Shiftwork, Compensating Wage Differentials and Leisure

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Motivation

"He's out all night and sleeps all day."

Motivation (ctd.)

- Theory of Compensating Wage Differentials (Rosen, 1987)
  - shift work is a disamenity that must be remunerated accordingly to attract workers
  - size of wage premium depends on distribution of underlying tastes
- empirical evidence to determine size of wage differentials is mixed
- non-pecuniary aspects are important
- what are short-term and potential long-term influences of shift work?

Outline

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Theoretical Background

- each person maximizes his utility during each time unit t:

$$U_t(\ell_t; C_t) \tag{1}$$

subject to

$$T = \sum_{t=1}^{T} (\ell_t + n_t) \tag{2}$$

$$\sum_{t=1}^{T} C_t = \sum_{t=1}^{T} w_t n_t + V \tag{3}$$

- with n_t denoting working hours, ℓ_t leisure and C_t being the value of consumption

Empirical Specification

- the following empirical specification can be derived:

$$\ln w_i = \theta_i + \rho X_{it} + \delta \ln n_{it} + u_{it} \quad (4)$$

with θ_i being an individual fixed-effect that represents individual preferences for the *timing* of work

- estimation equation:

$$\ln w_i = \mathbf{X}\beta_1 + \mathbf{H}\beta_2 + \mathbf{Z}\beta_3 + \beta_4 S + \beta_5 N + \epsilon \quad (5)$$

where $\mathbf{X}$ denoting individual characteristics, $\mathbf{H}$ household information, $\mathbf{Z}$ work information, N denotes working hours and S being the shift indicator

Selection Issues

→ θ_i represents marginal disutility of work at given time intervals across a day

- preferences for shift work cannot be assumed to be entirely random
- it can be easily assumed that a worker chooses to work shifts if he can derive a higher utility from it than for daytime work
- non-random shift choice is accounted for by the following structural form equation:

$$S^* = \chi \mathbf{Y} + \delta (\ln w_s - \ln w_d) + \nu \quad (6)$$

where $\mathbf{Y}$ captures variables that influence shift choice and $(\ln w_s - \ln w_d)$ is the associated shift premium

Data and Sample

Data:

- Time Use Data for Germany for 2001/2002 evenly distributed over the year to guarantee the most accurate and unbiased time use pattern
- more than 200 activities are reported for 10 minute time intervals

Sample:

- full-time employed men aged 25 – 65 in dependent employment
- only information for the standard workweek (Monday – Friday)
- N = 2931

Variable Definitions and Instruments

- shift indicator
  1. self reported shift status – indicated by respondent
  2. unusual working hours – derived from time diaries
- dependent variable:
  - log hourly wages – compensating wage differentials
- main instruments:
  - rate of reported shift work/unusual working hours by occupation (Kostiuk, 1990)

Time Dimension – Working Hours

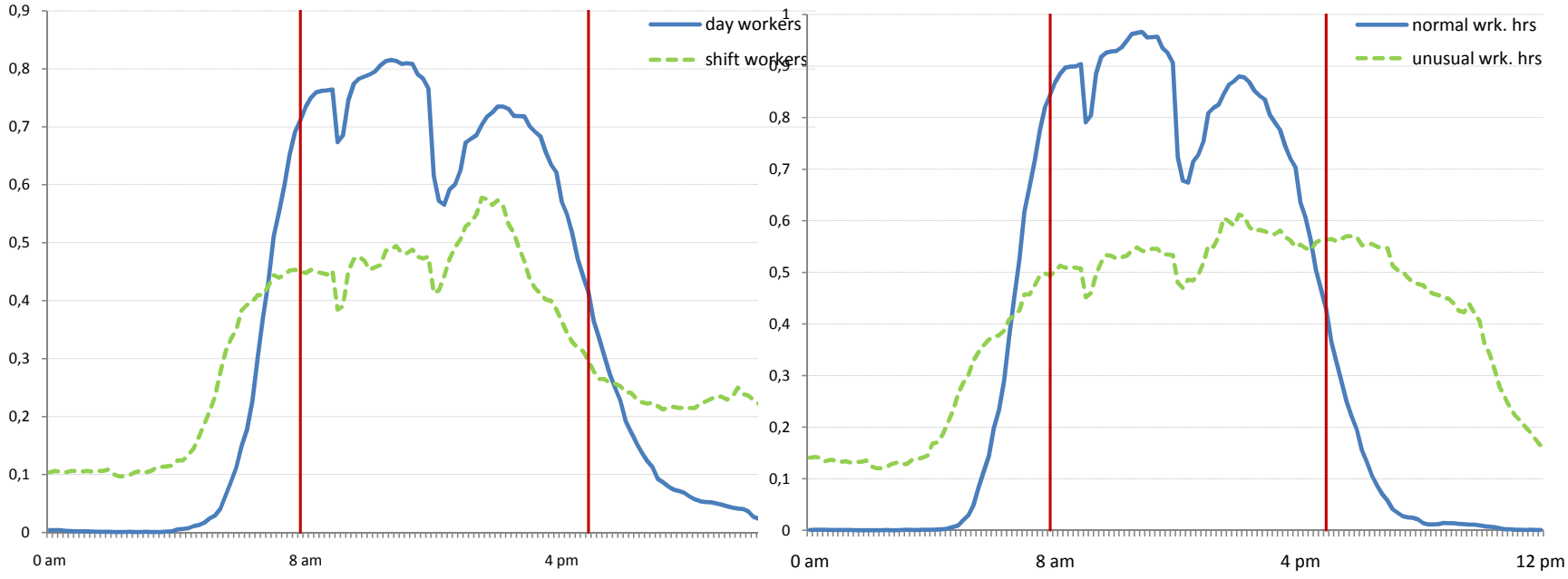

Figure 1: Distribution of working hours of men who directly report to work shifts (left panel) and of those who work during unusual hours (right panel).

Time Dimension – Leisure

	shift workers		day workers	
	reported	unusual	reported	usual
fraction of men enjoying leisure at:				
3 am	0.004	0.003	0.004	0.004
9 am	0.115	0.111	0.104	0.105
3 pm	0.097	0.100	0.058	0.057
9 pm	0.556	0.398	0.754	0.797
daily minutes of leisure:				
general leisure	245.48	198.96	243.71	253.90
	(131.16)	(140.37)	(119.93)	(116.40)
N	725	520	2206	2411

Selected Descriptive Statistics

	shift workers		day workers	
	reported	unusual	reported	usual
unusual wrk hours	0.366	1.000	0.116	0.000
	(0.482)	(0.000)	(0.320)	(0.000)
shift work	1.000	0.510	0.000	0.191
	(0.000)	(0.500)	(0.000)	(0.393)
log hourly wage	2.433	2.489	2.530	2.509
	(0.366)	(0.494)	(0.471)	(0.439)
low skilled	0.050	0.031	0.009	0.016
	(0.217)	(0.173)	(0.092)	(0.126)
medium skilled	0.803	0.623	0.491	0.557
	(0.398)	(0.485)	(0.500)	(0.497)
high skilled	0.148	0.342	0.497	0.426
	(0.355)	(0.475)	(0.500)	(0.495)
non-male income (log)	3.339	3.168	3.427	3.456
	(3.312)	(3.357)	(3.356)	(3.341)

Results - Compensating Wage Differentials

	Shift indicator		Selection term	
	reported	unusual	reported	unusual
All Workers	0.077*	0.052*		
	(6.20)	(3.78)		
Shift Workers			-0.055*	-0.015
			(2.48)	(0.43)
Day Workers			-0.044*	-0.203*
			(1.77)	(6.76)

Methods: OLS and switching regressions with endogeneous switching

Additional controls: age, education, marital status, health status, # of kids, Western Germany, log non-male income, computer usage at work, public sector, usual wrk. hours, and 3 occupation dummies.

Results – Non-Pecuniary Aspects

- comparable results for both groups of workers can only be obtained when workers with similar characteristics are compared

→ nearest neighbor matching approach

Hypotheses and related dependent variables:

1. compensating wage differentials compensate workers adequately
   → satisfaction with work and leisure
2. higher risk of being alone (involuntary)
   → fraction of total leisure spent alone and satisfaction of time spent with others
3. more time for kids?
   → fraction of total leisure spent with kids and satisfaction with time for kids

Results – Non-Pecuniary Aspects (ctd.)

	reported	unusual
Hyp. 1: work satisfaction	-0.014	-0.006
	(0.49)	(0.19)
Hyp. 1: leisure satisfaction	-0.031	-0.018
	(1.12)	(0.57)
Hyp. 2: satis. w/ time for others	-0.047*	-0.056*
	(1.87)	(1.90)
Hyp. 3: satis. w/ time for kids	-0.052	0.024
	(1.57)	(0.71)

Additional controls: age; age^2; education; married; health status; household size; indicators for kids under 6, household help, Western Germany, second job, public sector, summer.

Results – Non-Pecuniary Aspects (ctd.)

	reported	**unusual**
Hyp. 2: fraction of leisure alone	0.024	0.053*
	(1.37)	(2.76)
Hyp. 3: fraction of leisure w/ kids	0.012*	-0.009*
	(3.13)	(2.16)

Additional controls: age; age^2; education; married; health status; household size; indicators for kids under 6, household help, Western Germany, second job, public sector, summer.

Concluding Remarks

1. compensating wage differentials
   - evidence for negative selection into shift work (self-reported)
   - wage differential is major driving force for selection
2. impact on the private life:
   - short-run effect: hedonic wages
   - potential long-run effect: involuntary loneliness
   - evidence that shifted working schedules allow men to enjoy more of their time with their kids