EC331 Presentation
Estimating the Costs of Terror

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Introduction

- Research aims to estimate the economic impact/cost of terrorism.
  - Currently only looking at the UK from 1970-2016.
- Using asset market responses as a proxy for economic costs.
  - Clear issues with this approach but offers best identification of terror response.
- Results so far suggest that only events at the tail of the terror distribution move markets significantly.

The Big Picture - Why does this matter?

- Modern macro models often struggle to explain equity premium puzzle.
- Barro (2006) argues that incorporating rare disaster 'black swan' risk can solve this.
- Previous literature either treats disasters as endogenous e.g. measuring a disaster as >10% fall in GDP or uses warfare as a proxy for disaster.
- The UK has been involved with a handful of conflicts since 1980 but subjected to 3041 terror attacks.
- An estimate of the cost and distribution of terror attacks would let us test the hypothesis that terror attacks can help explain this puzzle.

Methodology

- Event Study
  - ▸ Calculating Cumulative Abnormal Returns and then taking an average across events to get a Cumulative Average Abnormal Return.
- Non-parametric approach
  - ▸ Kernel regression on index returns to produce an empirical distribution of returns, compare post terror event returns to non-parametric conditional distribution to determine whether events can be labeled extreme.
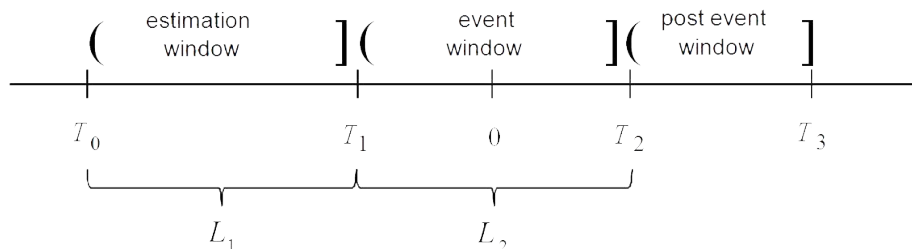
Event Study

Figure 1

- Formulae for cumulative abnormal returns:
  - $AR_{i,\tau} = R_{i,\tau} - E[R_{i,\tau}|\Omega_{i,\tau}]$
  - $CAR_{i(\tau_1,\tau_2)} = \sum_{t=\tau_1}^{\tau_2} AR_{i,t}$
- And then taking an average: $CAAR_{(\tau_1,\tau_2)} = \frac{1}{N} \sum_{i=1}^{N} CAR_{i(\tau_1,\tau_2)}$
- There's a range of different ways of specifying $E[R_{i,\tau}|\Omega_{i,\tau}]$
- But for index data can only use constant mean return model.

Terror Data

- Using terror data from the Global Terrorism Database compiled by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland.
    - Includes a range of variables such as wounded, killed, property damage, target, perpetrator group, ideology and weapon used.
    - All data from 1993 is missing - potentially quite problematic as 1993 Bishopsgate Bombing is one of the largest terror events ever on UK soil.
    - Since 1970 there have been 3041 events classed as terrorism by the GTD.
    - On average that implies an attack occurs every 6 days.
- Only two data transformations:
    - Terror attacks occurring on weekends (i.e. non-market days) moved to following Monday.
   - Construction of a terrorism intensity variable similar to Global Terrorism Index approach.

Index Data

- Index data comes from Thomson Reuters' Datastream and is collected at the daily level.
  - UK indices include:
    - FTSE ALLSHARE, 11611 market day observations.
    - FTSE 100 (from 1983 onwards).
    - FT 30 (predecessor to the FTSE).
    - MSCI UK.
    - GBP:USD forex data.

Summary Statistics I
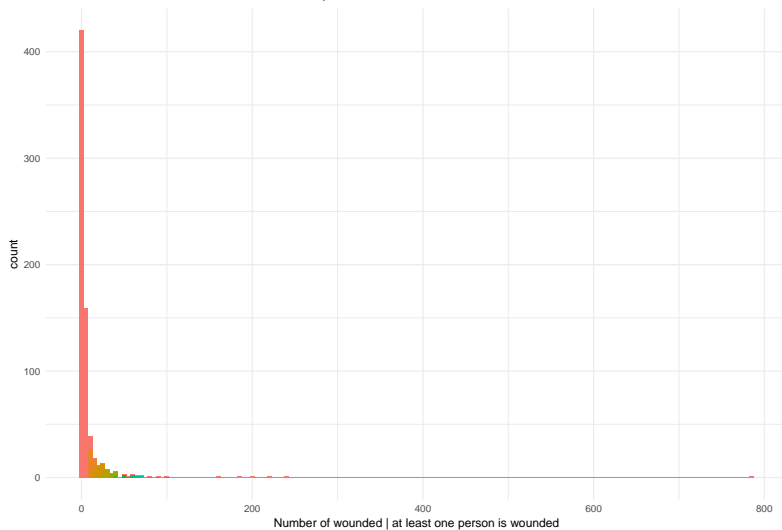

Number of wounded from UK Terror Attacks, 1970–2016
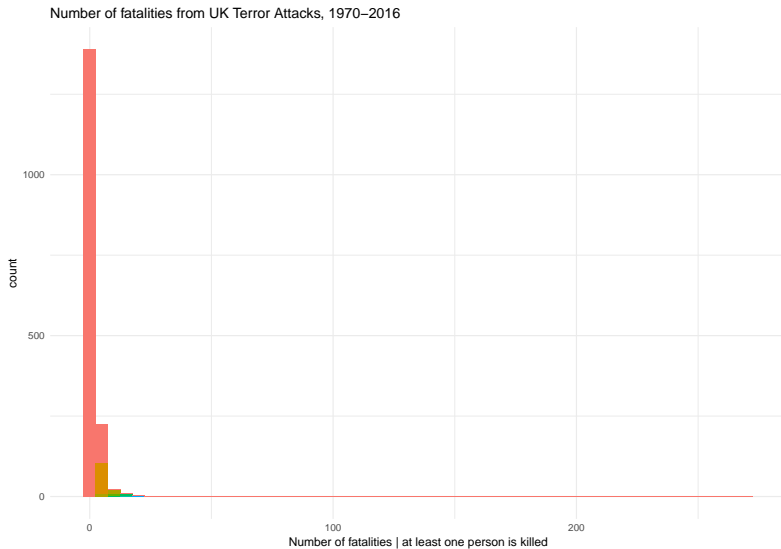xlim(0, 100)
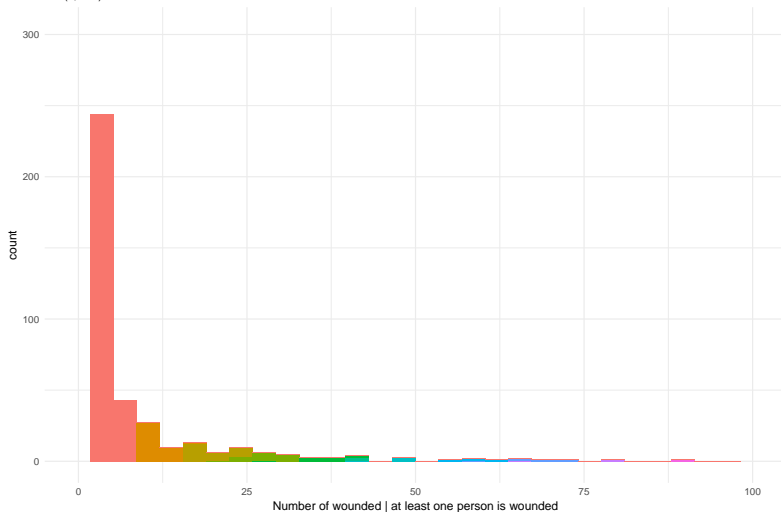
Summary Statistics II
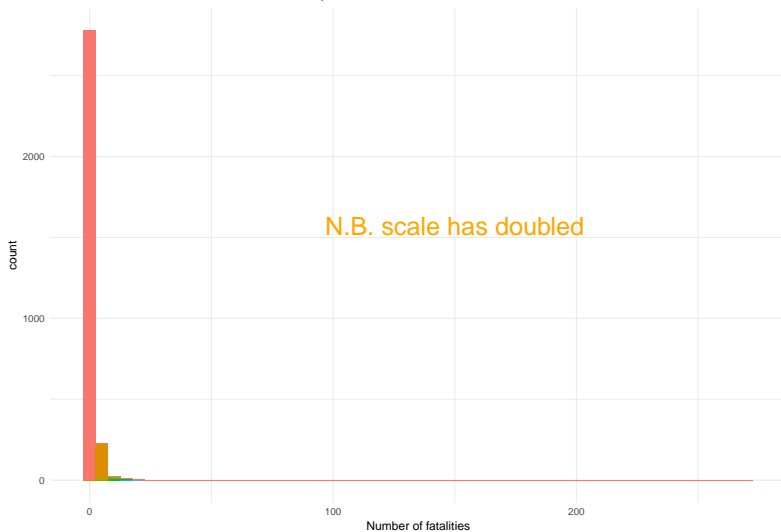
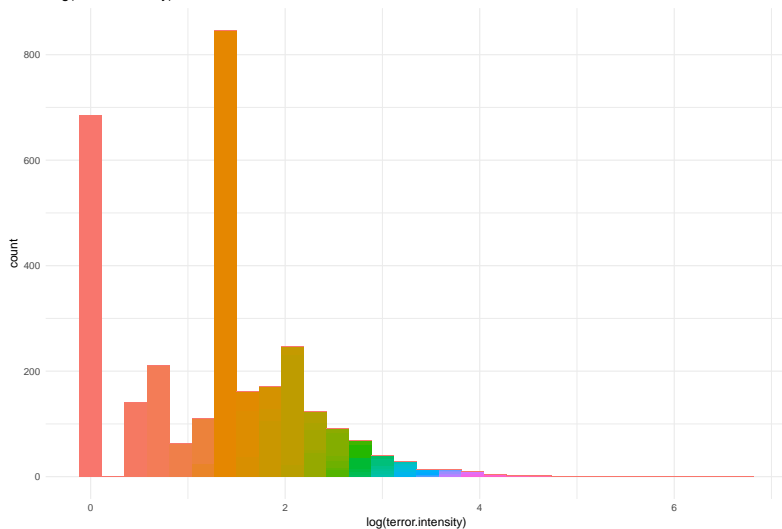Number of wounded from UK Terror Attacks, 1970–2016

Summary Statistics III

Number of fatalities from UK Terror Attacks, 1970–2016

Summary Statistics IV
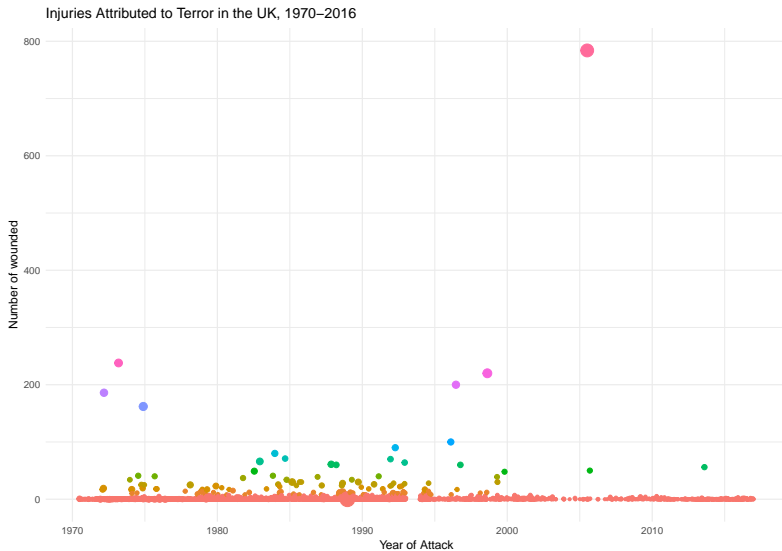

Number of fatalities from UK Terror Attacks, 1970–2016

N.B. scale has doubled

Summary Statistics V

Log(Terror Intensity) from 1983–2016 in the UK
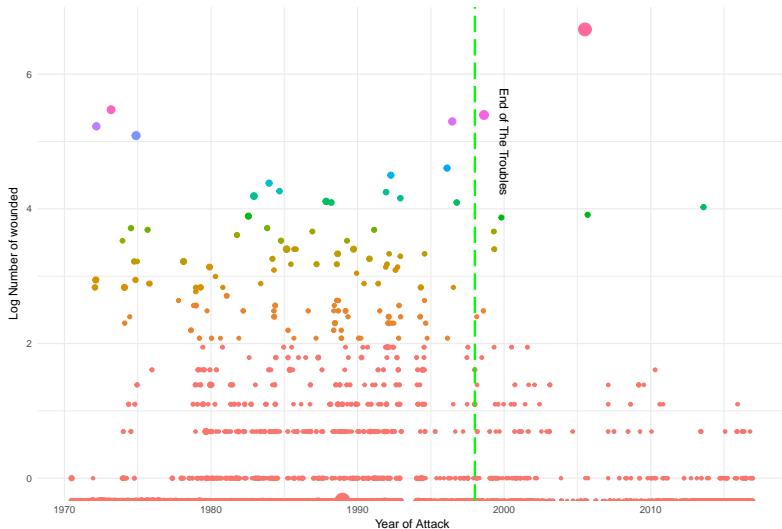
Terror Trends Over Time I

Injuries Attributed to Terror in the UK, 1970–2016

Terror Trends Over Time II

Injuries Attributed to Terror in the UK, 1970–2016

Index Returns and Terror Attacks

FTSE All–Share Price
Five largest terror attacks shown

Terror Attacks

| Date	nkill	nwound	propvalue	terror.intensity	event.name
1988-12-21	270	0	0	813	Lockerbie
2005-07-07	56	784	0	564	London 7/7
1998-08-17	29	220	0	198	Omagh
1996-06-17	0	200	1079120000	104	1996 Manchest
1982-12-06	16	66	0	82	Droppin Well

Terror Intensity

Terror Intensity,
Top 5 Events
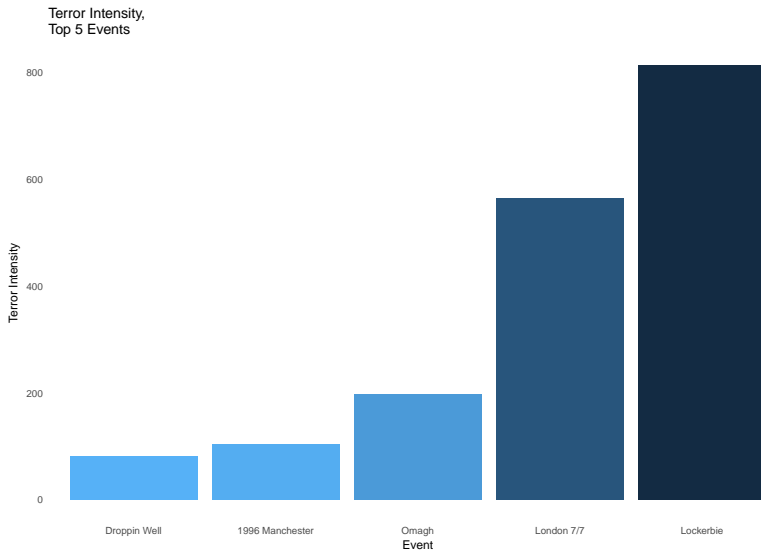
Results I - Lockerbie Bombing

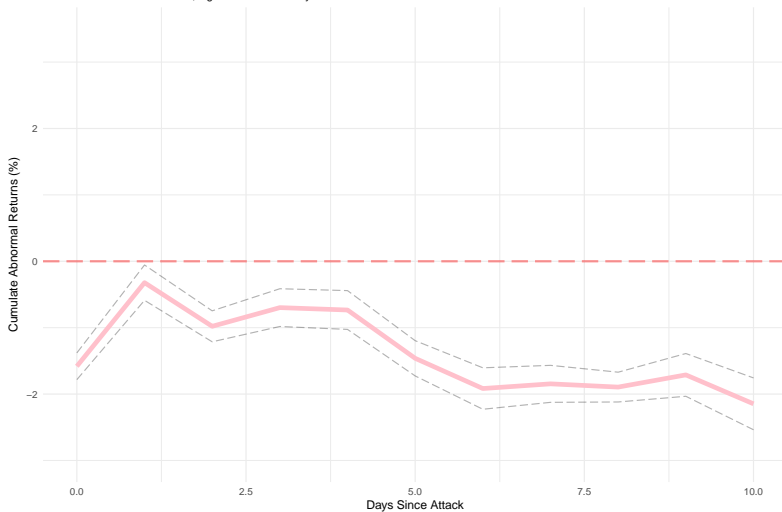Lockerbie Bombing, Cumulative Abnormal Returns
FTSE ALL SHARE Price Index, log differenced – 21 December 1988
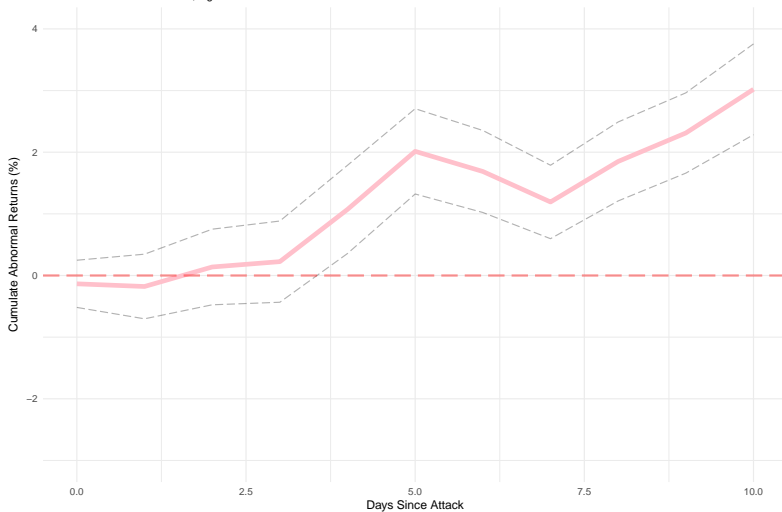
Results II - 7/7 London
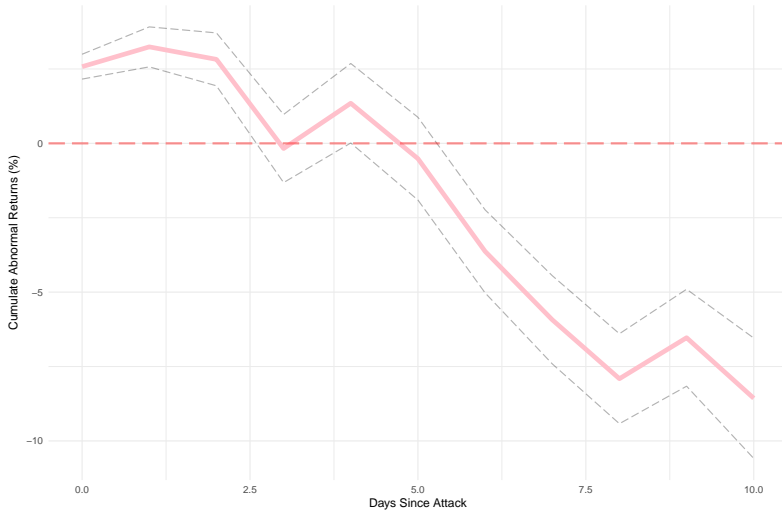

London 7/7 Bombings, Cumulative Abnormal Returns
FTSE ALL SHARE Price Index, log differenced – 7 July 2005

Results III - Omagh Bombing
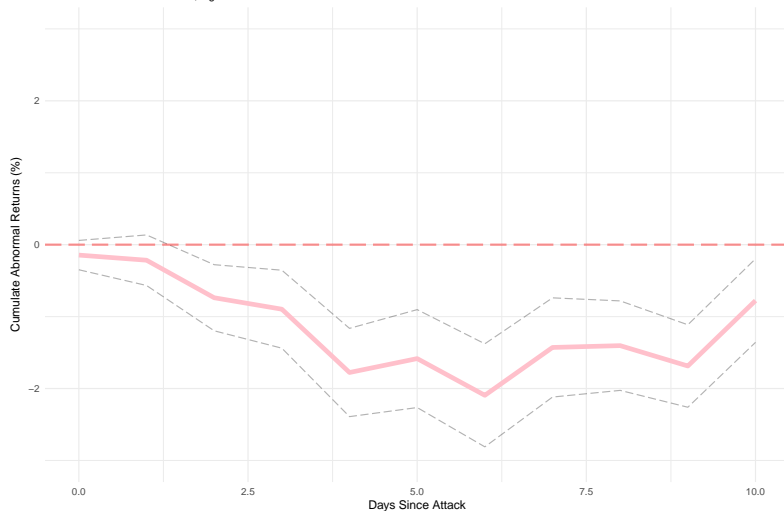

Omagh Bombing, Cumulative Abnormal Returns
FTSE ALL SHARE Price Index, log differenced – 15 August 1998

Results IV - 1996 Manchester Bombing

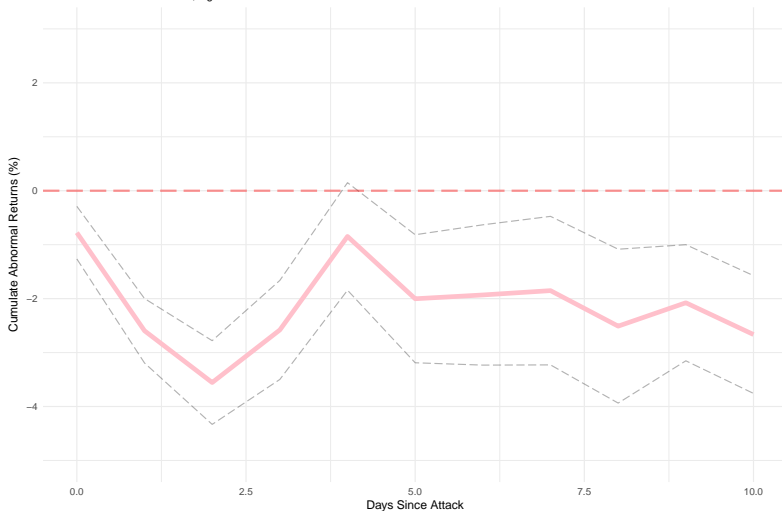1996 Manchester Bombing, Cumulative Abnormal Returns
FTSE ALL SHARE Price Index, log differenced – 15 June 1996

Results V - Droppin Well Disco Bombing

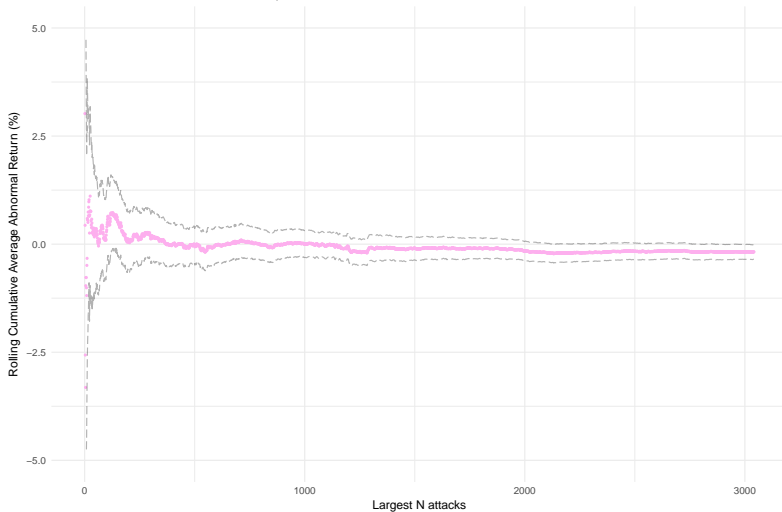Droppin Well Disco Bombing, Cumulative Abnormal Returns
FTSE ALL SHARE Price Index, log differenced – 6 December 1982

Results VI - Cumulative Average Abnormal Returns

Rolling mean of Cumulative Abnormal Returns
UK Terror Attacks with FTSE ALLSHARE data, 1980–2016

Conclusion/To Do

- Slicing data by industry rather than just looking at index data.
- Other stock market indicators such as volatility.
- Non-parametric approach and robustness/sensitivity checks.
- Come up with a model to link asset responses to economic costs.
    - Tobin's Q?
    - Consumption Euler equation, linking real returns on an asset to stochastic discount factor?
    - Lucas 'Tree' Asset Pricing model?

Bibliography

- Figure 1 on slide 5 from
  https://eventstudymetrics.com/index.php/event-study-methodology/
- Barro (2006) refers to: Barro, Robert J. 2006. Rare disasters and asset markets in the twentieth century. The Quarter Journal of Economics 121, no. 3: 823-866.