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The Impact of Compressed Workweek on Absenteeism: The Case of Ontario Prison Guards on a Twelve-hour Shift

Rosemary A. Venne

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Résumé de l'article

Depuis quelques décennies, on remet en question la semaine normale de travail par une série d'innovations dans les horaires de travail, notamment la semaine de travail comprimée (STC). L'horaire d'une STC reflète une relation d'arbitrage entre des jours de travail plus longs et moins de jours travaillés par semaine. La version la moins populaire de la STC (impliquant un peu plus de 3 % de la main-d'œuvre canadienne) est celle du quart de travail de 12 heures qu'on retrouve d'habitude pour des opérations continues.Nous inventorions d'abord les recherches pertinentes qui ont été publiées. Les premières recherches sur la STC, au début des années 70 étaient truffées d'un certain nombre de problèmes que les recherches ultérieures ont tenté de résoudre (v.g. petite taille des échantillons, manque de preuves empiriques, manque de données longitudinales et absence de groupe contrôle).Une recherche typique de ces années impliquait des perceptions ex post facto sans groupe contrôle. Ici, nous utilisons une méthodologie qui vise à mesurer l'impact d'un horaire de STC de 12 heures sur l'absentéisme au moyen d'un ensemble de données longitudinales et d'un groupe de comparaison dans un contexte d'avant et d'après. Contrairement aux recherches précédentes, nous utilisons une mesure empirique de performance avec un plan de recherche solide. Cette étude s'attarde sur les expériences d'un centre de détention provincial qui a mis sur pied une STC pour ses gardiens syndiqués durant la fin des années 80. Le syndicat local recherchait activement un horaire de STC permettant la prise de plus de fins de semaines complètes par année. Un comité patronal-syndical fut instauré pour examiner la journée de travail de 12 heures. Vu qu'un centre de détention est caractérisé par une haute intensité de main-d'œuvre, on a porté une attention particulière à l'absentéisme surtout avant et après l'implantation du nouvel horaire de travail.Pour ces gardiens, on a colligé des données sur l'absentéisme un an avant et deux ans après l'instauration de la STC. Les autres gardiens, exclus de cette expérience, ont servi de groupe de comparaison. Nous avons ensuite exploré différents modèles. Le développement de cadres de références permettant des prédictions en ce domaine est encore à l'étape de balbutiement. Le plus développé de ces cadres préliminaires prédit l'absence de forts effets sur l'absentéisme. Ici nous utilisons des modèles d'analyse transversale, diachronique et de comparaison de groupes pour examiner l'impact de la STC sur l'absentéisme des gardiens. Les études avec des données pour une seule période de STC (ex post seulement) utiliserait un modèle d'analyse transversale. Dans le modèle diachronique, la valeur de l'absentéisme dans la période pré-STC est utilisée pour évaluer ce que l'absentéisme des gardiens dans la période STC aurait été si un tel horaire n'avait pas été instauré. Le modèle de comparaison des groupes rend variable dépendante le changement dans l'absentéisme entre les périodes pré-STC et STC. Avec le modèle d'analyse transversale, la variable STC a un grand impact positif sur l'absentéisme. Pour le modèle diachronique, ce même impact est la moitié du précédent. Et pour le modèle de comparaison des groupes, la variable STC a relativement peu d'impact. Considérant que l'absentéisme de base des gardiens est d'environ 9 jours, l'impact de STC sur cet absentéisme est approximativement de 5 jours, 2,5 jours et 1 jour pour chacun des trois modèles.Donc, ces trois modèles produisent des résultats substantiellement différents. La variable STC perd de sa puissance à mesure que le modèle est mieux spécifié. Ces modèles démontrent l'importance d'utiliser une recherche méthodologique solide. En termes pratiques, nos résultats sont similaires à ceux des recherches précédentes et les prédictions faites à partir du cadre utilisé sont vérifiées. C'est différent quand on utilise d'autres modèles pour l'étude d'une même question, on en arrive à des conclusions différentes.

The Impact of the Compressed Workweek on Absenteeism

The Case of Ontario Prison Guards on a Twelve-Hour Shift

ROSEMARY A. VENNE

The study consists of absenteeism measures for a group of prison guards who switched from an 8-hour work day to a 12-hour day compressed workweek (CWW) schedule with absenteeism measures for one year prior to the onset of the schedule and two years on the new schedule. Absenteeism data were compared between the CWW group and a comparison group of regular schedule guards and between the pre-CWW and CWW periods. Absenteeism levels were higher for the CWW group compared to the comparison group, and were higher over the CWW period when compared to the pre-CWW period. In the best specified models, those guards on the CWW had higher absenteeism than the comparison group, though the latter difference was not statistically significant.

During the past few decades, the standard workweek has been challenged by a variety of innovations in work scheduling. After a period of relative stability from 1930 till the late 1960s, patterns of working time have undergone significant experimentation as considerable worker and employer interests have emerged in alternative ways to schedule worktime (Pierce et al. 1989). These alternative worktime arrangements include a variety of new schedules, such as flexible work hours and the compressed workweek. The

- VENNE, R., Department of Industrial Relations and Organizational Behaviour, College of Commerce, University of Saskatchewan, Saskatoon, Saskatchewan.

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compressed workweek (CWW) schedule refers to a tradeoff between longer working days and fewer days worked per week.

There are several variations of the compressed workweek, including the less common variation involving the 12-hour day, usually found in continuous operations and involving shiftwork. A cross-country Canadian survey of 385 organizations by the Conference Board (Paris 1989) noted that almost 30 percent (101 organizations) indicated that they have implemented some type of CWW schedule. Though not common (a recent Statistics Canada survey found that just over three percent of the labour force have a 12-hour workday, Siroonian 1993), the 12-hour CWW schedule is an important schedule for continuous operations workplaces such as hospitals and police forces. The 12-hour version of the CWW schedule suits a 24-hour organization workplace and often allows for "friendlier" hours of work for the employees with a greater number of free weekends.

This investigation examined the impact of the 12-hour shift at an Ontario detention centre over a two-year period. The prison, or provincial detention centre, began implementing the 12-hour shift for its guard employees during the late 1980s and was interested in the schedule's effect on the key organizational variable of absenteeism. First, the relevant literature is explored, followed by descriptions of the organization and the guards, the data set, the models, data results and finally conclusions.

COMPRESSED WORKWEEK RESEARCH

Early CWW research, beginning in the 1970s, was often anecdotal and impressionistic. Early studies mainly involved surveys and revealed that both employer and employee viewed the compressed workweek as positive. The early research was plagued by a number of problems, such as small sample size, lack of empirical evidence, lack of longitudinal data and lack of control groups. A typical study from this period would involve post-only perceptions or impressions, often without a control group (e.g., see Gannon and Reece 1972). Thus, in the early period of research, much of the evidence did not relate to empirical evidence but to "perceptions" of changes at the workplace. Another early study explored only management's perceptions of employee response to the CWW schedule (Robertson 1973). As early as 1979, Glueck was cautioning that some early positive results subsequently decline and may be due to "Hawthorne effects". Nord and Costigan (1973), Ivancevich and Lyon (1977) and Latack and Foster (1985) indicated that there may be "sleeper" or longer term effects of the schedule on the employee. All of these researchers pointed to the need for longitudinal studies and more empirical data in investigating the effect of the CWW schedule on the workplace and on the employee. Later research improved

somewhat with more case studies, field experiments and surveys being conducted.

A key workplace variable that has been much studied during the introduction of the CWW is absenteeism. Nord and Costigan (1973) in a post-period survey without a control group reported ten percent less absenteeism for the CWW employees. In a much better designed study by Ivancevich (1974), using a before and after survey, no significant differences in absenteeism were found between the CWW group and the control group. Cunningham (1982) reported less absenteeism in the CWW period between the CWW and the control group. Other post-period only studies using CWW and control groups (Latack and Foster 1985 and Cunningham 1989) also found lower absenteeism. Overall summaries of CWW research results tend to be generally positive (see Nollen 1982; Ronen 1984; Kopelman 1986) with reports of no change or small decreases in absenteeism. Still, it must be borne in mind that much of the early research was very impressionistic.

The methodology used in the present study measures the impact of a 12-hour CWW schedule on absenteeism in a longitudinal data set with a comparison group in a before and after framework. Unlike much of the research on this topic, the present study uses an empirical measure of performance with a very sound research design. Very little of the CWW research to date has used a comparable approach, with the exception of Ivancevich (1974) who used a 12-month study period, but relied on surveys and included no hard measures of outcomes. This study most closely resembles the research methodology of Ivancevich (1974) in terms of having pre- and post-survey periods and a control group. Given the many criticisms of previous CWW research, the current investigation's methodology overcomes many of the technical deficiencies that have plagued earlier research.

THE DETENTION CENTRE AND DATA COLLECTION

The prison, referred to as the detention centre, is a medium-sized provincial security unit located in an Ontario city. At the detention centre, the data were drawn from the largest group of employees, namely the correctional officers, more commonly referred to as prison guards or guards. All employees with the exception of management personnel were members of a provincially-based public sector union, with the guards belonging to the "correctional occupations bargaining group" of OPSEU (Ontario Public Service Employees Union).

Individual demographic information was collected on 102 guards in total – 70 who went on the 12-hour CWW schedule and 32 who served as the comparison group. The guards in the CWW group had an average tenure or seniority of approximately six years and an average age of 35,

while the guards in the comparison group were slightly older with an average age of 38 years and an average tenure of ten years (see Table 1). In addition, all but 14 of the guards were male and all belonged to the guards' union.

Absenteeism data were collected at the detention centre's adult-offender unit from attendance records for the 70 guards who were at the detention centre at least one year prior to and one year after the onset of the CWW schedule (April 1987 to April 1989). As regards the data during the third year (April 1989 to April 1990), some problems with missing data occurred that will be discussed in a subsequent section. The data are restricted to the 70 guards with continuous service in the detention centre over the initial two-year period from April 1987 to April 1989.[1] Other guards who did not go on the CWW schedule and who had two years of continuous service from April 1987 to April 1989 served as the comparison group. These 32 guards worked in other areas of the prison (e.g., youth-prisoner unit) and had a schedule similar to that of the adult-prisoner guards prior to the introduction of the CWW schedule (i.e., an eight-hour day with rotating shiftwork).

Many of the guard jobs in the detention centre are of necessity run on a continuous-operations basis, with shiftwork and weekend work being the norm. Though Pierce and Dunham (1992) point out that the motive behind many CWW shift schedules is most likely to be organizational needs (e.g., for continuous service reasons) rather than employee needs, in the present study the CWW schedule was driven mainly by employee preferences within a continuous operations workplace. The CWW schedule, which allowed for more whole weekends off per year, proved to be very popular with the rank and file membership and the CWW began to be implemented at several Ontario detention centres during the early 1980s. While it may be accurate to characterize central labour federations as lukewarm or negative toward the CWW schedules (Maklan 1977), the same cannot be said with respect to local unions. Some local unions actively bargain for the schedule as a "perk" for their members, who for various reasons favour the schedule. At the detention centre, the local union actively sought to obtain the CWW schedule for their members even though their central union, OPSEU, was not in favour of the schedule. Historically, the 12-hour workday is viewed as somewhat regressive by labour groups who struggled for many years to achieve the 8-hour day (Maklan 1977).

The 12-hour CWW schedule involved a twelve-week cycle of two days on, two days off, three days on, three days off, etc. with the guards having

1. Guards who quit, transferred or who went on long term sick leave (i.e., those who had absences of four consecutive months or longer over the two-year period) were also excluded.

every other weekend off and having the entire twelfth week off. The work day consisted of a day shift (7AM to 7PM) and a night shift (7PM to 7AM). With the CWW schedule, guards were at work only three or four days a week with up to two less commuting trips to work per week and had many more whole weekends off during the year than under the previous schedule. Some researchers (Latack and Foster 1985) propose that workers value the CWW schedule as an "escape" from the work environment as well as for its better arrangement of work hours. As the prison can be a difficult and occasionally dangerous work environment, the guards' interest in the schedule was likely due to the "escape" factor.

A union-management committee was set up to deal with the scheduling of the twelve-hour day as much of the previous eight-hour day's peak workload and coordination with medical and social services had to be reworked into a longer "CWW" day. The detention centre CWW schedule was begun on a trial basis in the adult-prisoner unit in April of 1988 on the basis of a memorandum of agreement between union and management. Though it was begun as a trial it does not seem that management or the union seriously considered terminating the schedule in the absence of a critical problem, possibly because of the enormous amount of time and work invested in the new schedule by the union-management committee.

Given the highly labour intensive nature of the detention centre, absenteeism had always been a major management concern especially with respect to the guards who had to be replaced with casual labour or with costly overtime. Absenteeism rates have always been monitored and this was especially the case before and after the new CWW schedule was implemented as management was concerned that the new schedule not be more costly in terms of absenteeism. To understand the concern with absence, the detention centre's specific absence policy must be mentioned. The detention centre has a short-term sickness policy in its collective agreement that might be considered generous compared to many private sector sickness provisions. Employees at the detention centre were entitled to full pay for the first 48 hours of absence (i.e., six eight-hour days) and to 75 percent pay for up to 992 hours of absence (i.e., 124 eight-hour days) in a calendar year due to sickness or injury. As is the case at many workplaces, documentation (i.e., doctor's note) was required for an absence of more than two days.

RESEARCH MODELS

Workplace interventions such as a major schedule change are often not evaluated, or are evaluated in a superficial manner that only examine employee reactions. The detention centre represented a unique opportunity

to evaluate the schedule change in terms of a key organizational variable, absenteeism. The best framework in the alternative worktime area is that proposed by Dunham and Pierce (1986). Their framework predicts that strong broad effects on organizational effectiveness or job outcomes (such as absenteeism) are less likely since these are secondary or general reactions which are further removed from the characteristics of the schedule. Also, these general reactions to the schedule are subject to intervening variables. Their framework predicts that more direct or "specific" reactions (such as employee attitudes to the schedule) will be most affected by a schedule change. Thus they predict that "schedule to organizational effectiveness" results would be less strong than "schedule to specific work attitude" results. Though other frameworks do not allow for specific predictions, Ronen and Primps (1981) in their earlier work note that there is little theoretical justification for expecting job outcome changes and that any changes in work-related variables (such as absenteeism) are secondary. Based on the Dunham and Pierce (1986) framework, we would not expect strong effects on guards' absenteeism with the implementation of the CWW schedule at the detention centre. CWW research results suggests that the effect of the CWW schedule would be a slight decrease or no change in absenteeism (Nollen 1982; Ronen 1984; Kopelman 1986).

Examination of other intervention evaluations provide viable models for the present study. Barnow (1987) reviews studies that use a wide variety of models to assess the impact of a training program intervention on workers' earnings. The various studies used cross-section, lagged and difference regression models to estimate the impact of the training intervention, examining before and after earnings, with a matched control group. The present investigation used the same type of models to investigate the impact of the CWW schedule intervention on guards' absenteeism, examining absenteeism patterns before and after the schedule intervention for the CWW guards as well as using a comparison group of guards. The research problem here is the impact of the CWW schedule on the key organizational variable of absenteeism at the detention centre. Using the best framework and previous research, the schedule is predicted to have little or no impact on absenteeism.

For the following three OLS (ordinary least squares regression) models (cross-section, lagged and difference), assume that for each guard i, absenteeism depends on his/her demographic characteristics and whether or not that guard is on the CWW during the CWW schedule period (April 1988 to April 1990).

Cross-section Model

In the cross-section model, each guard's absenteeism during the CWW schedule trial (Y_{2i}) is explained by the guard's demographic characteristics and whether or not he or she is on the compressed workweek. In symbols,

(1) $Y_{2i} = A_i + B_0 + B_1TEN_i + B_2AGE_i + B_3FEM_i + B_4CWW_i + e_{2i}$

where Y_{2i} is absenteeism in the CWW period ([year2 + year3]/2), B_0 is the intercept, TEN_i is tenure at the beginning of the study, AGE_i is age at the beginning of the study, and FEM_i is the gender variable (coded female = 1). CWW_i is the CWW dummy variable in the CWW period. A_i is a "fixed effect" that captures the unobservable personal characteristics that are assumed to have remained unchanged over both the pre-CWW (year1) and CWW (year2 and year3) periods.

The cross-section model estimated by equation (1) ignores the fact that we have *both* a pre-CWW and a CWW period data set and uses the demographic characteristics of the non-CWW guards to estimate what the absence of those CWW guards would have been if the CWW schedule had not been implemented. Studies with only a CWW period (post-only) data would use this model. For example, Nord and Costigan (1973) used a survey of CWW workers after the onset of the CWW schedule.

If A_i, the fixed effects representing unobserved heterogeneity, is correlated with the CWW variable, then the coefficient of the CWW variable will be biased in the cross-section model. This would occur if the CWW guards had been systematically different from the comparison group guards in ways that are not captured by the demographic control variables. To the extent that A_i is correlated with any of the other variables, biased estimates would also occur.

Lagged Model

In the lagged model, the "lagged" value of absenteeism in the pre-CWW period (Y_{1i}) is used to estimate what the guard's absenteeism in the CWW period would have been had a CWW schedule not been implemented. Rather than simply using the guards' measured demographic characteristics as control variables, the guards' previous absenteeism captures both the measured demographic characteristics and the unmeasured personal attributes (the fixed effects term). In symbols, guard i's absenteeism in the pre-CWW period is given by

(2) $Y_{1i} = A_i + B_0 + B_1TEN_i + B_2AGE_i + B_3FEM_i + e_{1i}$

Substituting this into equation (1) gives

(3) $Y_{2i} = Y_{1i} + B_4CWW_i + e_{3i}$

where $e_{3i} = e_{2i} - e_{1i}$

The intuitive reasoning behind this lagged model is that the previous period's absenteeism captures the error term specific to the individual guard

– the fixed effect (Bassi 1983). If this model proves to be a good fit, then the pre-CWW period absenteeism would be a useful control variable. Since the fixed effect term (A_i) is included (controlling for unobservable heterogeneity) the problem of bias with the CWW coefficient (expected in the cross-section model) is not a concern here.

Difference Model

By "differencing over time", that is, by making the dependent variable the *change* in absenteeism between the CWW period and the pre-CWW period, any possible correlation between the error term and independent variables can be eliminated. As with the lagged model, the difference model uses the fact of having both before and after periods to control for any selectivity bias. Mathematically, the difference model is derived simply by subtracting Y_{1i} from both sides of equation (3). In effect, this technique imposes the constraint implied by theory that the coefficient of Y_{1i} equals 1. In other words, it imposes the restriction that the best predictor of this period's absenteeism is simply last period's absenteeism.

$$(4)\quad Y_{2i}\text{-}Y_{1i} = B_4CWW_i + e_{3i}$$

Missing Data

Concerns regarding missing data are especially important with small data sets. All of the missing data are concentrated in the third year of absence data. All guards had at least two years of complete data but 17 out of 102 guards changed position, transferred or left the detention centre at some point during the third year of data collection. These internal transfers within a detention centre and transfers to other detention centres are a common feature of guards' job movement within the provincial correctional services. Rather than discard from the study those guards who left in the third year and lose their complete two years of data, it was decided that guards with incomplete year-three data would remain in the analysis. There are various ways of dealing with missing data including deleting cases and imputing missing data (Tabachnick and Fidell 1989). Imputation (i.e., estimating missing data) can be accomplished using prior knowledge, mean values, or using regression analysis. Here imputation was accomplished using the first method. Using the prior knowledge method, the cases with missing monthly values in year3 were assigned the corresponding monthly value for year2 (e.g., December of year2 would be inserted for the missing value of December of year3). This method of data imputation prevents bias due to any seasonality of the monthly absence data. Compared to other imputation techniques, the prior knowledge method is perhaps less conservative than inserting a mean value but more cautious than using regression analysis to predict missing values.

As the absence variable displayed extreme positive skewness (distributions of absence usually involve a high frequency of zeros and low values), a logarithmic transformation was carried out on the variables of PRE (year1 absence) and POST (year2 and year3 absence) (Baba 1990; Tabachnick and Fidell 1989). All analysis used the transformed and imputed version of the data.

RESULTS

Table 1 presents the mean values of the variables for the guards on the CWW schedule and the comparison groups. The CWW group of guards was slightly younger with less tenure than the comparison group. Absenteeism was higher over the CWW period when compared to the pre-CWW period for both groups of guards, though the CWW group had higher absenteeism rates over the entire three-year period than the comparison group guards.

TABLE 1

Mean Values for CWW Group and Comparison Group

Variable Name	*Definition*	*Means: CWW group (n=70)*	*Means: Comparison group (n=32)*
POST	annual absenteeism in days, in CWW period, (year2+year3)/2	12.46	8.49
PRE	annual absenteeism in days, in pre-CWW period, year1	9.34	7.55
YEAR2	absenteeism in days, in year2	13.16	10.04
YEAR3	absenteeism in days, in year3	11.77	6.93
CHANGE	change in absenteeism POST - PRE	3.12	0.93
FEMALE	gender, 0=male (88), 1=female (14)	0.10	0.22
TENURE	tenure = years employed (from (appointment date)	5.90	10.06
AGE	age in years from birthdate	35.10	38.63

The first model in Table 2 is the common model of the post-only period design where cross-section data are collected at one point in time. Since this model assumes a post-only period, we are attempting to control

for any observable differences between the two groups by using the three demographic variables. Here the demographic variables function poorly as explanatory variables with the CWW variable showing a large positive impact on absenteeism. If base absenteeism for guards at the detention centre is approximately 9 days per year, then being on the CWW schedule is associated with a 5 day increase in absenteeism under this model.[2]

TABLE 2

OLS Regression with the Three Models

Model *Dependent Variable*	*Cross-section Model* *POST*	*Lagged Model* *POST*	*Difference Model* *CHANGE = POST-PRE*
CWW	0.57	0.30	0.12
	(2.58)***	(1.73)*	(0.65)
PRE		0.54	
		(5.45)***	
TENURE	0.02		
	(0.76)		
AGE	-0.02		
	(-1.06)		
FEMALE	0.14		
	(0.52)		
Constant	2.13	0.86	0.07
	(4.44)***	(3.89)***	(0.46)
N	102	102	102
R^2	0.08	0.28	0.00
F	2.12*	19.39***	0.42

(t statistics in brackets)
* $p < .10$ (critical t = 1.64 - two-tailed test)
** $p < .05$ (critical t = 1.96 - two-tailed test)
*** $p < .01$ (critical t = 2.57 - two-tailed test)

2. In any OLS regression, the coefficient of each variable represents the impact on the dependent variable (Y) for a one-unit change in the independent variable (X). Since the dependent variable, however, is the *natural logarithm* of absenteeism (log of POST), the coefficient of each variable represents the approximate *proportional* impact on absenteeism of a one-unit change in each independent variable. For example, for the cross-section model, being on the CWW schedule is associated with a 57 percent increase in absenteeism. If the base absenteeism is about 9 days per year then the impact (57 percent) is approximately 5 days (i.e., 0.57 × 9 days = 5 days). The *exact* impact of a change in an independent variable can also be calculated by converting the predicted values of log of POST back to non-transformed values using the exponential function. For example, the calculated impact of the CWW variable on POST absenteeism is 4.36 days. Thus the simple calculation of the proportional impact is close to the more tedious exact calculation.

The lagged model represents an improvement in research design over the cross-section model. Here both the before and after periods are used and we can also control for a guard's unobservable characteristics by using that guard's absence during the pre-CWW period. The coefficient of the CWW variable is 0.30, about half its value in the previous model. If the base absenteeism is about 9 days per year, then the impact (30 percent) of the schedule on the guards is approximately 2.5 days.

The difference model has a different dependent variable than the two previous models – it attempts to explain the *change* in absenteeism from the pre-CWW to the CWW period. Since the dependent variable is the change in a guard's absenteeism, any explanatory power in the model must come solely from the CWW variable. The CWW variable has a relatively minor impact. If the base absenteeism is about 9 days per year, then the impact of the CWW variable on the guards is approximately 1 day.

Since the three models give different results for the CWW variable, it is necessary to choose between them. The lagged and difference models have an improved theoretical specification compared to the cross-section model. The coefficient of the critical CWW variable decreases in magnitude and significance as we move across the three models in Table 2. The CWW variable loses its potency as the models become better specified. The cross-section model fails to take into account the unobserved heterogeneity and the demographic variables function poorly as control variables. There is a smaller impact of the CWW variable in the more correctly specified models (models in which unobserved heterogeneity is taken into account or differenced out).

The three models make it is possible to demonstrate the importance of using a sound methodological research design. From the first model it is possible to show how a simple cross-section design (post-period data) can lead to incorrect conclusions. For example, using the cross-section model greatly overestimates the impact of the CWW schedule on the guards' absenteeism. By not controlling for the unobserved heterogeneity, the results can lead to biased estimates. In fact, Butler and Ehrenberg (1981) suggest that models including fixed effects are more appropriate methodologically as unobserved heterogeneity often tends to be correlated with observed differences. Given the differences between the cross-section and the two following models, it seems that there are unobserved heterogeneity effects present, implying that the CWW guards are systematically different from the comparison group guards in ways not captured by the demographic variables. For these reasons, we have more faith in the two models which take account of or difference out these fixed effects.

With the increasingly better specified models (the lagged and difference models), the coefficient of the key CWW variable is positive though

marginally significant or insignificant. Of these two models, the difference model is the preferred one. As the dependent variable is the change in a guard's absenteeism between the pre-CWW and CWW periods, any explanatory power in the difference model must come from the CWW variable. The results of the preferred model imply that the CWW variable had a positive effect on absenteeism (i.e., those on the CWW schedule experienced greater absenteeism than the comparison groups guards). In the difference model, the estimated CWW impact is 12 percent or a one-day increase in guards' absenteeism over the CWW period.

While the one-day impact may not be statistically significant in the difference model, from the detention centre's point of view there is a cost associated with any increase in absenteeism. Management at the detention centre felt that direct and indirect effects of the compressed workweek schedule probably led to increased absenteeism and other problems (e.g., communication flow difficulties) within the adult-prisoner unit. With the CWW schedule, the guards had less regular contact with their fellow guards and with the inmates. It is also possible that there was a decrease in workgroup cohesion and a decrease in job involvement with the CWW schedule. Decreased job involvement and decreased workgroup cohesion are both associated with an increase in absenteeism (Ng 1989; Drago and Wooden 1992). This attempt to explain the increase in absenteeism due to factors possibly associated with the CWW schedule is, of course, speculation on the detention centre's part since these two factors (workgroup cohesion and work involvement) were not measured. Yet it is interesting to note that after these decreased workgroup contact problems were corrected (i.e., a "unit" system of workgroups was instituted in 1991 which allowed for more regular contact between groups of prison guards) management noted a reduction in communication problems as well as decreased absenteeism. Though this speculation is impressionistic and anecdotal, it does point to other possible variables that future research might consider, such as changes in the nature of work during a CWW schedule trial.

Another possibility that may help to account for the increase in absenteeism relates to perception on the part of the guards. Despite the general management attention regarding elevated absenteeism, it is possible that the guards under the new schedule still perceived one day away as being only one day absent even though a twelve-hour day away was counted as an absence of 1.5 days. The CWW guards' perception of their personal absenteeism may have been in terms of "calendar days" rather than in terms of standard eight-hour days. As an illustration, if absenteeism were expressed in twelve-hour days, the mean absenteeism for POST (CWW guards) would be expressed as 8.31 twelve-hour days absent per year instead of 12.46 eight-hour days absent per year. Indeed, there is some anecdotal evidence

that this was the guards' perception. For example, the union launched a successful grievance over the issue of length of bereavement leave at the detention centre. Normal bereavement leave is three days. Since the guards on the CWW schedule were working twelve-hour days, management felt that the guards should only be entitled to two "CWW" workdays off. However, the arbitrator held that a three-day leave refers to three "calendar" days whether the guards were working a twelve or an eight-hour day.

The non-significant increase in absenteeism found in this study differs somewhat from the typical CWW research results which usually report slight reductions or no change in absenteeism. Ivancevich (1974), for example, found no significant difference in absenteeism between CWW and control groups though his measure of absenteeism was impressionistic. Reviewers such as Kopelman (1986) caution that decreases in absenteeism and other outcome effects may be shortlived. Indeed, if absenteeism had been charted for only the first three months following the onset of the CWW, it would have appeared that average absenteeism was on the decline at the detention centre. This emphasizes the importance of longitudinal research. Even some recent studies have used a short period of four months to assess the outcomes of a CWW schedule (e.g., Dunham et al. 1987). Indeed, Ivancevich and Lyon's (1977) follow up to the initial Ivancevich (1974) study revealed a decline of the CWW schedule's positive impact at the 24-month mark. Predictions from the Dunham and Pierce (1986) model (no strong impact for the outcome variable of absenteeism) are satisfied here. Though absenteeism was elevated over the CWW period, there was not a significant impact in the difference model. Thus the results of the present study do not contradict the predicted results nor do they differ greatly from the findings of recent research.

Before concluding, it remains to discuss the issue of interactive models, the imputation procedure and the Tobit procedure. Interactive models examine possible interactive effects between the CWW dummy variable and the demographic variables (i.e., the possible impact of the compressed workweek variable with a guard's age or tenure). The interactive results for the three models were analyzed and it was found that, in terms of absenteeism, those guards with high tenure were slightly less affected by the CWW variable. However, average effects were unchanged. Since allowing for interactive terms does not dramatically affect the estimated impact of the CWW variable, the benchmark non-interactive models were utilized in subsequent analysis.

Absenteeism in the CWW period is composed of the average of YEAR2 and YEAR3. In an attempt to disentangle any potential short-run and long-run effects of the CWW, the OLS analysis was repeated with YEAR2 and again with YEAR3 replacing POST as the dependent variable for the

cross-section and lagged models. In the difference model, CHANGE is replaced with YEAR2 minus PRE and again with YEAR3 minus PRE as dependent variables. Separating out the CWW-period absence is a check on the POST variable to ensure that there are not significant differences between the impact of the CWW schedule in each of the two years. The CWW variable appears to have had a slightly greater impact during year YEAR3 than during YEAR2. Two possible explanations may account for these results. One explanation is that the results point toward a transitional period (YEAR2) after which the impact of the CWW schedule increased (YEAR3). An alternative explanation is that YEAR2 did experience an impact of the CWW schedule but that the impact was offset or blunted by a Hawthorne type effect which helped to decrease absenteeism during YEAR2. It is not a major concern that YEAR2 and YEAR3 results differ slightly in magnitude as the conclusions arrived at in the present study (with POST as dependent variable) are very similar in terms of direction and effect.

It is recommended that analysis be repeated using the non-imputed data set as a verification of the method used in handling the missing data (Tabachnick and Fidell 1989). OLS regression analyses were carried out on the non-imputed and non-transformed data sets, respectively. Also, analysis with the non-transformed data set serves as a further verification of the appropriateness of the logarithmic data transformation. With the non-transformed data set, the results of the analyses with and without the imputed data appear similar enough that we can have confidence that the imputation method has not adversely affected the results. For the non-transformed data, the analysis confirmed Baba's (1990) assertion that non-normal distributions (of the dependent variable) can produce depressed correlations. Thus the transformation of the data increased the explanatory power of the models.

Baba (1990) proposes that the Tobit analysis procedure be used with absenteeism measures since absence data contain clustering of the dependent variable at zero. This is a common problem as absence data often contains a number of zero values. For example, a number of prison guards have no recorded absence over the CWW period. The Tobit procedure avoids the potential bias of OLS and produces more consistent estimates. The Tobit and OLS analyses were compared over the models. However, since the present dependent variable of absenteeism exhibits quite moderate clustering at zero (less than 10 percent of the PRE and POST absence values are zero) it is not surprising that the OLS and Tobit results are very similar.

CONCLUSIONS

The present study investigated the impact of a 12-hour CWW schedule trial on workplace absenteeism over a two-year period. As predicted by the

model, the CWW schedule did have a moderate (though non-significant) impact, adding one day of absenteeism to the yearly average of the CWW guards. The study demonstrated the importance of a sound methodological research design (using an objective data measure instead of impressions, before and after study periods, a longitudinal perspective and a comparison group) assessing the impact of an important workplace intervention. The paper also makes a contribution to the question of appropriate research models by showing that using poorly specified models can lead to biased results. Previous conclusions of post-only period research (i.e., cross-section model) are highly suspect and can lead to biased results. Lack of rigorous research methodology was and still is a problem in this area and may help to account for the positive results of earlier research. Given the problems with past CWW research, the present investigation represents a resolution of many of the methodological problems that plagued earlier research.

The detention centre management appeared to be rather neutral about the CWW schedule experience, though the guards continued to favour it. In spite of the unique work environment of the detention centre, the results here may be applicable to a broader range of occupations that use a 12-hour CWW with continuous operations. The CWW schedule continues to be in use throughout the detention centres in Ontario as well as other provinces. Future research can investigate a larger number of outcome variables using the present study's methodology. Researchers need to explore how changes resulting from the compressed workweek vary with a number of workplace factors. The predominantly survey and qualitative research in this area needs to be bolstered by more thorough quantitative and longitudinal research with empirical outcome measures related to the impact of the CWW.

While the incidence of the compressed workweek is low, and is not likely to dramatically increase in the near future, the schedule does represent an important alternative in work scheduling with the potential to alter the relationship between work and non-work for employees and to affect changes in certain workplace outcomes. It is also important to note that the main thrust behind alternative worktime scheduling seems to be coming from changes in our workforce. The needs of a changing labour force (e.g., increasing female labour force participation, the growing number of single-parent and dual-earner families, and a more urban workforce experiencing longer commuting distances) may reinforce these worktime trends toward the longer blocks of work and nonwork time which the compressed workweek provides. The push for alternative worktime arrangements is expected to continue from our increasingly diverse labour force. While the CWW schedule has been referred to as one of the great fads of the 1970s and 1980s (with early writers predicting dramatic increases in the use of the schedule), it

bears stating that when well suited to the workplace and the employees the CWW schedule has the potential to be a tailor-made intervention for jobs in continuous operations allowing for employees to have longer "escape" periods from work and even increased job autonomy (Latack and Foster 1985; Poor 1973). Pierce and Dunham (1992) also point out that the CWW can be used to alleviate some of the negative effects of shift work. The latter reason appears to be the main motivation for the implementation of the CWW schedule in the present study.

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RÉSUMÉ

Semaine de travail comprimée et absentéisme : les gardiens de prison ontariens sur un quart de douze heures

Depuis quelques décennies, on remet en question la semaine normale de travail par une série d'innovations dans les horaires de travail, notamment la semaine de travail comprimée (STC). L'horaire d'une STC reflète

une relation d'arbitrage entre des jours de travail plus longs et moins de jours travaillés par semaine. La version la moins populaire de la STC (impliquant un peu plus de 3 % de la main-d'œuvre canadienne) est celle du quart de travail de 12 heures qu'on retrouve d'habitude pour des opérations continues.

Nous inventorions d'abord les recherches pertinentes qui ont été publiées. Les premières recherches sur la STC, au début des années 70 étaient truffées d'un certain nombre de problèmes que les recherches ultérieures ont tenté de résoudre (v.g. petite taille des échantillons, manque de preuves empiriques, manque de données longitudinales et absence de groupe-contrôle). Une recherche typique de ces années impliquait des perceptions *ex post facto* sans groupe contrôle. Ici, nous utilisons une méthodologie qui vise à mesurer l'impact d'un horaire de STC de 12 heures sur l'absentéisme au moyen d'un ensemble de données longitudinales et d'un groupe de comparaison dans un contexte d'avant et d'après. Contrairement aux recherches précédentes, nous utilisons une mesure empirique de performance avec un plan de recherche solide.

Cette étude s'attarde sur les expériences d'un centre de détention provincial qui a mis sur pied une STC pour ses gardiens syndiqués durant la fin des années 80. Le syndicat local recherchait activement un horaire de STC permettant la prise de plus de fins de semaines complètes par année. Un comité patronal-syndical fut instauré pour examiner la journée de travail de 12 heures. Vu qu'un centre de détention est caractérisé par une haute intensité de main-d'œuvre, on a porté une attention particulière à l'absentéisme surtout avant et après l'implantation du nouvel horaire de travail.

Pour ces gardiens, on a colligé des données sur l'absentéisme un an avant et deux ans après l'instauration de la STC. Les autres gardiens, exclus de cette expérience, ont servi de groupe de comparaison.

Nous avons ensuite exploré différents modèles. Le développement de cadres de références permettant des prédictions en ce domaine est encore à l'étape de balbutiement. Le plus développé de ces cadres préliminaires prédit l'absence de forts effets sur l'absentéisme. Ici nous utilisons des modèles d'analyse transversale, diachronique et de comparaison de groupes pour examiner l'impact de la STC sur l'absentéisme des gardiens. Les études avec des données pour une seule période de STC (*ex post* seulement) utiliserait un modèle d'analyse transversale. Dans le modèle diachronique, la valeur de l'absentéisme dans la période pré-STC est utilisée pour évaluer ce que l'absentéisme des gardiens dans la période STC aurait été si un tel horaire n'avait pas été instauré. Le modèle de comparaison des groupes rend variable dépendante le changement dans l'absentéisme entre les périodes pré-STC et STC.

Avec le modèle d'analyse transversale, la variable STC a un grand impact positif sur l'absentéisme. Pour le modèle diachronique, ce même impact est la moitié du précédent. Et pour le modèle de comparaison des groupes, la variable STC a relativement peu d'impact. Considérant que l'absentéisme de base des gardiens est d'environ 9 jours, l'impact de STC sur cet absentéisme est approximativement de 5 jours, 2,5 jours et 1 jour pour chacun des trois modèles.

Donc, ces trois modèles produisent des résultats substantiellement différents. La variable STC perd de sa puissance à mesure que le modèle est mieux spécifié. Ces modèles démontrent l'importance d'utiliser une recherche méthodologique solide.

En termes pratiques, nos résultats sont similaires à ceux des recherches précédentes et les prédictions faites à partir du cadre utilisé sont vérifiées. C'est donc dire qu'en utilisant différents modèles pour l'étude d'une même question, on en arrive à des conclusions différentes.