The Dynamics of Domestic Violence
Learning about the Match

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Crime Survey of England and Wales 2015

- Over 8% of women experienced domestic abuse
- Domestic abuse accounts for 20% of all reported violent incidents
- Highest rate of repeat victimization of any type of crime

Economic Research on Abuse

- Has mostly focused on
    - variation by educational attainment, labour market conditions, culture and social norms
    - other triggers such as emotional cues and instrumental violence
    - impact of law enforcement, welfare and cash-transfer policies

- No studies on dynamic and simultaneous links between abuse, labour supply, partnership status and fertility

Our Contribution

Estimate dynamic model of labour supply, partnership status and fertility with learning about partner's abusive type

- Builds on Brian, Lillard and Stern (2006)
  - women choose partnership status and learn about type but abstract from labour supply and fertility is exogenous
- Builds on Bowlus and Seitz (2006)
  - women choose partnership status and labour supply but no learning about type and fertility is exogenous
- Builds on Keane and Wolpin (2010)
  - women choose labour supply, partnership status and fertility but no abuse or learning

Main Research Questions

In our more comprehensive environment, we address the
following questions:

- What is the effect of uncertainty about partner's violent
  nature?
    - does it lead to delays in marriage-specific investments,
      most notably fertility?
- What are the labour supply responses of women facing
  possible domestic violence?
    - do certain labour supply choices trigger domestic abuse?
- What is the effect of female "empowerment" on abuse
  rates?
    - through higher wages
    - more generous childcare support

Avon Longitudinal Study of Parents and Children

ALSPAC also known as "Children of the 90s" survey

- Pregnant women with estimated delivery dates between April 1991 and December 1992
- Questions on abuse annually until child was 6 years old
  - was partner physically cruel
  - was partner emotionally cruel
  - subjective measure aligns with individual's expectations
  - "any" abuse gives similar incidence as British Crime Survey
- Drop non-white women and other standard restrictions
  - 9,359 women between ages of 17 and 40
  - 56,926 woman-year observations
  - over 80 percent with observations for all seven years
  - impute wages from UK Labour Force Survey

Descriptive Statistics at Baseline

Means at Mid-Pregnancy		
	Mean	St. Dev
Age	28.1	4.5
Married	.96	.19
Marriage Duration	4.8	3.5
Has Child	.55	.50
Number Children	.78	.89
Low Qualification	.24	.43
Medium Qualification	.38	.49
High Qualification	.37	.49
N	9,359	

Descriptive Statistics - Domestic Abuse

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	Physical	Emotional	Any
Mean	.024	.087	.092
N	56,926	56,926	56,926
Any Abuse		Time t+1	
		0	1
Time t	0	.943	.057
	1	.505	.495

Domestic Abuse by Age
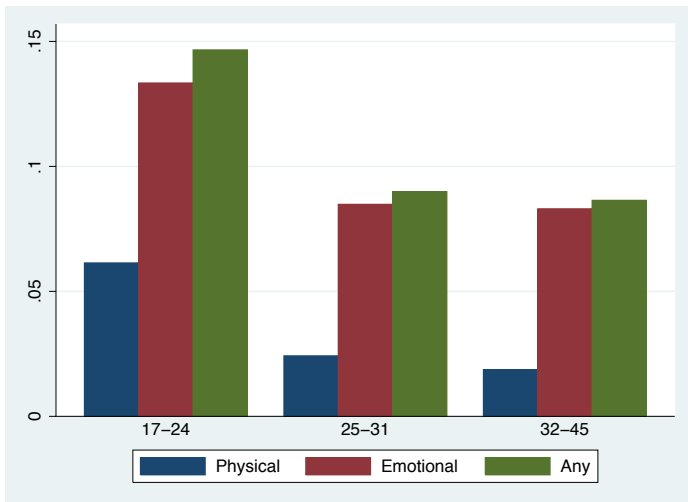
Domestic Abuse by Education
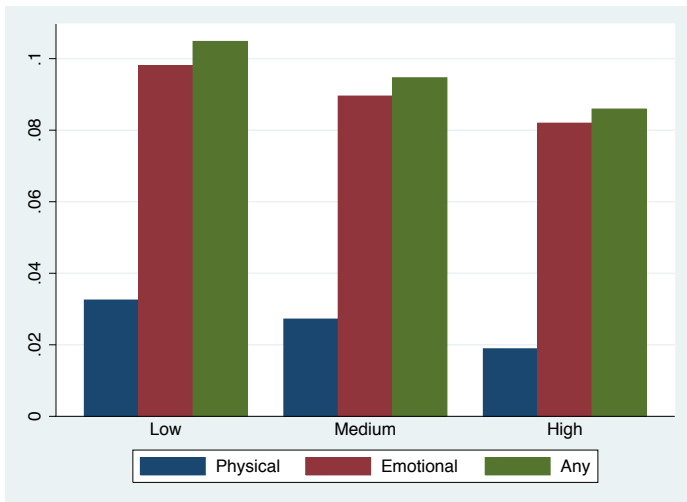
	Mean	N
Nonemployed	.471	53,746
Part-time	.345	53,746
Full-time	.184	53,746
Married	.937	56,926
Birth	.121	37,876

LPMs with Fixed Effects

	Ab(t-1,t)	UE(t)	Div(t-1,t)	B(t-1,t)
	(1)	(2)	(3)	(4)
Ab(t-1,t)		-.018		
Ab(t-2,t-1)			.030**	-.027**
PT(t-1)	-.009*			
FT(t-1)	.027**			
Controls	Yes	Yes	Yes	Yes
N	33,015	31,485	34,482	35,033

Optimization Problem

- Discrete choice dynamic programming problem
- At the start of each period t, a woman chooses to be
    - in non-employment, part-time or full-time work, $k_t \in \{0, 1, 2\}$
    - single or married $m_t \in \{0, 1\}$ (marriage offer probability ς)
    - pregnant or not $f_t \in \{0, 1\}$

Abuse Environment

- Abuse is a semi-endogenous stochastic process
- Males of two possible unknown types: "non-violent nature" and "violent nature"
- A violent man $r = 0$ will abuse $z_t = 1$ with probability χ_0^k
- A non-violent man $r = 1$ will abuse $z_t = 1$ with probability $\chi_1 < \chi_0^k$
- ϕ_t is belief partner is non-violent type at time t (in state space)
- $\phi_t = \phi_b$ at start of new partnership: proportion of non-violent types in population

Learning Dynamics

- Belief about partner's nature updated according to Bayes' rule (law of motion)

- Updating belief partner is non-violent when $z_{t-1} = 0$ (no abuse last period):

$$\phi_{t|z_{t-1}=0} = \frac{\phi_{t-1}(1 - \chi_1)}{\phi_{t-1}(1 - \chi_1) + (1 - \phi_{t-1})(1 - \chi_0^k)}.$$

- Updating belief partner is non-violent type when $z_{t-1} = 1$:

$$\phi_{t|z_{t-1}=1} = \frac{\phi_{t-1}\chi_1}{\phi_{t-1}\chi_1 + (1 - \phi_{t-1})\chi_0^k}.$$

- Belief enters utility flow thus affecting all three choice dimensions

Utility Flow and Consumption

- Contemporaneous Utility

$$U_t = \frac{\mu^{k_t} C_t^{1-\lambda}}{1-\lambda} + \left(\Psi_t^m - \bar{\Psi}_t^z\right) m_t + \Psi_t^n$$

$$\Psi_t^m = \psi^m + \varepsilon_t^m$$

$$\bar{\Psi}_t^z = \left(\phi_t \chi_1 + (1-\phi_t) \chi_0^{k_t}\right) \psi^z$$

$$\Psi_t^n = \beta_1^n n_t - \beta_2^n n_t^2 + f_t \varepsilon_t^f$$

$$n_{t+1} = n_t + f_t$$

- Consumption

$$C_t = \begin{cases} \tau\left(w_t + w_t^h - c_t\right) & \text{if } m_t = 1 \\ w_t - c_t & \text{if } m_t = 0 \end{cases}$$

Wage Offers and Child Care Costs

■ Wage Offers

$$w_t^k = exp\left(\beta_0^k + \beta_1^k a + \beta_2^k x_t + \beta_3^k x_t^2 + \varepsilon_t^k\right)$$

$$w_t^h = exp\left(\beta_0^h + \beta_1^h a + \beta_2^h t_t + \beta_3^h t_t^2 + \varepsilon_t^h\right)$$

$$\frac{Pr\left(a=1|q\right)}{Pr\left(a=0|q\right)} = exp\left(\beta_0^a + \beta_1^a d_{q=1} + \beta_2^a d_{q=2}\right)$$

$$x_{t+1} = x_t + k_t$$

$$k = 1, 2$$

■ Child Care costs

$$c_t = \rho^{k_t}(\beta_1^c n_t + \beta_2^c n_t^2) - (\beta_3^c n_t + \beta_4^c n_t^2)(1 - m_t)$$

Model Mechanisms

- Learning about type directly changes utility of marriage over time
- Learning indirectly changes utility of having children over time
  - may be more costly to separate with children (no more sharing costs)
  - allows for delay in fertility until violent nature more clearly known
- Learning indirectly changes utility of labour supply over time
  - may want more experience and higher earnings if likely to become single (expected future non-labour income effect)
  - avoid abuse until type known
  - present non-labour income effect weighs against more labour supply

- Full backward recursion to obtain expected maximum future returns (EMAXs)
- Discretize belief state space into 61 point grid
  - denser toward ends of unit interval
  - reflects natural properties of Bayesian updating process
    - updates smaller when prior is close to zero or one
- Simulate forward from age 16 to 44 (sample 17 to 40) to account for
  - initial conditions problem
    - unemployed, single, no children at age 16
  - terminal period effects
    - less sharp changes at age 40 when simulate to 44

Estimation Method

- Simulated Method of Moments/Indirect Inference
- 41 parameters and 85 empirical moments (static and dynamic)
- Compute simulated moments from year in which they give birth
  - mimics ALSPAC sampling method
  - all ALSPAC women give birth between periods 1 and 2
- Match simulated birth rate to external estimate from ONS

Identification

Three main groups of moments

- marriage rate, marriage duration, divorce rate by abuse status, abuse rates, abuse onset and persistence by work status
  - newly formed couples (short marriage durations) key in identifying abuse parameters and speed of learning
- employment rates, transitions and wages by age and qualifications
- children by abuse status, out of wedlock births, work by marital status and number of children

Model Fit - Abuse Rates

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	All	Low E	Med E	High E	
	.092	.101	.094	.085	
	(.087)	(.104)	(.091)	(.063)	
17-24	**25-32**	**33-40**	$\mathbf{UE}_{t-1}$	$\mathbf{PT}_{t-1}$	$\mathbf{FT}_{t-1}$
.144	.087	.085	.101	.084	.106
(.095)	(.081)	(.088)	(.098)	(.057)	(.111)

- Model explains lower abuse rates in PT (learning/selection)
  - have kids only after learn have non-abusive partner
  - work part-time when have kids due to childcare costs
- Model explains higher abuse rates when young (learning/selection)
  - stay married to non-abusive types (older less abused)
  - re-marriage rates drop with age
  - work less when young (younger more abused)

Parameter Estimates - Abuse

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ϕ^b	χ_1	χ_0^0	χ_0^1	χ_0^2	ψ^z
.663	.019	.718	.566	.560	141.4
(.000)	(.000)	(.000)	(.000)	(.000)	(.222)

- Small probability of being abused by non-violent type
- High probability of being abused by violent type when non-employed
- Probability of being abused same in part-time and full-time given married to violent type
- Not inconsistent with less abuse when part-time (mostly married to non-violent types)

- more marriage, more divorce, delayed fertility and overall fewer children
  - divorcing with children is costly (not sharing costs)
- more labour supply
  - avoid abuse until type known
  - expected future non-labour income effect outweighs present one
- higher abuse rate (14 percentage points)
  - don't select out of marriage with violent type in beginning
  - more labour supply doesn't fully offset

- more labour supply
  - especially amongst low and medium qualified women
- more delayed fertility and overall fewer children
  - more costly to have children when working
- lower abuse rate (.3 percentage points)
  - because more labour supply

- less labour supply due to non-labour income effect
    - especially amongst low and medium qualified
- lower propensity to be married
- more overall children including out-of-wedlock births due to non-labour income effect
- higher abuse rate (.3 percentage points)
    - less labour supply while single persists after marriage (less accumulated experience, lower wage offers)

Learning Effects

- Uncovered important interactions between uncertainty about violent nature of partner (learning) and labour supply, marriage duration and fertility
    - more marriage (at younger ages), more divorce, delayed fertility and less children
    - more labour supply to avoid possible abuse and "prepare" for divorce
    - uncertainty about type explains substantial portion of abuse rate

Incentive Effects

- Female empowerment through higher wages
    - more labour supply and modest decrease in abuse rate
- Increased child support yields present and expected non-labour income effects which lead to
    - less labour supply and modest increase in abuse rate
    - "surprising" unintended consequence of social policy

- Work in child outcomes
    - cognitive
    - non-cognitive
    - health

- Trace broader range of effects of domestic abuse on mother and child