanent part of an employer's workforce. As we shall discuss in the literature review, the technical definition of contingency varies, producing a range of estimates of the size of this segment of the labor force. However, research on contingent workers agrees on several points. Contingent work is less desirable and the great majority of contingent workers would prefer to have non-contingent or "core" positions (Hipple, 1998). This is understandable. Contingent work pays less, is more likely to be part time, and is associated with multiple job holding.

The literature has established that contingent workers are disproportionately women and minorities, but it has not explored the role of the foreign born in such jobs. This paper examines foreign-born workers and the contingent labor force in information technology occupations. To be sure, such jobs that are not expected to last are found in all industries, although typically more so in agriculture, services, and technical and professional support positions. However, information technology has come under increased scrutiny in the past few years as the single largest source of demand for high-skilled foreign-born workers. Debate swirls around the large number of specialty workers (H-1B visa) issued "temporary" six-year work authorization to meet IT demand (see discussion in the conclusions).

LITERATURE ON CONTINGENT WORK

While the Bureau of Labor Statistics has developed one reliable measure of contingent work, experts have otherwise not established a comprehensive definition of contingency. The reason, as one author noted, is that "[m]uch of the evidence for claims regarding the growth, characteristics, or sources of growth of contingent work is indirect or anecdotal, based on small-scale studies or on inferences from large but inadequate data sets" (Spalter-Roth and Hartmann, 1998:69) Nonetheless, studies on contingent work have reached general consensus on the principal attributes of those workers, including demographic characteristics and rates of pay and access to benefits relative to their full-time, permanent counterparts.

The Concept of Contingency. While some authors have labeled the growth of contingent labor in the U.S. a recent development (Belous, 1989; Nollen and Axel, 1996), others have pointed out that the country has, throughout much of its history, had a secondary, non-traditional labor force. For example, scholars spoke during the 1960s of a "peripheral" workforce that since the mid-19th century had included many black Americans, newly arrived foreign born, and women consigned to part-time and/or seasonal jobs (Barker and Christensen, 1998). According to one other author, since at least 1973, the growth of non-traditional jobs has far outpaced that of full-time, permanent employment (duRivage, 1992).

Some studies link the contemporary contingent workforce with recent growth in the service and information technology sectors (Women's Bureau, 1988). Many authors insist that the growth of the contingent workforce is the result of changed business practices as firms seek to cut labor costs with a reduced number of core workers supplemented with more flexible peripheral or contingent workers. This strategy occurred in parallel with corporate downsizing in the 1980s and 1990s (Belous, 1989). Contingent employment, according to this view, depends on management strategies and on economic conditions. Firms hire contingent workers for defined projects and in boom periods, but they shed much of their contingent labor force during a recession.

Other studies attribute the supposed growth in contingent labor to workers' desire for more flexible schedules that permit them to give priority to non-economic considerations such as family life and education. Proponents of this worker-driven view note that contingent labor includes many highly skilled individuals, such as nurses, accountants, substitute teachers, and engineers, who often enter into alternative employment arrangements voluntarily (Polivka and Nardone, 1989). In contrast to this notion of workers' choices, Tilly (1992) demonstrated that, while employers continued to create contingent jobs throughout the 1980s and early 1990s, a substantial portion (nearly 75 percent) of those who filled those positions did so involuntarily.

Debate over the definition of contingent employment has taken place for at least the past decade-and-a-half. Audrey Freedman, an economist with The Conference Board, first coined the term "contingent employment" during a Congressional hearing in 1985 (Nollen and Axel, 1996). That same year, Freedman (1985:35) formally defined contingent employment as:

> conditional and transitory employment arrangements as initiated by a need for labor—usually because a company has an increased demand for a particular service or a product or technology, at a particular place, at a specific time.

Belous (1989:6) defined contingent workers as individuals who have "a weak affiliation with a specific employer and do not have a significant stake in the company at which they are employed." In addition, employers do not conclude with contingent workers the kinds of implicit contracts for continued employment that are reserved for full-time, permanent (core) employees.

The Bureau of Labor Statistics Definition. At around the same time, economists at the U.S. Department of Labor's Bureau of Labor Statistics (BLS) offered their own definition of contingent employment as "any job in which the individual does not have an explicit or implicit contract for long-term employment or one in which the minimum hours worked can vary in a nonsystematic manner" (Polivka and Nardone, 1989:11; Barker and Christensen, 1998). Thus, the stress was on temporariness and unpredictability, rather than more vague notions of attachment and affiliation.

Belous made an early estimate of the U.S. contingent workforce in 1988, counting four employee classes within the national labor force: temporary workers, part-time workers, individuals employed in the business services sector, and the self-employed. Belous placed the contingent population somewhere between 29.9 million and 36.6 million workers—between 25 and 30 percent of the national labor force (Belous, 1989). Almost immediately after Belous published his estimates of the contingent workforce, BLS economists, challenged them (Barker and Christensen, 1998).

For example, BLS experts insisted that not all part-time workers are contingent employees (as Belous' count implied), but rather many part-time workers were in stable, long-term employment arrangements (Polivka and Nardone, 1989). Nonetheless, it was not until 1995, when the BLS developed the first nationally representative data on contingent workers by means of a supplement to the Current Population Survey (CPS), that BLS economists were able to offer their own figures. Perhaps the most important conclusion of the 1995 survey was that the contingent workforce was considerably smaller than Belous had estimated. The CPS data determined that between 2.7 million and 6.0 million U.S. workers were employed in contingent arrangements—roughly 2.2.to 4.9 percent of the total national labor force (Nardone, Veum, and Yates, 1997; Barker and Christensen, 1998).

The 1995 BLS measurement consisted of three separate estimates. The first estimate (2.7 million) included all wage and salary workers who had worked for their employer for one year or less and expected to continue working for that employer for another year or less. Estimate two (3.4 million) included workers from estimate one, as well as self-employed individuals who had been and expected to be employed in their current assignment for one year or less. The third and broadest estimate (6 million) removed the one-year tenure and expected duration requirement for wage and salary workers (but kept it for the self-employed), counting virtually all workers who expected their jobs to be temporary (Polivka 1996).

Variation in Rates of Contingency. Recent studies have reversed earlier predictions that the contingent workforce would continue to grow until at least the turn of the century (Nollen and Axel, 1996). In 1997, the BLS performed a second survey of contingent labor by means of a special supplement to the CPS. The 1997 data showed that the total number of contingent workers had actually declined slightly since 1995, from a maximum of six million to 5.6 million workers, which represented 4.4 percent of the national labor force (Hipple, 1998). The 1999 CPS supplement indicates that roughly the same proportion of workers (4.3 percent) held contingent jobs (Bureau of Labor Statistics, 1999).

Most authors have reached consensus with regard to the principal attributes of contingent workers, in spite of defining and measuring contingent employment in different ways and with different results. In 1989, Belous noted that contingent employees earned substantially less than traditional employees and had much less chance of receiving benefits, especially employer-provided health care and pensions (Belous, 1989; GAO, 1991). Since then there has also been general agreement that women, blacks, and youth are disproportionately represented in the contingent workforce (Carré, 1992; Polivka, 1996; Nardone, Veum, and Yates, 1997; Spalter-Roth, 1998; Bernasek and Kinnear, 1999).

Few studies have discussed the substantial proportion of foreign-born contingent employees in the U.S. In fact, one of the only works to mention any connection between contingent employment and migrants is the 1988 Women's Bureau conference summary, which warned that a sustained increase of contingent work could pose dangers to (lower-skilled) foreign-born populations threatened with displacement from traditional jobs (Women's Bureau, 1988). What is clearly missing from the existent literature, then, is a systematic look at the proportion of foreign born within the U.S. contingent workforce, especially within the skilled sector.

DATA AND SAMPLE

The Current Population Survey (CPS) provides information on the nativity of IT workers as well as on their overall numbers and other demographic characteristics. Conducted by the Bureau of the Census for the Bureau of Labor Statistics, this is the premier source of data on the American labor force. This monthly survey is based on a sample of 48,500 households, excluding persons in the armed forces and institutionalized living quarters. Data are from detailed questions about the working status of everyone in these households. As will be seen below, most items on the household survey are asked of all members. However, wages are asked of only workers who are part of an out-going rotation sample (approximately one-quarter).[1]

[1] Only the March CPS asks all workers in the sample for their earnings. Otherwise, all monthly supplements consist of four changing subsample groups that rotate into and out of the CPS over the year. Only the outgoing rotation group is asked about wages because it is such a sensitive question.

We use the February 1995, 1997, and 1999 CPS supplements that specifically ask about contingent status using the definitions presented above in the review of literature. Our sample is restricted to employed men and women in the U.S. civilian labor force (CLF) aged 16 and older, and residing in the 50 States or the District of Columbia. The sample is further restricted to individuals who report occupations in a broad range of information technology occupations. We follow the U.S. Department of Commerce in so far as we start with the two most important IT occupations and include other occupations directly or partly involved with the use or provision of information technology and/or computer services (DOC 1999; see Appendix Table 1).

The sample includes both native-born and foreign-born workers. The later include naturalized citizens, permanent aliens, legal temporary workers, and unauthorized workers. We choose not to separately identify naturalized citizens, although that is possible with these data, because most of their labor market outcomes are driven by duration of time in the United States that we control for. Unfortunately, we cannot distinguish between resident aliens who are permanent, legal temporary, or unauthorized. Given the skill composition of this labor force it very unlikely that there are any unauthorized workers of note.

The composition of the legal foreign-born class is indirectly proxied by years spent in the United States. Most classes of temporary visas do not permit indefinite stays and the largest temporary class of admission, the Specialty H-1B visa, permits no more than six years stay. Therefore, it is safe to assume that practically all workers who report having been in the United States for seven or more years are either permanent resident aliens or naturalized citizens. Given what we know about these populations, most all workers who report having been in the country for six years or less are most likely to be temporary visa holders (see discussion in the Conclusion).

Summary Statistics. Table 1 presents definitions and summary statistics for each of the explanatory variables in the model. Out of all individuals in the sample 5.6 percent reported meeting the BLS's criterion for contingent work status. Workers in the sample averaged just over 2 years of post-secondary education and 31 years of work experience. Out of the total sample, 1.9 percent were foreign born who had been in the United States 5 years or fewer; 2.6 percent had been in the United States between 6 and 10 years, and 1.3 percent had been in this country between 11 and 15 years (all ranges inclusive). Nearly 7 out of 10 workers in the sample were males. Sixty-two percent were married with spouse present. The sample is almost evenly divided between the three survey years.

TABLE 1 ABOUT HERE

METHODOLOGY

The analysis of contingent status and earnings involves a simultaneous-equation model in which an endogenous process selects IT workers into and out of contingent employment, and contingent and core IT worker earnings are censored by unobservable latent variables influencing this selection process. Let I_i^* be a dichotomous variable equal to 1 if worker i is observed in a contingent work situation and 0 otherwise. Analogous to Lee's (1978) unionism

and wage rates analysis, contingent worker earnings for individual i (E_i^c) are observed ($E_i^c > 0$) only if the individual is selected into contingent employment ($I_i^* = 1$). Conversely, core worker earnings are observed ($E_i^{nc} > 0$) only for individuals who are selected into core employment ($I_i^* = 0$).

Following Mincer (1974) and Chiswick (1978), we assume that earnings are a function of human capital variables (schooling, work experience, years since immigration) that may influence worker productivity in contingent and core jobs. However, in the spirit of Dickens and Lang (1985), Piore (1979) and others, we also allow for the possibility that other variables, not directly related to worker productivity, may influence earnings, and that variables including years since immigration may shape the selection of workers into contingent and core jobs independent of their effect on earnings. Let: X_i denote person i's human capital; Z_i^c, Z_i^{nc} denote other variables influencing contingent and core worker earnings, and Z_i represent variables influencing the selection of worker i into contingent and core work. Expected earnings for contingent and core workers are conditional upon the selection process:

(1a) $E(E_i^c) = \alpha_0 + \alpha_1 X_i + \alpha_2 Z_i^c + E(u_i^c / I_i^* = 1)$; and

(1b) $E(E_i^{nc}) = \beta_0 + \beta_1 X_i + \beta_2 Z_i^{nc} + E(u_i^{nc} / I_i^* = 0)$,

where α_1 and β_1 denote, respectively, the returns from human capital in contingent and core jobs; α_2 and β_2 represent the marginal effects of non-human-capital variables on earnings in the two employment statuses; and the error terms, u_i^c, u_i^{nc} are assumed to be approximately normally and independently distributed with variances $(\sigma^c)^2, (\sigma^{nc})^2$ after correcting for potential selectivity bias. If there is selectivity bias, the conditional expectations of the errors are not zero; they are equal to:

(2a) $E(u_i^c / I_i = 1) = -\phi(I_i) / \Phi(I_i)$, and

(2b) $E(u_i^{nc} / I_i = 0) = \phi(I_i) / (1 - \Phi(I_i))$.

(Heckman, 1974), where ϕ and Φ are, respectively, the normal density and cumulative distribution functions, both evaluated at I_i, the probit indicator function given by:

(3) $I_j = \gamma_0 + \gamma_1 X_i + \gamma_2 Z_i^c + \gamma_2 Z_i^{nc} + \gamma_2 Z_i + \varepsilon_i$.

Following Heckman (1974), refined by Lee (1978), the estimation of this model follows a two-step procedure. In the first step, a probit corresponding to equation [3] is estimated using the complete set of explanatory variables in the model. The estimated coefficients from the probit measure the effects of human capital and other variables on the probit indicator function representing the selection of individuals into and out of contingent employment status. (To obtain the estimated effect of these variables on the probability of contingent work, the probit

indicator function must be substituted into the normal cumulative distribution function.). They are also the basis for estimating inverse-Mills ratios:

(4a) $IMR_i^c = -\phi(I_i)/\Phi(I_i)$,

(4b) $IMR_i^{nc} = \phi(I_i)/(1-\Phi(I_i))$.

In the second step, the inverse-Mills ratios are included as explanatory variables, together with X_i, Z_i^c and Z_i^{nc} in the corresponding earnings equation. To improve efficiency, we estimated the probit equation and the two earnings equations jointly, using the maximum likelihood method.

Following the Mincerian approach typically used in modeling earnings, the earnings variable is expressed in log form, and the human capital variables include years of post-secondary schooling (ED), work experience (EXP), and experience-squared (EXPSQ). The Z_i^c and Z_i^{nc} variables also include years since immigration (YSI), Sex (SEX=1 if male, 0 if female), and dummy variables for the 1997 and 1999 survey years (YEAR97 and YEAR99; the default year is 1995). The variables in the Probit regression include, in addition to the human capital variables, SEX, and year-of-survey dummies; and marital status (MARST=1 if married with spouse present, 0 otherwise). Central to the analysis, the regression includes dummy variables for years since immigration (0 to 5 years, 6 to 10 years, 11 to 15 years; the default category is > 15 years).[2]

FINDINGS

We present our findings in two parts:

(1) The results of the probit estimation of contingent status (corresponding to Equation 3);
(2) Estimates of log earnings conditional upon contingent and core status (Equations 1a and 1b).

Contingent Status Probit Regression. The results of our probit estimation of contingent-worker status appear in Table 2. Panel A of Table 2 presents findings from the full sample of 7,568 individuals. Panel B presents findings for the subsample of 1,406 individuals for whom earnings data are available (i.e., those included in the second-step estimation). Qualitatively, the results from the two probit equations are identical (with the exception of the intercept term). The Chi-squared statistics reported at the bottom of the Table indicate that both explain a significant amount of the variation in contingent status in these worker samples. We focus our analysis on the full-sample results.

TABLE 2 ABOUT HERE

[2] YSI was used instead of years since immigration dummy variables in the earnings regressions because of the relatively small sample of individuals for which the Contingent Worker Survey provides earnings data, which resulted in small numbers of workers in each of the years-since-immigration categories. When we replaced YSI with the three dummy variables in the earnings regressions, all three were insignificant.

Recent foreign born (those in the U.S. for 5 years or fewer) are significantly more likely to be observed in a contingent work status than natives or foreign born who have been in the U.S. longer than 15 years. The estimated coefficient on the 0-to-5-year dummy variable (0.527) is positive and significant at well below the .01 level. However, the years-since-immigration effect disappears completely after only 5 years. The estimated coefficients on the 6-to-10 and 11-to-15 year immigration dummy variables are not significantly different from zero.

As should be expected, human capital appears to be negatively associated with contingent status. Education is negatively associated with contingent status, although the effect of post-secondary schooling is statistically significant only in the earnings sample. Experience is negatively associated with contingent status, e.g., IT workers are less likely to be contingent as they accumulate work experience. The quadratic effect (EXPSQ) is positive but small, indicating that this negative experience effect is weaker at high experience levels. Otherwise, individuals who are married with spouse present are significantly less likely to be found in contingent work status than are unmarried workers or workers whose spouse is not present. Men are significantly less likely to be in a contingent work status than women.

There is some variation in the probability of contingent work status among the three survey years. Controlling for all other variables in the probits, there is no significant difference in the likelihood of contingent work between the 1995 and 1997 samples. However, *ceteris paribus*, the probability of contingent work status was lower in the 1999 sample. This suggests that, other things (including human capital and years since immigration) being equal, the incidence of contingent work may have decreased somewhat between 1997 and 1999.

Estimated coefficients on the corresponding variables in the probit indicator equation are difficult to interpret. To simplify interpretation, Table 3 presents the estimated probability of contingent work status for each of the years-since-immigration subgroups evaluated at the means of all explanatory variables. These were obtained by (1) inserting the estimated probit indicator equation into the normal distribution function; (2) estimating the probability of contingent work status after setting the years-since-immigration dummy variable to 1 for the 0-5-year group and 0 for each of the other two groups, and (3) repeating (2) for each of the remaining two years-since-immigration groups. This permits us to compare the probability of contingent work status between years-since-immigration groups, holding all other variables constant at their means—that is, for otherwise identical workers.

The findings in Table 3 indicate that the likelihood of contingent work status for foreign born who have been in the U.S. longer than 5 years is between .05 and .06 and is equivalent to that of natives. However, it more than twice as large—0.13—for the recent (0-to-5-year) foreign-born group.

TABLE 3 ABOUT HERE

Earnings Regressions Estimates. Before turning to the regression results, Table 4 establishes that there is a statistically significant difference in the average earnings between foreign-born

and native-born workers.[3] Before introducing controls, the nominal foreign-born wage is 17 percent greater that that of native-born workers. This finding is similar to that of a yet broader sample of highly skilled workers, e.g., the nominal earnings of all foreign-born scientists and engineers is also greater than that of the native born (Espenshade and Usdansky, 1999). Perhaps, the nominal earnings of the foreign born are greater because, on average, they are better educated than natives (see discussion).

TABLE 4 ABOUT HERE

However, we also wish to know whether otherwise similar foreign born and natives receive the same wage. We used the probit estimates summarized in Table 3 to control for selection into contingent work status while estimating the (log) earnings of workers in each of the two job statuses. This was accomplished by including inverse-Mills ratios (IMR) for contingent status as explanatory variables in the log earnings equations (1a-1b), and jointly estimating the contingent-status and earnings equations following the procedure suggested by Lee (1978). Intuitively, the IMRs control for the influence of individuals' ex-ante likelihood of being in a particular work status on their observed earnings in that status.[4]

Table 5 reports the results of the two earnings regressions. Panel A summarizes the estimated (log) earnings regression for contingent workers, while panel B presents the findings for core workers. Because earnings are expressed in log form, the estimated coefficients represent the percentage change in earnings associated with a 1-unit change in the associated explanatory (row) variable.

TABLE 5 ABOUT HERE

The standard human capital variables significantly explain earnings for either work status and in the expected direction. Years of post-secondary schooling have a significant positive effect on earnings (an increase of 11.5 percent per year of post-secondary schooling for contingent workers and 6.5 percent for core workers). Earnings increase by an estimated 10 to 13 percent per year of work experience for individuals in the two job-status groups, although at a (slightly) declining rate as experience increases.

Males have significantly higher earnings both as contingent and as core workers. Males earn 33 percent more than otherwise similar females in contingent IT jobs and 46 percent more in core jobs. There is no evidence of sample selection bias in this worker sample. The inverse-Mills ratios (IMRs) are not significantly different from zero in either of the two earnings equations. Lastly, and importantly, although earnings for core workers increased significantly (by 18.5 percent) between 1995 to 1997 and 1999, there was no significant change in contingent-worker earnings over this period.

[3] The size of the earnings sample is sufficient for a combined analysis of the foreign born, but too small to reliably estimate earnings within core or contingent status by foreign born year of entry into the United States (i.e., 175 foreign- and 1231 native-born workers).

[4] If the estimated coefficient on the IMR in an earnings regression is not statistically significant, we can conclude that sample selectivity bias is not a concern (i.e., we fail to reject the null hypothesis of zero selectivity bias; see Lee, 1978).

As for the effect of foreign-born status, there is no evidence that earnings increase with years since immigration for either contingent or core workers. These results of no difference in earnings for otherwise similar workers hold for a combined sample of all IT workers, as well as, when slope intercepts are used for year-of-immigration for foreign born (instead of YSI, results not shown here).[5] In short, the nominal wage advantage of foreign born over natives disappears after controls are introduced. Thus, the effect of foreign-born experience on earnings operates entirely through the effect of recent immigration on a disproportionate selection into contingent work status.

And the effect of working in contingent jobs is to significantly lower earnings even among otherwise similar workers. Table 6 reports expected weekly earnings for IT workers with the average characteristics in the sample and controlling for contingent-work status. Expected weekly earnings are $389 for contingent workers and $570 for core workers. That is, earnings are 46 percent higher for core than they are for contingent workers. This difference is significant at well below the .01 level.

TABLE 6 ABOUT HERE

CONCLUSIONS

The information technology sector is similar to older sectors of the labor market with a clearly identifiable and equivalent share of lower-end contingent jobs. While we use the BLS's most expansive measure of contingency, this remains a conservative measure of contingent status when compared to other measures in the literature. Even so, we find that among average workers about 5 percent of natives but 13 percent of recently arrived foreign born are found in contingent work where earnings are substantially less than in the IT core.[6]

Yet, it appears that only the recently arrived foreign born are so affected. In fact, there does not appear to be an assimilation effect on foreign-born workers' contingent status. Foreign born who have more than five years of U.S. experience are no more likely to be contingent workers than are natives, whereas the assimilation cross-over typically occurs only after 10 or 15 years. Moreover, and controlling for selection into contingency, years since immigration do not significantly affect IT worker earnings. But if the foreign born earn the same as comparable natives regardless of job segment, or year in country, the expected earnings of many unlucky recent foreign born are 46 percent lower than in the IT core.

U.S. Policy and the Foreign-born Temporary Worker. These patterns suggest several things about U.S. immigration policy. First, immigration policies appear to impact the IT sector most especially due to of a sizable supply of temporary specialty visa workers (H-1Bs) during our time frame. Consider their impact on the two central IT occupations (Ellis and Lowell 1999). There were a total of 375,000 foreign-born workers in the central IT workforce as of 1999 while demographic estimates place the numbers who were H-1Bs at roughly 255,000 workers (Lowell

[5] As in the analysis of contingent status we introduced year since entry dummy variables for the combined sample. We also tried a combined foreign-born dummy variable that also remained statistically insignificant.

[6] Our research found than nearly one-fifth of recent arrivals were in contingent jobs as of 1997. Perhaps this parallels the fact the relative share of contingent IT jobs also decreased 1997 to 1999.

2000). Again the H-1B visa is for six years, so they are evidently the predominant supply of recently arrived foreign-born IT workers. These H-1B workers obviously might be expected to more likely to be placed in temporary jobs. At the same time, their labor market power is reduced because they are effectively tied to a single employer during their visa stay which may increase the likelihood that they are exploited (Lowell 1999).[7]

Secondly, it suggests that the IT industry is unique in that otherwise similar workers, be they foreign or native born, earn the same. This is not the case 1970-1997 among all scientists and engineers where foreign-born nominal wages also exceed those of natives, but after introducing controls the foreign-born *ceteris paribus* wage is less (Espenshade and Usdansky, 1999). In the IT industry by way of contrast, our findings suggest no *ceteris paribus* wage differential. Perhaps, this is because growth in the IT sector itself was rather remarkable during the period we analyze and that militated against differential treatment. And perhaps, U.S. immigration policy works well in so far as it requires employers of new foreign born workers to pay the sector's "prevailing wage" which these results suggest they do.

Finally, not only are recently arrived foreign born more likely to be contingent workers where earnings are lower, the contingent sector has not experienced earnings growth. While core IT workers enjoyed a substantial 19 percent earnings growth between 1995 and 1999, earnings of contingent workers were stagnant over this period. All together, the findings of this research support the proposition that even in highly skilled occupations such as information technology the foreign born are disproportionately found in lower-paying contingent jobs. However, foreign-born characteristics *per se* appear to play a secondary role in this outcome. Government foreign-born admission policy and the large supply of temporary visaholders appear to play an important part in the creation of this particular labor market segmentation.[8]

[7] Unfortunately, the CPS only permits us to measure in 5-year increments, but the conclusion is only strengthened thereby.

[8] It would be reasonable to counter that only between one-seventh and one-fifth of recent foreign born are found in contingent jobs 1997-1999. But for several reasons the share of H-1Bs in contingent jobs is likely to be much greater and a 46 percent wage differential between job segments says nothing good about labor standards. Clearly, policies that target contingency are needed to set a level playing ground for the majority of IT employers who are good actors.

REFERENCES

Barker, Kathleen and Kathleen Christensen, eds. 1998. *Contingent Work: American Employment Relations in Transition*. Ithaca: ILR Press.

Belous, Richard S. 1989. *The Contingent Economy: The Growth of the Temporary, Part-time and Subcontraced Workforce*. Washington, D.C.: National Planning Association.

Bernasek, Alexandra and Douglas Kinnear. 1999. "Workers' Willingness to Accept Contingent Employment." *Journal of Economic Issues* 33 (2) (June): 461-469.

Bureau of Labor Statistics, U.S. Department of Labor. 1999. *Contingent and Alternative Employment Arrangements*. Available: http://stats.bls.gov/news.release/conemp.nws.htm.

Carré, Françoise J. 1992. "Temporary Employment in the Eighties." Pages 45-88 in *New Policies for the Part-Time and Contingent Workforce*, Virginia L. duRivage (ed.), Armonk, NY: M.E. Sharpe.

Chiswick, B.R. 1978. "The Effect of Americanization on the Earnings of Foreign-born-Born Men." Journal of Political Economy 86(5):897-921.

DOC (U.S. Department of Commerce). 1999. *The Emerging Digital Economy, II*. U.S. Washington, D.C.: Department of Commerce, http://www.ecommerce.gov.

Dickens, William T. and Kevin Lang, 1985, A Test of Dual Labor Market Theory, American Economic Review 75:792-805.

duRivage, Virginia L. 1992. *New Policies for the Part-time and Contingent Workforce*. Armonk, NY: M.E. Sharpe.

Ellis, Richard and B. Lindsay Lowell. 1999. "Foreign-born-Origin Persons in the U.S. Information Technology Workforce," Report III of the IT Workforce Data Project, www.uefoundation.org.

Espenshade, Thomas and Margaret Usdansky. 1999. "Migration of the Highly Skilled: Foreign-born Born Scientists and Engineers in U.S. Labor Markets." Paper presented at the meetings of the Population Association of America, New York, March .

Freedman, Audrey. 1985. The New Look in Wage Policy and Employment Relations. Conference Board Report No. 865. New York: The Conference Board.

Heckman, J., 1974, Shadow Prices, Market Wages, and Labor Supply, Econometrica 42:679-94.

Hipple, Steven. 1998. "Contingent Work: Results from the Second Survey." *Monthly Labor Review* 121 (11) (November): 22-35.

Lee, Lung-Fei, 1978, Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables, International Economic Review 19:415-33.

Lowell, B. Lindsay. 1999. "Skilled Temporary and Permanent Immigration to the United States," in Research on Immigration and Integration in the Metropolis, http://riim.metropolis.net/Virtual%20Library/1999/wp99S2.pdf.

— 2000. "H-1B Temporary Workers: Estimating the Population," A Report for the Institute of Electrical and Electronic Engineers, http://www.ieeeusa.org/grassroots/immreform/h1breport.pdf.

Mincer, Jacob. 1974, Schooling, Experience, and Earnings (Columbia University Press, New York).

Nardone, Thomas J, Jonathan R. Veum, and Julie Yates. 1997. "Measuring Job Security." *Monthly Labor Review* 120 (June): 26-33.

Nollen, Stanley D. and Helen Axel. 1996. *Managing Contingent Workers: How to Reap the Benefits and Reduce the Risks*. New York: Amacom.

Piore, M.J., 1979, *Birds of Passage: Migrant Labor in Industrial Societies* (Cambridge University Press, Cambridge).

Polivka, Anne E. 1996 "A Profile of Contingent Workers." *Monthly Labor Review* 119 (October): 10-21.

Polivka, Anne E. and Thomas Nardone. 1989. "On the Definition of 'Contingent Work.'" *Monthly Labor Review* 112 (December): 9-16.

Spalter-Roth, Roberta and Heidi Hartmann. 1998. "Gauging the Consequences for Gender Relations, Pay Equity, and the Public Purse." In *Contingent Work*: *American Employment Relations in Transition*, Kathleen Barker and Kathleen Christensen, eds. Ithaca: ILR Press, 69-102.

U.S. General Accounting Office (GAO). 1991. *Workers at Risk: Increased Numbers in Contingent Employment Lack Insurance, Other Benefits.* Report to the Chairman, Subcommittee on Employment and Housing, Committee on Government Operations, House of Representatives. Washington, D.C.: U.S. General Accounting Office, 1991.

Women's Bureau, U.S. Department of Labor. 1988. Flexible Workstyles: A Look at Contingent Labor: Conference Summary. Washington, D.C.

Table 1. Descriptive Statistics on Variables

Variable	Description	Mean	Std. Dev.
CONT3	Contingent Job ("3rd" Definition)*	0.06	0.23
YEAR97	1997 CPS (1995 omitted category)	0.32	0.47
YEAR99	1999 CPS (1995 omitted category)	0.34	0.47
EXP	Years of Labor Force Experience	31.41	11.09
YSI	Years Since Immigration	2.12	7.16
D0TO5	0 - 5 Years Since Immigration**	0.02	0.14
D6TO10	6 - 10 Years Since Immigration**	0.03	0.16
D11TO15	11-15 Years Since Immigration**	0.01	0.11
SEX	Sex	0.70	0.46
ED	Years of Education	2.10	2.12
MARST	Marital Status (Single omitted)	0.63	0.48
EARN	Hourly Earnings, Dollars	131.95	355.22

N = 7,568

* Using the BLS most expansive definition, see text in literature review.

** Omitted category is 16 years or more since immigration

Table 2. Probit Regression Estimates of Contingent Status Model

	Full Sample		Earnings Sample	
Variable	Estimated Coefficient	T-Statistic	Estimated Coefficient	T-Statistic
YEAR97	-0.023	-0.404	-0.100	-1.124
YEAR99	-0.142	-2.411	-0.290	-3.196
EXP	-0.064	-6.394	-0.068	-4.289
EXPSQ	0.001	6.115	0.001	4.073
D0TO5	0.527	3.919	0.356	1.918
D6TO10	0.010	0.066	0.002	0.008
D11TO15	0.083	0.409	0.237	0.758
SEX	-0.098	-1.925	-0.452	-5.587
ED	-0.016	-1.299	-0.036	-2.011
MARST	-0.249	-4.796	-0.279	-3.512
CONSTANT	-0.291	-1.794	1.204	4.634
Log likelihood function	-1575		-792	
Restricted log likelihood	-1637		-843	
Chi-squared	124		102	
Degrees of freedom	10		10	
Number of Observations	7568		1406	

Panel A reports results from the full sample. Panel B reports results from the subsample of individuals for which earnings data are available.

Table 3. Mean Weekly Earnings, Foreign born and Natives

	Mean	SD
Foreign-borns	816.33	592.70
Natives	695.15	505.22
t-test for difference in earnings between 2 groups:	2.57	

Table 4. Estimated Probability of Contingent Employment, by Years Since Immigration, Full Sample

Years Since Immigration	Estimated Probability*
0 to 5	0.13
6 to 10	0.05
11 to 15	0.06
> 15	0.05

*Evaluated at Means of All Other Variables

Table 5. Selectivity-Corrected Estimates of Contingent and Core Worker Log Weekly Earnings Equation

	Contingent		Core	
Variable	Estimated Coefficient	T-Statistic	Estimated Coefficient	T-Statistic
Constant	3.240	11.790	4.239	7.200
YEAR97	-0.026	-0.250	0.054	0.762
YEAR99	-0.032	-0.237	0.185	2.250
EXP	0.129	4.151	0.101	4.961
EXPSQ	-0.002	-3.937	-0.002	-5.544
YSI	0.002	0.352	0.005	1.245
SEX	0.334	2.046	0.461	4.006
ED	0.115	4.804	0.065	4.611
IMR	0.178	0.405	-0.036	-0.095
R-Square	0.292		0.139	
Mean Log of Earnings:	5.964		6.345	
Number of Observations	404		1002	

Table 6. Expected Weekly Earnings for a Person with the Average Characteristics in the CPS S&E Sample, by Employment Status

Contingent	Core	% Difference between Contingent and Core Workers
$389.08	$569.56	46.38%

*Evaluated at the full-sample (N=7,568) mean of all other explanatory variables in earnings regressions

Appendix. Table 1. Occupations in Information Technology.

55	Engineers, Electrical and Electronic
64	Computer Systems Analysts and Scientists
129	Computer Science Teachers
213	Electrical and Electronic Technicians
228	Broadcast Equipment Operators
229	Computer Programmers
304	Supervisors, Computer Equipment Operators
306	Chief Communications Operators
308	Computer Operators
347	Office Machine Operators, n.e.c.
353	Communications Equipment Operators, n.e.c.
385	Data-Entry Keyers
523	Electronic Repairers, Communications and Industrial Equipment
525	Data Processing Equipment Repairers
527	Telephone Line Installers and Rapairers
529	Telephone Installers and Rapairers
533	Miscellaneous Electical and Electronic Equipment Repairers
538	Office Machine Repairers
555	Supervisors, Electricians and Power Transmission Installers
575	Electricians
576	Electrician Apprentices
577	Electrical Power Installers and Repairers
683	Electrical/Electronic Equipment Assemblers

Note: Occupations and occupational codes available from the Current Population Survey.