Clark et al. (2020): The impact of Terrorism on Individual Well-Being

Evidence from the Boston Marathon Bombing

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Introduction: Research Interest

Effect of terrorism on outcomes such as:

- **Wellbeing**
    - Happiness
    - Stress
    - Negative affect
    - Net affect (happiness - negative affect)
- **Time allocation**
    - Market hours
    - Household Work
    - Childcare
    - Active Leisure
    - Watching TV or listening to Media
    - Sleep

Introduction: Big Picture

Time-Series of data around 2013 Boston Marathon Bombing

Focus on *individual* rather than *aggregated* consequences

Research on terrorism needs to account for:

- Non-random timing of attacks
- Short-lived effects

Approaches:

- Synthetic control groups
- Difference-in-Differences (`DiD`)
- Regression Discontinuity Design (`RDD`)

Introduction: Contribution

First study on the effect on individual wellbeing of this event

Problem: Neither `RDD` nor `DiD` work here

- `RDD`: Overlap of marathon and bombing effects
- `DiD`: Effects are too short-lived

Clark et al.(2020) provide their own event study: effects last for *one week*

Solution: Combined `RDD` and `DiD` model

Difference in `RDD` effects between 2012 (control group) and 2013 (treatment group)

Empirical Approach

RDD, Local-Linear Regression and DiD

Data and Setup

Data: American Time Use Survey + Well-Being module (BLS 2020)

- 4842 observations (ca 50/50 in 2012 and 2013)
- $\pm$ 35 days around the marathon
- Code and Data freely available here

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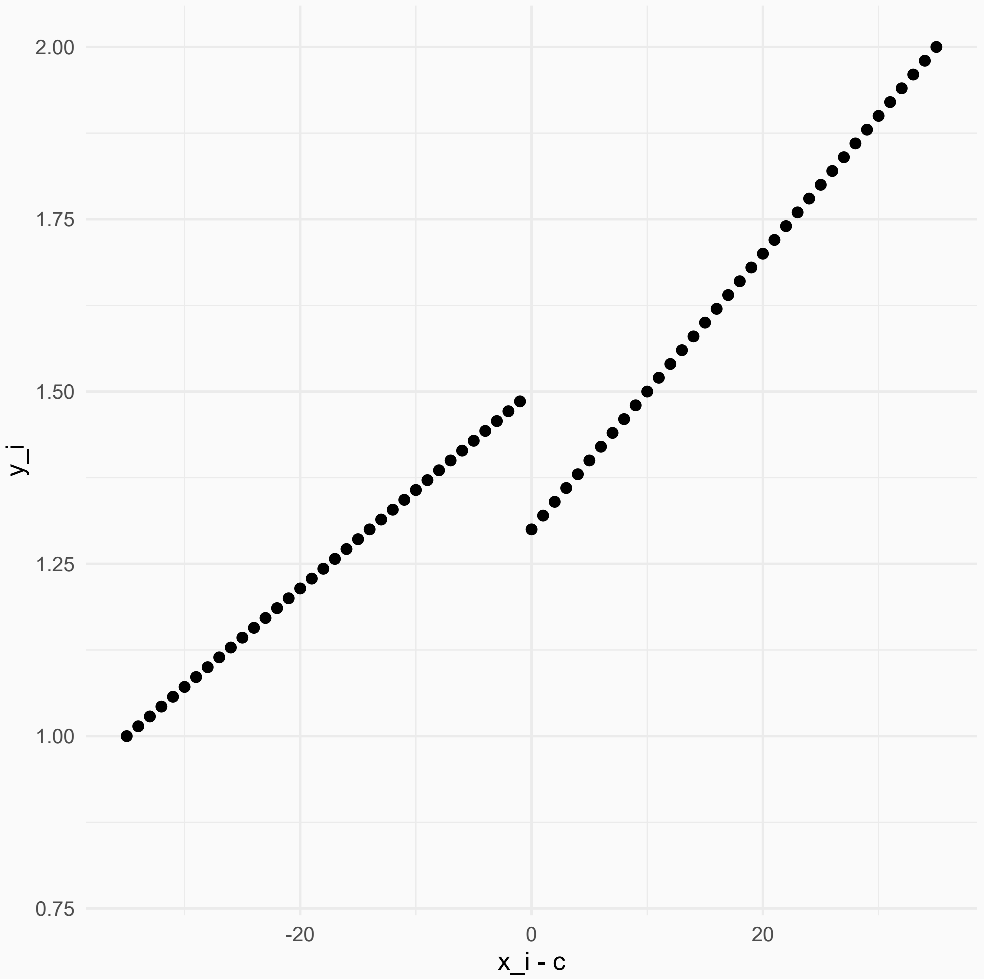
Outcomes: Daily wellbeing and time-use reports y_i

Runnning variable: Time distance to Marathon $D_i = x_i - c$

Exposure to treatment: Deterministic in time, via exposure through media $\Rightarrow$ `Sharp RDD`

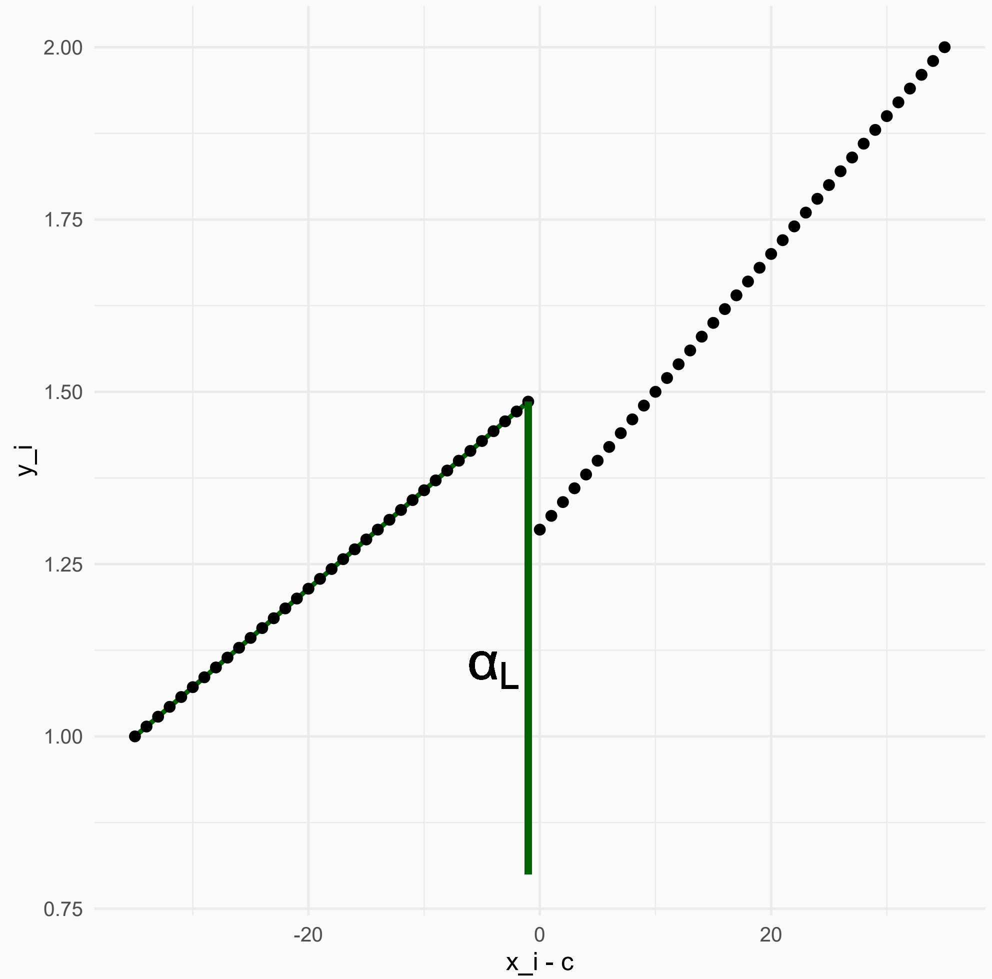
$$T_i = \begin{cases} 0 & \text{for } x_i \geq c \\ 1 & \text{for } x_i < c \end{cases}$$

Local Linear Regression



Limit `bandwidth` around the event (here: 35 days)

Local Linear Regression

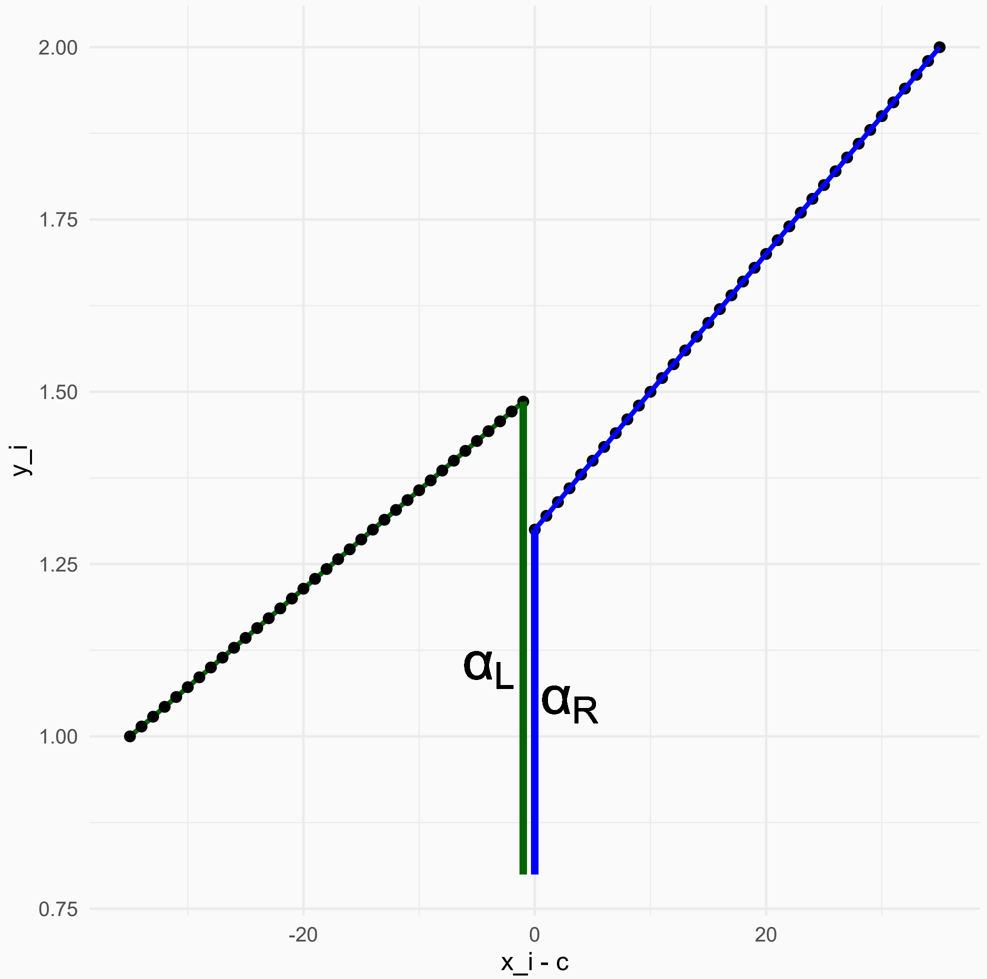


Limit `bandwidth` around the event (here: 35 days)

Combine seperate regressions for left and right side:

$$y_i = \left[\alpha_L + \sigma_L D_i + u_i\right] \cdot (1 - T_i)$$

Local Linear Regression

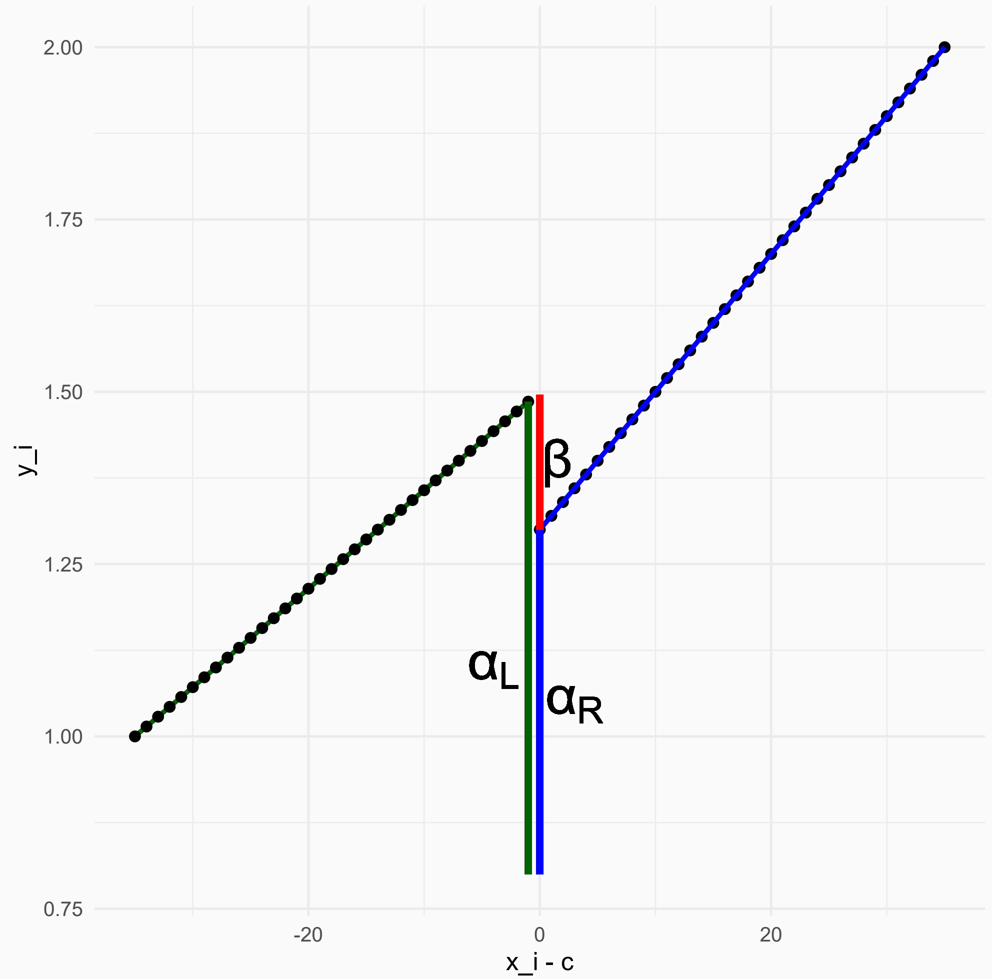


Limit `bandwidth` around the event (here: 35 days)

Combine seperate regressions for left and right side:

$$y_i = \left[\alpha_L + \sigma_L D_i + u_i\right] \cdot (1 - T_i) + \left[\alpha_R + \sigma_R D_i + u_i\right] \cdot T_i$$

Local Linear Regression



Limit `bandwidth` around the event (here: 35 days)

Combine seperate regressions for left and right side:

$$
\begin{aligned}
y_i =& \left[\alpha_L + \sigma_L D_i + u_i\right] \cdot (1 - T_i) \\
&+ \left[\alpha_R + \sigma_R D_i + u_i\right] \cdot T_i \\
=& \alpha_L + \underbrace{(\alpha_R - \alpha_L)}_{\beta} T_i \\
&+ \sigma_L D_i \cdot (1 - T_i) \\
&+ \sigma_R D_i \cdot T_i \\
&+ u_i
\end{aligned}
$$

Identification: Problem

Wellbeing and time-use may be affected by multiple events:

- Boston Marathon
- 2013 Attack

Effects might *cancel out* or *add up* $\Rightarrow$ **biased treatment estimate**

Solution: Use 2012 Boston Marathon as control group.

$$Year_i = \begin{cases} 0 & \text{for 2012} \\ 1 & \text{for 2013} \end{cases}$$

This imports the usual `DiD` assumptions

Also introduce control variables to account for population differences between 2012 and 2013

Identification: Solution

Again, we just combine regressions using a dummy:

$$\begin{aligned} y_i = &\left[\alpha_{LC} + \beta_C T_i + \sigma_{LC} D_i \cdot (1 - T_i) + \sigma_{RC} D_i \cdot T_i + u_i\right](1 - Year_i) \\ &+ \left[\alpha_{LT} + \beta_T T_i + \sigma_{LT} D_i \cdot (1 - T_i) + \sigma_{RT} D_i \cdot T_i + u_i\right](Year_i) \end{aligned}$$

Identification: Solution

Again, we just combine regressions using a dummy:

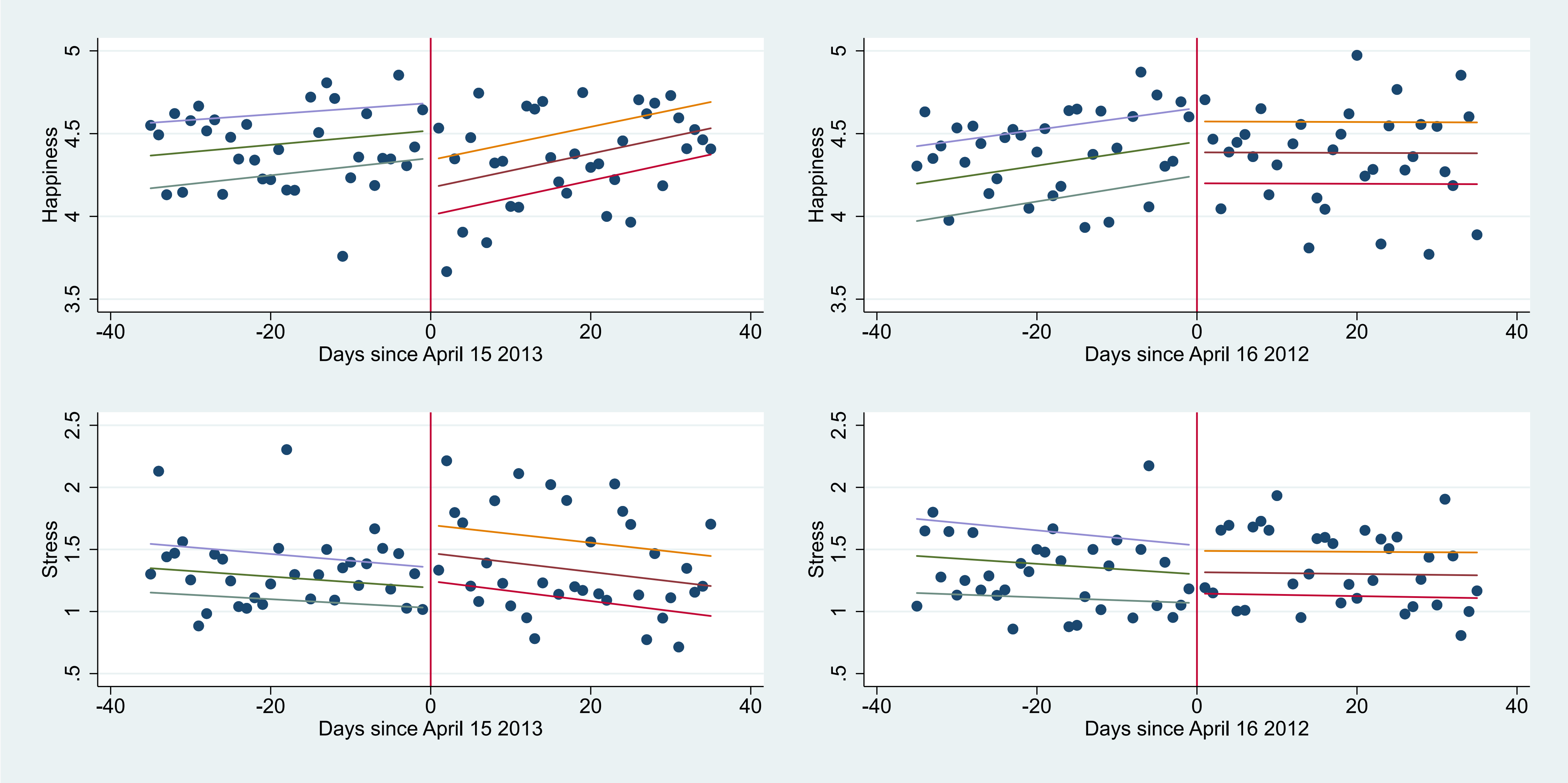
$$\begin{aligned} y_i = &\left[\alpha_{LC} + \beta_C T_i + \sigma_{LC} D_i \cdot (1 - T_i) + \sigma_{RC} D_i \cdot T_i + u_i\right](1 - Year_i) \\ &+ \left[\alpha_{LT} + \beta_T T_i + \sigma_{LT} D_i \cdot (1 - T_i) + \sigma_{RT} D_i \cdot T_i + u_i\right](Year_i) \end{aligned}$$

Rewritten:

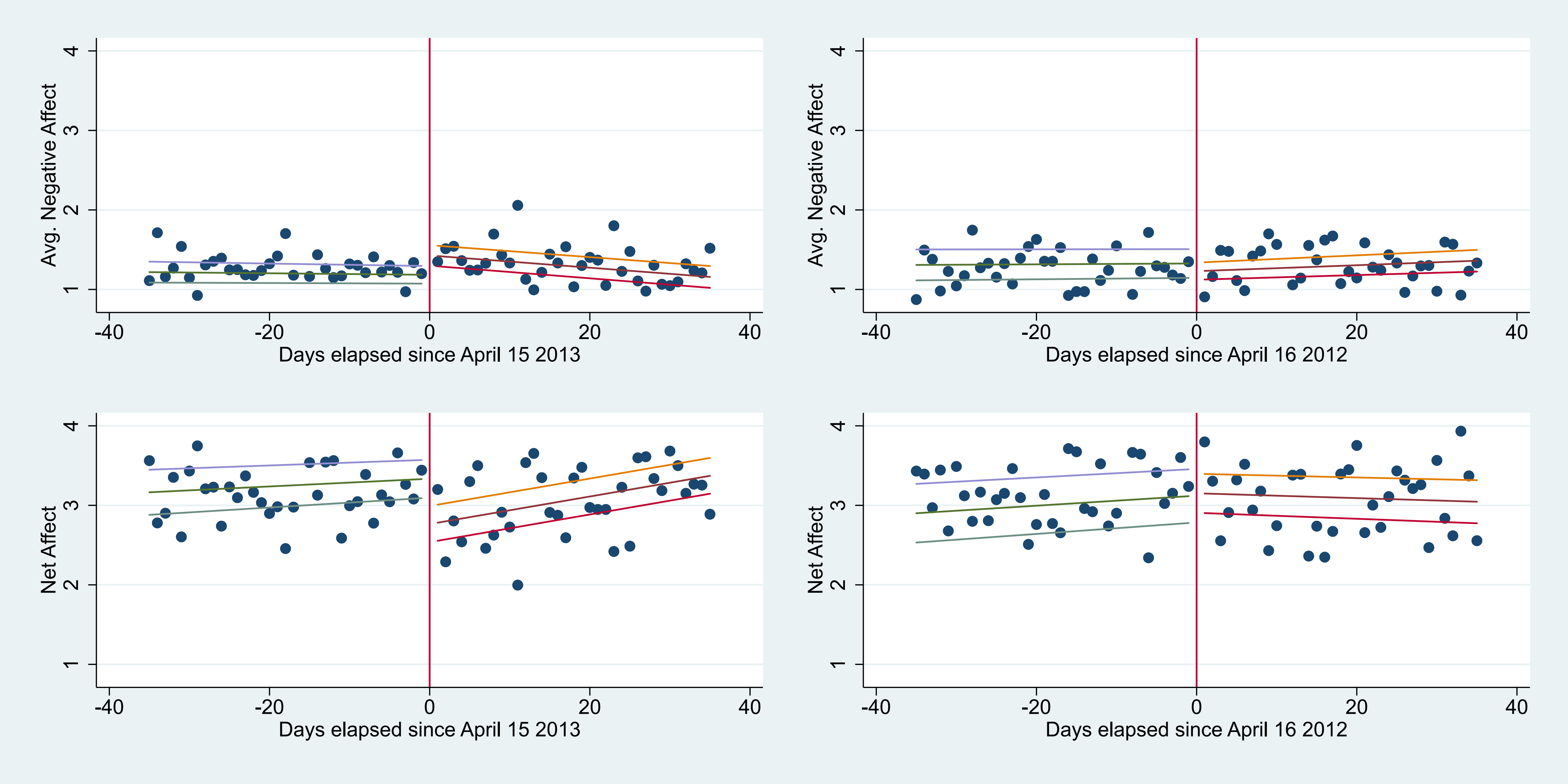
$$\begin{aligned} y_i = \alpha_{LC} + (\alpha_{LT} - \alpha_{LC}) Year_i + \beta_C T_i + &\underbrace{(\beta_T - \beta_C) T_i \cdot Year_i}_{\text{RDD-DiD Estimator}} \\ &+ \sigma_{LC} D_i (1 - T_i)(1 - Year_i) \\ &+ \sigma_{RC} D_i (T_i)(1 - Year_i) \\ &+ \sigma_{LT} D_i (1 - T_i)(Year_i) \\ &+ \sigma_{RT} D_i (T_i)(Year_i) \\ &+ u_i \end{aligned}$$

Main Results

Effects on Well-Being: Happiness & Stress



Effects on Well-Being: Negative and Net Affect



Effects on Well-Being: More Stuff

Table 2. *The Effect of the Boston Marathon Bombing on Individual Well-being.*

	Happy	Stress	Negative affect	Net affect
Mean month before (SD)	4.44 (1.23)	1.24 (1.42)	1.20 (1.01)	3.25 (1.86)
1a) RDD (2)	−0.351**	0.351**	0.327***	−0.651***
Bandwidth 35 days, 2013 data	(0.136)	(0.172)	(0.117)	(0.196)
Observations	2,124	2,142	2,110	2,095
R^2	0.097	0.105	0.102	0.098
1b) RDD (non-parametric estimates)	−0.383**	0.298	0.277***	−0.618***
Optimal bandwidth, 2013 data	(0.171)	(0.191)	(00968)	(0.199)
2) Diff-in-Diff (3)	0.00973	−0.000760	0.00230	0.00333
Pooled 2012 and 2013 data	(0.0609)	(0.0678)	(0.0493)	(0.0937)
Observations	20,902	21,075	20,879	20,712
R^2	0.028	0.047	0.052	0.034
3) RDD* Diff-in-Diff (4)	−0.379*	0.272	0.355**	−0.720**
Bandwidth 35 days, 2012 and 2013 data	(0.216)	(0.266)	(0.154)	(0.307)
Observations	4,366	4,396	4,341	4,316
R^2	0.062	0.068	0.069	0.063

*** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$

Effects on Time Use: Regression Results

Table 5. *The Effect of the 2013 Boston Marathon Bombing on Other Outcomes.*

	Sleep	Active leisure	Television	Household work	Childcare	Market hours
Mean month before (SD) Hours per day	8.64 (2.28)	0.29 (0.86)	2.69 (2.77)	1.58 (2.11)	0.40 (1.11)	3.10 (4.15)
RDD* Diff-in-Diff (4) Bandwidth 35 days, 2012 and 2013 data	0.0297 (0.301)	−0.165 (0.135)	0.421 (0.371)	−0.373 (0.309)	−0.0109 (0.119)	−0.607** (0.271)
Observations	4,842	4,842	4,842	4,842	4,842	4,842
R^2	0.124	0.077	0.199	0.141	0.354	0.519

Notes: The outcome variables are measured in hours per day. Hours of work are unconditional of being employed and are set to zero for the unemployed and inactive. Robust standard errors in parentheses. Standard errors are clustered at the level of the running variable (days elapsed). Weights are applied throughout. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Effects for different populations:

- *Mens and* rural peoples affects were *not* affected
- People from *nearer states* were stronger affected (2x)
  - Counterevidence to previously found spillovers
- No effects for *education*

Conclusion and Summary

New method to find effects for coinciding events: `RDD DiD`

Shortcomings:

- No formal identification proof (*does it need one?*)
- No discussion of `DiD` assumtpions, i.e. *parallel trends*
- Only one control group (2012) (*there are more years*)

References

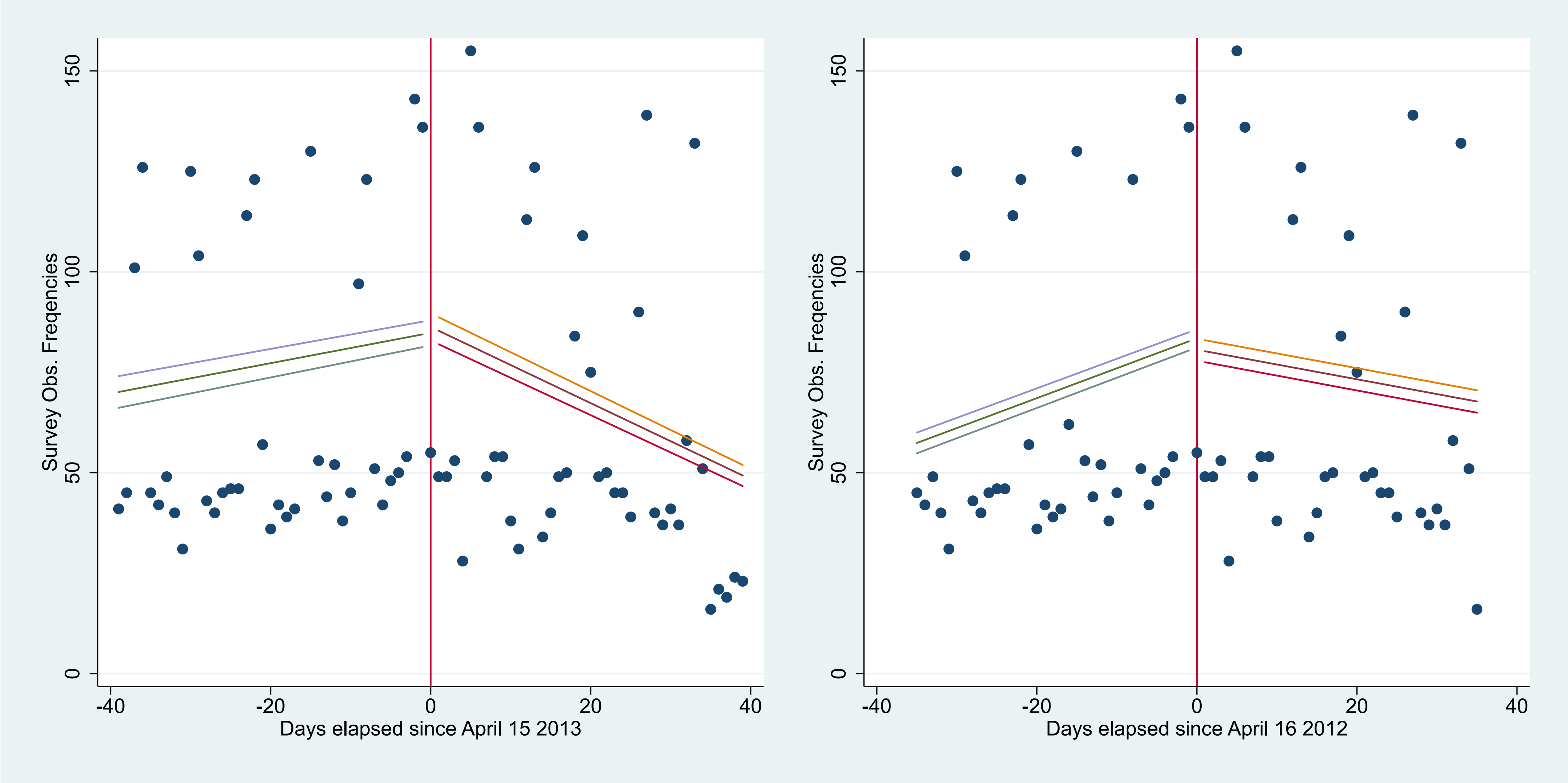
BLS (2020). *American Time Use Surves (ATUS)*. URL: https://www.bls.gov/tus/

Clark et al. (2020). *Clark et al.(2020): The impact of Terrorism on Individual Well-Being. Evidence from the Boston Marathon Bombing*. The Economic Journal, 130, 2065-2104. https://doi.org/10.1093/ej/ueaa053

Appendix

RDD, Local-Linear Regression and DiD

Checking for Manipulation: Survey Frequency



Checking for Manipulation: Other Controls