Temporary Employment and Strategic Staffing in the Manufacturing Sector

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While prior research has identified different ways of using temporary workers to achieve numerical flexibility, quantitative analysis of temporary employment has been limited to a few key empirical indicators of demand variability that may confound important differences. Our analysis provides evidence that many manufacturers use temporary workers to achieve what we call planned and systematic numerical flexibility, rather than simply in a reactive manner to deal with unexpected problems. Although temporary work may provide many benefits for employers, a key function appears to be the provision of numerical flexibility *not* to buffer core workers but to externalize certain jobs.

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A preponderance of quantitative evidence indicates that the dramatic growth in temporary employment in the US during the 1980s and 1990s did not reflect a change in workers' preferences but was largely employer-driven (Estevão and Lach 2000, Ono and Zelenev 2003). Employers have turned to temporary work arrangements primarily to achieve numerical flexibility (Houseman 2001, Kalleberg et al. 2003, Uzzi and Barsness 1998). Usually operationalized as demand volatility, numerical flexibility is represented by various measures of industry seasonality and cyclicality (Abraham 1990, Houseman 2001, Kalleberg, et al. 2003). Numerical flexibility, however, is a heterogeneous concept that includes everything from replacing temporarily absent employees to permanently temping out entire positions.

In this paper, we analyze the determinants of use, intensity, and form of use of temporary workers by Wisconsin manufacturers. We differentiate three ways in which temporary employment can be used to achieve numerical flexibility: reactive use, where temps are used to deal with unexpected fluctuations in demand; planned use, to buffer regular employees, accommodate expected fluctuations, or screen for regular employment; and systematic use, to permanently staff positions with temporary workers. Our results provide evidence that temporary contracts are used to achieve planned and systematic numerical flexibility.

Alternative uses of temporary contracts for employers

Prior to the 1980s, the temporary help services (THS) industry was very sensitive to business cycles, and the industry remains cyclically responsive (Segal and Sullivan 1997). However, the THS industry experienced counter-cyclical growth during the 1981-

83 recession, and only a modest slowdown followed by employment growth during the early 1990s' recession (Theodore and Peck 2002). Although the THS industry did experience substantial job loss during the 2001 recession, the earlier patterns suggest it has moved beyond its "'shock absorber' function," with "some occupational niches … becoming 'temped out' on a continuing basis" (Theodore and Peck 2002: 470-71). Likewise, the manufacturing sector in the 1990s saw increased output with an absolute decline in employment, "suggesting a dramatic structural change in manufacturers' hiring behavior" (Estevão and Lach 2000: 137).

Seeking to differentiate the numerical flexibility hypothesis, we begin by reworking Christensen's (1998) distinction between crisis-driven (reactive) and strategic (proactive) approaches to temporary employment. *Reactive* numerical flexibility includes filling in for temporarily absent regular employees and using temps as a stopgap, short-term measure to deal with unexpected fluctuations in employment or demand. More strategically, *planned* numerical flexibility includes using temporary contracts to screen for regular employment and two short-term adjustment strategies: to deal with expected or regular fluctuations (to avoid having to staff peak demand) and to buffer core workers. Not staffing to peak and buffering are often conflated but are based on distinct goals. Finally, *systematic* numerical flexibility is a longer-term strategy that targets specific jobs or job categories for permanent staffing by temporary workers.

Reactive and planned approaches involve a short-term use of temps to fill *regular positions in irregular times* such as sickness, peak demand or a probationary period. A systematic approach to numerical flexibility involves a long-term use of *temporary positions in regular times*. In reactive and planned approaches, temps are used to fill in

for, augment, buffer or screen for otherwise regular positions. In systematic use, formerly regular positions are transformed into "market mediated" (Abraham 1990) employment relations by being permanently staffed with temporaries.

In the section that follows, we outline three sets of hypotheses that are derived from the literatures associated with each of these approaches to using temporary workers. Because the logic behind using temporary workers is different and sometimes contradictory from one approach to another, some organizational and labor market traits lead to opposing hypotheses. We draw out these differing perspectives and look at the overall weight of evidence that can be associated with one approach versus another. After reviewing the data and our empirical results, we discuss the implications of our findings for adjudicating between the uses of the temporary employment relationship.

Hypotheses

Reactive numerical flexibility

We identify four sets of special or unexpected circumstances that may induce employers to use temps in a reactive or ad hoc manner: low or high local unemployment rates, labor shortages, high turnover rates, and layoffs. In soft labor markets, where there is increased likelihood that workers will turn to temporary work, employers may react by using more temps (Uzzi and Barsness 1998). On the other hand, in tight labor markets, establishments may have trouble finding regular workers and thus turn to temporary workers as a stop-gap solution. These arguments suggest a nonlinear relationship between unemployment rates and use of temporary workers. We therefore test *Hypothesis 1: Plants facing either very tight or very soft labor markets are more likely to use*

temporaries.

Establishments may also have trouble finding regular workers because of problems with their normal recruiting methods, skills mismatch, and/or lack of interest by full-time job seekers in their firm or industry. Kalleberg et al. (2003) find a negative association between *perceived* labor shortages and use of temps, but they suggest a more targeted measure of labor shortage might produce a different result. We use direct measures of unfilled regular openings to test the hypothesis that temporary agencies and direct-hire temporary arrangements may provide an ad hoc solution to *actual* plant-specific labor shortages. Thus, we propose *Hypothesis 2: Employers who report difficulty hiring regular workers are more likely to use temps.*

Labor turnover problems provide another situation that may lead to crisis-driven use of temps. Again, the ready supply of workers available from temp agencies provides a short-term solution to employers experiencing high turnover rates.[1] Thus, *Hypothesis 3: Firms with higher turnover rates are more likely to use temps.* Finally, Christensen (1998), argues that a crisis-driven model implies a positive association between layoffs and use of temps. Struggling establishments and myopic cost cutters may shed regular workers and then have to hire temps to get the work done, suggesting *Hypothesis 4: The number of layoffs is positively associated with use of temps.*

Planned numerical flexibility

Our hypotheses on planned flexibility are based on three variables: turnover rates, layoffs, and demand variability. Hypotheses 3 and 4 proposed a positive relationship between use of temps and, respectively, the turnover rate and number of layoffs in a firm.

These same variables, with the sign of association reversed, form the basis of Hypotheses 5 and 6. If temps are being effectively used to screen workers, we should see reduced turnover in the regular workforce. Thus, *Hypothesis 5: Plants with lower turnover are more likely to use temporary workers*. A second form of planned numerical flexibility is use of temps to buffer core workers from downturns (Abraham 1990), which generates a prediction of reduced layoffs (Gramm and Schnell 2001). Therefore, we propose *Hypothesis 6: The number of layoffs is negatively associated with use of temps.* A potentially complementary, but distinct form of planned numerical flexibility is not staffing to peak, which leads to the expectation temps will be used more in volatile industries (Abraham 1990, Houseman 2001, Kalleberg, et al. 2003). Thus *Hypothesis 7: Plants with variable demand are more likely to use temps.*

Systematic numerical flexibility

If use of temps is perceived by employers as providing competitive advantages *and* is widespread among competitors, then employers may be expected to imitate such a strategy (DiMaggio and Powell 1983). Given the explosive growth in temporary employment and its widespread prevalence in our data, we expect that employers with greater ability to pursue systematic numerical flexibility will do so. Systematic use of temporary contracts is a complicated endeavor in which specific jobs or job clusters must be assessed, targeted and perhaps reorganized to be temped out on a permanent basis. We therefore base our hypotheses on the assumption that this strategy requires organizational and financial resources, and plants with such resources will avail themselves of this strategy. Having controlled for key variables, then, we expect that if systematic numerical

flexibility is a central reason employers use temporary contracts, their use will be positively correlated with key organizational resources. Superior organizational resources should not be related to use of temps if such is primarily for reactive or planned flexibility; simply filling in for or expanding the regular workforce should not require any particular organizational resource. Our hypotheses on systematic flexibility are based on four variables: being part of a larger organization, having a human resources department, establishment growth, and percentage of skilled employees.

Being part of a larger organization provides branch plants with superior resources. Osterman argues that branch plants are more likely to adopt flexible work practices because they receive more technical assistance and better information (1994: 180). Thus, branch plants are more able to pursue the complex strategy of systematic numerical flexibility. If the primary use of temps is for simpler reactive or planned flexibility, then independent establishments would be equally likely to use temps. We therefore test *Hypothesis 8: Branch plants are more likely to use temps.*

The same logic holds for establishments with human resource departments. The core function of the HR office has been transformed from an administrative to a strategic role focused on operational effectiveness (Mohrman and Lawler 1997). One priority of HR departments is “adopting measures to increase the flexibility of the workforce” (Gutierrez 1995: 25), suggesting *Hypothesis 9: Establishments with HR departments are more likely to use temps.*

Establishment growth is another characteristic that provides plants with more resources to implement a systematic flexibility model. Lack of growth is one indicator of struggling plants that may be unable to engage in strategic planning. While growing

plants may be resource-constrained during periods of accelerated growth, such growth also confers clear benefits in terms of a steady stream of revenue, less uncertainty about the future, and mid-term organizational slack. This reasoning suggests *Hypothesis 10: Establishment growth is positively associated with use of temporary workers.*

Davis-Blake and Uzzi (1993) find that establishments with higher levels of firm-specific training are less likely to use temps. Following similar logic, we test the argument that the more skilled positions in the workforce, the fewer peripheral, unskilled jobs available to be permanently temped out. Thus, *Hypothesis 11: The percentage of skilled employees is negatively associated with use of temps.* The hypotheses are summarized in Table 1, which presents them in relation to the types of numerical flexibility.

[TABLE 1 ABOUT HERE.]

Data and method

We use data from a 1998 telephone survey of Wisconsin manufacturing establishments to test the hypotheses. The stratified random sample for the telephone survey was drawn from a purchased database compiled by Wisconsin Manufacturers and Commerce, the statewide manufacturers' association. The population includes all establishments registered with the Wisconsin Department of Workforce Development for Unemployment Compensation purposes (the ES-202 file; n=10,488). After removing from the sampling population plants with fewer than ten employees, the remaining establishments were divided by their county address into metropolitan and nonmetropolitan locations and each group was stratified by establishment size (number of employees). Because of our belief that unique characteristics of the establishments

(location, size, labor market conditions) influence their employment, we did not control for multiple branches of single firms in our sample.

Nonmetropolitan establishments and large establishments were over-sampled to provide sufficiently large numbers for analyses. Random samples were drawn within each location-size stratum. In all, 1,003 establishments were interviewed. Statistical weights adjust for the disproportional sampling and, when used, allow results to accurately reflect the population of Wisconsin manufacturing establishments with 10 or more employers, with a three percent margin of error.[2] The descriptive measures presented below are weighted to accurately represent the population, but the regression models are unweighted because they contain adequate control variables (firm location and size). The industrial representation of the sample strongly resembles that of the population of manufacturers. The distributions differ by more than 1 percentage point for only a few SIC codes.[3]

The survey was conducted by the University of Wisconsin Survey Center in Madison in the first half of 1998. Interviewers asked to speak to the person in charge of hiring production workers at the sampled site. In most cases, this was the human resource director or personnel manager. The interviews took an average of 18 minutes, and the final response rate was 69 percent.[4] The reference year for the questions was 1997.

Although Wisconsin's economy bears similarities to national profiles, certain characteristics distinguish Wisconsin from other states. Throughout the 1990s, Wisconsin's economy was particularly robust. Unemployment rates were among the lowest in the country, falling to a record low of 3.3% in early 1998 when the phone survey began, compared with 4.6% for the entire US (seasonally adjusted rates for

Jan.1998; Wisconsin Department of Workforce Development, 1999). Manufacturing was unusually strong in Wisconsin at this time. In 1996, Wisconsin ranked second in the nation in the share of non-farm workers employed in manufacturing; 23% of Wisconsin's workers were in this sector compared with 15.2% nationwide (US Census). The state's labor force is also distinctive in that only 7.2% is nonwhite (about half these are African-American), and women are highly involved in the labor force (representing 47% of the workforce). Only two-thirds of the state's population resides in metro areas, compared with 80% nationally. These factors may limit the generalizability of the findings to other states with similar demographic and economic characteristics. However, this dataset provides unique detail about the use of temporary workers within manufacturing, allowing comparisons of labor utilization strategies among establishments with similar needs for workers.

Statistical models and dependent variables

Three main regression models are estimated. First, a probit model using maximum likelihood estimation predicts the effect of the independent variables on whether or not an establishment used temporary employees in the survey year. "Temporary employees," the dependent variables in all the models, is a binary variable coded 1 if the establishment had any direct-hire or THS agency temporaries. Second, two tobit models estimate the association between the independent variables and the percentage of all production workers who are temporary employees.[5] A two-limit tobit model, used because observations may be censored at 0% or 100%, is based on the sample of all manufacturing establishments; a one-limit tobit model is used for a subsample of

establishments that used temps in 1997, where observations may be censored at 100%. For the subsample of plants that used temps, we also provide OLS estimates to ease interpretation of the results. Models with both the full sample and the truncated sample are estimated to see whether the relationships change when only those plants that use temps are included.

Independent variables

Unless otherwise noted, all variables come from Tigges's survey of Wisconsin manufacturers. The civilian labor force unemployment rate (H1), taken from the Local Area Unemployment Statistics (LAUS) of the US Department of Labor and measured at the county level, is the 1997 annual average, not seasonally adjusted. To test a nonlinear association we created two binary variables, coded as 1 if a county unemployment rate is either one standard deviation above (high=5%) or below (low=2.64) the mean unemployment rate across counties. Throughout, we use the term "regular" to refer to full- and part-time production employees or positions, as distinguished from temporary workers or positions. We use two separate measures of difficulty hiring (H2): the number of days it took to fill the last regular position, and the number of unfilled regular openings in the survey year. The turnover rate (H3; H5) and number of layoffs (H4; H6) refer to regular employees in the survey year. Variable demand (H7) is measured by two variables, industry seasonality and industry cyclicality, created by Kalleberg and Reynolds (2000) using BLS nonfarm employment data from 1974 to 1994.[6] Establishment growth (H10) is measured using the natural logarithm of the total number of regular openings in the previous year. Net of any hiring problems, the number of

regular openings is a proxy for plant growth. Independent plant status (H8) and presence of a HR department (H9) are both binary variables coded as 1 if yes. Percentage of skilled employees (H11) is calculated as the number of skilled regular workers divided by total number of regular workers.

Controls

Davis-Blake and Uzzi (1993) find that large establishments are less likely than small establishments to use temps, while others find positive associations between plant size and use of temps (Houseman 2001, Kalleberg and Reynolds 2000, Uzzi and Barsness 1998). Establishment size is measured as the natural logarithm of the total number of regular production workers employed in 1997. Prior research on the relationship between unionization and use of temps has focused on unionization *levels* within establishments (Abraham 1988, Gramm and Schnell 2001, Houseman 2001, Uzzi and Barsness 1998). Only Kalleberg et al. (2003) test whether the *presence* of a union affects the use or intensity of use of temporary workers, finding a positive association. We control for union presence, a binary variable coded as 1 if yes. Because women and minorities have historically been disproportionately concentrated in temporary jobs (Callaghan and Hartmann 1991), we control for the proportions of production workers who are female or minority. Finally, we control for two variations in labor market structure: urban/rural location (metropolitan location coded as 1 if yes) and the extent to which women are integrated into the workforce (county female labor force participation rate, according to the 1990 US Census).

[TABLES 2 AND 3 ABOUT HERE.]

Results

Table 2 presents the unweighted means and standard deviations of the independent and control variables used in the multivariate analyses. Table 3 presents weighted, detailed statistics regarding workforce composition among Wisconsin manufacturing establishments. Across all manufacturers, 13% of the production workforce held temporary positions in 1997, compared with 21% among the subset of establishments that used temporary workers.

Table 4 presents the probit regression model estimating the probability that an establishment used any temporary employees, including coefficients and marginal effects calculated at the means of the independent variables. Table 5 presents regression models predicting the percentage of production employees in temporary positions; Model 1 is a tobit model including all establishments and Model 2 presents both tobit and OLS models containing only plants that used temps. The results presented in these models provide little support for the hypotheses relating to reactive use of temps (H1-H4). There are no statistically significant relationships in any of these models between use of temps and the unemployment rate (H1), the turnover rate (H3), or the number of layoffs (H4). Of the reactive hypotheses, only H2, that temp use is related to difficulty hiring workers, receives some support. The more days to fill the last regular position, the higher the probability of using temps and the larger percentage of temporary positions. Roughly, for establishments average on all characteristics, an additional ten days to fill the last regular position brings a one percent increase in the probability of using temps. Among plants that use temps, each additional ten days to fill the last position increases the percentage of temps by one point.

[TABLES 4 AND 5 ABOUT HERE]

Results in Tables 4 and 5 fail to provide support for strategic use of temps to recruit and screen employees: use of temporaries is not inversely related to the turnover rate (H5). Employers may be using temps to screen workers, but our evidence does not suggest that temporaries are being used effectively as a screening and recruiting method to reduce turnover. Similarly, use of temps is not inversely related with layoffs, thus our results fail to show that temps are used strategically to buffer regular employees (H6). This appears to contradict Wenger and Kalleberg's (2006) finding that temps are used, in the aggregate, as a "buffering" mechanism. However, the difference is terminological: they use the term buffering to refer to what we are calling systematic numerical flexibility, that is, the ability to adjust the workforce as needed. We reserve the term buffering for protecting a core workforce from layoffs.

Tables 4 and 5 provide evidence for our argument that buffering core workers and staffing peak demand with temps are distinct uses. Although the buffering hypothesis is not supported, there is some support for H7, which predicts that use of temporaries is more likely in industries with variable demand. In particular, use of temps and percentage of temps are both higher in more seasonal industries, though not in more cyclical ones.

Our results for models analyzing use of temps (Table 4) provide broad support for the four hypotheses regarding systematic numerical flexibility (H8-11). Establishment growth increases the likelihood of using temps. For a plant that is average on all characteristics, being an independent establishment decreases the probability of using temps by 8%. Having an HR department increases the probability of using temps by 12%, holding the other variables at their means. The percentage of skilled employees also

shows a significant negative association with the use of temps, though the magnitude is slight.

The first model in Table 5, predicting the percentage of temporary positions among all establishments, also provides support for three of the four hypotheses on systematic numerical flexibility. Consistent with H8-H10, the variables for growing establishments, branch plants and establishments with HR departments are all significant in the expected direction, indicating that plants with more resources more intensely use temporary contracts. Independent establishments have three percent fewer temporary production workers, and plants with HR departments have six percent more temps.

However, none of the systematic numerical flexibility hypotheses (H8-10) receive support in the second model in Table 5, which includes only establishments that use temps. This indicates that better organizational resources help discriminate between plants that use temps and those that do not, but are not related to intensity of use among plants that use temps. Combined with the lack of support for nearly all the hypotheses regarding reactive and planned use of temps – except partial support for H2 concerning difficulty hiring (reactive use) and H7 on not staffing to peak (planned use) – the results in Tables 4 and 5 provide broad support for the argument that manufacturers use temporary employment contracts as part of a strategy to systematically achieve numerical flexibility.

There a few more noteworthy results. Table 4 shows that for a plant average on all other characteristics, unionization decreases the probability of using temps by 55%. Union presence blocks the use of temps (Table 5, Model 1), but does not reduce the intensity of their use among manufacturers with temporary workers(Model 2). Further,

the percentage of minorities in the plant is significant in all models in Tables 4 and 5, indicating that minorities are positively associated with the probability and intensity of use of temps. The models in Table 5 also show a significant, negative association between plant size and intensity of use of temps. We interpret this simply as an effect of the numbers – two temps in a plant with 50 employees (4%) versus ten temps in a plant with 500 employees (2%) – and not as a theoretically interesting result.

Discussion

When asked directly about the relative importance of various reasons for using temps, nearly half of respondents indicate that filling in for temporarily absent employees is "not important" (full results available upon request). The two reasons employers cite most frequently for using temporary workers are, first, to adjust the size of the workforce to changing demands and, second, to identify good candidates for regular jobs. This contrasts with Houseman's (2001) survey, in which the three most commonly cited reasons are dealing with unexpected fluctuations in demand, filling in for temporary vacancies, and filling in for temporarily absent employees. Employers in Abraham's (1988) survey also predominately cite special projects and filling in for vacancies or absences. That is, whereas Abraham and Houseman's findings indicated a predominance of what we have termed *reactive* numerical flexibility, our results suggest a more proactive, strategic use of temporary workers, more in line with Kalleberg et al.'s (2003) finding that variable demand was the most common reason. These discrepancies are a bit curious. The Abraham survey is over 20 years old while the Houseman survey is nationally representative of private sector US establishments. Strategic use of temps to

screen workers and achieve numerical flexibility may have become more important over time, and may be more important in manufacturing because the sector tends to have higher paying jobs, is more highly unionized and more volatile than the service sector.

Our multivariate analyses also provide little support for hypotheses regarding reactive use of temps: temporary use is not positively associated with the area unemployment rate, the turnover rate or layoffs, though it is positively related to one measure of difficulty hiring. Further, our results do not support the hypothesis that temps are used to buffer the core workforce. When asked directly, two-thirds of our respondents who used temps reported that buffering regular workers was “not important” as a motivation for using temps, and the use of temps is not inversely related to layoffs in our regression models. While buffering is understood in most of the literature to be an important element of numerical flexibility, we think it has been too commonly conflated with using temps to staff peak demand. These are two potentially overlapping, but motivationally distinct uses of temporary positions. Consistent with our findings, using temps to staff peak demand may or may not also be intended to buffer regular employees from variations in demand.

Our analyses support the argument that employers are using temporary workers to achieve planned and systematic numerical flexibility. On planned numerical flexibility, the data indicate that employers are using temps so they do not have to staff to peak. On systematic flexibility, branch plants, establishments with a HR department, and growing organizations all have a higher probability of using temps; these are indicators of organizational resources giving plants greater ability to identify peripheral jobs that can be cost-effectively temped out on a permanent basis. If use of temps was restricted to

reactive and planned types of numerical flexibility, which are less resource intensive uses, then temp use should be equally likely across plants that vary on these characteristics. Similarly, establishments with more minorities are more intense in their use of temporary workers, which is noteworthy since a higher percentage of minorities among regular employees may indicate more jobs at the lower end of the queue (Tomaskovic-Devey 1993). Our finding regarding branch plants differs from two other studies where no association was found between being part of a larger organization and use of temps (Davis-Blake 1993, Kalleberg et al. 2003). Again, this may be due to our study's focus on the manufacturing sector, which might be more likely to pursue a systematic approach to numerical flexibility.

At the height of the boom in temporary work in manufacturing, Wisconsin manufacturers in 1997 were using temporary contracts to achieve numerical flexibility in planned and systematic ways, rather than simply as a stopgap measure to deal with variations in demand. For those workers with bargaining power, other forms of financial security and social support, or a desire to trade security and predictability for flexibility, temporary work may be very appealing. However, for the flexibility of temporary work to benefit workers, abundant work and financial security are necessary conditions (Henson 1996), and access to health insurance, pensions, and training are also important. The negative outcomes often associated with temporary work at the lower end of the job queue are not borne simply by individual workers.[7] Workers who are involuntarily in temporary positions and are without another source of income security must resort to state welfare benefits and income tax credits (Spalter-Roth and Hartmann 1998: 95). Employment regulation, which is still based on the norm of full-time employment with a

single employer, must be revamped in order to provide stability and security for temporary workers. This is particularly true to the extent that employers are using temporary employment to achieve systematic numerical flexibility by permanently staffing positions with temporary workers. Although our measures of the systematic flexibility model are indirect and imperfect, we hope to have provided an impetus for more research in this direction.

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[1] An anonymous reviewer pointed out, correctly, that the causality could also go the other way – turnover could be a response by regular workers to the signals employers send by using many temporary workers. This muddies our reasoning that a positive association between turnover and temps is an indicator of reactive use. While both directions are plausible, the fact that temporary work is largely an employer-driven phenomenon (Estevão and Lach 2000) leads us to think the more common case is where employers turn to temps because of labor shortage problems.

[2] The weights were developed by considering the proportion of establishments in the final sample to the total number of establishments within each stratum. There were two axes of stratification: Metropolitan/Nonmetroplitan location and establishment (employment) size. There were four establishment size groups (10-49, 50-249, 250-499, 500+) for each locational stratum. The stratified random sampling method provided equal number of cases of metropolitan and nonmetropolitan establishments, and a sufficiently large number of large sized firms in order to thoroughly investigate the use of temporary workers in both rural and urban locations.

[3] The survey data have a slightly higher percentage in the categories of lumber and wood products (SIC 24) and rubber and plastics (SIC 30) and a slightly lower representation in food (SIC 20), printing/publishing (SIC 27), non-electrical machinery (SIC 35), and miscellaneous manufacturing (SIC 39).

[4] This response rate compares favorably with 51% for the Upjohn survey (Houseman 2001), 65.5% for Osterman’s establishment survey (Osterman 1994), and 54.6% for the second National Organizations Study (NOS-II Kalleberg, et al. 2003).

[5] When an outcome is censored or truncated, OLS models may provide inefficient and inconsistent estimates (Long 1997). Tobit models allow for censored data, as in the case of percentages (censored from below at 0 and above at 100).

[6] Industry seasonality "is calculated by regressing the logarithm of monthly employment in the establishment's four-digit SIC code industry on month dummy variables and then finding the standard deviation of the set of 12 dummy variables." Industry cyclicality "is calculated by regressing the logarithm of change in monthly employment in the establishment's four-digit SIC code industry on the logarithm of the change in monthly nonfarm employment plus month dummy variables. The measure is the coefficient of the logarithm of the change in monthly nonfarm employment" (Kalleberg and Reynolds 2000: 161).

[7] Temporary work has been associated with stigmatization at work, insecurity, fragmentation of schedules (Henson 1996, Parker 1994) and psychological ill health (Martens et al. 1999).

Table 1. Expected relationships among explanatory variables and use of temporary workers

Reactive Use	Planned and Systematic Use
	Screen Employees
H1. Unemployment rate (+,-)	
H2. Difficulty hiring (+)	
H3. Turnover rate (+)	*H5*. Turnover rate (-)
	Buffer
H4. Number of layoffs (+)	*H6*. Number of layoffs (-)
	Not Staff to Peak
	H7. Variable demand (+)
	Systematic Numerical Flexibility
	H8. Part of larger organization (+)
	H9. Have HR department (+)
	H10. Growing plants (+)
	H11. Percentage skilled employees (-)

Note: The expected direction of a relationship is indicated with a plus sign (+) for positive associations and a minus sign (-) for negative associations. Competing hypotheses appear on the same row.

Table 2. Means, standard deviations, minimum and maximum values among the variables.

Independent variables	Mean	SD	Minimum	Maximum
High county unemployment rate	.134	.340	0	1
Low county unemployment rate	.165	.371	0	1
Turnover rate	10.156	7.470	0	100
Number of layoffs	4.712	30.665	0	580
Difficulty hiring: # unfilled regular openings	2.219	7.305	0	100
Difficulty hiring: # days to fill last regular position	29.091	48.894	0	730
Industry seasonality (1974-1994)	22.100	49.989	2.647	304.101
Industry cyclicality (1974-1994)	1.814	.926	-2.125	5.935
Growing establishment: total # openings (natural log)	27.925	56.883	0	600
Independent establishment (1=yes)	.432	.496	0	1
HR department present (1=yes)	.699	.459	0	1
Percent of regular production employees skilled	19.490	24.866	0	100
Control variables				
Plant size: number of regular employees	175.065	343.451	2	8100
Unionized workforce (1=yes)	.291	.455	0	1
Metro location (1=yes)	.545	.498	0	1
Female labor force participation rate (county, 1990)	59.839	4.035	44.462	69.356
Percent of regular (FTE + PTE) production workforce female	31.365	26.284	0	100
Percent of regular production employees minority	13.714	19.038	0	97.449

Note: SD = standard deviation.

Table 3. Descriptive statistics for Wisconsin manufacturers, 1997

	All Establishments	Plants that used temps (N=647)	Plants that did not use temps (N=356)
Workforce composition			
Percent of all employees female	26.59	28.17	23.97
Percent of all full-time employees (FTEs) female	24.67	25.11	22.94
Percent of all part-time employees (PTEs) female	38.30	40.23	34.38
Percent of all limited-term employees (LTEs) female	-----	31.87	-----
Percent of all employees minorities	17.03	20.17	11.72**
Percent of all FTEs minorities	14.76	16.89	11.55*
Percent of all PTEs minorities	10.11	12.91	4.41**
Percent of all LTEs minorities	-----	24.79	-----
Percent of plants that use:			
0% LTEs	33.81	-----	
1-99% LTEs	66.16	-----	
100% LTEs	00.03	-----	
Mean percent of production LTEs	13.09	21.21	
Mean of average length of LTE position (days)	-----	66.68	

Note: Differences in proportions for establishments that used temps versus those that did not are tested using a two-tailed t-test.
* $p < .05$; ** $p < .01$

Table 4. Probit regression estimating the probability that a manufacturing establishment in Wisconsin uses temporary employees

Variables	Coefficient	Control Variables	Coefficient
Low unemployment rate	.112	Plant size: number of regular	.113*
	(.156)	employees (natural log)	(.054)
	[.039]		[.041]
High unemployment rate	-.078	Unionized workforce (1=yes)	-.553***
	(.163)		(.110)
	[-.006]		[-.207]
Turnover rate	.008	Metro location (1=yes)	.012
	(.007)		(.118)
	[.003]		[.004]
Number of layoffs	-.002	Female labor force participation	-.053
	(.001)	rate (1990)	(1.661)
	[-.001]		[-.019]
Difficulty hiring: # unfilled	-.009	% regular production workforce	-.000
regular openings (natural log)	(-.010)	female	(.002)
	[-.003]		[-.000]
Difficulty hiring: # days to fill last	.002*	% regular production employees	.001*
regular position	(.001)	minority	(.003)
	[.001]		[.002]
Industry seasonality (1974-1994)	.004**	Plant size: number of regular	.113*
	(.001)	employees (natural log)	(.054)
	[.001]		[.041]
Industry cyclicality (1974-1994)	-.028	Unionized workforce (1=yes)	-.553***
	(.051)		(.110)
	[-.010]		[-.207]
Growing establishment: total #	.048**		
openings (natural log)	(.014)		
	[.017]		
Independent establishment	-.217*		
(1=yes)	(.099)		
	[-.079]		
HR department present (1=yes)	.324**		
	(.116)		
	[.119]		
% regular production employees	-.004*		
skilled	(.002)		
	[-.001]		
Intercept	4.975		
	(167.123)		
Log Likelihood	-524.588		
Chi Square	120.96		
N	907		

Note: Standard errors are in parentheses. Marginal effects, evaluated at the means of the independent variables, are in brackets. For dummy variables, the marginal effect is calculated as the change from 0 to 1 on the probability of using temporaries. Dependent and independent variables are for the year 1997 unless otherwise noted.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 5. Tobit and OLS regressions predicting percentage of all production employees in temporary positions among Wisconsin manufacturers

	Model 1	Model 2	
Variables	Tobit Coefficient	Tobit Coefficient	OLS Coefficient
Low unemployment rate	.566	-.712	-.712
	(2.289)	(1.906)	(1.939)
High unemployment rate	-1.182	-1.713	-1.713
	(2.514)	(2.158)	(2.195)
Turnover rate	.046	-.021	-.021
	(.091)	(.076)	(.077)
Number of layoffs	-.017	.019	.019
	(.021)	(.017)	(.018)
Difficulty hiring: # unfilled regular openings (natural log)	-.064	-.003	-.003
	(.152)	(.126)	(.128)
Difficulty hiring: # days to fill last regular position	.086***	.071***	.071***
	(.014)	(.011)	(.011)
Industry seasonality (1974-1994)	.191***	.176***	.176***
	(.013)	(.010)	(.011)
Industry cyclicality (1974-1994)	-.792	-.734	-.734
	(.762)	(.633)	(.644)
Growing establishment: total # openings (natural log)	.653**	-.068	-.068
	(.233)	(.219)	(.223)
Independent establishment (1=yes)	-3.000*	-.421	-.421
	(1.495)	(1.279)	(1.301)
HR department present (1=yes)	5.638**	1.967	1.967
	(1.817)	(1.589)	(1.617)
% regular production employees skilled	-.032	.033	.033
	(.031)	(.029)	(.029)
Control variables			
Plant size: number of regular employees (natural log)	-1.846*	-3.779***	-3.779***
	(.811)	(.679)	(.690)
Unionized workforce (1=yes)	-6.172***	-1.043	-1.043
	(1.667)	(1.404)	(1.428)
Metro location (1=yes)	-.359	-1.481	-1.481
	(1.789)	(1.509)	(1.535)
Female labor force participation rate (1990)	21.692	34.649	34.649
	(25.335)	(21.734)	(22.106)
% regular production workforce female	.012	.028	.028
	(.029)	(.025)	(.025)
% regular production employees minority	.161***	.112***	.112***
	(.038)	(.030)	(.031)
Intercept	-2177.765	-3459.387	-3459.387
	(2548.42)	(2186.183)	(2223.561)
Log Likelihood	-2710.160	-2292.263	
Chi Square/R Square	307.88	395.63	0.501
N	884	570	570

Note: Standard errors are in parentheses. Dependent and independent variables are for the year 1997 unless otherwise noted. Model 1 includes all establishments in the sample; Model 2 includes only those establishments that used temporaries in 1997.

* p < .05; ** p < .01; *** p < .001