Job Displacement and Crime: Evidence from Danish Micro Data

Patrick Bennett (Norwegian School of Economics)

Amine Ouazad (Ecole polytechnique)

Global Labor Markets Conference, September 2016
What are the *consequences* of unemployment?

- Impacts above and beyond the employer-employee pair → job separations may not be efficient.

Other significant social costs of crime. Crime a key driver of politicians' approval rates.

1990-2016: coincidence of crime and unemployment peaks in the US and in Denmark.

But Levitt (2004): the economy has too small an effect.

Studies of the effect of unemployment on crime combine county-level (or equiv) data with an IV (exchange rate, industrial spec. a la Bartik).

Captures the overall impacts of unemployment conditional on validity of IV.

Significant impacts of unemployment on property crime.
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What we’re doing

- Unique Danish administrative 1985-2000 individual data to estimate the impact of individual job separation ⇒ individual crime.
  - Using job displacement as an arguably idiosyncratic driver of job separations.

- Checks placebo tests and pre-displacement trends.
- Estimates family dynamics following displacement.
- How local income inequality magnifies displacement impacts.
- Incarceration periods correlated with larger earnings losses post-displacement.
- Prior contributions use county-level or equivalent analysis:
  - Split total impact of unemployment on crime = Individual impact + Spillover effects.
  - Unemployment effects vs Separations.

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Outline

1. Danish registry: longitudinal individual history.
2. Correlations of crime and transitions into unemployment.
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4. Main Results.
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5. Two extensions:
   5.1 Family spillovers.
   5.2 Inequality and Crime.
Danish Registry

- Database of every individuals residing in Denmark from 1980-present.
  1. **Employment spells:** *Integrated Database for Labor Market Research.*
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- Tied by an individual Central Person Register (CPR).

- Focus on men, born 1945 to 1960, continuously in the sample.

  Endogenous exit and reentry not a significant issue.
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(i) Employer-Employee

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Wage (2000 DKK)</td>
<td>238,170</td>
<td>169,906</td>
<td>141,047</td>
<td>247,029</td>
<td>317,177</td>
<td>8,830,448</td>
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<tr>
<td>Weeks Fully Unemployed</td>
<td>2.88</td>
<td>9.06</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Firm size</td>
<td>4124.46</td>
<td>9860.5</td>
<td>20</td>
<td>183</td>
<td>2273</td>
<td>7,494,777</td>
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</tbody>
</table>

(ii) Demographics and Education

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>39.23</td>
<td>6.56</td>
<td>35</td>
<td>39</td>
<td>44</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Birth Year</td>
<td>1952.27</td>
<td>4.67</td>
<td>1948</td>
<td>1952</td>
<td>1956</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Married</td>
<td>60.55%</td>
<td>48.87%</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Less than high school</td>
<td>27.23%</td>
<td>44.52%</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
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<tr>
<td>High School</td>
<td>4.20%</td>
<td>20.06%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Vocational</td>
<td>44.33%</td>
<td>49.68%</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>University or beyond</td>
<td>22.75%</td>
<td>41.92%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Missing education</td>
<td>1.49%</td>
<td>12.10%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
</tbody>
</table>
(iii) Family Structure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family income (2000 DKK)</td>
<td>484,396</td>
<td>451,135</td>
<td>323,507</td>
<td>461,747</td>
<td>588,389</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Wage as fraction of HH Income</td>
<td>50.47%</td>
<td>29.97%</td>
<td>36.11%</td>
<td>53.76%</td>
<td>67.10%</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Family size</td>
<td>2.89</td>
<td>1.35</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Adults in Family</td>
<td>1.89</td>
<td>0.62</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Number of children</td>
<td>1.05</td>
<td>1.14</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>8,830,448</td>
</tr>
</tbody>
</table>

(iv) Police and Court Records

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of charge</td>
<td>2.27%</td>
<td>14.89%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Number of charges</td>
<td>1.66</td>
<td>3.34</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>200,391</td>
</tr>
<tr>
<td>Probability of conviction</td>
<td>1.91%</td>
<td>13.69%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Probability of conviction - Property</td>
<td>0.65%</td>
<td>8.06%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Probability of conviction - Violent</td>
<td>0.13%</td>
<td>3.67%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Probability of conviction - DUI</td>
<td>0.67%</td>
<td>8.14%</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Number of convictions</td>
<td>2.26</td>
<td>5.89</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>168,517</td>
</tr>
<tr>
<td>Probability of conviction to Prison</td>
<td>26.29%</td>
<td>44.02%</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>168,517</td>
</tr>
<tr>
<td>Length of prison sentence (days)</td>
<td>2341.89</td>
<td>5844.60</td>
<td>14</td>
<td>30</td>
<td>240</td>
<td>44304</td>
</tr>
</tbody>
</table>
Crime: *Citations/Arrests → Conviction*

- We focus on citations/arrests occurring *after* job loss, and which lead to a conviction.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Time from Offense to Charges (days)</th>
<th>Time from Charges to Conviction (days)</th>
<th>Time from Conviction to Prison (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>P25</td>
</tr>
<tr>
<td>At least 1 charge</td>
<td>59.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Excluding speeding</td>
<td>78.1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Excluding zeros</td>
<td>149.1</td>
<td>42</td>
<td>10</td>
</tr>
</tbody>
</table>

(50.5%)[1] (12.4%)[2]
## Unemployment Transitions are Endogenous

<table>
<thead>
<tr>
<th>Dependent:</th>
<th>(1) Total Crime</th>
<th>(2) Property Crime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specification:</td>
<td>OLS</td>
<td>Fixed Effect</td>
</tr>
<tr>
<td>Year +7</td>
<td>0.0156***</td>
<td>0.0012***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Year +6</td>
<td>0.0155***</td>
<td>0.0016***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Year +5</td>
<td>0.0173***</td>
<td>0.0029***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Year +4</td>
<td>0.0196***</td>
<td>0.0049***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Year +3</td>
<td>0.0218***</td>
<td>0.0068***</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0005)</td>
</tr>
<tr>
<td>Year +2</td>
<td>0.0232***</td>
<td>0.0082***</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0005)</td>
</tr>
<tr>
<td>Year +1</td>
<td>0.0249***</td>
<td>0.0098***</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0005)</td>
</tr>
<tr>
<td>Unemployment Year</td>
<td>0.0303***</td>
<td>0.0153***</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0005)</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Unemployment Year</th>
<th>Year −1</th>
<th>Year −2</th>
<th>Year −3</th>
<th>Year −4</th>
<th>Year −5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0303***</td>
<td>0.0153***</td>
<td>0.0127***</td>
<td>0.0074***</td>
<td>0.0300***</td>
<td>0.0150***</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0005)</td>
<td>(0.0003)</td>
<td>(0.0003)</td>
<td>(0.0005)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
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</thead>
<tbody>
<tr>
<td>Individual Fixed Effect</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.005</td>
<td>0.001</td>
<td>0.003</td>
<td>0.001</td>
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<tr>
<td>Observations</td>
<td>8,830,448</td>
<td>8,830,448</td>
<td>8,830,448</td>
<td>8,830,448</td>
</tr>
<tr>
<td>Clusters</td>
<td>551,903</td>
<td>551,903</td>
<td>551,903</td>
<td>551,903</td>
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</table>
Correlations between Observables and Unemployment Transitions

<table>
<thead>
<tr>
<th></th>
<th>(1) Transition into Unemployment</th>
<th>(2) Total Crime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than High School</td>
<td>0.042***</td>
<td>0.070***</td>
</tr>
<tr>
<td>High School Education</td>
<td>-0.002***</td>
<td>-0.010***</td>
</tr>
<tr>
<td>Vocational Education</td>
<td>0.005***</td>
<td>-0.022***</td>
</tr>
<tr>
<td>University or Greater</td>
<td>-0.053***</td>
<td>-0.053***</td>
</tr>
<tr>
<td>Missing Education</td>
<td>0.011***</td>
<td>0.034***</td>
</tr>
<tr>
<td>Married</td>
<td>-0.069***</td>
<td>-0.073***</td>
</tr>
<tr>
<td>Lag of Tenure</td>
<td>-0.108***</td>
<td>-0.073***</td>
</tr>
<tr>
<td>Lag Firm Size</td>
<td>-0.043***</td>
<td>-0.012***</td>
</tr>
<tr>
<td>Age</td>
<td>-0.084***</td>
<td>-0.039***</td>
</tr>
<tr>
<td>Observations</td>
<td>8,830,448</td>
<td></td>
</tr>
</tbody>
</table>

- Similar signs for the correlation with crime and with displacement → overestimate.
Mass Layoffs and Job Displacement

Focusing on a sample of arguably sudden and unexpected job separations.

- **Mass layoffs**: a decline in firm size of 30% or 40% compared to
  - (i) peak firm size in 1985-1990 (JLS definition)
  - (ii) average firm size in 1985-1990.
  - (iii) firm-specific size trend in 1985-1990 for declining firms.

  \[ n_{j,t} = \alpha_j + \beta_j \cdot t + \varepsilon_{j,t} \text{ on } 1985 - 1990 \text{ used to predict} \]

  \[ n_{\hat{j},t} = \hat{\alpha}_j + \hat{\beta}_j \cdot t \text{ for } t \geq 1990 \]

- Displaced workers: focus on workers least likely to lose employment during a mass layoff event.
  - Workers continuously employed between 1987 and 1989.
  - Full time employment.
  - Ten or more employees.
  - Not enrolled in education.
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  - (ii) average firm size in 1985-1990.
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    - \( n_{j,t} = \alpha_j + \beta_j \cdot t + \varepsilon_{j,t} \) on 1985 – 1990 used to predict
    - \( \hat{n}_{j,t} = \hat{\alpha}_j + \hat{\beta}_j \cdot t \) for \( t \geq 1990 \)

- **Displaced workers**: focus on workers least likely to lose employment during a mass layoff event.
Displacement Rate along the Business Cycle

![Graph showing the displacement rate along the business cycle from 1990 to 2000. The graph includes lines for Peak, Average, Firm Trend, and Unemployment (right scale).]
Specification

- Baseline regression.

\[ Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(\text{Displaced in year } t - k) + \text{Individual}_i \]

\[ + Year_t + \text{Municipality}_{m(i,t)} + x_{it}\beta + \text{Constant} + \varepsilon_{it} \]
Specification

- Baseline regression.

\[ Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(Displaced \ in \ year \ t - k) + Individual_i \]
\[ + Year_t + Municipality_{m(i,t)} + x_{it}\beta + Constant + \varepsilon_{it} \]

- Effects \( \delta_0, \ldots, \delta_7 \) relative to the pre-displacement year \(-1\).
Specification

- Baseline regression.

\[
Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(\text{Displaced in year } t - k) + \text{Individual}_i \\
+ Year_t + \text{Municipality}_{m(i,t)} + x_{it} \beta + \text{Constant} + \varepsilon_{it}
\]

- Effects \( \delta_0, \ldots, \delta_7 \) relative to the pre-displacement year \(-1\).
- Placebo coefficients: \( \delta_{-5}, \ldots, \delta_{-2} \).
Specification

- Baseline regression.

\[ Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(\text{Displaced in year } t - k) + \text{Individual}_i + Year_t + \text{Municipality}_{m(i,t)} + x_{it}\beta + \text{Constant} + \varepsilon_{it} \]

- Effects \( \delta_0, \ldots, \delta_7 \) relative to the pre-displacement year \(-1\).
- Placebo coefficients: \( \delta_{-5}, \ldots, \delta_{-2} \).
- Individual fixed effect: individual unobservables.
Specification

- Baseline regression.

\[
Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(\text{Displaced in year } t - k) + \text{Individual}_i \\
+ Year_t + Municipality_{m(i,t)} + x_{it} \beta + \text{Constant} + \varepsilon_{it}
\]

- Effects \( \delta_0, \ldots, \delta_7 \) relative to the pre-displacement year \(-1\).
- Placebo coefficients: \( \delta_{-5}, \ldots, \delta_{-2} \).
- Individual fixed effect: individual unobservables.
- \( Municipality_{m(i,t)} \): municipality unobservables, differences in policing efforts.
Specification

- Baseline regression.

\[
Crime_{it} = \sum_{k=-5}^{+7} \delta_k \cdot 1(\text{Displaced in year } t - k) + \text{Individual}_i \\
+ \text{Year}_t + \text{Municipality}_{m(i,t)} + \mathbf{x}_{it} \beta + \text{Constant} + \epsilon_{it}
\]

- Effects $\delta_0, \ldots, \delta_7$ relative to the pre-displacement year $-1$.
- Placebo coefficients: $\delta_{-5}, \ldots, \delta_{-2}$.
- Individual fixed effect: individual unobservables.
- $\text{Municipality}_{m(i,t)}$: municipality unobservables, differences in policing efforts.
- Multinomial, propensity score matching, fixed effect f.d./within $\rightarrow$ similar results.
Impact of Job Displacement on Crime

Panel Regression Coefficient

Year Relative to Displacement

Total
Property
DUI
Violent
Robustness to Alternative Definitions

Panels Regression Coefficient

Year Relative to Displacement

- Original
- 40% Threshold
- Average 1985–1989
- Firm–Specific Trend
### Placebo Test: Current convictions of Future Displaced Workers

<table>
<thead>
<tr>
<th>Sample:</th>
<th>dependent</th>
<th>Property</th>
<th>Violent</th>
<th>Property</th>
<th>Violent</th>
<th>Property</th>
<th>Violent</th>
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<tbody>
<tr>
<td>1989</td>
<td>Future Displaced</td>
<td>0.0008</td>
<td>0.0007</td>
<td>0.0005</td>
<td>0.0004</td>
<td>0.0000</td>
<td>-0.0002</td>
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<tr>
<td></td>
<td>Worker</td>
<td>(0.0008)</td>
<td>(0.0008)</td>
<td>(0.0005)</td>
<td>(0.0005)</td>
<td>(0.0003)</td>
<td>(0.0003)</td>
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<tr>
<td>1985-1989</td>
<td>Year Dummies</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td></td>
<td>Municipality Dummies</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Controls</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>R Squared</td>
<td>0.000</td>
<td>0.003</td>
<td>0.000</td>
<td>0.002</td>
<td>0.000</td>
<td>0.001</td>
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<td>Observations</td>
<td>102,360</td>
<td>102,360</td>
<td>102,360</td>
<td>102,360</td>
<td>511,800</td>
<td>509,955</td>
</tr>
<tr>
<td></td>
<td>Number of Individuals</td>
<td>102,360</td>
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<td>102,360</td>
<td>102,360</td>
<td>102,360</td>
<td>102,360</td>
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<tr>
<td></td>
<td>F</td>
<td>1,232</td>
<td>0.315</td>
<td>0.896</td>
<td>0.085</td>
<td>0.011</td>
<td>1.548</td>
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Incarceration: Larger Earnings Losses?

- Mechanical incapacitation effect of incarceration on earnings.
Incarceration: Larger Earnings Losses?

- Mechanical incapacitation effect of incarceration on earnings.

- Larger earnings losses than what is predicted by the incapacitation effect.
Impact of displacement is twice as high at P75 of Gini (+0.43) than at the P25 of Gini (+0.2 ppt).
Results hold when excluding Copenhagen and Frederiksberg.
Pre-displacement marital status is a statistical predictor of the impact of displacement on crime.
  - Impact of job displacement on crime is $+0.9$ ppt for single individuals, $+0.3$ ppt for individuals with children, and $+0.19$ ppt for 2-adult or more families.

Displacement leads to long-run increases in the probability of marriage dissolution.
  - $0.9$ ppt in the short run (year of displacement), $3.5$ ppt seven years after displacement.

Weak evidence of impacts of parental displacement on younger family members’ crime.
  - one year after displacement for sons’ property crime ($+0.3$ ppt).
Conclusion

- Find economically and statistically significant impacts of displacement on crime.
  - Inequality seems to magnify the impact of mass layoffs on crime.
  - Displacement leads to separations, but little evidence of family spillovers.
  - Incarceration correlated with larger, non-mechanical, earnings losses.

- Institutional differences? External validity?

  - $\Delta$Separation Rate + $\Delta$Arrival Rate + $\Delta$Wage distribution $\sim$ $\Delta$Unemployment

- Policy implications: Impacts beyond employer-employee pair.
  - Separations unlikely to be efficient: Blanchard and Tirole’s (2008) tax on layoffs.