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Americans' Responses to Terrorism and Mass-Shooting: Evidence from the American Time Use Survey and Well-Being Module*

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Abstract

A small but significant literature concludes that terrorism impacts the economy, although the impact of mass-shooting has not yet been addressed by economists. We compare the economic effects of two tragedies: the 2013 Boston Marathon Bombing and the 2012 Sandy Hook School Shooting. Fatal attacks are rare on any given day, and to estimate their effects we combine RDD with differences-in-differences. Using diaries of daily activities for a representative, random sample of Americans, we find a decline of over half an hour per day in average hours worked, while time spent accessing the media increased slightly. Active leisure fell after the BMB but increased after the SHSS. Daily data on emotional feelings reveal that subjective well-being fell dramatically after the BMB, and especially so for women, who are likely more averse to risk; but the findings are mixed for the SHSS. The latter induced a significant increase in meaningfulness, which was greatest for respondents with college education. We discuss these differences against economic, a priori, and drive conclusions that may be relevant for policy.

Keywords: Well-being, Time Use, Terrorism.

JEL classification: I31, J21, J22, F52.

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1. Introduction

Today, OECD governments expend large budgets on terrorism prevention and yet little is known on the economic costs of terrorism for the general population - in spite of the surge of literature after the 9/11 attacks in New York.[3] Mass-shootings, as such, have received no attention to date by economists and we argue that they, too, are likely to affect economic behavior, possibly in ways similar to terrorism.

Terrorism can affect individual economic behavior by increasing uncertainty, feelings of fear, and risk aversion (Gary Becker and Yona Rubinstein, 2011), which are widely known to affect consumers' and investors' behavior. By the same channel, terrorism may impact the utility individuals derive from leisure and consumption (Bruno Frey, Simon Luechinger and Alois Stutzer, 2007; Robert Metcalfe, Nattavudh Powdthavee, and Paul Dolan, 2011), with or without changing the demand for goods. Security measures massively put in place after terrorism may also contribute to a slowing of economic activity (Todd Sandler and Walter Enders, 2012) in sectors other than the military (Mirko Draca, Stephen Machin, and Robert Witt, 2011, document massive police deployment after terrorism). Terrorism may increase stress, with spillovers on health outcomes (Adriana Camacho, 2008; Michael Pesko, 2014; Michael Pesko and Christopher Baum, 2016). Massive media coverage of terrorism contributes to affect individuals far beyond those directly hit by the attack, in line with evidence from Israel that media coverage largely contributes to the impact of fatal attacks on consumer behavior (Gary Becker and Yona Rubinstein, 2011). Mass-shootings may well impact economic behavior via similar mechanisms.

We here exploit data from the American Time Use Survey (ATUS) and Well-Being (WB) module, collected on a daily basis for a representative random sample of the American

[3] See, for example, Edward Glaeser and Jesse Shapiro (2002).

population, to estimate the effect on individual time use and emotional well-being of the 2013 Boston marathon bombing, which sadly caused the death of three spectators and a policeman, while 264 spectators were injured. We also focus on the tragic Sandy Hook school shooting, a few months earlier, in which 20 children and 6 staff members were killed. The latter would not properly be considered as "terrorism", which is normally associated with a political or social agenda (Todd Sandler and Walter Enders, 2012), though it provoked six-fold more deaths than did the Boston bombing; and both attacks received intensive coverage by the media. The Boston marathon bombing was on the New York Times front-page for 11 consecutive days, while the Sandy Hook shooting did the same for 8 days. Therefore, we may expect both tragic episodes to have impacted Americans' economic behavior.

Two brothers from a Chechenia family were the perpetrators of the Boston marathon terrorist attack, which might thus be considered as an act of "transnational" terrorism, based on the country of the attack and the country of origin of the terrorists (Todd Sandler and Walter Enders, 2012).[4] In contrast, the author of the shooting at Sandy Hook elementary school was an American citizen, which would then characterize that tragedy as "domestic". We may, a priori, expect transnational terrorism to have more of an impact on individual economic behavior than domestic shootings, as individual uncertainty and feelings of fear (the drivers of the economic impact of terrorism) are likely to be magnified. This is the first study to examine this issue.

Terrorist attacks may not occur on a day taken at random, but are often timed close to political elections (José Montalvo, 2011), or as a reaction to violence from the "other side" (David Jaeger and Daniele Paserman, 2008), or perhaps due to specific trade relations (Daniel Mirza

[4] The two Chechen brothers grew up in the Soviet republic of Kyrgyzstan, and though one had become a permanent resident of the U.S. and the other had just acquired American nationality in 2012, their foreign background was widely emphasized in the global media and they were reported to be at least somewhat associated with Al Qaeda.

and Thierry Verdier, 2008). Therefore, we account here for the possible endogeneity of the day of the attack by taking a differences-in-differences approach, in which we use answers to the survey around the days of the 2012 Boston marathon (Monday 16th April 2012) as a counterfactual for the 2013 Boston bombing (which occurred on Monday April 15th 2013). As for the Sandy Hook school shooting (that took place on Friday 14th December 2012), answers to the survey in similar calendar days of 2013 (Friday 13th December 2013) serve to control for possible changes in time use and emotions that may be usual during that period of the year and would then not be driven by the tragic shooting. Although using comparable 2013 data as a counterfactual for 2012 data may be imperfect as individuals may remember the tragic happenings a year later, the survey was, unfortunately, not collected in 2011.[5] We would expect that, on average, the shooting impacted individual responses more than the "anniversary" of the shooting, and thus, our estimates may at least set a lower bound for its true effects. Thus, we compare answers to the survey before and after the day of the "attack" to answers to the surveys before and after the counterfactual-day of the "attack". This naturally leads us to implement a combined differences-in-differences and (sharp) regression discontinuity design (whereby the running variable is the distance in days from the tragic event). Our findings indicate that both tragedies significantly affected economic activity and emotional well-being, though sometime in opposite directions.

The remainder of the paper is structured as follows. Section 2 discusses the economic impact of fatal attacks. The data for the analysis are described in Section 3 and the empirical approach in Section 4. Section 5 provides descriptive and graphical evidence; while the

[5] The ATUS Well-Being Module was collected in 2010, 2012 and 2013, but the 2010 data are too close to the economic crisis to be used as a counterfactual here. In any case, the 2010 data format is quite different from that of the later surveys, which also adds to non-comparability. There was also a change in the format of the ATUS Well-Being Module in March 2013, but we show that our conclusions are not sensitive to focusing only on data collected after this change.

estimation results are given in Section 6. The findings are discussed and conclusions are drawn, in the last two sections.

2. The effect of fatal attacks on individual time use and well-being

Accounting for time allocation, economic agents are assumed to maximize the expected utility from leisure and consumption (where the latter also includes home-produced goods, such as meals, or a clean home), subject to a time constraint (there are only 24 hours in a day) and a budget constraint, in a given (public) environment (Elena Stancanelli, Olivier Donni, and Robert Pollak, 2012). Increased uncertainty and feelings of fear of death could affect individual labor supply, by changing the expected utility from future income, and that could lead to a drop in labor supply. Economic activity may, though, increase in the security sector; while security procedures slow economic activity elsewhere (Todd Sandler and Walter Enders, 2012). If individuals feel more insecure, they may spend less time outside and more time at home and, as a result, active leisure time could decline, while the time devoted to household work could increase In particular, parental time investment in the children may possibly vary in the aftermath of an attack, if parents respond to increased environmental uncertainty (Gary Becker (1981). Sleep may also be affected negatively, which may in turn affect productivity at work (Jeff Biddle and Daniel Hamermesh, 1990). This is the first study to analyze the effects of terrorism on individual daily life activities using time diaries, which contain unique measures of daily time allocation (Thomas Juster and Frank Stafford, 1985).

The time diary, filled in daily by the ATUS participants, reveals daily labor supply, time spent on household work, childcare, active leisure (sports, walking), watching/listening-to the news, as well as sleep time, providing us with unique measures of daily activity in the days around the two different attacks. The WB module of the ATUS solicits daily emotional well-being feelings associated with the pursuit of daily activities. This measure of well-being is much more focused than broader recall questions based on longer time periods and without a direct connection to daily life activities (Daniel Kahneman *et al*. 2004; Daniel Kahneman and Alan Krueger, 2006; Alan Krueger and Andreas Mueller, 2012), that were used in the scant literature on the effects on well-being of terrorism (Bruno Frey, Simon Luechinger and Alois Stutzer, 2007; Robert Metcalfe, Nattavudh Powdthavee, and Paul Dolan , 2011).[6] There is an established literature in economics that uses subjective well-being questions to approximate individual utility (Rafael Di Tella and Robert MacCulloch, 2006; Andrew Clark, 2011). Moreover, WB collected information on six different emotional feelings (asked in a randomized order), which also enables us to expand on earlier work that focuses primarily on happiness and stress (Adriana Camacho, 2008; Michael Pesko, 2014; Michael Pesko and Christopher Baum, 2016). For example, meaningfulness that has received wide attention by psychologists in relation to engagement/disengagement in employment (William A. Kahn, 1990; Douglas May, Richard Gilson, and Lynn Harter, 2004) may also respond to terrorism.

3. The data, sample selection, and outcome variables

The data for our main analysis are drawn from the 2012 and 2013 American Time Use Survey (ATUS) and Well-Being module (WB), which is run by the Bureau of Labor Statics (BLS). Over ten thousand Americans are randomly drawn out of a representative sample of the U.S. population to respond to this survey each year and interviews take place continuously, on any day (Monday to Sunday included), beginning in January of each year and ending in December. The response rate to the survey was 52 % to 58% (depending on the year) and the BLS provides weights to correct for non-responses, which we use throughout the analysis. The day of the interview is typically chosen by the BLS interviewers and the ATUS activity diary collects information on the activities carried out over a 24-hour period, a full-day starting in the middle of the night. We focus on the following outcomes:

[6] Alan Krueger (2007), using specific data from Wisconsin, found that 9/11 temporarily increased sadness while reducing enthusiasm, focusing though on only that region of the U.S. William Schlenger et al. (2002) focused on a web survey of self-reported Posttraumatic Stress Disorder measures in the two months after 9/11, to conclude that adults residing in New-York were especially affected. Their data and method are very different from ours.

- Hours worked in any jobs, set equal to the sum of hours worked in the main and other jobs.
- All household work, encompassing mostly "interior" household work (done within the respondent's home), such as cleaning, tidying-up, cooking, doing the dishes, doing the laundry, administrative paper work, repairs, and gardening. Childcare that includes any activity done for or with the children from the (same) household.
- Active leisure, defined as playing sports and exercising.
- Watching television or listening to the news, including watching television not for religious purposes[7] and listening to the radio (but not to music). This is an imperfect measure of exposure to news, as it also includes watching movies and sports, due to the design of the underlying questions.
- Sleep, net of loss of sleep (as the diary distinguishes the two activities).

The ATUS Well-Being module was collected in 2010 (which we feel was too close to the economic crisis to be of use here as a counterfactual year), 2012 and 2013. Specifically, three activities were randomly-selected from those reported by the respondent in the daily diary (BLS, 2015)[8] and respondents were asked to consider six emotional feelings experienced while doing each of these three activities, by means of a Computer Assisted Interview (CAT):

- Happy.
- Sad.
- Tired.
- Pain.
- Stress.
- Meaningful.

The order in which these emotional feelings were asked varied randomly. Each feeling was measured on a scale from zero (not having experienced any happiness, for example, at all) to six (having experienced the greatest happiness possible). Non-responses and refusals to reply are set equal to missing (there are very few of these, less than ten out of many thousands of valid responses). We also compute a global measure of subjective well-being, the so-called

[7] We exclude time spent watching television for religious purposes, as this is coded separately and we aim to capture time spent watching the news.
[8] With the exception of sleep and a few other activities which were not considered in the emotional well-being module before March 2013 (see later discussion in this Section).

"affect balance" (Norman Brandburn, 1969), given by the difference between the average of positive (happy, meaningful) and negative (sad, stress, tired, pain) feelings.

As for the data comparability across waves, the way in which activities were randomly-drawn changed in March 2013 (BLS, 2015). Due to a programming error in the data-collection software, certain activities were less likely than others to be selected for follow-up questions in the 2012 WB Module and the first few months of the 2013 WB module (January to end of March). Most diary activities were eligible for the WB module questions, but sleeping, grooming, and a few other activities were not (BLS, 2015). This error in the activity-selection process was corrected on March 25, 2013. The data from the 2012 and 2013 surveys look very similar (see t-tests in Tables 1 and 2 and the discussion in Section 4). The survey weights were adjusted by the BLS to mitigate this error, and we use weights in all of the analysis (including the graphs and descriptive tables).

Finally, let us note that ATUS and WB data were matched to the Current Population Survey (CPS) to obtain information on gender, age, education, family composition, State of residence, and total household income: ATUS respondents are a random sample of American CPS survey respondents. Total household income is measured in sixteen brackets or intervals (see Table in the Appendix). Setting the respondent's household income equal to the lowest bound of the household income interval to which the respondent's household income is assigned (out of the 16 intervals available), produces a distribution of income with a median of $50,000, which is an underestimate of the 2013 median household income of $52,250 (according to Amanda Noss, 2014, for the U.S. Census Bureau).[9] We use the logarithm of household income, which is less sensitive to measurement error.

3. The Empirical Method

We linearly model individual demand for time, using an OLS approach. There are few zeros in the broad, aggregated time-use activities considered here, and the zeros may represent infrequency, rather than non-participation (Frazis, Harley and Jay Stewart, 2012). The direct and immediate impact of terrorism on individual utility is picked up using the ATUS

[9] Alternatively, using the mid-point of each income bracket, as in the case of a uniform income distribution, would produce an overestimated median household income figure of $54,999.

emotional feelings questions, which are also modelled linearly, for simplicity, correcting the standard errors as appropriate.

The empirical model is estimated separately for the effects of the Boston marathon bombing and those of the Sandy Hook School shooting, both named hereafter, for simplicity, as the "attacks". Attacks rarely happen on random days, and to control for the potential endogeneity of the day of the attack, we take a differences-in-differences approach. We use answers to the survey on counterfactual days of a different calendar year than that of the attack to construct a plausible control group. Specifically, the day of the 2012 Boston marathon (Monday 16th April 2012) serves as a counterfactual for the day of the 2013 Boston marathon bombing (Monday 15th April 2013), and for the Sandy Hook shooting, which occurred on Friday 14th December 2012, we use Friday 13th December 2013 as the counterfactual day. We are aware that this is not perfect, as individuals may remember the shootings a year later, but the survey was not collected in 2011 (it was collected in 2010, which is too close to the economic crisis to be useful here). Globally, we would expect that the majority of individuals did not remember the shootings a year later. If they did, they are likely to be, on average, less affected a year later than on the very day of the shooting. Thus, this approach may provide an underestimate of the true effect of the Sandy Hook shooting.

In line with much of the empirical literature in this area, we also initially consider survey participants who were residents of States geographically close to the location as the treated group, while those from other States serve as a counterfactual. We expect that the economic behavior of residents of the States closer to the dramatic events will be affected, at least on average, to a larger extent than residents in the rest of the United States. Since everyone, though, is likely to be affected, this approach underestimates the true effect of the attack. Moreover, the sample size narrows down quickly when focusing on a short period of time around the day of the attack, and thus, we do not focus only on Massachusetts for the Boston bombing, or on Connecticut, for the Sandy Hook shooting, but we define as “States nearby” the geographically-close States of Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. We consider the same geographical area as “States nearby” for each of the two attacks.

Let us write the combined triple differences-in-differences regression model for the outcome *W* (encompassing measures of emotional well-being and time use activities):

1) $W_i = \zeta\ T_i * S_i * Year_i + \tau\ T_i + \varphi\ S_i\ + \pi\ Z_i + \nu_{\ i\ +}\ \mu_{\ i}$

where ζ selects the effect of the attack on the outcome variable W. We have denoted the treatment ‘T’ as a dummy that takes value 1 in the days *after* the Boston marathon day (Monday April 16th in 2012 and Monday April 15th in 2013), or respectively, the days *after* the Sandy Hook massacre day (Friday 14th December 2012 and its counterfactual day, Friday 13th December 2013). The group of States located geographically close to the attack are denoted S, while the other States are the counterfactual. The year of the attack is labelled Year and it corresponds, respectively, to 2013 for the Boston Bombing, and 2012 for the Sandy Hook School shooting. Z is a matrix of individual characteristics, including controls for demographic characteristics (age, race, and gender), education, and a quadratic in the logarithm of household income. We control for State, year, month, and day (Monday to Sunday) fixed effects in the matrix v. The errors μ are assumed to be normally distributed. The standard errors are robust and clustered at the individual level (to control for the fact that emotional feelings are considered for three activities). Notice that the individuals who answered the survey on the exact day of the attack (respectively, Monday April 16th in 2012 and Monday April 15th in 2013, or Friday 14th December 2012 and Friday 13th December 2013) are dropped from all the empirical estimations, as standard practice.

Differences-in-differences models have been widely used in the empirical literature on the economic costs of terrorism, although finding a counterfactual not affected by the attack is often challenging, which has led researchers to construct a "synthetic" counterfactual, drawn from data on unaffected geographical areas (Alberto Abadie and Xavier Gardeazabal, 2003). However, Robert Metcalfe, Nattavudh Powdthavee, and Paul Dolan (2011) found a significant and negative effect of the 11th September 2001 (9/11) attacks in New York on the mental well-being of the individuals in the UK, suggesting that transnational terrorism can have effects far beyond national boundaries, due to media coverage, and also because many of the victims of 9/11 were British. And indeed, we find that residents in the rest of the U.S. react to the attack (and not always in the same direction as residents of States nearby), which invalidates using them as a control group (Section 5).

An RDD approach, using as the running variable the elapsed distance in days from the relevant event (such as for example, the individual birthday, or a new law being passed) is an accepted procedure in the RDD literature, as long as it cannot be manipulated by individuals (David S. Lee and Thomas Lemieux, 2010), which hinges, in our context, on seeing whether the ATUS Well-Being survey was run continuously in the period of the attack. It is possible to check for this by running a McCrary test (Justin McCrary, 2008), indicating that the survey was run continuously before and after the attack (Figure A in the Appendix). Both tragic events studied here were isolated attacks and we would not expect the impact to be long-lasting. The RDD provides an estimate of the immediate effect of the attack (Joshua Angrist and Jorn-Steffen Pischke, 2009; David S. Lee and Thomas Lemieux, 2010), while enabling us to control for the endogeneity of the day of the event, which is an advantage relative to event studies, often used in applied finance to estimate abnormal returns after unexpected shocks (Danielle Sandler and Ryan Sandler, 2014). However, for the RDD approach to be meaningful, it is also required that no other major change happened on the day of the treatment that may have affected the outcome variables (individual well-being and time use). To properly control for this possible issue, we interact the RRD model with the differences-in-differences model that exploits counterfactual calendar days.

Let the running variable be *D*, which is defined as the absolute distance in days from the terrorist attack; it is negative for days before and positive for days after, while the day of the attack is set as day zero (and dropped from the empirical model, as standard). The treatment *T* is defined as above. The outcome variable *W* is observed either before the attack $W(_0)$ or after the attack $W(_1)$, and never both times for the same individual. Let us assume, first, that any difference in outcomes between diaries recorded before or after that attack is due to the attack (the sample is randomly drawn by the BLS and individuals were randomly allocated to answer the survey in the days before and after the attack). For each individual *i*, interviewed before or after T (the Boston bombing), or any individual j interviewed before or after the Sandy Hook school shooting, exposure to the treatment *T* is thus a deterministic function of the calendar day *J* for which the ATUS activity diary was recorded and we estimate the average impact (γ) of the attack on individual outcomes by taking the difference between the responses of individuals interviewed before or after the attack:

2) $\gamma = E[W(_1) - W(_0)]$

which can be approximated as usual under RDD by the difference in the mean outcomes of the respondents who filled out the ATUS diary in a small window of days before and after the day of the attack (the cutoff point). Assuming a linear model for the outcome and only selecting data for the year of the attack:

3) $W_i = \gamma_{RD}\ T_i + \beta\ f(D_i)\ T_i + \lambda\ f(D_i)\ (1-T_i\ ) + u_i$

Where f(D) is a polynomial function of the distance in days from the attack interacted with the treatment dummy *T*, to allow for different effects on either side of the cutoff. Next, to control for the possible non-randomness of the day of the attack, the RRD approach is combined with the differences-in-differences model for the pooled 2012 and 2013 data, which gives the following regression model:

4) $W_i = \zeta' \; T_i{*}Year_i + \varphi \; f(D_i){*}Year_i {*}T_i + \varphi' \; f(D_i){*}Year_i{*}(1-T_i) + \beta' \; f(D_i){*}T_i + \lambda' \; f(D_i){*}(1-T_i) + \pi' \; T_i + \tau' \; Z_i + \nu_i + \mu_i$

We apply the procedure in Sebastian Calonico, Matias Cattaneo, and Rocio Titiunik (2014), to determine the optimal bandwidth, and use the same bandwidth for the parametric and non-parametric models – respectively, 28 days bandwidth for the Boston bombing and 14 days bandwidth for the Sandy Hook shooting. We also check the sensitivity of the estimates to setting different bandwidths, such as one, two, or three weeks. Robust standard errors are used in all model specifications and the standard errors of the well-being-outcome models are also clustered at the individual level, since emotional feelings were collected for the same individual for three randomly-selected activities.

4. Descriptive and graphical evidence

We first examine the comparability of the treatment and control samples, before and after the treatment (respectively, the Boston marathon, and the Sandy Hook shooting), as is usually done, by producing a battery of t-tests. Next, we provide preliminary graphical evidence of the effect of the treatment on the outcome variables, as customary in RDD. And finally, as standard practice when taking a differences-in-differences approach, we compute preliminary raw differences-in-differences estimates of the effect of the treatment on the outcomes.

5.1. Descriptive statistics: balance tests for treatment and control groups

We provide here some preliminary descriptive evidence of the samples for analysis. First, in line with the empirical strategy, let us distinguish the two samples of respondents that participated in the survey in the period *before* or *after* the day of the attack, in the year of the attack). We consider three samples of survey respondents: the population sample, the *States nearby,* and the *other States*. In Table 1, we show descriptive statistics for these three samples in the period *before* and *after* the day of the attack, in the year of the attack. Table 2 illustrates descriptive statistics for these three samples in the period *before* and *after* the *counterfactual day* of attack, in a different year than that of the attack. These counterfactual calendar days serve as the control group. The sample characteristics considered are demographics (age, gender, and black or white),[10] education[11] and income. It is standard procedure to compare the treatment and control groups by performing t-tests for the difference in sample means of the observables (balancing tests), and we show the statistical significance of the t-tests in the tables. Our main conclusions in this respect are as follows.

- We find no significant difference between the observables of the *population sample* that answered the survey in the month *before* or the month *after* the Boston bombing (the statistical significance of the t-test is reported alongside column 3, in the first block of Table 1).
- The observable characteristics of the residents of the *States nearby* in the month *before* the Boston bombing do not differ significantly from the month *after* (as reported in column 5, in the first block of Table 1).
- In contrast, the residents of *States nearby* interviewed in the month *before* the bombing differ significantly in terms of average education, income, and, to a lesser extent, race, from the residents of *other U.S. States* interviewed in the month *before* the bombing (column 6, in the first block of Table 1).
- Similar conclusions are drawn when comparing the mean characteristics of residents of *States nearby* in the month *after* the bombing to those of residents of *other U.S. States*, interviewed in the month *after*, which are found to differ significantly as regards gender, age, and income (see column 7, in the first block of Table 1).

This suggests that the area defined as "States nearby" is quite different in terms of observable characteristics from the rest of the United States. Somewhat similar conclusions are drawn when examining the observables of the comparable subsamples for interviews conducted in

[10] We focus on white or black race, the remainder including Hispanics and other ethnic groups.

[11] The educational variable is the original variable in the ATUS-CPS that ranges from 31 (corresponding to less than first grade) to 46 (indicating a doctoral degree), with 39 indicating a high school diploma and 43 a bachelor's degree. This is irrelevant here, as we are interested in data comparability in the control and treatment groups. In the regression model, we use education dummies.

the two-weeks[12] before or after the Sandy Hook school shooting (second block in Table 1), in which we detect some significant differences for most samples considered, probably also due to the smaller sample size and the specificity of the season (close to Christmas). Nevertheless, any such differences are unlikely to be driven by the occurrence of the Boston bombing or the Sandy Hook school shooting, which were entirely unanticipated by the general population – and the RDD checks also suggest that the survey was run normally after the attacks.

5.2 Graphical RDD evidence and the common trends assumption

Next, let us gain some preliminary insights into the responses to the attack by simply plotting the raw data (the dots in Figures 1 to 4), which show the average value of the outcome variable (grouped by bins of a day) in the days before (negative values on the horizontal axis) or after (positive values) the day of the attack (set as zero). For the sake of brevity, we consider only a subset of the outcomes and select some of the most salient: happiness, emotional balance, labor supply, and leisure hours. Non-parametric estimates of the effect of the attack on each of these outcomes (the solid lines in the graphs) are also plotted together with the 5% confidence intervals around these estimates (the two dashed lines). The relevant "γ_{RD}" coefficients are estimated by means of a local polynomial with a triangular kernel (as in Austin Nichols, 2014) for the optimal bandwidth (determined as in Sebastian Calonico, Matias Cattaneo, and Rocio Titiunik, 2014), using the BLS weights and correcting the standard errors as appropriate. In addition, to corroborate our empirical strategy, we also plot similar figures for the counterfactual period around the days of the counterfactual day of the attack (right block of graphs in each Figure). This serves as a "placebo", and also as a test for the "common trends" assumption that the (predicted) outcome behaves similarly in the days before (the baseline period) the true day of the attack, or the days before the counterfactual day of the attack.

Figure 1 illustrates a large immediate drop in Americans' happiness (top left graph in Figure 1) and global emotional balance (bottom left graph in Figure 1) due to the Boston marathon bombing, both based on the raw data (the dots) and the RDD estimates (the solid lines). These negative effects of the bombing are statistically significant, as the standard error bounds (the dashed lines) do not cross. We also plot comparable estimates for the counterfactual day of the attack, the day of the 2012 Boston marathon, for which we detect no significant change in either happiness (top right graph in Figure 1) or emotional balance (bottom right graph in

[12] Since the massacre took place mid-December and each survey year runs from January to December.

Figure 1). This indicates that the effects found are not spuriously due to the specific calendar day of the event, but are robust to controlling for day and year fixed effects (see also next section). Moreover, the baseline periods are very similar across the two sets of graphs, indicating that the common trend assumption is met.

Figure 2 is similar to Figure 1, except that it is drawn for the occurrence of the Sandy Hook school shooting, for which we detect no significant change in Americans' happiness (top left graph in Figure 2) or emotional balance (bottom left graph in Figure 2) in the aftermath of this tragedy. Furthermore, nothing changes significantly for the counterfactual day of the Sandy Hook shooting (right graphs in Figure 2), which would suggest that there is no confounding event that may blur our conclusion of no effect of this shooting on Americans' subjective well-being.

Next, the impact of the Boston marathon bombing on hours worked or leisure time is depicted in Figure 3. Hours worked increase immediately after the bombing (see the solid line in the top left graph of Figure 3) but not significantly so, as the standard error bounds cross each other before and after the bombing (see the dashed lines in the top left graph of Figure 3). However, counterfactual evidence for the 2012 Boston marathon day (top right graph in Figure 3) suggests a somewhat significant increase in working hours (not entirely clear from the dashed lines but at least slightly in this direction) immediately after the 2012 Boston marathon, when there was no terrorist attack. Therefore, it could be that working hours were actually affected negatively by the Boston bombing, as contrary to what would normally happen after a marathon day, they did not increase. The regression models interacting RDD with diff-in-diff will be able to better answer this question in the next Section of the paper.

As far as active leisure hours go, these are often spent outside the home, and increased feelings of fear due to terrorism would, a priori, act to reduce them. Indeed, we do find a remarkably significant drop in active leisure hours in the days immediately after the Boston bombing (bottom left graph of Figure 3). This is not a spurious effect due to the marathon itself, as there is no significant change in the time spent in sports after the 2012 Boston marathon day (bottom right graph of Figure 3).

Time allocation responses to the Sandy Hook shooting are plotted in Figure 4, which reveals a significant drop in hours worked in the immediate aftermath of the Sandy Hook school shooting (top right graph in Figure 4), which is not observed for the counterfactual day a year later (top left graph in Figure 4). Although the shooting took place on a Friday, and most individuals work less on weekend than week days, there is no significant drop in hours worked after the counterfactual Friday a year later. Therefore, this would suggest that Americans did immediately react to the shooting by working significantly less – and we shall test for the robustness of this finding in the next Section. There is no evidence of any impact of the Sandy Hook shooting on active leisure hours (bottom left graph in Figure 4), nor did leisure hours vary after the counterfactual day (bottom right graph in Figure 4).

5.3 Descriptive evidence on the outcomes: raw differences-in-differences estimates

We illustrate the behaviour of the outcome variables in the various treatment and control samples defined for our analysis, and calculate preliminary raw estimates of the effect of the treatment on the outcomes of interest (based on the differences in the average outcome of the treatment and control group, before and after the treatment), without controlling for observables (columns 7 and 10 of Table 3). Specifically, three samples are distinguished: the population sample around the days of the attack (columns 2 to 4 of Table 3); the sample of residents of States nearby around the days of the attack (columns 5 to 7 of Table 3); and the sample that responded to the survey around the counterfactual days of the attack (column 8 to 10 of Table 3). We also show, for the sake of completeness, the raw 'before-after' estimates of the effect of the treatment on the outcomes, for the first of these samples (col. 4 of Table 3), although this would only be a valid empirical approach if individual emotional feelings and daily time uses varied randomly by calendar days, and the day of the attack was random. The raw differences-in-differences estimates of the effect of the attack on the outcomes of the residents of States nearby (the treated), versus the residents of other States (the control group), are shown in column 7 of Table 3. Those for the effect of the attack on the outcomes of the population in the days around the attack (treatment days), versus the counterfactual calendar days in which there was no attack (control days), are given in column 10 of Table 3. Finally, the first block of Table 3 refers to the Boston marathon bombing, while the second block covers the Sandy Hook school shooting.

Based on these calculations, we find that, after the Boston marathon bombing:

- a significant decline in happiness, going from -0.17 (before-after estimate) to -0.14 (diff-in-diff based on counterfactual days), or as large as -0.50 when focusing on States nearby as the treatment group;
- similar estimates for the effect of the bombing on meaningfulness, slightly larger than on happiness, though the before-after estimate is close to zero and not significant;
- a weak increase in stress based on the before-after estimate, which becomes non-significant when taking differences-in-differences;
- a weak increase in tiredness according to the before-after estimate, which is strongly significant and much larger (0.23) when taking calendar day counterfactual diff-in-diff, but not significant for the contemporaneous (in the year of the attack) States nearby model.
- an increase in sadness of 0.10 to 0.15, although not significant for the contemporaneous States nearby specification;
- an increase of 0.21 in pain, only significant under the counterfactual calendar days approach;
- a significant drop in affect balance, according to three specifications, and equal, respectively, to -0.20 (before-after), -0.31 (counterfactual day diff-in-diff), and -0.63 (States-nearby diff-in-diff).

In contrast, individual daily time allocation does not appear to be much affected by the Boston bombing and the few significant effects are not consistent from one specification to the other, suggesting that, especially for the daily time use outcomes, it may be important to combine the various empirical approaches (as we plan to do in the next Section).

For the Sandy Hook school shooting, the following can be noticed:

- a significant decline in happiness, going from -0.20 (before-after estimate) to -0.40 (diff-in-diff);
- a significant decline in meaningfulness of about the same size as in happiness, although it becomes non-significant when accounting for the calendar days counterfactual;
- a weak drop in stress according to a simple before-after approach, which disappears when taking differences-in-differences;
- a significant increase in tiredness of roughly the same size, in absolute value, as the happiness decline, although it becomes non-significant when accounting for the calendar days counterfactual;
- a significant increase in sadness of 0.35, when controlling for counterfactual calendar days, which is non-significant in the other diff-in-diff specification and only weakly significant (but close to zero) in the before-after specification;
- no effect on pain;
- a significant drop in affect balance, ranging from -0.28 (before-after), to -0.32 (counterfactual days diff-in-diff) and, twice as large, -0.69, when controlling for States nearby;
- a reduction in working hours, which is statistically significant and equal to about one hour under a before-after approach, and also significant, although smaller in size, under a calendar-day-counterfactual differences-in-differences approach;

- an increase in time spent watching the news or listening to the radio, which is statistically significant under the three approaches;
- no significant effect on household work or active leisure;
- some sporadic effect on childcare (before-after) or sleep (diff-in-diff for States nearby), depending on the specification adopted.

Estimates combining these different empirical approaches and controlling for individual characteristics, as well as day, month, year, and State fixed effects, come in the next Section.

6. Model estimation results

The results of our estimation of differences-in-differences and RDD regressions are presented in Table 4, for the Boston bombing, and Table 5, for the Sandy Hook school shooting. We only show the estimated coefficient for the impact of the attack on the outcomes, but the full results are available on request. For simplicity, we use the same sample bandwidth in all specifications, which corresponds to the optimal bandwidth for the RDD, but we check the robustness of the estimates to using different sample cuts (the last section of Tables 4 and 5), and also look at the heterogeneity of the responses across different groups of the population in Table 6. As before, the "attack" refers hereafter to either the occurrence of the 2013 Boston marathon bombing, or the 2012 Sandy Hook shooting.

6.1 Results of estimation of differences-in-differences models

First, we show the diff-in-diff estimates for the effect of the attack on emotional feelings and time uses (*Specification 1,* in Tables 4 and 5, respectively), using as the control group counterfactual calendar days in a different year (i.e. responses to the survey around the days of the 2012 Boston marathon, or close days in 2013, for Sandy Hook). Notice that we observe the treatment and the control groups in the days *before* or *after* the attack (or the counterfactual day of the attack in the counterfactual calendar year), and thus we can take a diff-in-diff approach, in which the treatment is the day of the attack, as discussed earlier in this paper (Section 3). Within this framework, many of the effects of interest turn out to be statistically significant (*Specification 1*, in Tables 4 and 5).

Next, in line with much of the empirical literature in this area, we also consider residents of States nearby as the treatment group, and residents of other States as the control group, which gives a "triple" differences-in-difference estimator when interacted with the treatment and control groups above (Equation 1, Section 3). Here, it strikes us immediately that the attack appears to statistically significantly affect the residents of States nearby and residents of other States, although to different degrees - and sometimes even in the opposite direction (S*pecification 2* of Tables 4 and 5), which may be due to the fact that individuals farther away from the attack are affected differently. For example, average hours worked drop in the weeks after the Boston bombing[13] for residents of States nearby (first row of coefficients in *Specification 2* of Table 4) but increase for residents of other States (second row of coefficients in *Specification 2 o*f Table 4); and the opposite is true for the Sandy Hook shooting, which appears to increase hours worked by those living relatively nearby, but reduce them for the rest of the United States. While we acknowledge that some of these differences may also be due to the small sample sizes used when focusing on geographical proximity to the attack (see number of observations in columns 5 and 6 of Table 3 for the year of the attack, which are approximately twice as many when pooling 2012 and 2013 data), this evidence suggests that the rest of the United States cannot be taken as the control group for the effects of the attack. Moreover, it is hard to know where to set the borderline for the

[13] Notice that here we have not yet implemented an RDD design and so our estimates do not pick up the immediate effect of the attack, but the average effect over the sample period considered. Moreover, if an RDD design is appropriate for the data-generation process, these diff-in-diff estimates are not correct, as we do not control for the days elapsed and their interaction with the treatment dummy in the diff-in-diff models, as we do in the RDD.

effects to differ with geographical distance from the attack, and other factors than simple geographical distance may need to be taken into account, such as State of birth, or geographical mobility, which the data do not track back in time. Thus, we focus the rest of our analysis on the average effects for the American population, which are interesting in their own right.

6.2 Results of estimation of RDD and combined RDD and differences-in-differences

Because any effects of the isolated attacks for the general population under consideration are unlikely to last very long, and due to the potential endogeneity of the day of the attack (see the discussion in the Introduction and in Section 3), using RDD appears appropriate to capture the immediate impact of the attack. *Specification 3,* in Tables 4 and 5, provides the RDD estimates, using only the analysis sample of the year of the attack, as in standard RDD. Controls for individual observables and States, day, month, and year fixed effects are included in *Specifications 3,* as we have reason to believe that RDD alone does not suffice to identify the effects at stake, due to the substantial variation in emotions and time uses, by day of the week and calendar period, as discussed earlier. Specifically, results of estimation of *Specification 3* are included for completeness, to show that they are not too different from our preferred specification, which is *Specification 4*, combining RDD with the counterfactual-calendar-day differences-in-differences approach, revealing that the attack had an immediate impact on respondents along many of the dimensions considered.

According to our preferred specification (*Specification 4)*, the immediate average effect of the attack, for the average American, shows that:

- Happiness feelings declined significantly, by 0.47 in absolute value, in the aftermath of the Boston Marathon Bombing (BMB hereafter), while they were not impacted by the Sandy Hook School Shooting (SHSS hereafter).
- BMB also caused a significant drop in meaningfulness, equal to -0.34, while SHSS increased it, by about 0.44.
- Stress was apparently not affected by BMB (the estimated coefficient is close to zero and not significant statistically) while it increased by 0.34 (significant at the ten per cent level) after SHSS.
- Tiredness increased significantly after both BMB (by 0.75) and SHSS (by 0.44, significant at 10%).
- BMB raised sadness significantly, by 0.25, while this effect is close to zero and not significant for SHSS.
- Feelings of pain increased strongly by 0.60 due to BMB but, in fact, declined weakly by 0.3 after SHSS.
- Overall, the affect balance declined strongly and dramatically, by 0.8, due to BMB, but the effect does not appear to be significant for SHS, due to the mix of increases in both "positive" feelings (meaningfulness and the decline in pain) and "negative" feelings (tiredness and stress).

These contrasting findings for BMB versus SHSS may be explained in light of the theoretical literature. It is possible that Americans felt somewhat relieved that they were not among the victims of the domestic school shootings, and also that the shooting was over; while the occurrence of terrorism increased the fear of future terrorism, which can hit anyone at any time. This holds true, regardless of whether individuals feel sorry for the victims, as our data are collected in association with carrying-out specific daily activities and are not meant to capture general feelings specifically related to BMN or SHSS. Survey participants were not reminded of these episodes when responding to the survey. Thus, we would expect to find an effect only if BMB or SHSS changed individual attitudes to daily life and one would expect such effects to be especially strong in the case of transnational terrorism.

As for the uses of time, again the picture looks quite different for BMB or SHSS:

- Hours worked by Americans immediately dropped by more than half an hour per day, on average, following BMB, and slightly more, by 0.78, after SHSS.
- Household work hours also dropped on average (by less than half an hour per day) for Americans after BMB but were not affected by SHSS, while childcare time was not affected by either event.
- BMB strongly reduced active leisure hours (by 0.22 of an hour), as *a priori* expected, due to increased fears of participating in sports outside, while SHSS increased active leisure by 0.34 of an hour.
- Time spent watching television or listening to the radio increased significantly after both trasgedies, as one might have expected - by less than half an hour per day after BMB and by slightly more than half an hour per day after SHSS. These two figures are quite close and within each other's 5% confidence bounds, suggesting that time spent on the media increased similarly for BMB and for SHSS. However, bear in mind that the media coverage lasted for more days after BMB than SHSS, which may also contribute to explaining some of the differences in Americans' responses to these events.
- Finally, sleep declined by about twenty minutes per day in the immediate aftermath of BMB, but SHSS had no effect on sleep.

These estimates corroborate the conclusion that terrorism has a stronger negative impact on individual daily life and economic activity than other types of fatal shootings.

6.3 Robustness checks

We now examine the robustness of these estimates. First, in line with our a priori empirical approach (Introduction and Section 3), we also interact the RDD with the triple differences-in-differences model (*Specification 5* in Tables 4 and 5, respectively). The results of the estimation show, indeed, that the estimates of the immediate effect of the attack differ for the residents of States geographically close to the place of the attack (first row of coefficients in *Specification 5*) than for the rest of the U.S (second row of coefficients in *Specification 5*).Thus, confirming (as in *Specification 2)* that both groups were affected by BMB or SHSS, though to a lesser extent, and ccasionally even in opposite directions (see also above discussion for *Specification 2).* Thus, it seems that one cannot easily draw a control group from the other States, contrary to the widespread practice in the empirical literature in this area.

We stay with *Specification 4* that interacts RDD with counterfactual-calendar-day differences-in-differences, as our preferred specification. Several additional robustness checks are performed as regards *Specification 4.* The robustness of the estimates to dropping individual observables from the regression model is tested in *Specification 6*. Many of the estimates are robust to dropping controls and the majority of the estimated coefficients remain close in size, for both BMB and SHSS models. However, some of the estimates become non-significant statistically and/or quite different in size when dropping controls from the empirical specification. This suggests that controls should indeed be included, as is normal when estimating differences-in-differences.

Next, we check the sensitivity of the estimates to narrowing (*Specification 7)* or expanding (*Specification 8)* the sample bandwidth, as customary when implementing RDD. Most of the estimates are very close to those in the baseline specification (*Specification 7)* for the BMB model. Unfortunately, for SHSS, the sample size falls dramatically when narrowing the bandwidth, which probably explains why some of the estimates are quite different. Due to data limitations, as each survey year closes by the end of December, we cannot expand the sample bandwidth for the analysis of SHSS, unless we use 2013 data, under which scenario we could no longer control for counterfactual calendar days, which would likely lead to misleading results.

6.4 Heterogeneity in responses

Women have often been found to be more risk-averse than men, though there is considerable disagreement on this in the empirical literature (Rachel Croson and Uri Gneezy, 2009) and therefore, it is reasonable to test whether women react differently from men (college-educated individuals were found to respond differently to terrorism in Israel; Gary Becker and Yona Rubinstein, 2011). Therefore, we re-estimate our preferred specification for women and the college-educated to check whether they react differently to the attack than did the average American.

Globally, we find that women do react more than men to these tragic happenings, as many of the estimated impacts appear larger for women than for men (see Table 6). One of the most striking differences is in the estimated effect of BMB on stress, which was close to zero and not significant statistically for the population sample (first block of results in Table 6), but is strongly significant, positive and very large, for women (second block of results in Table 6), showing an increase in stress of 0.70 (the average value of stress for the population in the days before the attack was 1.40). Stress is also found to increase more for women than for men in the aftermath of the SHSS. On the other hand, the college-educated appear to respond to either BMB or SHSS, less than do individuals with lower levels of education. Many of the estimates are not significant for Americans with college education, although they are actually found to slightly reduce childcare in the aftermath of BMB (third block of results in Table 6), as if they felt, perhaps, that investment in children had become more uncertain. Exposure to the media may contribute in explaining some of these findings, as time spent in front of the media does not significantly vary for the college-educated after either event. However, women did not spend more time listening to the radio or watching television after BMB (as the estimated coefficient is close to zero for them), but they spent over an hour more than usual on these activities after SHSS. A higher degree of risk-aversion is likely to be driving the stronger responses of women.

7. Summary of findings and discussion

We find a significant and negative impact of the Boston bombing on hours worked of almost 40 minutes per day, a drop in household work of 20 minutes, a drop of over 10 minutes in active leisure, and a drop of 15 minutes in sleep, while time spent in front of the media increased by only 20 minutes. The negative and positive values do not add up, perhaps because some amount of time was lost in security procedures. Considering women, who are often said to be more risk-averse than men and thus, potentially more sensible to fatal attacks, most of these time-use effects become insignificant, except for the decline in leisure (which stays close in size to that estimated for the overall sample) and the reduction in hours worked, which is greater than for the average individual. The working hours of the college-educated (who may be less responsive to the media coverage) slightly increase (only weakly significant) while their childcare hours decline significantly, by about 20 minutes per day. According to the economic model of parental investment with children, this time investment is especially profitable for the higher-educated and it is thus plausible that they may reduce such time in the face of increased uncertainty.

As for emotional well-being, the Boston marathon bombing reduced the affect balance (equal to the difference between the sum of the positive and the sum of the negative feelings), which declined strongly by 0.80, i.e. by about 26% (the average affect balance in the days before the bombing was equal to 3, on a scale of zero to six). In particular, happiness dropped by 11% and meaningfulness by almost 8%, while tiredness increased by 32%, sadness by almost 50% and feelings of pain by over 60%. Perhaps surprisingly, stress as such was not affected, in stark contrast with earlier work that focused only on stress. However, when restricting the sample to women, we find a large and strong increase in stress, as expected, of over 40%. Globally, women react much more strongly to the bombing than do men, something which has not been addressed (to the best of our knowledge) in earlier work on the effects of terrorism. The overall affect balance declines for women by 1.5, almost twice as much as for the average American (including both men and women in the sample). This is likely explained by the differential risk-aversion attitudes of women, which have been documented in much of the empirical literature on risk-aversion. In contrast, there is no significant effect of the bombing on the emotional balance of the college-educated, whose emotional feelings are not at all impacted, except for meaningfulness, which declines by more than twice that for the average American. This is in line with evidence from Israel that consumption of individuals with higher education was less responsive to terrorism.

Coming to the Sandy Hook shooting, our findings are mixed. In particular, it appears that individuals felt less at risk due to the Sandy Hook shooting than to the Boston Marathon bombing, regardless of the relative death tolls. Some individuals possibly felt relief that they were not among the victims and that the shooting was over, as meaningfulness did increase for the average American, by 0.40 (about 9%), and feelings of pain also dropped on average - although we also find that stress and tiredness increased on average, by similar amounts, so that overall things cancel out and there is no global significant effect on the affect balance.

Meaningfulness also increased for women and even more so for the college-educated, whose meaningfulness rose by 1.5 and for whom tiredness also dropped by 0.6. For daily activities also the picture is mixed, with a decline in working hours for the average individual (although not statistically significant for women or for the college-educated) and an increase in active leisure (statistically significant for all, and to the largest extent for the college-educated). Time spent in front of the media also increased immediately after the Sandy Hook school shooting for both women and men, but not for the college-educated.

Working hours fell after each attack, in line with the conclusions of earlier work that economic activity drops due to terrorism (Alberto Abadie and Javier Gardeazabal 2003).[14] We also find that time spent in front of the media increased similarly after both tragic events. However, in other time uses and emotional feelings, we find quite different reactions to BMB versus SHSS. The larger media coverage (remember, the Boston bombing was on the front page of the New York Times for longer than the Sandy Hook shooting) may partly explain the stronger individual responses to terrorism than to domestic shootings. Terrorism may increase the fear of future terrorism occurrence, while domestic mass shootings may perhaps generate some feelings of relief for not being among the victims, or relief that the shooting is over and the perpetrator was caught. This is somewhat in line with (scant) evidence that Americans value more the prevention of deaths from terrorism than from natural disasters (Kip Viscusi, 2009). It could also be that Americans are more accustomed to domestic shootings than to transnational terrorism, in line with evidence from Israel that "occasional" consumers are more impacted by terrorism than "regular" consumers (Gary Becker and Yona Rubinstein, 2011; Dov Waxman, 2011), which may suggest that attacks we are not familiar with would have more of an effect on individual behavior.

[14] Abel Brodeur (2015) finds that terrorist attacks temporarily reduce the overall number of jobs in the countries attacked.

8. Conclusions

This is the first study to evaluate the impact of the Boston marathon bombing on Americans' emotional well-being and time allocation. It is also the first to compare the effects of terrorism to those of a domestic mass-shooting, at the Sandy Hook elementary school. There are a priori reasons to expect the former to have a stronger impact on economic behavior than the latter, due to broader (and longer) media coverage and to stronger individual reactions to terrorism.

Feelings of risk aversion and fear, which are known to affect economic decisions, are the drivers of the economic impact of terrorist attacks. Increased stress and its negative effect on health outcomes has also attracted considerable attention in the literature on the economic impacts of terrorism. Substantial negative effects of terrorism on economic growth and subjective well-being have been found in earlier work, although less is known about the economic effects of mass shooting, even though it could be assumed that many of these factors apply to both types of fatal attacks.

Here we use unique daily data on individual time use, collected by means of a daily diary, and daily emotional feelings experienced in relation to performing three randomly-drawn activities from those reported in the daily diary. This wealth of daily data was collected for a representative random sample of the American population around the days of the 2013 Boston marathon bombing and the 2012 Sandy Hook school shooting, by the bureau of Labor Statistics, as part of the American Time Use Survey and the Well-Being Module. The data collection was in no way related to the tragic episodes we study here and individuals were not reminded of these tragedies when they were interviewed. We consider that this data provides a unique quasi- natural experiment on the effects of terrorism versus mass-shooting on the daily life of the average American, who were only indirectly involved in these tragedies.

There is limited evidence that attacks rarely happen on random days, and it is an established fact that subjective feelings and daily activities may vary dramatically by day of the week and month or season. Thus, we construct a counterfactual for the two fatal episodes considered here, using answers to the surveys around the days of the 2012 Boston marathon, and similar calendar days of 2013 for the Sandy Hook school shooting. The latter is obviously imperfect as the shooting happened in 2012, but the survey was not collected in 2011, and 2010 is too close to the economic crisis to be a reasonable counterfactual year. We would expect that, even if individuals remembered the tragic shooting a year later, their reactions would not be as strong as on the days close to the actual shooting, so that we can at least gather an underestimate of the effects of the shooting. Since we do not expect the effects of these isolated attacks to last very long, we also combine this counterfactual-day differences-in-differences approach with a regression discontinuity design, which enables us to gather the immediate impact of these tragedies. RDD studies that use as the running variable the distance in days from a given event have been widely used in the empirical literature.

We find an immediate drop in hours worked of over half an hour per day, on average, after both events, in line with earlier work on the effects of terrorism on economic activity. Time in front of the media also rose after each attack. However, for other uses of time and subjective emotional feelings, the estimated effects of the Boston marathon bombing are often quite different, occasionally even opposite in sign, from those of the Sandy Hook school shootings. Notably, leisure hours dropped as expected after the former but increased, somewhat unexpectedly, after the latter. Feelings of meaningfulness (one of the six feelings elicited) also declined after BMB, but increased after SHSS, while the opposite holds true for feelings of pain. Remarkably, the "affect balance", a measure widely used in the psychological literature, that takes the difference between the average of positive and negative feelings, declined strongly after the bombing but was not significantly affected by the shooting, due to the mix of contrasting feelings provoked by the latter.

We conclude that terrorism appears to have a greater negative impact on well-being and daily activities than other acts of mass violence. This is consistent with findings in the existing literature that individuals are more responsive to deaths from terrorism than to those from other causes. Our findings are likely to extend also to individuals in other countries.

Finally, because we find a reduction in economic activity after both events, but there appears to be less of an impact of the school shooting on emotions, it may perhaps be concluded that the common main driver of the reduction in economic activity is not fear, but rather enhanced security procedures, which may, incidentally, cast doubt on the best policy responses to the attacks. In the aftermath of the Sandy Hook shootings, multiple gun-control laws were proposed at the federal and state level, which may have contributed to reassure citizens more than the massive deployment of police security forces and controls that are typically instituted following a terrorist attack, which may serve as a continual reminder of the tangible threat of terrorism.

Bibliography

Abadie, Alberto and Javier Gardeazabal (2003), "The Economic Costs of Conflict: A Case Study of the Basque Country", *American Economic Review*, 93(1), 113-132.

Angrist, Joshua D. and Jorn-Steffen Pischke (2009) *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press.

Becker, Gary S. (1981), A Treatise on the Family, Harvard University Press, Cambridge.

Becker, Gary S. and Yona Rubinstein (2011), "Fear and the Response to Terrorism: an Economic Analysis", CEP Discussion Paper No 1079.

Biddle, Jeff E. and Daniel S. Hamermesh (1990), "Sleep and the Allocation of Time", *Journal of Political Economy*, 98(5), 922-943.

Brodeur, Abel (2015), "Terrorism and Employment: Evidence from Successful and Failed Terror Attacks", IZA DP 9526.

Bradburn, Norman M. (1969),"The structure of psychological well-being", Chicago: Aldine.

Bureau of Labor Statistics (2014), "American Time Use Survey (ATUS) Data Dictionary: 2010, 2012, and 2013 Well-Being Module Data Variables collected in ATUS Module" July 2014, US Bureau of Labor Statistics.

Bureau of Labor Statistics (2015), "American Time Use Survey User Guide: Understanding ATUS 2003 to 2014", June 2015, US Bureau of Labor Statistics.

Calonico, Sebastian, Matias D. Cattaneo and Rocio Titiunik (2014), "Robust Non-Parametric Confidence Intervals for Regression Discontinuity Designs", *Econometrica,* 82(6), 2295-2326.

Camacho, Adriana (2008), "Stress and Birth Weight: Evidence from Terrorist Attacks", *American Economic Review,* 98(2), 511-515.

Clark, Andrew, (2011), "Income and Happiness: Getting the Debate Straight", *Applied Research in Quality of Life*, 6(3), 253-263.

Croson Rachel and Uri Gneezy (2009), "Gender differences in preferences", *Journal of Economic Literature*, 47 (2), 1–27.

Draca, Mirko, Stephen Machin, and Robert Witt (2011), "Panic on the Streets of London: Police, Crime and the July 2005 Terror Attacks", *American Economic Review*, 101(5), 2157-2181.

Di Tella, Rafael and Robert MacCulloch (2006), "Some Uses of Happiness Data in Economics", *Journal of Economic Perspectives*, 20(1), 25-46.

Frazis, Harley and Jay Stewart (2012), "How to Think About Time-Use Data: What Inferences Can We Make About Long- and Short-Run Time Use from Time Use Diaries?" *Annals of Economics and Statistics,* 105/106, 231-246.

Frey, Bruno, Simon Luechinger and Alois Stutzer, (2007), "Calculating Tragedy: Assessing the Costs Of Terrorism," *Journal of Economic Surveys*, 21(1), 1-24.

Glaeser, Edward L. and Jesse M. Shapiro (2002), "Cities and Warfare: The Impact of Terrorism on Urban Form", *Journal of Urban Economics,* 51(2), 205-224.

Kahneman, Daniel, Alan B. Krueger, David A. Schkade, Norbert Schwarz and Arthur Stone (2004), "A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method", *Science*, 3 December 2004, 1776- 1780.

Kahn, William A. (1990), "Psychological Conditions of Personal Engagement and Disengagement at Work", *Academy of Management Journal*, 33(4), 692-724.

Kahneman, Daniel and Alan B. Krueger (2006), "Developments in the Measurement of Subjective Well-Being", *Journal of Economic Perspectives*, 20(1), 3-24.

Krueger, Alan B. (2007), *What Makes a Terrorist*, Princeton University Press.

Krueger, Alan B. and Andreas Mueller (2012), "Time Use, Emotional Well-Being and Unemployment: Evidence from Longitudinal Data", *American Economic Review*, Papers and Proceedings, 102(3), 594-599.

Jaeger, David A. and M. Daniele Paserman, (2008), "The Cycle of Violence? An Empirical Analysis of Fatalities in the Palestinian-Israeli Conflict", *American Economic Review,* 98(4), 1591-1604.

Juster F. Thomas and Frank P. Stafford (1985), "Time, Goods, and Well-Being", Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan.

Lee, David S. and Thomas Lemieux (2010), "Regression Discontinuity Designs in Economics", *Journal of Economic Literature,* 48(2), 281-355.

May, Douglas R., Richard L. Gilson and Lynn M. Harter (2004), "The psychological conditions of meaningfulness, safety, and availability and the engagement of the human spirit at work", *Journal of Occupational and Organizational Psychology*, 77, 11-37.

McCrary Justin (2008), "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics*, 142, 698-714.

Mirza, Daniel et Thierry Verdier (2008), « International Trade, Security and Transnational Terrorism: Theory and Empirics », *Journal of Comparative Economics,* 36(2), 179-194.

Metcalfe, Robert, Nattavudh Powdthavee and Paul Dolan (2011), "Destruction and Distress: using a quasi-experiment to show the effects of the September 11 attacks on mental well-being in the United Kingdom", *Economic Journal*, 121(550), 81-103.

McCrary, Justin (2008), "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics*, 142(2), 698-714.

Montalvo, Jose G. (2011), "Voting after the bombings: A natural experiment on the effects of terrorist attacks on democratic elections", *The Review of Economics and Statistics*, vol. 93, no. 4, p. 1146-1154.

Nichols, Austin (2014), "Stata Module for Regression Discontinuity Estimation", *Stata Journal*, Boston College.

Noss, Amanda (2014), "Household Income: 2013", United States Census Bureau, September.

Pesko, Michael F. (2014), "Stress and Smoking: Associations with Terrorism and Causal Impact", Contemporary Economic Policy, 32(2), 351-371.

Pesko, Michael F. and Christopher F. Baum (2016), "The self-medication hypothesis: Evidence from terrorism and cigarette accessibility", *Economics and Human Biology*, 22, 94-102.

Sandler, Todd and Walter Enders (2012), "The Political Economy of Terrorism", Cambridge University Press.

Sandler, Danielle H. and Ryan Sandler (2014), "Multiple Event Studies in Public Finance and Labor Economics: A Simulation Study with Applications", *Journal of Economic and Social Measurement,* 39, 31-57.

Schlenger, William, Caddel, Juesta M., Lori Ebert, Kathleen B. Jordan, Kathryn M. Rourke, David Wilson, Lisa Thalji, Michael J. Dennis, John A. Fairbank, Richard A. Kulka (2002), "Psychological Reactions to Terrorist Attacks", Journal of the American Medical Association (JAMA), 288 (5), 581-588.

Stancanelli, Elena, Olivier Donni and Robert A. Pollak (2012), "Individual and Household Time Allocation: Market Work, Household Work, and Parental Time", *Annals of Economics and Statistics,* 105-106, 5-15.

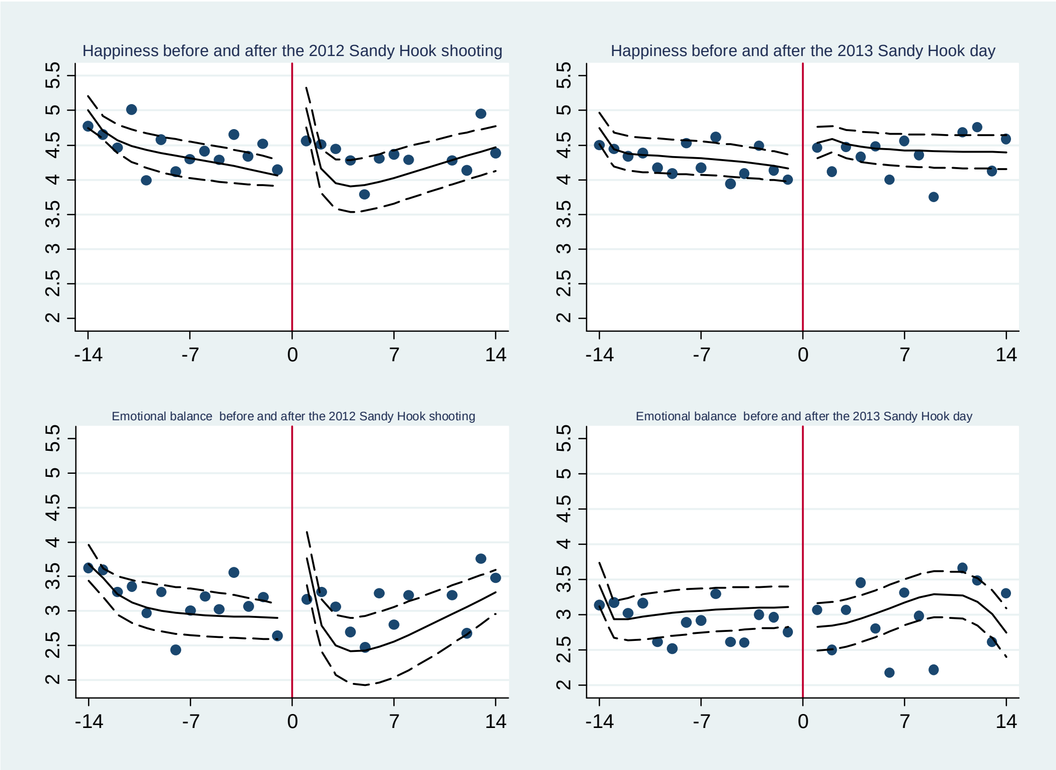
Viscusi, W. Kip (2009), "Valuing Risks of Death from Terrorism and Natural Disasters", *Journal of Risk and Uncertainty*, 38(3), 191-213.

Waxman, Dov (2011), "Living with terror, not living in Terror: The Impact of Chronic Terrorism on Israeli Society", *Perspectives on Terrorism,* 5(5-6), 1-13.

Figure 1. Individual emotional feelings before and after the Boston marathon day.

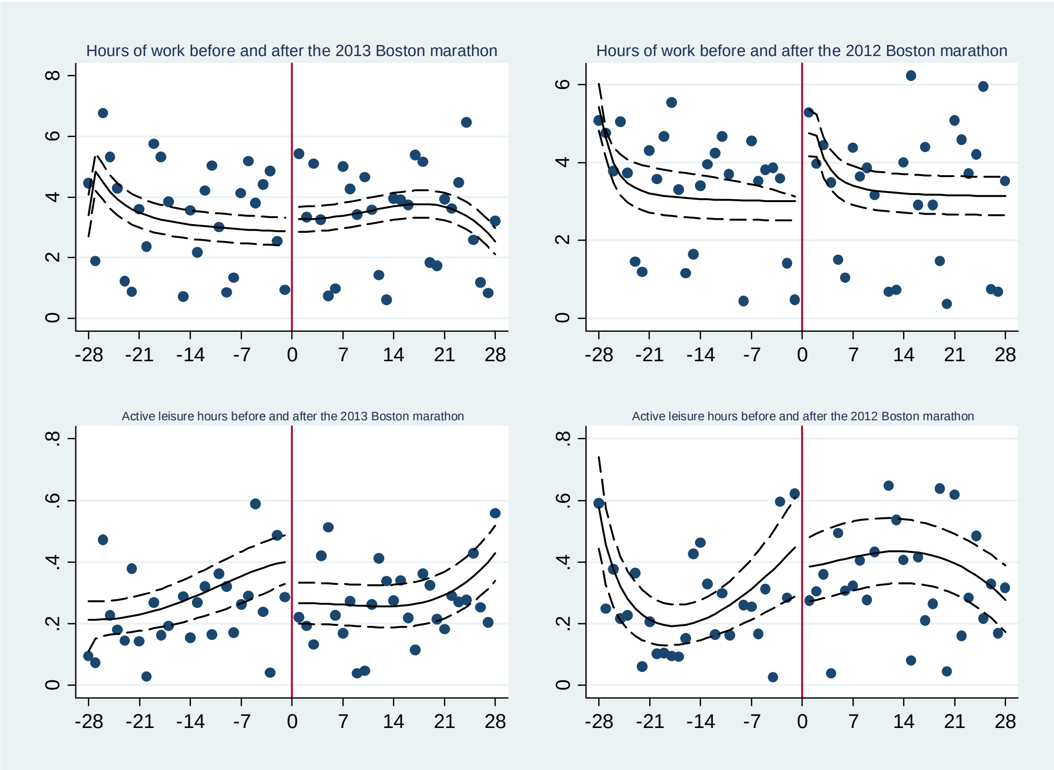
The vertical axis shows in the top block of graphs, the average happiness reported (on a scale from 0 to 6) by the days elapsed before (negative values) or after (positive values) the Boston marathon day (set equal to day zero), in 2013 (left block of graphs) and 2012 (right block of graphs). The bottom block of graphs plots emotional balance [the difference between the average of the positive feelings (happiness, meaningfulness) and the average of the negative feelings (sadness, pain, tiredness, stress)]. The dots correspond to the raw happiness means by bins of a day. The solid line is non-parametrically fitted using triangle kernel with a bandwidth of 28 days. The dashed lines are the 5% confidence intervals around the triangular kernel estimates.

Figure 2. Individual emotional feelings before and after the Sandy Hook day



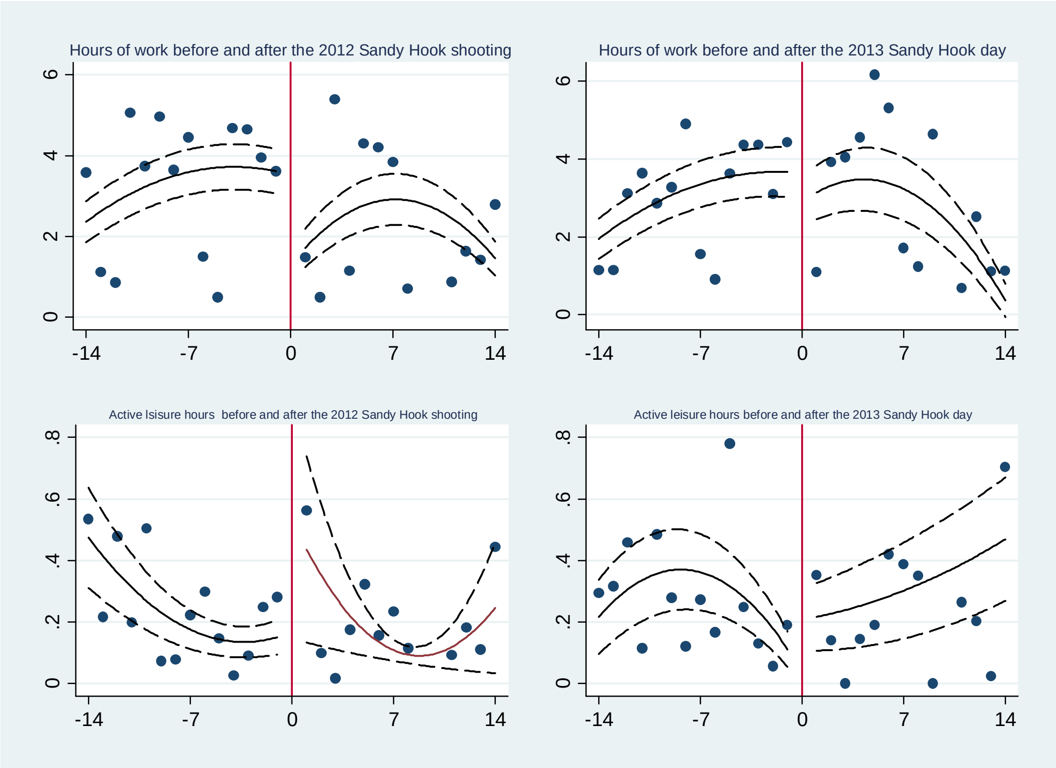
The vertical axis shows in the top block of graphs, the average happiness reported (on a scale from 0 to 6) by the days elapsed before (negative values) or after (positive values) the Sandy Hook (set equal to day zero), in 2013 (left block of graphs) and 2012 (right block of graphs). The bottom block of graphs plots emotional balance [the difference between the average of the positive feelings (happiness, meaningfulness) and the average of the negative feelings (sadness, pain, tiredness, stress)]. The dots correspond to the raw happiness means by bins of a day. The solid line is non-parametrically fitted using triangle kernel with a bandwidth of 28 days. The dashed lines are the 5% confidence intervals around the triangular kernel estimates.

Figure 3. Individual time uses before and after the Boston marathon day.



The vertical axis shows in the top block of graphs, the average hours work reported in the daily diary by the days elapsed before (negative values) or after (positive values) the Boston marathon day (set equal to day zero), in 2013 (left block of graphs) and 2012 (right block of graphs). The bottom block of graphs plots the average daily active-leisure hours. The dots correspond to the raw happiness means by bins of a day. The solid line is non-parametrically fitted using triangle kernel with a bandwidth of 28 days. The dashed lines are the 5% confidence intervals around the triangular kernel estimates.

Figure 4. Individual time uses before and after the Sandy Hook day.



The vertical axis shows in the top block of graphs, the average hours work reported in the daily diary by the days elapsed before (negative values) or after (positive values) the Sandy Hook day (set equal to day zero), in 2013 (left block of graphs) and 2012 (right block of graphs). The bottom block of graphs plots the average daily active-leisure hours. The dots correspond to the raw happiness means by bins of a day. The solid line is non-parametrically fitted using triangle kernel with a bandwidth of 28 days. The dashed lines are the 5% confidence intervals around the triangular kernel estimates.

Table 1. WB sample descriptive statistics before and after each event.
Statistical significance of the differences in sample means across the before-after subsamples is reported.

	Full sample Mean (std deviation)	Full sample Mean (std deviation)	States nearby Mean (std deviation)	States nearby Mean (std deviation)	Control States Mean (std deviation)	Control States Mean (std deviation)
Boston marathon bombing, Monday 15th April 2013						
	1-30 days before	**1-30 days after**	**1-30 days before**	**1-30 days after**	**1-30 days before**	**1-30 days after**
Age	48.14 (0.32)	47.68 (0.33)#	48.71 (0.80)	49.35(0.79)#	48.03 (0.35)#	47.36 (0.37)**
Woman	0.54 (0.01)	0.54 (0.01)#	0.55 (0.02)	0.54 (0.02)#	0.54 (0.01)#	0.55 (0.01)#
Education	40.49 (0.05)	40.45 (0.05)#	40.72 (0.13)	40.75 (0.13)#	40.44 (0.05)**	40.38 (0.05)**
White	0.80 (0.01)	0.80 (0.01)#	0.82 (0.01)	0.83 (0.01)#	0.79 (0.01)#	0.80 (0.01)#
Black	0.15 (0.01)	0.14 (0.01)#	0.12 (0.01)	0.12 (0.01)#	0.15 (0.01)*	0.14 (0.01)#
Income	59596 (765)	59665 (831)#	66457 (1980)	67710 (2085)#	58231 (826)**	57939 (899)**
Observations	*3123*	*2806*	*518*	*481*	*2605*	*2334*
Sandy Hook massacre, Friday 14th December 2012						
	1-15 days before	**1-15 days after**	**1-15 days before**	**1-15 days after**	**1-15 days before**	**1-15 days after**
Age	48.11 (0.49)	48.36(0.52)#	50.41(1.08)	47.96(1.25)#	47.70(0.56)**	48.45(0.56)#
Woman	0.50(0.01)	0.56((0.01)**	0.48(0.03)	0.62(0.03)*	0.51(0.01)#	0.55(0.02)**
Education	40.35(0.08)	40.48(0.07)#	41.02(0.17)	40.62(0.16)*	40.22(0.09)**	40.41(0.08)#
White	0.80(0.01)	0.79(0.01#	0.79(0.02)	0.83(0.03)#	0.81(0.01)#	0.79(0.01)#
Black	0.15(0.01)	0.15(0.01)#	0.18(0.02)	0.15(0.02)#	0.15(0.01)	0.15(0.01)#
Income	64090 (1170)	53764 (1154)**	7206 (2894)	60113 (2743)#	62469 (1266)**	52296 (1268)**
Observations	*1415*	*1230*	*239*	*231*	*1176*	*999*

The significance of the t-test of the difference in means for the full sample "before" and "after" the event is in Column 3.
The significance of the t-test of the difference in means for the States nearby "before" and "after" the event is in Col. 5.
The significance of the t-test of the difference in means of the States nearby and the control States "before" is in Col. 6.
The significance of the t-test of the difference in means of the States nearby and the control States "after" is in Col.7.
** indicates statistical significance at the 5% level of the t-test for the difference in means.
* indicates statistical significance at the 10% level of the t-test for the difference in means.
# indicates that the t-test for the difference in means is not statistically significant.
The data are from the 2012 and 2013 Current Population Survey linked to the American Time Survey and the Well-Being module (WB). Emotional feelings were asked for 3 activities randomly drawn. The observations are weighted using ATUS WB weights.

Table 2. WB sample descriptive statistics before and after each event.
The statistical significance of the differences in sample means across the counterfactual samples and the corresponding samples in the year of the Boston bombing (or Sandy Hook shooting) is reported.

	Full sample Mean (std deviation)	Full sample Mean (std deviation)	States nearby Mean (std deviation)	States nearby Mean (std deviation)	Control States Mean (std deviation)	Control States Mean (std deviation)
Boston marathon (bombing counterfactual) , Monday 16th April 2012						
	1-30 days before	**1-30 days after**	**1-30 days before**	**1-30 days after**	**1-30 days before**	**1-30 days after**
Age	48.21 (0.31)#	48.70 (0.31)#	50.44 (0.76)#	51.30(0.83)#	47.78 (0.34)#	48.20 (0.36)#
Woman	0.57 (0.01)**	0.54 (0.01)#	0.58 (0.02)#	0.52 (0.02)#	0.57 (0.01)#	0.55 (0.01)#
Education	40.47 (0.05)#	40.33 (0.05)#	40.91 (0.13)#	40.45 (0.13)#	40.39 (0.05)**	40.31 (0.06)**
White	0.78 (0.01)#	0.81 (0.01)#	0.82 (0.02)#	0.84 (0.02)#	0.78 (0.01)**	0.80 (0.01)#
Black	0.14 (0.01)#	0.13 (0.01)#	0.13 (0.01)#	0.11 (0.01)#	0.15 (0.01)#	0.14 (0.01)#
Income	58718 (768)#	57397 (776)*	68049 (2201)#	56392 (1940)**	56926 (808)**	57590 (847)**
WB Observations	*3092*	*2943*	*498*	*474*	*2594*	*2469*
Sandy Hook , counterfactual, Friday 13th December 2013						
	1-15 days before	**1-15 days after**	**1-15 days before**	**1-15 days after**	**1-15 days before**	**1-15 days after**
Age	48.79(0.48)#	48.36(0.49)#	51.52(1.17)#	51.03(1.12)*	48.24(0.52)#	47.71(0.54)#
Woman	0.54(0.01)*	0.52(0.01)**	0.57(0.03)**	0.55(0.03)#	0.53(0.01)#	0.51(0.01)*
Education	40.42(0.07)#	40.53(0.08)#	40.86(0.2)#	40.58(0.18)#	40.34(0.08)#	40.51(0.08)#
White	0.79(0.01)#	0.78(0.01)#	0.87(0.02)**	0.83(0.02)#	0.77(0.01)**	0.77(0.01)#
Black	0.15(0.01)#	0.16(0.01)#	0.11(0.02)**	0.12(0.02)#	0.16(0.01)#	0.17(0.01)*
Income	58603(1091)#	60709(1192)#	63918(2852)**	64999(2756)#	57518(1176)**	59664(1320)**
WB Observations	1485	1364	252	267	1233	1097

The significance of the t-test of the difference in means relative to the corresponding sample of 2013, for the Boston bombing, and 2012, for Sandy Hook, is given in each column.
** indicates statistical significance at the 5% level of the t-test for the difference in means.
* indicates statistical significance at the 10% level of the t-test for the difference in means.
# indicates that the t-test for the difference in means is not statistically significant.
The data are from the Current Population Survey linked to the American Time Survey and the Well-Being module (WB).
Emotional feelings were asked for 3 activities randomly drawn. The observations are weighted using ATUS WB weights.

Table 3. Descriptive statistics of outcome variable around the days of the attack and the counterfactual attack; and raw diff-in-diff estimates.

Boston marathon Bombing	**2013 Population sample**			**2013 States nearby**		***S close vs other S***	**2012 Counterfactual**		**2013 vs 2012**
	28 days before	28 days after	***2013 before-after***	28 days before	28 days after	***diff-in-diff***	28 days before	28 days after	***diff-in-diff***
	Mean (sd)	Mean (sd)	Coeff. (se)	Mean (sd)	Mean (sd)	Coeff. (se)	Mean (sd)	Mean (sd)	Coeff. (se)
Happiness	4.41 (1.61)	4.24 (1.67)	**-0.17 (0.04)****	4.37 (1.50)	3.87 (1.85)	**-0.50 (0.11)****	4.37 (1.59)	4.34 (1.61)	**-0.14 (0.06)****
Meaningful	4.38 (1.78)	4.30 (1.90)	**-0.07 (0.05)**	4.44 (1.60)	3.86 (2.16)	**-0.58 (0.12)****	4.37 (1.83)	4.47 (1.72)	**-0.18 (0.07)***
Stress	1.43 (1.80)	1.52 (1.90)	**0.08 (0.05)***	1.47 (1.72)	1.60 (2.03)	**0.13 (0.12)**	1.42 (1.70)	1.45 (1.78)	**0.06 (0.07)**
Tired	2.31 (1.95)	2.40 (1.97)	**0.09 (0.05)***	2.55 (1.88)	2.58 (2.07)	**0.02 (0.13)**	2.39 (1.90)	2.24 (1.92)	**0.23 (0.07)****
Sad	0.55 (1.25)	0.70 (1.40)	**0.15 (0.04)****	0.67 (1.29)	0.77 (1.37)	**0.10 (0.8)**	0.59 (1.30)	0.62 (1.38)	**0.11 (0.05)****
Pain	0.93 (1.60)	0.94 (1.64)	**0.01 (0.04)**	0.93 (1.56)	0.96 (1.55)	**0.03 (0.10)**	1.14 (1.74)	0.94 (1.66)	**0.21 (0.06)****
Affect balance	3.09 (2.07)	2.88 (2.13)	**-0.20 (0.06)****	2.99 (1.96)	2.36 (2.34)	**-0.63 (0.14)****	3.00 (2.05)	3.11 (2.03)	**-0.31 (0.08)****
Work hours	3.18 (4.15)	3.51 (4.23)	**0.33 (0.11)****	3.10 (4.02)	3.21 (3.95)	**0.10 (0.26)**	3.20 (4.31)	3.39 (4.44)	**0.15 (0.16)**
Household work hours	1.59 (2.12)	1.67 (2.21)	**0.08 (0.06)**	1.51 (2.26)	1.76 (2.20)	**0.25 (0.13)***	1.53 (2.12)	1.66 (2.26)	**-0.05 (0.08)**
Childcare hours	0.39 (1.11)	0.37 (1.04)	**-0.02 (0.03)**	0.32 (1.11)	0.40 (1.08)	**0.08 (0.07)**	0.35 (1.09)	0.36 (1.29)	**-0.04 (0.04)**
Active leisure hours	0.30 (0.83)	0.27 (0.78)	**-0.03 (0.02)**	0.27 (0.72)	0.32 (0.86)	**0.05 (0.05)**	0.31 (0.91)	0.39 (1.06)	**-0.10 (0.03)****
Watch news hours	2.65 (2.70)	2.76 (3.00)	**0.11 (0.08)**	2.73 (2.24)	2.88 (2.63)	**0.14 (0.18)**	2.78 (2.71)	2.54 (2.73)	**0.35 (0.11)****
Sleep hours	8.60 (2.20)	8.46 (2.03)	**-0.14 (0.06)****	8.37 (2.58)	8.10 (2.23)	**-0.27 (0.13)****	8.66 (2.25)	8.48 (2.09)	**0.04 (0.08)**
WB observations	*2653*	*2541*	*5194*	*443*	*429*	*5194*	*2724*	*2784*	*10702*
Time use observations	*918*	*893*	*1810*	*155*	*150*	*1810*	*925*	*946*	*3682*
Sandy Hook school Shooting	**2012 Population sample**			**2012 States nearby**		***S close vs other S***	**2013 Counterfactual**		**2013 vs 2012**
	14 days before	14 days after	***2013 before-after***	14 days before	14 days after	***diff-in-diff***	14 days before	14 days after	***diff-in-diff***
	Mean (sd)	Mean (sd)	Coeff. (se)	Mean (sd)	Mean (sd)	Coeff. (se)	Mean (sd)	Mean (sd)	Coeff. (se)
Happiness	4.36 (1.55)	4.17 (1.74)	**-0.20 (0.06)****	4.35 (1.35)	3.95 (1.80)	**-0.40 (0.15)****	4.31 (1.61)	4.48 (1.54)	**-0.36 (0.09)****
Meaningful	4.20 (1.98)	4.00 (1.97)	**-0.21 (0.08)****	4.12 (2.06)	3.61 (2.05)	**-0.50 (0.18)****	4.48 (1.75)	4.21 (1.81)	**0.06 (0.11)**
Stress	1.49 (1.82)	1.36 (1.71)	**-0.12 (0.07)***	1.37 (1.89)	1.34 (1.51)	**-0.03 (0.16)**	1.35 (1.70)	1.31 (1.74)	**-0.08 (0.09)**
Tired	2.17 (2.00)	2.35 (1.95)	**0.19 (0.08)****	1.73 (1.99)	2.22 (1.80)	**0.49 (0.18)****	2.22 (1.89)	2.29 (1.99)	**0.12 (0.12)**
Sad	0.51 (1.20)	0.60 (1.39)	**0.09 (0.05)***	0.52 (1.20)	0.56 (1.13)	**0.03 (0.12)**	0.89 (1.64)	0.63 (1.37)	**0.35 (0.08)****
Pain	0.85 (1.59)	0.94 (1.66)	**0.09 (0.07)**	0.48 (1.29)	0.59 (1.38)	**0.11 (0.14)**	0.87 (1.60)	0.87 (1.61)	**0.10 (0.09)**
Affect balance	3.07 (1.95)	2.79 (2.19)	**-0.28 (0.08)****	3.34 (2.12)	2.65 (2.29)	**-0.69 (0.20)****	3.04 (2.09)	3.08 (2.17)	**-0.32 (0.12)****
Work hours	3.38 (4.24)	2.32 (3.64)	**-1.06 (0.16)****	2.74 (4.14)	2.23 (3.77)	**-0.51 (0.38)**	3.18 (4.23)	2.49 (3.77)	**-0.38 (0.23)****
Household work hours	1.56 (2.20)	1.55 (1.97)	**-0.01 (0.08)**	1.43 (2.00)	1.28 (1.88)	**-0.14 (0.20)**	1.57 (1.94)	1.73 (2.17)	**-0.17 (0.12)**
Childcare hours	0.43 (1.11)	0.32 (1.22)	**-0.10 (0.05)****	0.17 (0.94)	0.23 (0.81)	**0.06 (0.11)**	0.38 (0.97)	0.31 (1.11)	**-0.04 (0.06)**
Active leisure hours	0.23 (0.86)	0.20 (0.98)	**-0.03 (0.04)**	0.42 (1.48)	0.12 (0.38)	**-0.30 (0.08)**	0.28 (0.94)	0.31 (1.09)	**-0.06 (0.05)**
Watch news hours	2.75 (2.78)	3.27 (3.12)	**0.53 (0.12)****	2.84 (2.60)	3.66 (3.62)	**0.81 (0.28)****	2.80 (2.90)	2.64 (2.82)	**0.69 (0.16)****
Sleep hours	8.59 (2.39)	8.73 (2.47)	**0.14 (0.10)**	9.36 (2.96)	8.83 (2.25)	**-0.53 (0.23)****	8.43 (2.21)	8.77 (2.34)	**-0.21 (0.13)**
WB observations	*1300*	*1037*	2337	*217*	*192*	*2337*	*1351*	1146	4834
Time use observations	*445*	*360*	*805*	*76*	*66*	805	477	400	1682

Standard errors (denoted as se) are given in brackets aside each raw diff-in-diff coefficient estimate (denoted as coeff.)."S close" stands for States nearby and "other S", for other States.
** denotes statistical significance at the 5% level; * denotes statistical significance at the 10% level.
For the WB sample, the number of observations varies from one emotional feeling to the other, as some individuals did not answer all the six feelings. We report here, for the sake of brevity, the number of observations that reported all the six feelings for the three activities, for whom the affect balance indicator could be computed. Emotional feelings are measured on a scale of 0 to 6; and time uses in hours per day.

Table 4. Results of estimation of the effect of the 2013 Boston marathon bombing on individual emotional well-being and time uses.

	Happy	Meaning	Stress	Tired	Sad	Pain	Affect	Work	Housework	Childcare	active leisure	watch news	Sleep
Mean 28 days before	*4.41*	4.38	1.43	2.31	0.55	0.93	3.09	3.18	1.59	0.39	0.30	2.65	8.60
1)DD 2013	**-0.0799**	**-0.118***	**0.0966**	**0.224***	**0.0795**	**0.157****	**-0.232***	**0.120**	**-0.186****	**-0.0627**	**-0.0682****	**0.176***	**0.0221**
	(0.0616)	(0.0687)	(0.0679)	(0.0737)	(0.0508)	(0.0619)	(0.0792)	(0.116)	(0.0782)	(0.0388)	(0.0339)	(0.0966)	(0.0788)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*10818*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.061*	*0.074*	*0.075*	*0.065*	*0.052*	*0.107*	*0.068*	*0.516*	*0.140*	*0.231*	*0.085*	*0.207*	*0.119*
2)DD S*13	**-0.334*****	**-0.530*****	**-0.107**	**0.0979**	**-0.104**	**0.0296**	**-0.438*****	**-0.712*****	**0.166**	**0.0108**	**0.154*****	**0.0102**	**-0.206***
	(0.0912)	(0.101)	(0.101)	(0.109)	(0.0750)	(0.0913)	(0.117)	(0.168)	(0.114)	(0.0564)	(0.0492)	(0.140)	(0.115)
DD 2013*other S.	-0.0192	-0.0209	0.116*	0.206***	0.0984*	0.152**	-0.151*	0.254**	-0.217***	-0.0647	-0.0972***	0.174*	0.0609
	(0.0638)	(0.0711)	(0.0703)	(0.0763)	(0.0526)	(0.0640)	(0.0820)	(0.120)	(0.0811)	(0.0402)	(0.0351)	(0.100)	(0.0817)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*10818*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.062*	*0.076*	*0.075*	*0.065*	*0.052*	*0.107*	*0.069*	*0.517*	*0.141*	*0.231*	*0.086*	*0.207*	*0.120*
3) RDD *(only 2013)*	**-0.555*****	**-0.0104**	**0.182**	**0.544*****	**0.444*****	**0.514*****	**-0.687*****	**0.0615**	**-0.0140**	**-0.0333**	**-0.182*****	**0.0886**	**-0.306****
28 days bw, all controls	(0.109)	(0.122)	(0.122)	(0.130)	(0.0894)	(0.108)	(0.139)	(0.194)	(0.135)	(0.0634)	(0.0533)	(0.172)	(0.137)
Observations	*5340*	*5308*	*5367*	*5357*	*5354*	*5365*	*5255*	*1832*	*1832*	*1832*	*1832*	*1832*	*1832*
Rsquared	*0.105*	*0.111*	*0.115*	*0.105*	*0.068*	*0.109*	*0.118*	*0.550*	*0.175*	*0.281*	*0.105*	*0.249*	*0.149*
4) RDD*2013	**-0.471*****	**-0.338****	**0.0936**	**0.756*****	**0.253****	**0.599*****	**-0.828*****	**-0.633*****	**-0.406*****	**-0.000635**	**-0.222*****	**0.395****	**-0.294***
28 days bw., all controls	(0.121)	(0.136)	(0.134)	(0.145)	(0.100)	(0.122)	(0.156)	(0.228)	(0.154)	(0.0766)	(0.0668)	(0.191)	(0.155)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*10818*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.063*	*0.076*	*0.076*	*0.068*	*0.054*	*0.109*	*0.072*	*0.517*	*0.141*	*0.232*	*0.086*	*0.207*	*0.121*
5) RDD*2013*S	**-1.328*****	**-0.901*****	**0.515*****	**0.238**	**-0.522*****	**0.0950**	**-1.236*****	**-1.130*****	**0.818*****	**-0.0353**	**0.125**	**-0.212**	**-0.160**
	(0.155)	(0.171)	(0.171)	(0.184)	(0.127)	(0.155)	(0.198)	(0.293)	(0.198)	(0.0985)	(0.0859)	(0.245)	(0.200)
RDD*2013*other S.	**-0.174**	**-0.133**	**-0.0235**	**0.702*****	**0.371*****	**0.577*****	**-0.549*****	**-0.402***	**-0.578*****	**0.00769**	**-0.246*****	**0.442****	**-0.263**
28 days bw., all controls	(0.126)	(0.141)	(0.139)	(0.151)	(0.104)	(0.127)	(0.162)	(0.236)	(0.160)	(0.0793)	(0.0692)	(0.197)	(0.161)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*10818*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.070*	*0.079*	*0.078*	*0.069*	*0.055*	*0.109*	*0.076*	*0.519*	*0.142*	*0.232*	*0.086*	*0.208*	*0.122*
6) RDD*2013	**-0.463*****	**-0.211**	**0.174**	**0.716*****	**0.360*****	**0.668*****	**-0.824*****	**-0.238**	**-0.215**	**0.125**	**-0.287*****	**0.351***	**-0.470*****
28 days bw., no controls	(0.122)	(0.137)	(0.135)	(0.146)	(0.101)	(0.126)	(0.156)	(0.304)	(0.163)	(0.0857)	(0.0682)	(0.207)	(0.159)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*10818*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.046*	*0.037*	*0.049*	*0.041*	*0.029*	*0.041*	*0.056*	*0.130*	*0.029*	*0.023*	*0.034*	*0.052*	*0.069*
7) RDD*2013	**-0.854*****	**0.174**	**0.378****	**0.722*****	**0.638*****	**0.437*****	**-0.832*****	**-1.165*****	**-0.459****	**0.218****	**-0.0917**	**0.363**	**-0.207**
14 days bw., all controls	(0.176)	(0.192)	(0.193)	(0.207)	(0.142)	(0.166)	(0.221)	(0.327)	(0.227)	(0.108)	(0.103)	(0.275)	(0.223)
Observations	*5748*	*5707*	*5771*	*5764*	*5767*	*5772*	*5658*	*1946*	*1946*	*1946*	*1946*	*1946*	*1946*
Rsquared	*0.084*	*0.109*	*0.087*	*0.094*	*0.071*	*0.151*	*0.079*	*0.511*	*0.171*	*0.229*	*0.112*	*0.233*	*0.150*
8) RDD*2013	**-0.256*****	**-0.331*****	**0.0568**	**0.547*****	**0.171****	**0.554*****	**-0.630*****	**-0.146**	**-0.108**	**-0.0297**	**-0.176*****	**0.408*****	**-0.0480**
56 days bw., all controls	(0.0866)	(0.0988)	(0.0969)	(0.104)	(0.0700)	(0.0872)	(0.112)	(0.163)	(0.108)	(0.0560)	(0.0508)	(0.136)	(0.112)
Observations	*20136*	*20047*	*20210*	*20198*	*20179*	*20220*	*19877*	*6830*	*6830*	*6830*	*6830*	*6830*	*6830*
Rsquared	*0.039*	*0.061*	*0.054*	*0.050*	*0.043*	*0.092*	*0.041*	*0.499*	*0.141*	*0.213*	*0.072*	*0.196*	*0.122*

** denotes statistical significance at the 5% level; * denotes statistical significance at the 10% level. DD stands for differences in differences estimates and RDD for regression discontinuity estimates (bw is bandwidth). S states for States nearby, 13 for 2013, and other S, for other States. The controls are: gender, a quadratic in age, education dummies, race dummies, number of children aged less than 18, a quadratic in household income, a series of main economic activity dummies (employment, unemployment, retirement, other inactivity), a dummy for residing in a metropolitan area, an indicator for whether the day of the interview was a vacation day, and State, day, month and year fixed effects. The latter fixed effects are included in all the models estimated, while the rest of the controls are dropped, when no controls are mentioned above. The RDD models also include linear controls for the days elapsed before or after the attack and their interaction with the day of the attack, as standard., and these are also fully interacted with the year of the attack and the States nearby dummies in the models in which RDD and diff-in-diff are combined. Emotional feelings are measured on a scale of 0 to 6; and time uses in hours per day.

Table 5. Results of estimation of the effect of Sandy Hook School shooting on individual emotional well-being and time uses.

	Happy	Meaning	Stress	Tired	Sad	Pain	Affect	Work	Housework	Childcare	active leisure	watch news	Sleep
Mean 14 days before	***4.36***	***4.20***	***1.49***	***2.17***	***0.51***	***0.85***	***3.07***	***3.38***	***1.56***	***0.43***	***0.23***	***2.75***	***8.59***
1) DD 2012	**-0.324*****	**0.104**	**-0.131**	**0.0312**	**0.215*****	**-0.0119**	**-0.196**	**-0.454****	**-0.300*****	**-0.0323**	**-0.00708**	**0.546*****	**0.00762**
	(0.0953)	(0.111)	(0.102)	(0.115)	(0.0833)	(0.0903)	(0.126)	(0.176)	(0.111)	(0.0559)	(0.0538)	(0.150)	(0.129)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.094*	*0.089*	*0.097*	*0.085*	*0.105*	*0.155*	*0.080*	*0.443*	*0.195*	*0.234*	*0.086*	*0.256*	*0.127*
2) DD S * 2012	**-0.521*****	**-0.629*****	**0.274***	**0.306***	**0.352*****	**0.162**	**-0.859*****	**0.653****	**-0.292***	**0.0415**	**-0.0872**	**0.886*****	**0.00581**
	(0.141)	(0.164)	(0.150)	(0.170)	(0.123)	(0.133)	(0.186)	(0.274)	(0.172)	(0.0871)	(0.0839)	(0.233)	(0.201)
DD 2012*other S	**-0.215****	**0.237****	**-0.189***	**-0.0328**	**0.140**	**-0.0462**	**-0.0146**	**-0.582*****	**-0.242****	**-0.0405**	**0.0101**	**0.372****	**0.00648**
	(0.0996)	(0.116)	(0.106)	(0.120)	(0.0873)	(0.0946)	(0.132)	(0.184)	(0.116)	(0.0585)	(0.0563)	(0.156)	(0.135)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.096*	*0.091*	*0.098*	*0.085*	*0.106*	*0.155*	*0.084*	*0.443*	*0.196*	*0.234*	*0.086*	*0.258*	*0.127*
3) RDD *(only 2012)*	**0.242**	**-0.0344**	**0.569*****	**0.495*****	**0.128**	**0.0846**	**-0.159**	**-0.280**	**-0.267**	**-0.0622**	**0.201****	**0.634*****	**-0.254**
14 days bw., all controls	(0.150)	(0.187)	(0.162)	(0.183)	(0.122)	(0.144)	(0.194)	(0.293)	(0.185)	(0.0987)	(0.0841)	(0.245)	(0.218)
Observations	*2386*	*2369*	*2404*	*2400*	*2401*	*2404*	*2337*	*805*	*805*	*805*	*805*	*805*	*805*
Rsquared	*0.222*	*0.166*	*0.200*	*0.192*	*0.161*	*0.251*	*0.198*	*0.475*	*0.241*	*0.299*	*0.176*	*0.326*	*0.210*
4) RDD*2012	**-0.0719**	**0.441****	**0.341***	**0.437***	**-0.0769**	**-0.292***	**0.130**	**-0.782****	**-0.0928**	**0.0462**	**0.341*****	**0.585****	**-0.0518**
14 days bw., all controls	(0.185)	(0.216)	(0.197)	(0.223)	(0.162)	(0.176)	(0.245)	(0.347)	(0.219)	(0.111)	(0.107)	(0.297)	(0.254)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.096*	*0.090*	*0.102*	*0.087*	*0.106*	*0.158*	*0.081*	*0.449*	*0.197*	*0.235*	*0.089*	*0.256*	*0.138*
5) RDD*2012*S	**0.169**	**-0.245**	**0.0313**	**-0.669****	**0.304**	**0.354**	**0.117**	**1.467*****	**-0.184**	**-0.148**	**0.0784**	**1.318*****	**-0.00489**
	(0.258)	(0.295)	(0.271)	(0.311)	(0.222)	(0.242)	(0.340)	(0.499)	(0.315)	(0.159)	(0.153)	(0.426)	(0.365)
RDD*2012*other S	**-0.106**	**0.427***	**0.334**	**0.562****	**-0.142**	**-0.378****	**0.106**	**-1.072*****	**-0.0733**	**0.0828**	**0.344*****	**0.393**	**-0.0308**
14 days bw., all controls	(0.191)	(0.223)	(0.204)	(0.230)	(0.168)	(0.182)	(0.253)	(0.358)	(0.226)	(0.114)	(0.110)	(0.306)	(0.262)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.101*	*0.097*	*0.103*	*0.090*	*0.107*	*0.159*	*0.088*	*0.450*	*0.197*	*0.236*	*0.094*	*0.259*	*0.139*
6) RDD*2012	**-0.0983**	**0.473****	**0.283**	**0.292**	**-0.0767**	**-0.119**	**0.153**	**-1.699*****	**0.0791**	**0.132**	**0.326*****	**0.928*****	**0.0297**
14 days bw., no controls	(0.186)	(0.217)	(0.198)	(0.224)	(0.164)	(0.184)	(0.245)	(0.429)	(0.235)	(0.123)	(0.108)	(0.327)	(0.259)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.072*	*0.061*	*0.081*	*0.059*	*0.062*	*0.061*	*0.059*	*0.145*	*0.056*	*0.040*	*0.055*	*0.082*	*0.088*
7) RDD*2012	**-0.558***	**0.0922**	**-0.601****	**0.0349**	**-0.0772**	**-0.208**	**-0.00555**	**-0.353**	**-0.0826**	**0.468*****	**0.551*****	**0.342**	**-0.547**
7 days bw., all controls	(0.285)	(0.341)	(0.305)	(0.343)	(0.252)	(0.262)	(0.395)	(0.533)	(0.322)	(0.157)	(0.153)	(0.433)	(0.364)
Observations	*2603*	*2589*	*2630*	*2628*	*2623*	*2628*	*2559*	*890*	*890*	*890*	*890*	*890*	*890*
Rsquared	*0.145*	*0.126*	*0.159*	*0.149*	*0.142*	*0.191*	*0.127*	*0.514*	*0.222*	*0.300*	*0.160*	*0.372*	*0.220*

** denotes statistical significance at the 5% level; * denotes statistical significance at the 10% level. DD stands for differences in differences estimates and RDD for regression discontinuity estimates. S denotes the States nearby and other S., the other States. The controls are: gender, a quadratic in age, education dummies, race dummies, number of children aged less than 18, a quadratic in household income, a series of main economic activity dummies (employment, unemployment, retirement, other inactivity), a dummy for residing in a metropolitan area, an indicator for whether the day of the interview was a vacation day, and State, day, month and year fixed effects. The latter fixed effects are included in all the models estimated, while the rest of the controls are dropped, when no controls are mentioned above. The RDD models also include linear controls for the days elapsed before or after the attack and their interaction with the day of the attack, as standard., and these are also fully interacted with the year of the attack and the States nearby dummies in the models in which RDD and diff-in-diff are combined. Emotional feelings are measured on a scale of 0 to 6; and time uses in hours per day.

Table 6. Heterogeneity of the immediate responses by women and the college educated to the Boston marathon bombing or the Sandy Hook Shootings.

	Happy	Meaning	Stress	Tired	Sad	Pain	Affect	Work	Housework	Childcare	Active leisure	Watch news	Sleep
Boston marathon bombing													
Population sample													
RDD*2013	**-0.471*** **	**-0.338** **	**0.0936**	**0.756*** **	**0.253** **	**0.599*** **	**-0.828*** **	**-0.633*** **	**-0.406*** **	**-0.000635**	**-0.222*** **	**0.395** **	**-0.294* **
28 days bw, all controls	(0.121)	(0.136)	(0.134)	(0.145)	(0.100)	(0.122)	(0.156)	(0.228)	(0.154)	(0.0766)	(0.0668)	(0.191)	(0.155)
Observations	*10980*	*10912*	*11022*	*11012*	*11003*	*11020*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*	*3722*
Rsquared	*0.063*	*0.076*	*0.076*	*0.068*	*0.054*	*0.109*	*0.072*	*0.517*	*0.141*	*0.232*	*0.086*	*0.207*	*0.121*
Sample only women													
RDD*2013	**-0.663*** **	**-0.678*** **	**0.701*** **	**1.279*** **	**0.403*** **	**1.002*** **	**-1.520*** **	**-0.958*** **	**0.180**	**-0.143**	**-0.202*** **	**0.0904**	**-0.0470**
28 days bw, all controls	(0.162)	(0.181)	(0.191)	(0.205)	(0.141)	(0.176)	(0.217)	(0.278)	(0.228)	(0.108)	(0.0593)	(0.241)	(0.213)
Observations	*6082*	*6052*	*6095*	*6094*	*6094*	*6098*	*6,006*	*2054*	*2054*	*2054*	*2054*	*2054*	*2054*
Rsquared	*0.085*	*0.099*	*0.096*	*0.086*	*0.062*	*0.105*	*0.087*	*0.536*	*0.140*	*0.286*	*0.104*	*0.199*	*0.142*
Sample only college educated													
RDD*2013	**-0.330**	**-0.758*** **	**-0.276**	**0.125**	**-0.198**	**-0.0878**	**-0.416**	**-0.0754**	**0.413* **	**-0.347** **	**0.0130**	**0.227**	**-0.300**
28 days bw, all controls	(0.211)	(0.240)	(0.247)	(0.253)	(0.177)	(0.190)	(0.269)	(0.426)	(0.249)	(0.145)	(0.109)	(0.271)	(0.233)
Observations	*3649*	*3634*	*3658*	*3657*	*3657*	*3658*	*3621*	*1228*	*1228*	*1228*	*1228*	*1228*	*1228*
Rsquared	*0.162*	*0.131*	*0.161*	*0.161*	*0.132*	*0.169*	*0.182*	*0.542*	*0.215*	*0.351*	*0.104*	*0.256*	*0.177*
Sandy Hook school shooting													
Population sample													
RDD*2012	**-0.0719**	**0.441** **	**0.341* **	**0.437* **	**-0.0769**	**-0.292* **	**0.130**	**-0.782** **	**-0.0928**	**0.0462**	**0.341*** **	**0.585** **	**-0.0518**
14 days bw., all controls	(0.185)	(0.216)	(0.197)	(0.223)	(0.162)	(0.176)	(0.245)	(0.347)	(0.219)	(0.111)	(0.107)	(0.297)	(0.254)
Observations	*4951*	*4916*	*4989*	*4983*	*4978*	*4987*	*4863*	*1690*	*1690*	*1690*	*1690*	*1690*	*1690*
Rsquared	*0.096*	*0.090*	*0.102*	*0.087*	*0.106*	*0.158*	*0.081*	*0.449*	*0.197*	*0.235*	*0.089*	*0.256*	*0.138*
Sample only women													
RDD*2012	**0.0243**	**0.539* **	**0.479* **	**0.783** **	**0.0356**	**0.208**	**-0.0161**	**0.419**	**-0.564* **	**0.245**	**0.180* **	**1.103*** **	**-0.203**
14 days bw., all controls	(0.266)	(0.307)	(0.286)	(0.329)	(0.237)	(0.254)	(0.352)	(0.433)	(0.329)	(0.178)	(0.0929)	(0.358)	(0.359)
Observations	*2630*	*2602*	*2647*	*2645*	*2642*	*2648*	*2569*	*897*	*897*	*897*	*897*	*897*	*897*
Rsquared	*0.181*	*0.158*	*0.144*	*0.103*	*0.149*	*0.194*	*0.153*	*0.453*	*0.236*	*0.317*	*0.194*	*0.265*	*0.179*
Sample only college educated													
RDD*2012	**0.341**	**1.602*** **	**-0.0608**	**-0.657* **	**0.206**	**0.346**	**1.022** **	**-0.422**	**-0.416**	**-0.218**	**0.568*** **	**-0.409**	**0.496**
14 days bw., all controls	(0.316)	(0.368)	(0.354)	(0.373)	(0.289)	(0.271)	(0.406)	(0.617)	(0.365)	(0.181)	(0.161)	(0.426)	(0.342)
Observations	*1698*	*1688*	*1706*	*1704*	*1703*	*1706*	*1678*	*575*	*575*	*575*	*575*	*575*	*575*
Rsquared	*0.192*	*0.191*	*0.176*	*0.206*	*0.242*	*0.214*	*0.191*	*0.566*	*0.307*	*0.381*	*0.295*	*0.288*	*0.297*

** denotes statistical significance at the 5% level; * denotes statistical significance at the 10% level. DD stands for differences in differences estimates and RDD for regression discontinuity estimates. The controls are: gender, a quadratic in age, education dummies, race dummies, number of children aged less than 18, a quadratic in household income, a series of main economic activity dummies (employment, unemployment, retirement, other inactivity), a dummy for residing in a metropolitan area, an indicator for whether the day of the interview was a vacation day, and State, day, month and year fixed effects. The models also include linear controls for the days elapsed before or after the attack and their interaction with the day of the attack, as standard, which are also fully interacted with the year of the attack. Emotional feelings are measured on a scale of 0 to 6; and time uses in hours per day.

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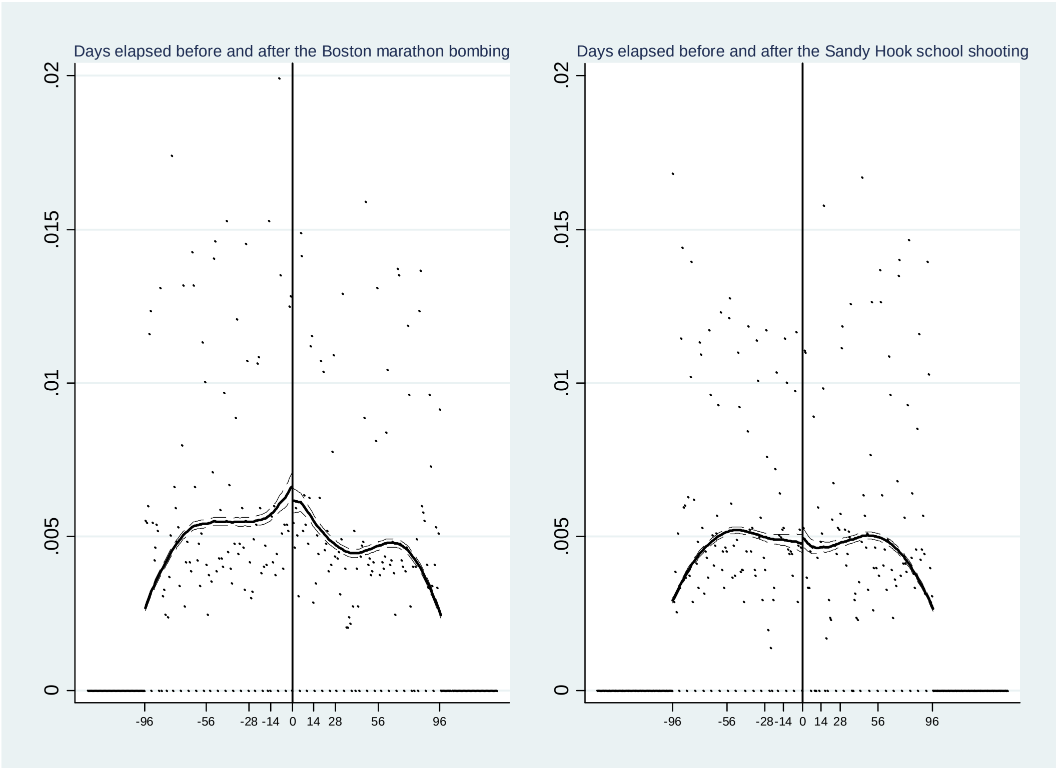
Appendix. Figure A. MacCrary density function of daily responses to the ATUS-WB survey



The vertical axis shows the density function of the running variable (i.e. the density function of daily survey responses) against the distance in days from the attack (set equal to day zero). The data for the Boston bombing (which occurred on Monday 15th April 2013) are drawn from the 2013 ATUS-WB survey; while the data for the Sandy Hook school shooting (that took place on Friday 14th December 2012) are obtained pooling together the 2012 and 2013 ATUS-WB surveys. The dots correspond to the raw data on daily participation to the survey; the solid line is non-parametrically fitted using the procedure in McCrary (2008), and the dashed lines are the 5% confidence intervals around the estimates, also as in McCrary (2008).