UPPSALA UNIVERSITET

The Price of Violence

Long term effects of assault on labor force participation and health

Petra Ornstein, Uppsala university

UPPSALA UNIVERSITET

Violence is bad, but how bad?

Information on the impact of assault is useful for:

- Meeting the needs of assault victims
- Policy decisions through information on expected benefit of crime reduction strategies
- Sociological understanding of violence

UPPSALA UNIVERSITET

Identification problem

Robust connection between assault and ill-health (in women), but what are the causal effects?

- Focus: Violence -> ill-health

  Lack of studies on causal link! (Ehrensaft et al, 2006; Kilpatrick et al., 1997; Lindhorst and Oxford, 2008; Stevenson & Wolfers, 2006)

- Reverse causation

  substance abuse -> violence exposure (Kilpatrick et al, 1997)

- Confounding

  Lack of resources -> stress -> ill health

  (Aizer, 2010) -> violence exposure

UPPSALA UNIVERSITET

Identification strategy

- Large-scale and high-quality longitudinal data
- Follow individuals previous to assault
- Rich background information
- Propensity score matching

Improvements on previous studies

- Identification
- Including men
- Large sample (-> Heterogenous effects)
- Long term effects
- Objective measures

UPPSALA UNIVERSITET

Setup

DATA

- Micro data from administrative registers
- LOUISE/LISA: Swedish population 16-64 years 1994-2008
- Cause of death Register
- National Inpatient Care Register

SELECTED SAMPLE

- Registered in Sweden at least two consecutive years in 1997-2002
- Not hospitalized because of assault previous to 1998
- Cases have been hospitalized with cause of injury ”assault” in 1998-2002
- Matches are selected on information 1-4 years prior to the assault

UPPSALA UNIVERSITET

Pre-assault characteristics: assaulted, a random sample non-assaulted

	Women		Men	
	Unselected sample	Assaulted	Unselected sample	Assaulted
Age	37.7 (0.045)	35.9*** (0.252)	37.4 (0.014)	32.6*** (0.139)
Years of schooling	12.4 (0.01)	11.1*** (0.052)	12.09 (0.003)	11.097*** (0.025)
Married (%)	42.9 (0.2)	20.9*** (1.0)	36.3 (0.1)	10.9*** (0.4)
Newly separated (%)	7.3 (0.1)	13.9*** (0.9)	7.4 (0.0)	13.2*** (0.5)
Child <4	15.3 (0.2)	13.9 (0.9)	13.1 (0.0)	6.6*** (0.3)
Single parent	10.8 (0.1)	26.1*** (1.1)	2.4 (0.0)	4.2*** (0.3)
Sick leave (mean, last 4 years)	14.1 (0.19)	33.6*** (1.75)	8.0 (0.046)	17.1*** (0.677)
Any DI (year 1-4, %)	5.0 (0.1)	16.5*** (0.9)	3.4 (0.0)	8.0*** (0.4)
Sick leave or DI (last 4 years)	27 (0.37)	81.7*** (3.41)	17.8 (0.095)	40.0*** (1.339)
In-care patient (%)	55.8 (0.2)	81.7*** (1.0)	35.4 (0.1)	58.6*** (0.7)
Mental problem diagnose (%)	4.0 (0.1)	34.9*** (1.2)	4.1 (0.0)	22.5*** (0.6)

UPPSALA UNIVERSITET

Missing Data

D_i: Assault victimization

Y_{i1}: Potential outcome for unit i after assault

Y_{i0}: Potential outcome for unit i, not assaulted

For individual i=1,...,N we observe

$Y_i = Y_{i1} D_i + (1 - D_i) Y_{i0}$

-> Never both potential outcomes!

UPPSALA UNIVERSITET

Identifying Assumption 1: SUTVA

Stable Unit Treatment Value Assumption:

$\{Y_{i1}, Y_{i0}\}$ are functions of D_i and the individual only.

(Unobservable) effect of assault for individual *i:*

$$\Delta_i = Y_{i1} - Y_{i0}$$

Average effect of assault on the assaulted =

$$ATT = E(\Delta|D=1) = E(Y_1|D=1) - E(Y_0|D=1)$$

UPPSALA UNIVERSITET

Identifying Assumption 2: CIA

Weak Unconfoudedness:

Y_0 is independent of D conditional on X

Propensity score: $p(X) = P(D=1|X)$

Enough: Y_0 indep of D | p(X) (Rosenbaum & Rubin, 1983)

$$ATT(p(X)) = E(Y_1|D=1,p(X)) - E(Y_0|D=1,p(X))$$
$$= E(Y_1|D=1,p(X)) - E(Y_0|D=0,p(X))$$

UPPSALA UNIVERSITET

Identifying Assumption 3: Overlap

For all assaulted, there are non-assaulted with the same characteristics as those of the assaulted:

$$P(D=1|X)<1; \forall X$$

$$ATT=E(ATT(p(X)))$$

UPPSALA UNIVERSITET

Matching: Basic Idea

Match assaulted to non-assaulted with similar characteristics (here: close values on p(X))

{k(1,i),..., k(M,i)} the M nearest matches for *i*

Define:

$\tilde{Y}_{i1}=Y_{i1}|D=1$

$\tilde{Y}_{i0} = \sum Y_{k(j,i)}/M|D=0; \quad j=1,...,M$

Estimator: $ATT_M= \sum (\tilde{Y}_{i1}-\tilde{Y}_{i0})/N; \quad 1,...,N$

UPPSALA UNIVERSITET

Matching In Practice

Risk set matching: $p(X_t)$ (Li et. al., 2001)

No future information, controls may become assaulted

ATT *now instead of possibly later*: lower bound on ATT

Parametric estimation: $\text{logit}(p(X_{it})) = \beta X_{it}$

Separate estimations based on sex & employment

X_t = {age $_t$, years of schooling $_t$, employment$_t$, disposable income $_t$, days on sickness benefits and disability benefits $_t$, hospital visits $_t$, hospitalization for mental problem $_t$, marital/cohabiting status $_t$, recent separation from partner $_t$, number of children, age of children, and custody}

Nearest neighbor with replacement, 5 matches

UPPSALA UNIVERSITET

How well can we estimate ATT?

Estimated propensity score:

Bias of order $O_p(N^{-1/\dim(X)})$

Bias correction -> Reduces bias to $O_p(N^{-1/2})$

Match values: $\tilde{Y}_{i0} = \sum_j Y_{k(j,i)}/M|D=0;$ $j=1,...,M$

Regression estimate: $\mu_0(X)=E(\tilde{Y}_0|X)$ (matches)

Bias corrected match value:

$$Y\_bias_{k(j,i)} = Y_{k(j,i)} + \mu_0(X_i) - \mu_0(X_{k(j,i)})$$

(Abadie & Imbens, 2012)

UPPSALA UNIVERSITET

Inference: $V(ATT_M)$

Define:

$K_M(i)$= #copies of match i /M

$K´_M(i)$= #copies of match i /M^2

$$V(ATT_M) = \sum_i [\, D_i(Y_{i1} - Y_{i0} - ATT)^2 + (1-D_i)\sigma^2(K_M(i)^2 - K´_M(i))^2 \,]$$

$\sigma^2 = V(ATT)$

(Abadie et. al, 2004; Abadie & Imbens, 2006)

UPPSALA UNIVERSITET

Assessing Assumptions

1) Overlap

2) Unconfoundedness

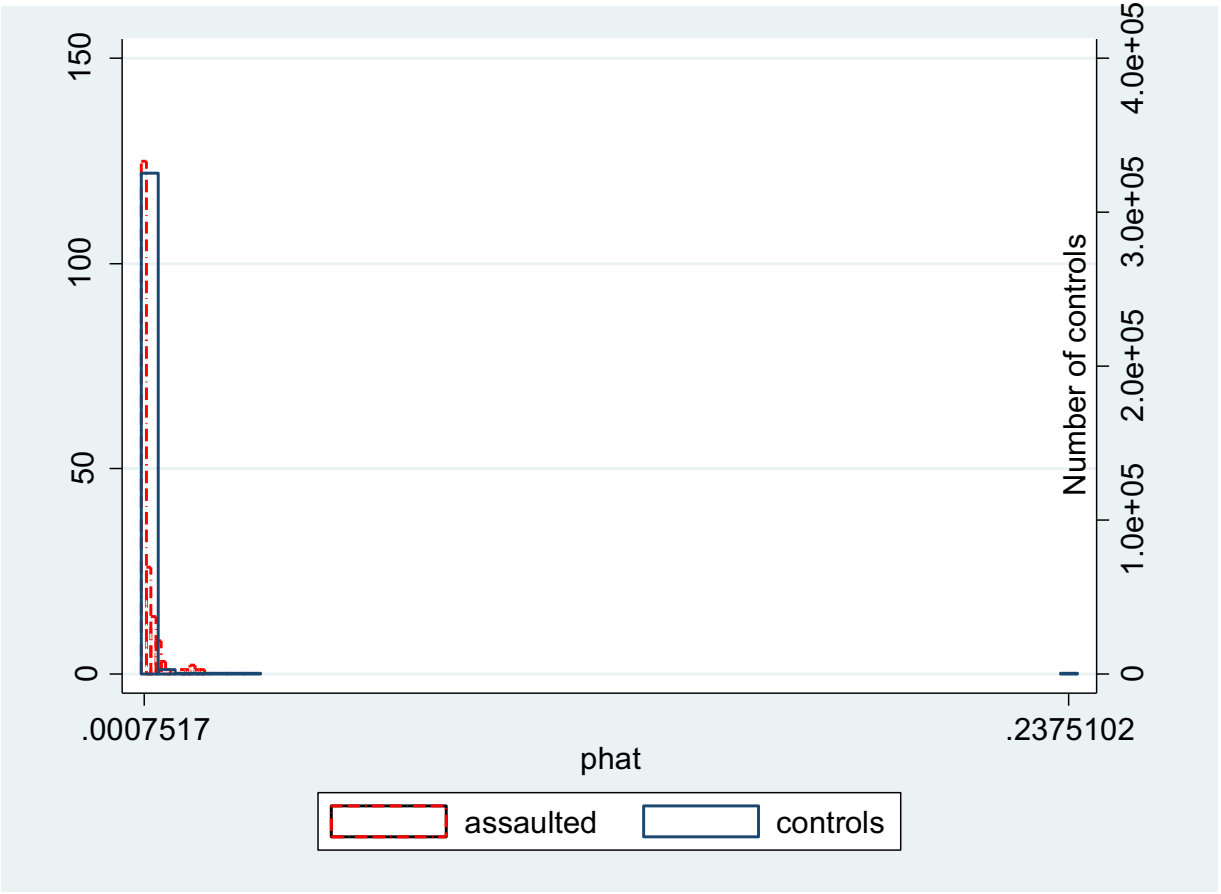
Check match quality

Selection on observables only: Plausible?

Sensitivity analysis

UPPSALA UNIVERSITET

Overlap



Right tail of propensity score distribution for assault in1998, women not working 1997.

UPPSALA UNIVERSITET

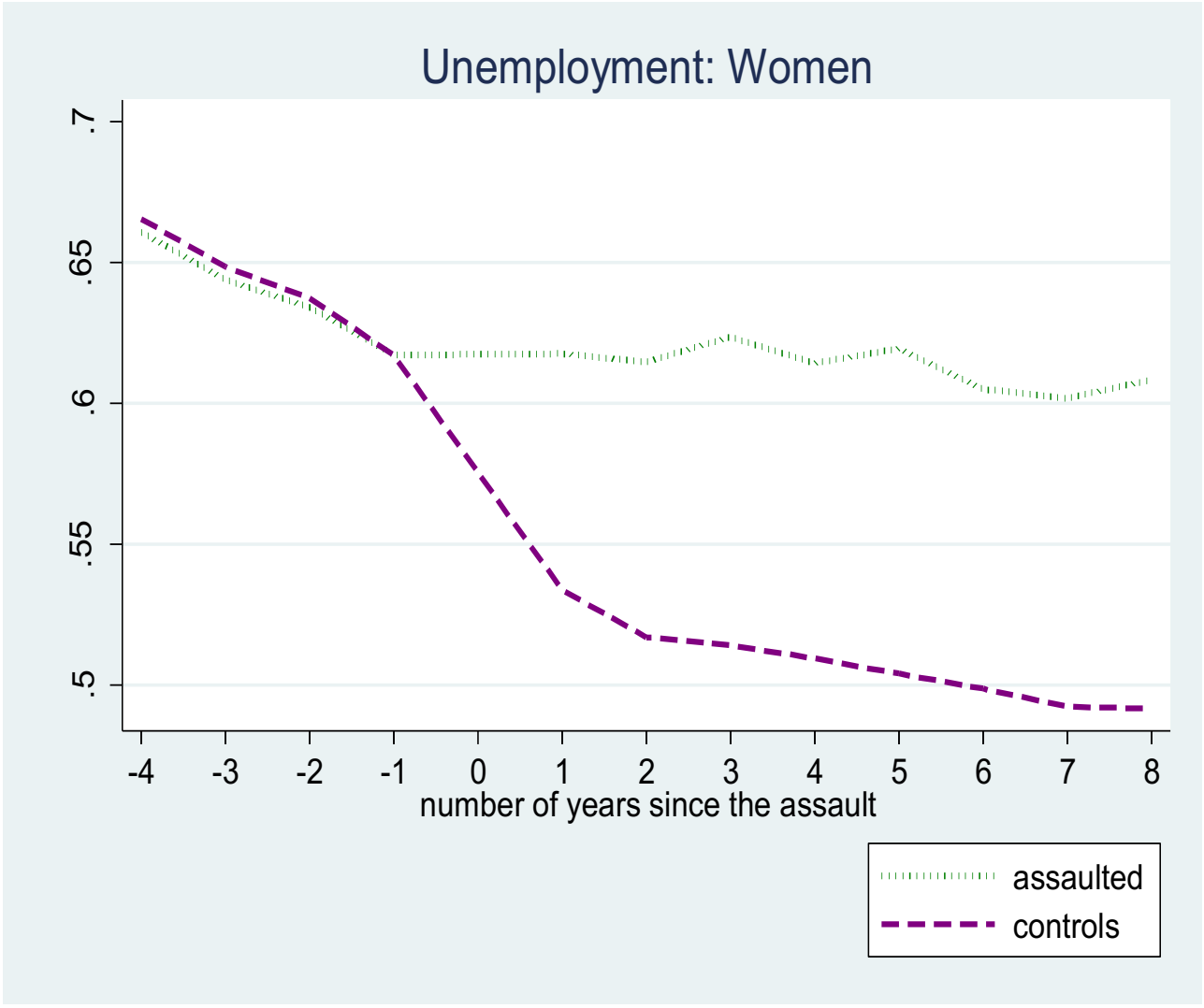
Match Quality

	Women		Men	
	Matched controls	Assaulted	Matched controls	Assaulted
Age	36.1 (0.25)	35.9 (0.25)	32.5 (0.14)	32.6 (0.14)
Years of schooling	11.1 (0.052)	11.1 (0.053)	11.1 (0.025)	11.1 (0.025)
Married (%)	21.6 (1.1)	21.1 (1.0)	10.8 (0.4)	10.9 (0.4)
Newly separated (%)	12.2 (0.8)	14.0 (0.9)	13.0 (0.5)	13.2 (0.5)
Child <4	15.2 (0.9)	13.8 (0.9)	6.9 (0.4)	6.6 (0.3)
Single parent	26.1 (1.1)	25.9 (1.1)	4.2 (0.3)	4.2 (0.3)
Sick leave (mean, year 1-4)	31.4 (1.71)	33.6 (1.77)	16.0 (0.65)	17.1 (0.68)
Any DI (last 4 years, %)	16.6 (1.0)	16.5 (0.9)	8.2 (0.4)	8.0 (0.4)
Sick leave or DI (year 1-4)	79.4 (3.34)	79.8 (3.29)	40.4 (1.37)	39.9 (1.33)
In-care patient (%)	81.2 (1.0)	81.6 (1.0)	60.0 (0.7)	58.6 (0.7)
Mental problem diagnose (%)	32.9 (1.2)	34.5 (1.2)	21.1 (0.6)	22.5* (0.6)
Working (%)	38.5 (1.2)	38.3 (1.2)	51.0 (0.7)	50.8 (0.7)
Real income + transactions (mean year 1-4, SEK)	109,000 (4,579)	106,000 (1,285)	90,000 (752)	91,000 (977)
Risk occupation (%)	21.1 (1.0)	22.4 (1.1)	5.3 (0.3)	5.1 (0.3)
	7,627	1,534	25,896	5,205

*** p<0.01, ** p<0.05, * p<0.1

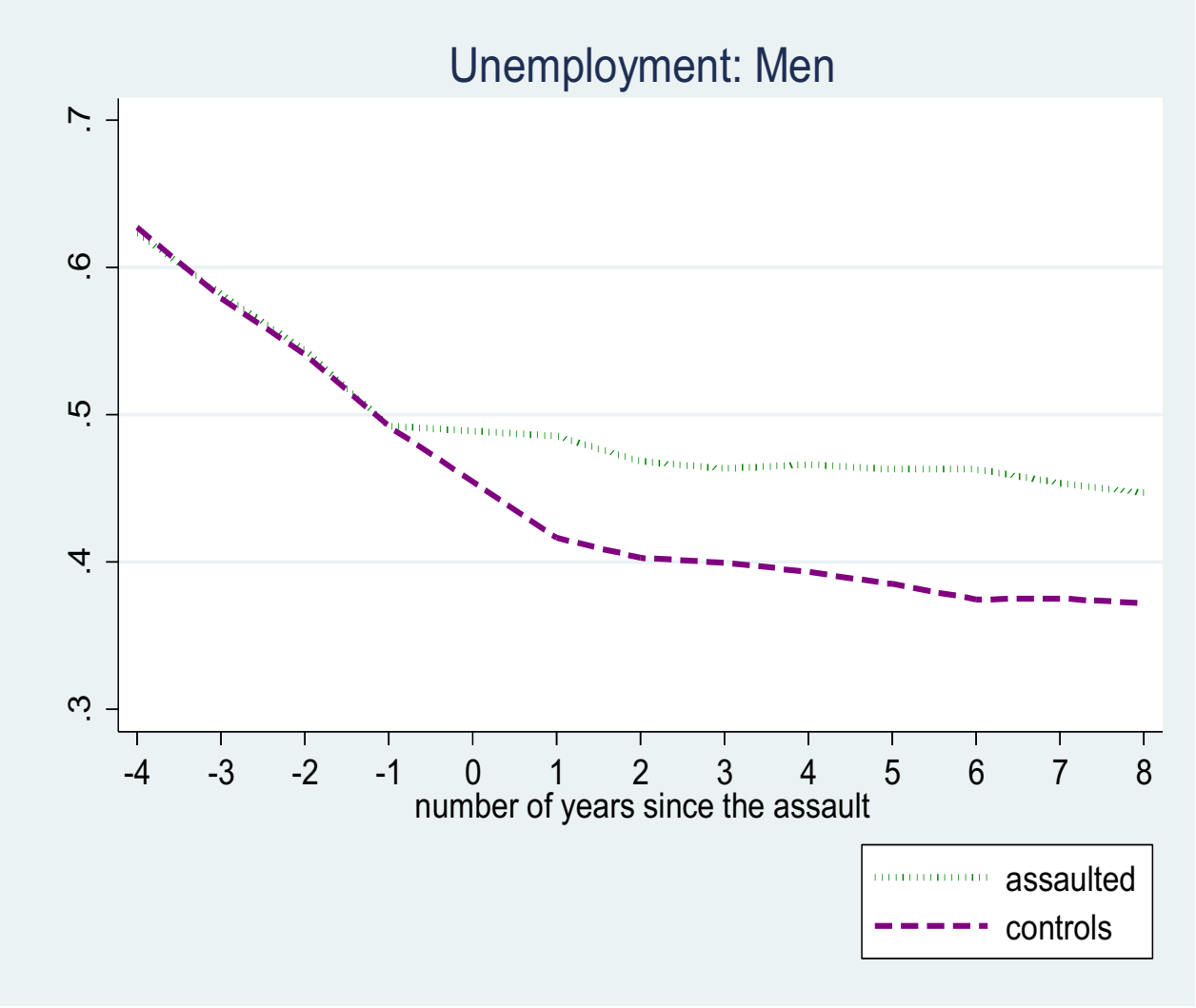
UPPSALA UNIVERSITET

Probability of not working: Women



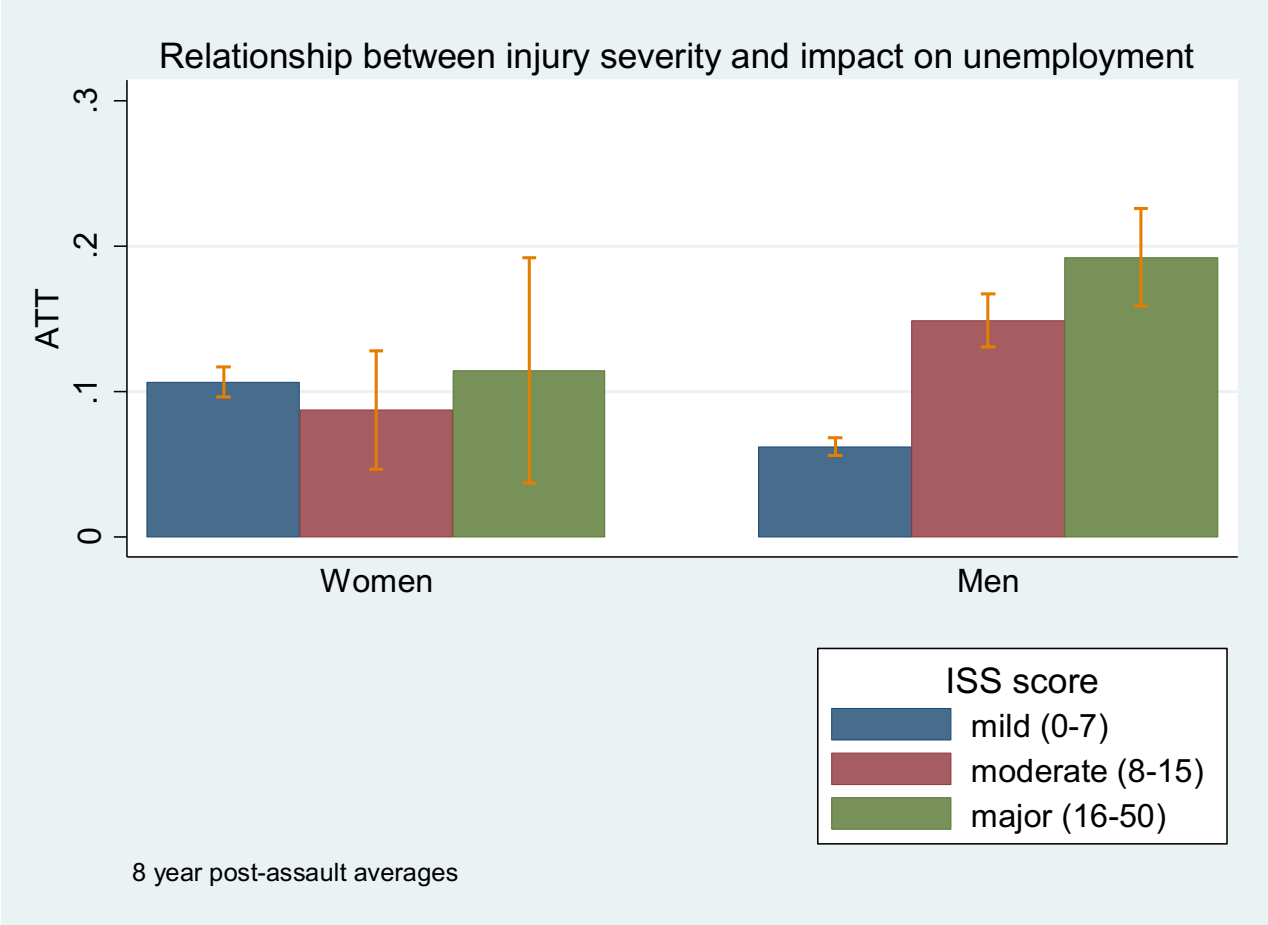
UPPSALA UNIVERSITET

Probability of not working: Men



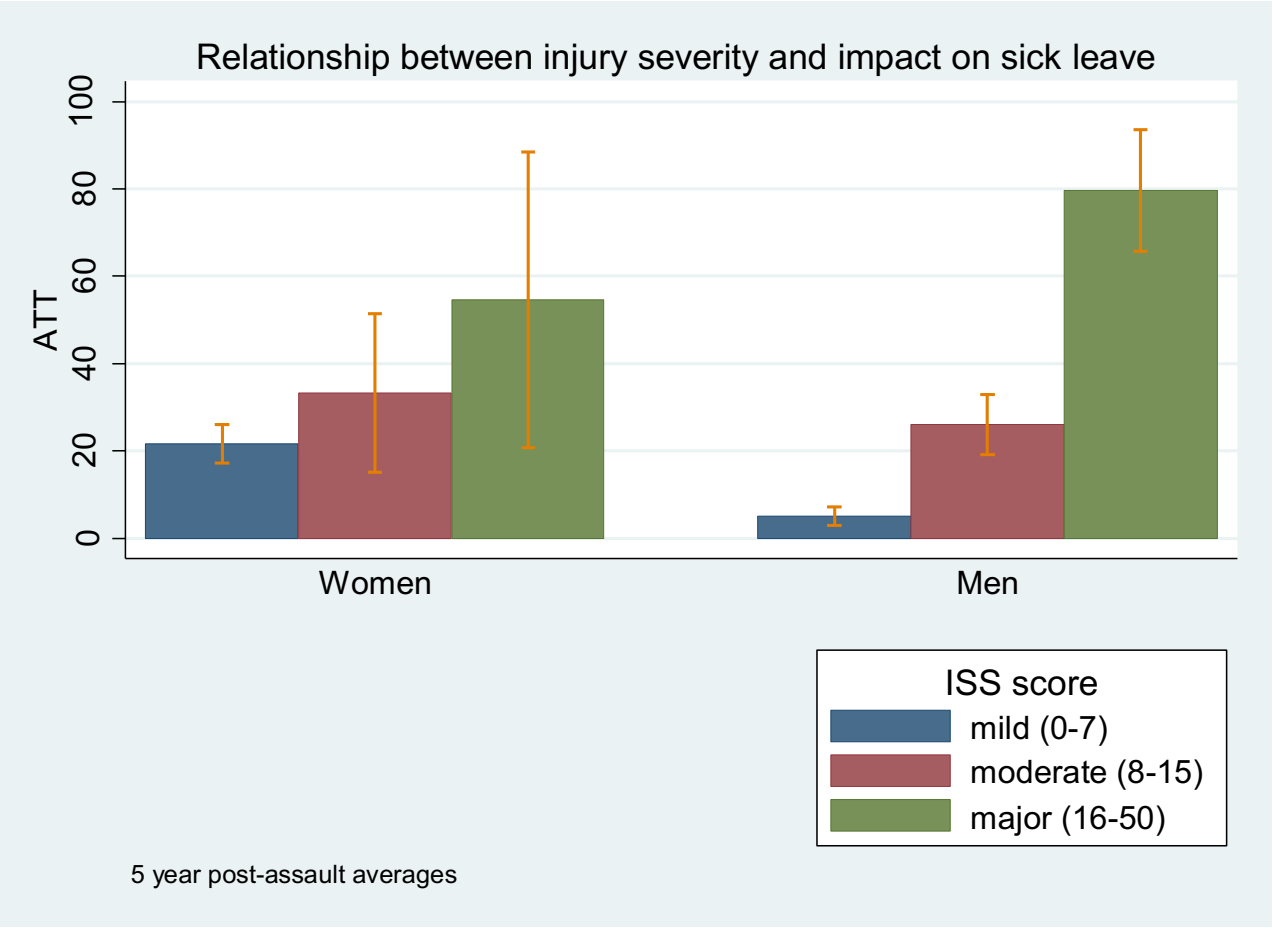
UPPSALA UNIVERSITET

Direct effects of physical injury



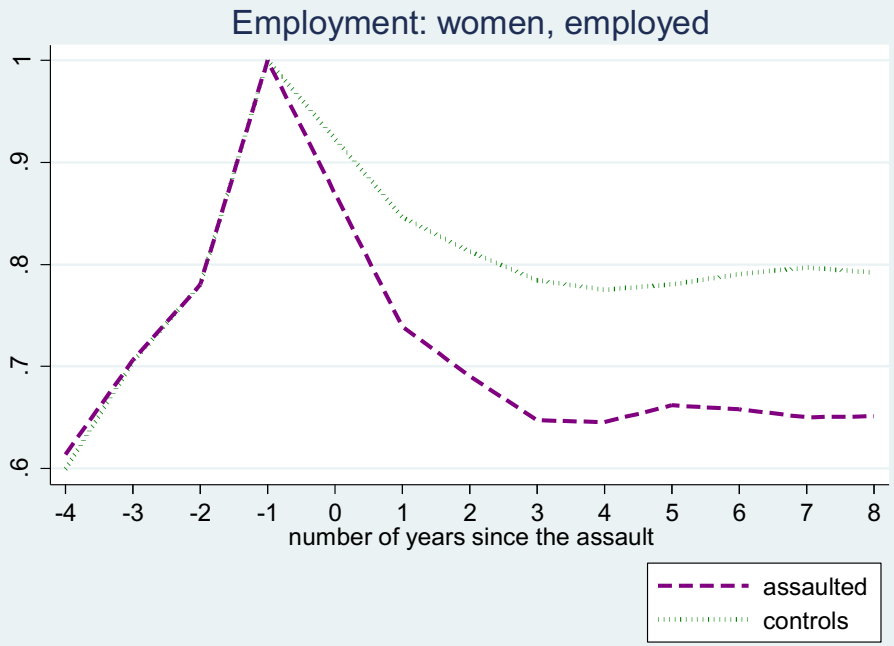
UPPSALA UNIVERSITET

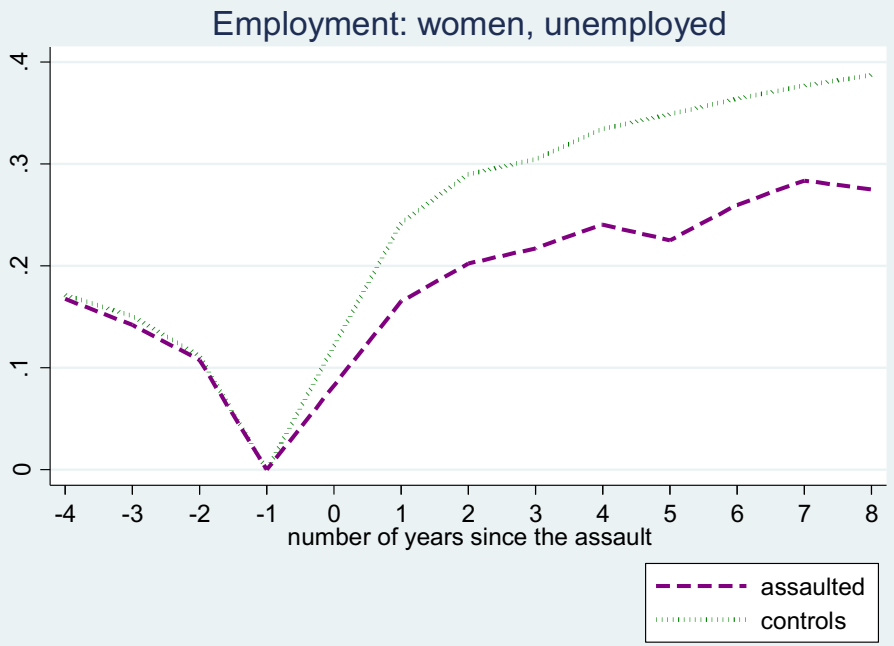
Direct effects of physical injury



UPPSALA UNIVERSITET

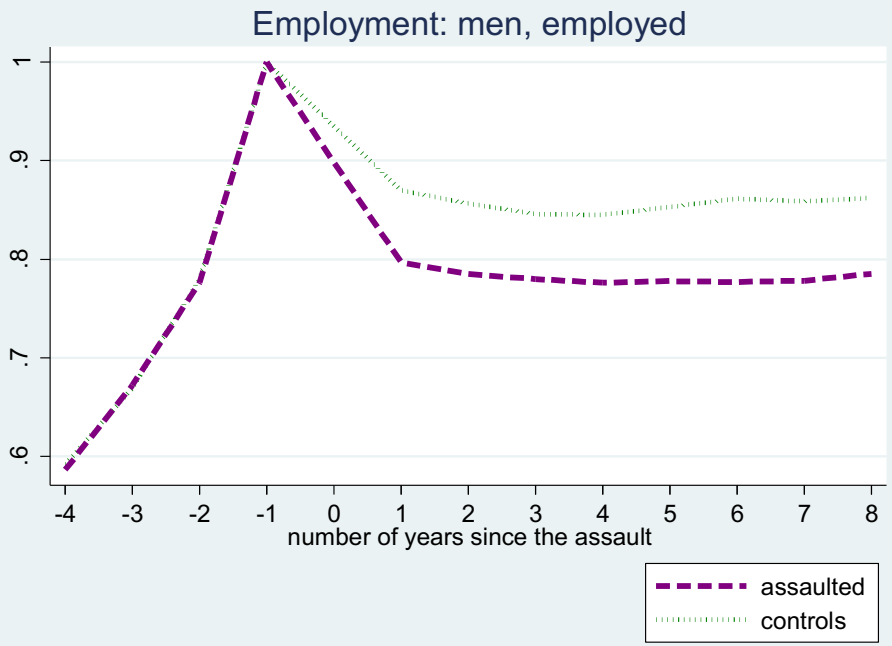
Heterogeneity

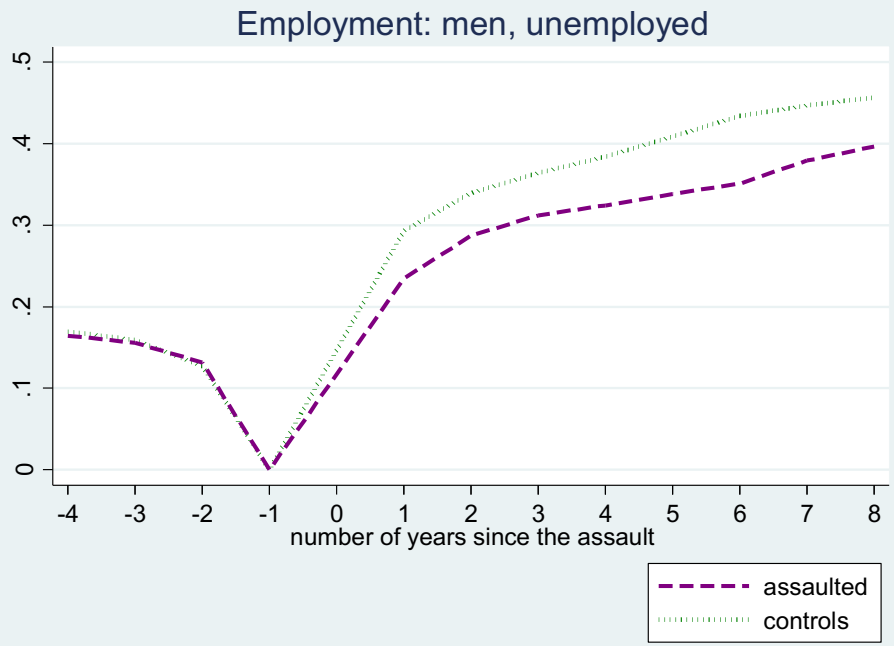




UPPSALA UNIVERSITET

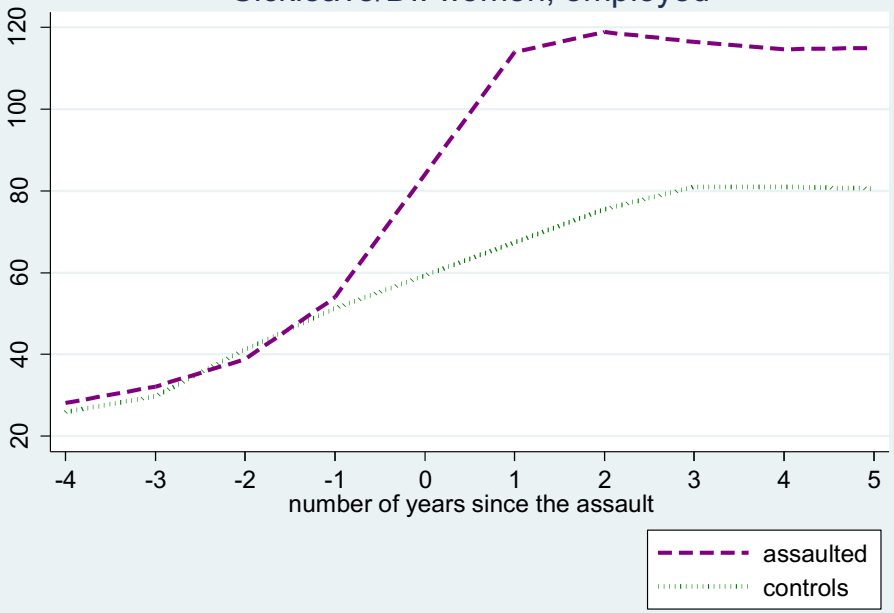
Heterogeneity

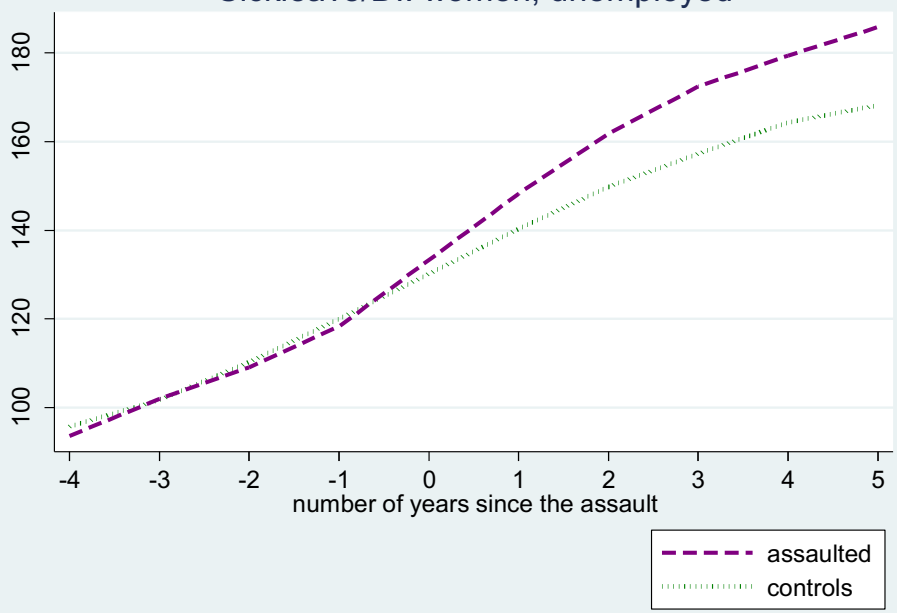




UPPSALA UNIVERSITET

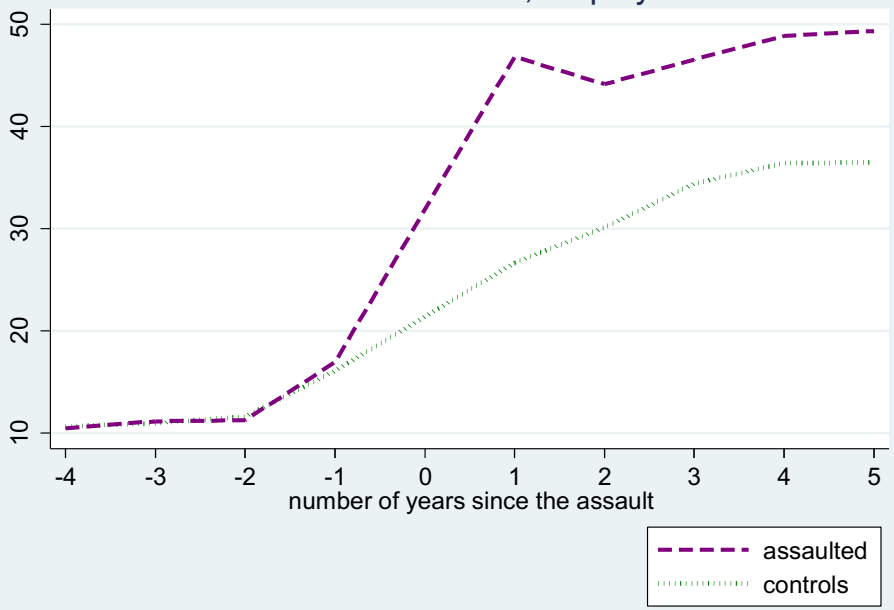
Days on sickness insurance, women

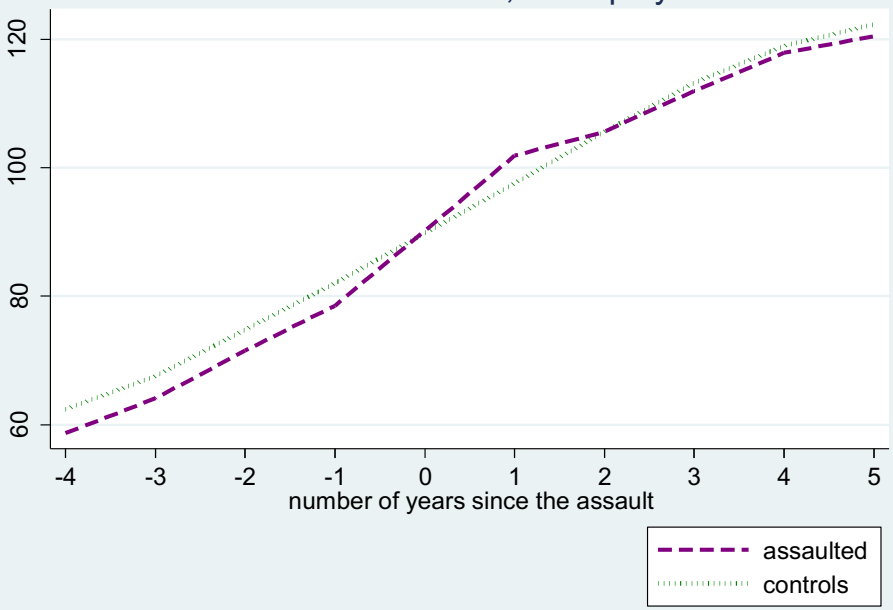




UPPSALA UNIVERSITET

Days on sickness insurance, men





UPPSALA UNIVERSITET

Summing up...

- Large selection *and* large causal effect of violence on both employment and sickness insurance uptake
- Physical injuries explain majority of effect in men, have little explanatory power in women
- Larger impact on sick leave for employed than unemployed
- Larger impact for women than for men – but *large* effects for men as well
- Effects remain over time

UPPSALA UNIVERSITET

Short-term effects of assault on employment probability

	Women		Men	
Unemployed:				
Assault	-0.077***	-0.071***	-0.060***	-0.059***
	(0.014)	(0.013)	(0.010)	(0.009)
# observations	1888	1871	5090	5048
Employed:				
Assault	-0.107***	-0.104***	-0.074***	-0.070***
	(0.020)	(0.019)	(0.008)	(0.008)
# observations	1176	1176	5272	5263
Assault year	Yes	Yes	Yes	Yes
Bias correction		Yes		Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Long term impact of assault on probability of employment

Years after assault:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployed women								
Assault	-0.071***	-0.074***	-0.081***	-0.087***	-0.112***	-0.094***	-0.082***	-0.101***
	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
# obs	1871	1859	1839	1817	1797	1753	1718	1694
Employed women								
Assault	-0.104***	-0.119***	-0.125***	-0.109***	-0.088***	-0.101***	-0.124***	-0.117***
	(0.019)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
# obs	1176	1178	1170	1160	1158	1148	1134	1132
Unemployed men								
Assault	-0.059***	-0.056***	-0.055***	-0.066***	-0.081***	-0.096***	-0.080***	-0.072***
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
# obs	5048	4994	4914	4841	4780	4635	4545	4481
Employed men								
assault	-0.070***	-0.064***	-0.059***	-0.061***	-0.068***	-0.077***	-0.074***	-0.069***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
# obs	5263	5239	5207	5171	5127	5083	5053	5033

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Short-term effects of assault on days on sickness insurance (Absolute numbers).

	Women		Men	
Unemployed:				
Assault	8.921**	7.562**	5.105	8.386***
	(3.742)	(3.702)	(3.472)	(2.114)
# observations	1888	1871	5090	5048
Employed:				
Assault	43.986***	43.961***	19.435***	19.373***
	(5.687)	(5.782)	(1.945)	(1.923)
# observations	1176	1176	5272	5263
Assault year	Yes	Yes	Yes	Yes
Bias correction		Yes		Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Long term impact of assault on sickness insurance uptake

Years since assault	(1)	(2)	(3)	(4)	(5)
Unemployed women					
Assault	7.562**	11.351***	14.278***	15.893***	19.100***
	(3.702)	(4.288)	(4.676)	(4.826)	(5.073)
# obs	1871	1859	1839	1817	1797
Employed women					
Assault	43.961***	40.453***	32.670***	31.230***	30.058***
	(5.782)	(6.154)	(6.139)	(6.191)	(6.361)
# obs	1176	1178	1170	1160	1158
Unemployed men					
Assault	8.094***	4.573**	5.373**	5.573**	5.699**
	(1.999)	(2.255)	(2.486)	(2.691)	(2.792)
# obs	5048	4994	4914	4841	4780
Employed men					
Assault	19.373***	13.522***	11.612***	12.368***	12.005***
	(1.923)	(1.963)	(2.072)	(2.163)	(2.202)
# obs	5263	5239	5207	5171	5127

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Match Quality: Women

X in t-1	Unemployed/ Absent			Employed		
	Unselected	controls	assaulted	Unselected	controls	assaulted
age	43.19***	35.27	35.70	42.79***	36.69	36.26
years of schooling	11.44***	10.67	10.71	12.48***	11.78	11.71
married	0.41***	0.19	0.18	0.51***	0.27	0.26
not cohabiting	0.46***	0.74	0.76	0.38***	0.66	0.68
newly separated	0.09***	0.14	0.14	0.05***	0.15	0.14
single parent	0.10***	0.27	0.26	0.08***	0.26	0.26
no. of children	0.42***	0.52	0.50	0.46	0.51	0.51
risk occupation	0.14***	0.09	0.09	0.43	0.41	0.43
Sickleave (4 years)	22.17***	31.01	34.18	12.86***	32.75	33.01
DI (4 years)	78.81	77.43	73.29	5.27	5.28	7.10
Sick/DI (last 4 years)	97.78	106.92	105.72	17.60***	37.03	38.17
in-care patient	1.00***	0.87	0.85	1.00***	0.75	0.76
psychiatric problem	0.08***	0.42	0.43	0.02***	0.19	0.21
real income (4 years)	893.25	956.08	951.15	1313.94***	1230.40	1238.30

*** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Match Quality: Men

X in t-1	Unemployed/ Absent			Employed		
	Unselected	controls	assaulted	Unselected	controls	assaulted
age	42.72***	33.78*	33.23	42.39***	32.27	32.01
years of schooling	11.39***	10.81	10.80	12.14***	11.39	11.38
married	0.32***	0.09	0.07	0.47***	0.15	0.14
not cohabiting	0.53***	0.76	0.78	0.39***	0.68	0.68
newly separated	0.08***	0.12	0.13	0.06***	0.14	0.13
single parent	0.02***	0.04	0.04	0.02***	0.04	0.04
no. of children	0.19***	0.15	0.16	0.45***	0.29	0.27
risk occupation	0.04	0.04*	0.03	0.08***	0.07	0.08
Sickleave (4 years)	19.23***	22.25	23.85	6.68***	10.36	10.77
DI (4 years)	70.60***	49.91	44.69	2.27	2.05	1.76
Sick/DI (last 4 years)	87.97***	71.66	68.22	8.80***	12.33	12.46
in-care patient	1.0***	0.68	0.67	1.00***	0.51	0.51
psychiatric problem	0.11***	0.32*	0.34	0.02***	0.11	0.12
real income (4 years)	991.90***	713.07	706.90	1650.36***	1127.88	1113.69

*** p<0.01, ** p<0.05, * p<0.1

UPPSALA UNIVERSITET

Excerpt from $p(X_t)$-estimation

Outcome: Assault in t			(log odds)		
WOMEN	1998	1999	2000	2001	2002
#children	-0.197	-0.855	0.523	0.013	-0.072
#children^2	-0.090	0.165***	0.125***	0.005	0.080
Age* #children	0.004	0.011	-0.029	-0.004	-0.008
single any last 4 years	1.071***	0.443*	1.041***	0.939***	0.943***
newly separated	0.539*	-0.024	0.081	-0.061	0.324
single parent	0.648**	0.840***	0.376	0.098	0.365
years of schooling	1.118*	-0.567	0.615	-0.367	-0.632**
(years of schooling)^2	-0.054*	0.018	-0.034	0.010	0.018
Mental problem, since 87	0.942**	1.485***	0.964***	1.070***	1.267***
Mental problem in t-1	0.761	0.662	0.403	1.236**	0.352
Mental problem in t-2	-1.227	0.763	0.926	0.153	0.402
Mental problem in t-3	0.595	-0.237	0.780	1.273*	1.104**
Mental problem in t-4	-1.236	-0.098	1.351**	1.021**	0.472
No. of hospitalizations, last 4	0.050	0.160**	0.125**	0.108**	0.109***
Any hospital care, last 4	-0.345	0.440	0.525	0.698*	0.433
Any hospital care, since 87	-0.106	-0.703**	-0.596*	-0.863***	-1.077***
Any hospital care in t-1	-0.257	-0.537	0.008	-0.827**	0.242
Any hospital care t-2	-0.249	-0.346	-0.986***	-1.068***	-1.227***
Any hospital care t-3	-0.899**	-1.142***	-1.001***	-1.794***	-1.000***
...					