When Paper Losses Get Physical: Domestic Violence and Stock Returns*

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Abstract

We study a negative externality of the stock market on families. We find a significant negative relationship between the local stock market return at the state level during the week and the reported incidence of domestic violence during the weekend. This relationship is robust to controlling for local economic conditions at the police agency-month level and only exists for the concurrent week stock returns. These findings suggest that wealth shocks caused by the stock market can affect stress levels within families, escalate arguments, and trigger violent behavior. We also find evidence that changes in expectations, as proxied by past stock returns, affect the magnitude of the effect of current stock returns. Using Google search volumes as an alternative proxy for the incidence of domestic violence yields similar results, albeit larger in magnitude. The negative relationship between stock returns and reported domestic violence is attributable to the middle part of the regional income distribution, where both the stock market participation of households and the prevalence of domestic violence are likely to be adequately high to generate substantial aggregate effects.

JEL classification: D03, D14, D62, J12

Keywords: domestic violence, intimate partner violence, stress, household, behavior

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1 Introduction

Domestic violence is one of the most common types of crime, as well as a very substantial public health problem. Nearly a third of women and more than a quarter of men in the U.S. experience physical violence by an intimate partner in their lifetime, while the estimated annual cost of domestic violence against women alone is more than $5.8 billion (Centers for Disease Control and Prevention, 2003, 2011). Economic models of household bargaining that incorporate domestic violence typically suggest that violence may arise because it provides positive utility to the perpetrator, while the victims' outside options determine their willingness to suffer domestic violence.[1] Card and Dahl (2011) develop a loss-of-control model to analyse how domestic violence can be triggered unintentionally when an argument escalates out of control. Their model provides similar predictions to a household bargaining one in which preferences are affected by emotional cues from a gain-loss function. They also find compelling evidence of domestic violence being triggered by emotional shocks related to losses in football when the home team was predicted to win.

Our paper studies a negative externality of the stock market affecting the incidence of domestic violence. Money is one of the most common sources of stress generally and in intimate relationships in particular.[2] There is also empirical evidence suggesting a link between economic stress and domestic violence.[3] Stock price movements represent shocks to wealth and may either exacerbate or relieve economic stress levels. Engelberg and Parsons (2016) find evidence of stock market having a meaningful impact on the stress levels of individuals, reflected in a significant negative relationship between local stock market returns and hospital admissions for psychological conditions. Based on these arguments, we hypothesize

[1] See, e.g., Tauchen, Witte, and Long (1991); Aizer (2010); Anderberg, Rainer, Wadsworth, and Wilson (2016)

[2] For example, in the latest annual "Stress in America" survey conducted by the American Psychological Association (APA) (2017), 62% of respondents report money as a source of stress. In a survey conducted in the U.S. by Harris Poll on behalf of SunTrust Bank in 2015, respondents reported finances to be the most common cause of stress in their relationship, cited by 35% of respondents, followed by annoying habits (25%). A summary of the survey findings is available online at: https://www.prnewswire.com/news-releases/love-and-money-people-say-they-save-partner-spends-according-to-suntrust-survey-300030921.html.

[3] See, e.g., Benson, Fox, DeMaris, and Van Wyk (2003); Schwab-Reese, Peek-Asa, and Parker (2016).

that stock returns might have a similar effect on stress levels within families and intimate relationships. The increased stress level could potentially trigger and escalate arguments, resulting in an upsurge of domestic violence.

To formalize our hypothesis, we construct a simple loss-of-control model adapted from the methodology of Card and Dahl (2011). In addition to predicting the negative link between stock market returns and the incidence of domestic violence, the model illustrates the importance of reference points in the form of expected stock returns and predicts that stock market losses should have a stronger effect than stock market gains. We explore these additional predictions in out empirical analysis.

To test our hypothesis, we construct a large sample of incidents of domestic violence in the U.S., using data from the National Incident Based Reporting System (NIBRS), which includes all reports of crime by city/county for the participating police agencies. The agencies included in our data cover a population of 11 million in 1996, the first year included in our sample. The coverage grows to nearly 81 million in 2015, as more agencies gradually join the system. We calculate daily and weekly incident rates, defined as number of reported incidents per 100,000 capita, at the level of individual police agencies. In our analysis, we define domestic violence as reported incidents of assault, aggravated assault, or intimidation by a spouse, partner, or boyfriend/girlfriend.[4]

We then construct a local stock market index for each U.S. state, calculated as the market-cap-weighted average return of all stocks headquartered in the state. Like Engelberg and Parsons (2016), our methodology utilizes the well-documented tendency of investors to overweight local stocks in their portfolios. Hence, our state-level stock index is likely to be a good proxy for the returns to investors in the same state.[5] This setup allows us to exploit

[4]When discussing the existing literature, we use the term *domestic violence* interchangeably with the terms *intimate partner violence* and *family violence* to refer to various types of violence perpetrated within the family, without specifying the exact definition in each case. We generally focus on violence against intimate partners, although the term domestic violence could in other contexts include other forms of violence as well, e.g., parent-to-child violence or sibling violence.

[5]French and Poterba (1991) document this "home bias" phenomenon in the international context, while Coval and Moskowitz (1999) show it also applies in domestic investments. Seasholes and Zhu (2010) provide evidence of local bias by individual investors.

the cross-sectional variation between states for each time period, in addition to variation across time within the state, which increases the robustness of our analysis. While not all families participate in the stock market, more than 20% of U.S. households do have direct investments in stocks, and approximately 50% have direct or indirect stock investments (Bricker, Dettling, Henriques, Hsu, Moore, John Sabelhaus, and Windle, 2014; Bricker and Li, 2017). This ratio clearly indicates that a sufficient amount of population are exposed to stock market movements, which could have a potential impact on aggregate rates of domestic violence.

We perform our main analysis at the weekly level. In order to study the relationship between weekly stock market returns and levels of domestic violence, for each week, we only include the incidents taking place during the weekend between Friday 4pm (stock market closing) and Sunday 12 pm (midnight), while the weekly stock returns are calculated from Monday to Friday. We choose the weekly frequency because weekly stock market returns represent larger and more meaningful wealth shocks from market movements than daily returns, while still allowing us to capture the relatively instantaneous effect of return shocks for a causal interpretation. Moreover, as discussed in more detail in the Internet Appendix Section A.3, the rates of domestic violence are significantly higher during the weekend, when stock markets are closed, than during weekdays. Based on our hypothesis, we anticipate that negative stock market returns should increase stress levels within families, trigger and escalate arguments, and result in higher levels of domestic violence.

Our results provide strong support for the hypothesis. We find a significant negative relationship between state-level stock market returns and rates of domestic violence. This relationship is robust to controlling for police agency-month joint fixed effects, holiday fixed effects, and week-of-the-year fixed effects capturing any seasonality within the year. We also control for state-level weekly insured unemployment rate, which is the only macroeconomic variable available at weekly intervals. Furthermore, the significant negative relationship between local stock returns and levels of domestic violence only holds for the concurrent week,

while lagged (or forward) stock returns have no significant predictive power over domestic violence. This last finding supports a causal interpretation of the negative correlation. We also find that the relationship between stock returns and domestic violence is larger in magnitude and statistically more significant for negative stock returns. We also find that exceptionally large negative weekly returns are associated with significantly higher levels of domestic violence. For example, the effect of a 13% drop in weekly return on domestic violence is nearly four times as big as that of a 7% drop in weekly return.

Our results also suggest that reference points matter. We perform the same analysis using returns relative to last four weeks' average return and find that the magnitude of the effect is much more stable across different model specifications. We also find that the directionality of the relationship is much clearer when controlling for reference point. When using returns relative to four-week average, only losses appear to have a significant negative relationship on domestic violence. Furthermore, the effect of such losses increases in a monotone fashion with the magnitude of loss.

A causal interpretation of the relationship between stock returns and domestic violence requires that an adequate number of households are exposed to the stock market. The existing studies show that the rate of stock market participation increases with income level, while the prevalence of domestic violence does the opposite.[6] This means that at the low end of the income distribution, stock returns are unlikely to be a significant determinant of domestic violence, while at the top end of the distribution, the rates of domestic violence may be too low to generate a substantial effect on the aggregate levels of domestic violence. These observations suggest that the link between stock returns and domestic violence is likely to be strongest in the middle part of the income distribution. Our empirical results support this prediction. The estimated effect of stock returns on domestic violence is significant in the middle tertile based on regional personal income per capita, while neither the top nor the bottom income tertile exhibit a significant relationship.

[6]Chien and Morris (2017) provide a good summary of stock market participation by income level.

A potential concern related to data on domestic violence bases on incidents reported to police agencies is that not all incidents get reported. This may lead to understating true incidence levels of domestic violence, and possibly result in a bias in the results, in case there are systematic differences in the propensity to report. To mitigate this concern, we construct an alternative proxy for the incidence of domestic violence based on Google search volumes for the keyword 'domestic violence' for each U.S. state. It seems plausible that victims (or perpetrators) of domestic violence might conduct online searches involving these keywords following incidents of domestic violence. Unlike with reporting to police, there is no reason why this indicator would understate the incidence of domestic violence, especially for the wealthier households. This methodology provides us with a state-level daily panel dataset of search volumes. For our analysis, we then construct a weekly panel dataset that includes the combined Google search volume for Friday, Saturday, and Sunday, of each week. Consistent with our main results using reported incidents of domestic violence, we find a statistically significant negative relationship between the weekly stock return and google search volume for 'domestic violence' during the weekend.

Another potential concern is that our findings might be driven by local firm events, such as layoffs or plant closures, that may also be also correlated with negative stock returns. This would mean that the channel is not stock-market-related financial stress but other economic stress. To address this issue empirically, we construct a state-level stock index for each police agency, excluding the companies based in any county which the police agency covers. We then perform our baseline regression analysis using these indices excluding local companies as the proxy for stock market return. The results are consistent with the main results, suggesting that our findings are not driven by other local economic factors.

To verify that our findings are specific to domestic violence and not a reflection of other general patterns in crime rates, we construct similar incidence rates for other offenses that might conceivably be correlated with stock returns. These include assults where the vistim is unknown to the perpetrator, murders, sex offenses, robberies, and drug offenses. We show

that none of these other types of offense exhibit a similar significant relationship between weekly stock returns and offense rates during the weekend. This supports our prediction that stock returns can induce stress in relationships and hence trigger incidents of domestic violence. Such changes in stress levels do not appear to translate into differences in the other offense rates we analyze.

Our estimates also suggest that the the economic magnitude of the effect of stock returns on domestic violence is not trivial. A 13-percentage-point decrease in weekly stock return relative to four-week average leads to an estimated 2.2% increase in domestic violence around the average rate.[7] The coefficient we estimate for a dummy indicating a local stock market drop of at least 13% relative to four-week average suggests an increase in domestic violence of 4.3% from the average rate. Interestingly, in terms of economic magnitude, the relationship between stock return and domestic violence based on Google search volume is much stronger than that based on reported incidents. The estimated coefficient in Table 8 Panel B (Model 5) suggests that a 13%-point decrease in stock return would result in 15% increase in domestic violence around the mean rate. For comparison, Card and Dahl (2011) estimate that upset losses in professional football by the home team lead to a roughly 10% increase in at-home male-on-female intimate partner violence on Sundays during the season. Engelberg and Parsons (2016) report an increase of more than 5% in hospital admissions associated with the Black Monday stock market fall of almost 25%.

Our paper is the first to document a link between the stock market and domestic violence. Domestic violence triggered this way could be viewed as a negative externality of stock market movements that affects household utility beyond the shock to financial wealth, and as such might help explain some of the implied high risk aversion or the limited stock market participation of households.[8] We also add to the literature on the economic causes of domestic violence and provide additional evidence of both the effect of economic stress as

[7]This estimate is based on model 4 in Table 5.

[8]Mehra and Prescott (1985) observed that historical stock returns are much higher than could be rationalized by standard intertemporal economic models, given the realized return volatility. This has been dubbed the "equity premium puzzle" in the literature.

well as the effect of emotional cues on the incidence of domestic violence.

2 Literature review and hypothesis development

2.1 Domestic violence in the economic literature

Economic theories incorporating domestic violence can be broadly divided into two categories. The first includes economic models of household bargaining that suggest that domestic violence arises because it provides positive utility to the perpetrator.[9] The victims' willingness to suffer violence is determined by their outside options. Early non-cooperative models of the family including domestic violence as a source of gratification and instrument of control include Tauchen et al. (1991) and Farmer and Tiefenthaler (1997). In related work, Pollak (2004) develops a model in which children adopt behavioral patterns with respect to domestic violence from their parents.

In the empirical literature following this framework, Aizer (2010) shows that decreases in the male-female wage gap reduce violence against women. Anderberg et al. (2016) show that an increase in male unemployment decreases the incidence of domestic violence, while an increase in female unemployment does the opposite. Bloch and Rao (2002) find evidence of men using domestic violence as a bargaining tool to extract transfers from the wife's family in the context of rural India.

The second strand of literature suggests that domestic violence can be triggered unintentionally when an argument escalates out of control. This channel is highlighted by Gelles and Straus (1989) and Kelly and Johnson (2008), among others. Card and Dahl (2011) develop a more formal loss-of-control model to study the link between family violence and the emotional cues associated with unexpected wins and losses by professional football home teams. In their empirical analysis, they find that upset losses lead to significant increases in at-home

[9]It is common in the literature to focus on domestic violence perpetrated by men, although there is obviously also a significant amount of domestic violence perpetrated by women. We adhere to this convention in referring to the perpetrator with masculine and to the victim with feminine pronouns.

violence by men against their wives and girlfriends. Similarly, Beland and Brent (2018) show that extreme traffic congestion is associated with significant increases in domestic violence.

There is also a substantial body of literature linking domestic violence to economic hardship. Conger, Elder, Jr., Lorenz, Conger, Simons, Whitbeck, Huck, and Melby (1990) study the negative impact of economic hardship on marital quality. Gelles and Straus (1989) describe the "typical wife beater" as someone worrying about economic security and dissatisfied with his standard of living. Benson et al. (2003) find evidence of financial strain and employment instability being related to domestic violence.

Another notable strand of literature focuses on the link between domestic violence and substance abuse. de Bruijn and de Graaf (2016) review the literature on the role of substance abuse in domestic violence and conclude that there is robust evidence of alcohol use increasing the likelihood of physical violence. There is also some evidence of cocaine use increasing women's risk of becoming a victim of domestic violence. Luca, Owens, and Sharma (2015) study the impact of alcohol prohibition in India and find evidence that restricting access to alcohol may help reduce domestic violence. There is evidence that treatment for substance abuse can help reduce domestic violence as well (e.g., Murphy and Ting, 2010).

Finally, Moffitt, Krueger, Caspi, and Fagan (2000) study to what extent perpetrators of domestic violence are the same as or similar to the perpetrators of other crime. They find that domestic violence and general crime represent different constructs that are moderately related; they are not two expressions of the same underlying antisocial propensity. In contrast to our study, Huck (2015) finds a positive relationship between stock returns and general crime rates, arguing that this is consistent with envy models, i.e., individuals see their own position as relatively worse following gains by others. In particular, he argues that low-income individuals who hold less (or no) stocks feel worse off relative to high income individuals on days with high stock returns, resulting in increase of crime rates for low-income individuals.

2.2 Domestic violence and stock market returns

We argue that large stock market movements may also have an immediate effect on the stress levels of individuals and hence trigger and escalate arguments, similar to the impact of unexpected football losses documented by Card and Dahl (2011). This argument is in line with the results of Engelberg and Parsons (2016), who find a connection between stock market and hospital admissions for psychological conditions. Lin, Chen, and Liu (2015) find a similar connection between mental disorders and stock market fluctuations in Taiwan. The medical literature provides further indirect support. Chen, Chen, Liu, and Lin (2012) find that daily falls in the stock market index are associated with higher incidence of stroke in Taiwan. Similarly, two studies using data from China find that stock market volatility is associated with higher levels of deaths due to coronary heart disease (Ma, Chen, Jiang, Song, and Kan, 2011) and higher cardiovascular mortality (Lin, Zhang, Xu, Liu, Xiao, Luo, Xu, He, and Ma, 2013).

A necessary condition for stock returns to have an effect on the level of domestic violence is that a substantial number of people hold stocks. Reassuringly, the literature shows that more than 20% of U.S. households have direct investments in stocks, while approximately 50% have direct or indirect stock investments (Bricker et al., 2014; Bricker and Li, 2017). In our domestic violence data, we do not observe what stocks perpetrators are holding. Hence, we follow Engelberg and Parsons (2016) to exploit the tendency of investors to overwhelmingly hold local stocks (home bias) to identify the relevant stock returns that induce domestic violence.[10]

2.3 Illustrative loss-of-control model

We follow the approach in Card and Dahl (2011) to construct a simple loss-of-control model for the incidence of domestic violence. We write the basic relationship between the likelihood

[10]French and Poterba (1991) document this "home bias" phenomenon in the international context, while Coval and Moskowitz (1999) show it also applies in domestic investments. Seasholes and Zhu (2010) provide evidence of local bias by individual investors.

of an argument escalating to violence and stock returns as:

$$h_t = h^0 - \mu(R_t - E_{t-1}[R_t]) \tag{1}$$

where h is the likelihood of an interaction escalating to violence. R_t is the stock market return in period t. μ is the gain-loss utility function associated with the stock market return. As in Card and Dahl (2011), the gains and losses are measured relative to expectations, i.e., the reference point matters. In our context, this setup is supported by a large number of studies suggesting that reference points matter in stock investments. For example, Odean (1998) shows that investors exhibit a strong preference for realizing winning rather than losing investments, while Heath, Huddart, and Lang (1999) show that past stock returns and reference prices matter for stock option exercise.

If we assume that μ is piecewise linear, similar to Card and Dahl (2011), we have:

$$\begin{aligned}\mu(R_t - E_{t-1}[R_t]) &= \alpha(R_t - E_{t-1}[R_t]), \quad R_t - E_{t-1}[R_t] < 0 \\ &= \beta(R_t - E_{t-1}[R_t]), \quad R_t - E_{t-1}[R_t] > 0,\end{aligned}$$

where α and β are positive constants. In this case, loss aversion implies that $\alpha > \beta$. From (1) we then have:

$$\begin{aligned}h^L(R_t) &= h^0 - \alpha(R_t - E_{t-1}[R_t]), \quad R_t - E_{t-1}[R_t] < 0 \\ h^G(R_t) &= h^0 - \beta(R_t - E_{t-1}[R_t]), \quad R_t - E_{t-1}[R_t] > 0.\end{aligned} \tag{2}$$

In the special case where $E_{t-1}[R_t] = 0$, the model simplifies into:[11]

$$\begin{aligned}h^L(R_t) &= h^0 - \alpha R_t, \quad \text{for losses} \\ h^G(R_t) &= h^0 - \beta R_t, \quad \text{for gains.}\end{aligned} \tag{3}$$

One challenge for testing our model empirically is that we cannot observe the expected stock return for the relevant investors. Therefore, we perform our main analysis for both

[11] An average annual stock return of 10% would imply a weekly compounding return of 0.18%.

raw stock returns, i.e., implicitly assuming a zero expected stock return, as well as for stock returns relative to last four weeks' average weekly stock return.

As an illustration of the model predictions and the impact of the different parameters, let us assume $\alpha = 0.1$ and expected stock return $E_{t-1}[R_t] = 2\%$. In this case, a negative stock return of 10% increases the likelihood of domestic violence by $-0.1 \times (-10\% - 2\%) = 1.2\%$. If the expected stock return is lower, say, $E_{t-1}[R_t] = -1\%$, the same 10% loss will increase the likelihood of domestic violence by only $-0.1 \times (-10\% - (-1)\%) = 0.9\%$.[12] In other words, larger losses increase the likelihood of domestic violence more, and the effect is larger when the expected return is higher.

Based on these observations, we formulate our main hypothesis as follows:

Hypothesis: *The incidence of domestic violence is negatively related to the difference between the realized local stock market returns and the investors' expectations.*

3 Data and methodology

3.1 Domestic violence data

We obtain data on reported incidents of intimate partner violence from the National Incident Based Reporting System (NIBRS), which includes all reports of crime filed by individual police agencies. The number of agencies increases over time, as more agencies join the NIBRS.[13] The NIBRS data include a large number of small agencies, which have many weekly observations with zero incidents reported. To improve the consistency of the agencies in our sample, and to reduce the noise introduced by large number of zero observations, we only include agencies covering populations of at least 10,000. The NIBRS database is available from 1991 onward, but its coverage in the first few years is very low, which could lead to

[12] The increase in the likelihood of domestic violence here is measured in percentage points, not in percent.

[13] There are also agencies leaving the system, but generally the number of agencies grows every year in our sample period.

poor representativeness of the data for these years. Hence, we cut our sample period from 1996 onward. Table 1 shows the number of agencies in our sample in each year. The agencies included cover a population of 80.7 million in 2015, the last year in our data, compared with 11.2 million in 1996, the first year.

The incident reports include the date and the time (by the hour) of the incident, as well as a number of other details. It is important to note that the incidents do not necesarily result in arrests, so the coverage of the data is broader than arrested or prosecuted cases. Similar to Card and Dahl (2011), we define domestic violence as a reported incident of assault, aggravated assault, or intimidation by a spouse, partner, or boyfriend/girlfriend. For calculating incident rates, we include all incidents satisfying these criteria, which means that our definition is less restrictive than that adopted by Card and Dahl (2011), who focus on male-on-female domestic violence occurring at home only.

We construct domestic violence rates, defined as number of reported incidents per 100,000 capita, at the level of individual police agencies. Our main analysis is performed on the basis of weekly observations. In order to establish a relationship between weekly stock market returns and levels of domestic violence, for each week, we only include the incidents taking place during the weekend, between Friday 4pm (stock market closing) and Sunday 12pm (midnight), while the weekly stock returns are calculated from Monday to Friday. Compared with daily returns, the weekly stock return is more likely to generate a meaningful wealth shock to households, while still allowing us to capture the instantaneous effect of return shocks for a causal interpretation. Moreover, as incidents of domestic violence happen much more often on Friday, Saturday, and Sunday, than on other weekdays (shown in our Internet Appendix Section A.3), we focus on the relationship between weekly stock returns and the domestic violence during these three days.

3.2 Local stock market returns

We obtain stock market data from the Center for Research in Security Prices (CRSP) for all U.S. stocks listed on NYSE, NASDAQ, and AMEX. We combine the stock data with company location data from Compustat. As an additional source of location data, we download all 10-K reports available in electronic format in the EDGAR database and add locations missing in Compustat based on these reports. This yields approximately 90% of the stock-day observations in CRSP during our sample period of 1996-2015. We then construct weekly state-level stock market index returns as market-cap-weighted average returns of all listed companies headquartered in each state. We use these state-level indices as a proxy for local stock returns for our analysis.

4 Main results

4.1 Description of the data

Table 2 shows summary statistics for the observations in our sample. The unit of observation is individual police agency on a weekly basis. The average domestic violence rate (DV rate) is 2.6 incidents per 100,000 capita.[14] For comparison, we include offense rates for other offense categories. Drug offense is the most common type of assault, with an average rate of 3.0 incidents per 100,000 capita.

The average weekly stock return at the state-level is 0.2%, with 55% of weekly observations involving positive and 45% negative returns. 4.0% of weekly observations involve negative returns of 5% or more, and 1.8% of 7% or more, while 0.9% involve losses of at least 9% and 0.2% losses of at least 13%. We also include the same statistics for stock returns relative to last for weeks' average return. Unsurprisingly, the average difference to four-week rolling average is very close to zero. In 48% of the weekly observations, the return is higher

[14]This rate is broadly consistent with the average male-on-female rate of 1.28 per Sunday from noon to midnight, as reported by Card and Dahl (2011).

than the four-week average, and in 52% lower.

The average agency in our data covers a population of approximately 41,000. We only include agencies covering at least 10,000 people, which thus represents the minimum, while the largest agency in our data covers a population of 1.1 million. The wealth level of agency locations, as measured by county-level personal income (PI) per capita, varies substantially from $12,000 to more than $100,000. The average state-level weekly insured unemployment (IU) rate is 2.4%, with weekly values ranging from 0.2% to 11.5%.

4.2 Stock market returns and incidence of domestic violence

Our hypothesis predicts a negative relationship between stock market gains or losses and domestic violence. To test this, we use OLS regressions of the following form:

$$ln(1 + DV\ rate)_{i,s,t} = \alpha_0 + \alpha_1 \times Return_{s,t} + \beta \times X_{i,s,t} + \epsilon_{i,t} \tag{4}$$

where $ln(1 + DV\ rate)_{i,s,t}$ is the natural logarithm of one plus the domestic violence rate ($DV\ rate$) of agency i, located in state s, during week t. $Return_{s,t}$ is the return of the stock market index for state s during week t, and $X_{i,s,t}$ is a vector of controls, including the weekly *insured unemployment (IU) rate*, and depending on the specification, *agency fixed effects* (2,139 agencies), *agency-year joint fixed effects*, *agency-quarter joint fixed effects*, or *agency-month joint fixed effects*to capture time-variant factors like local economic conditions at the state level, *holiday fixed effects* with dummies for major holidays taking place during the week t (19 different holidays), and *week-of-year fixed effects* (52 weeks) to capture any seasonal effects.[15] In all regressions, we cluster standard errors by agency.

The results, shown in Panel A of Table 3, are consistent with our hypothesis. In all model specifications, the incidence of domestic violence during weekends is significantly negatively

[15]The holidays and other major celebration days we include for holiday fixed effects are New Year's Eve, New Year's Day, Martin Luther King, Jr. Day, George Washingtons Birthday, Easter Day, 2nd Easter Day, Good Friday, Ascension Day, Whit Sunday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day, Christmas Eve, Christmas Day, Valentines Day, and Halloween.

related to stock market returns during the same week. As shown by Model 4, the result is robust to including agency-month joint fixed effects that capture all local economic factors at monthly frequency. This mitigates the potential concern that our results are driven by other economic factors that are correlated with stock returns. For example, during economic downturns, stock returns are likely to be lower, while the economic hardship could plausibly cause increased levels of domestic violence, independent of stock returns. In addition, we control for weekly insured unemployment rate, reported at the state level, which is the only macroeconomic variable available at weekly intervals.

To explore the impact of reference points, we also include a specification using weekly return relative to the rolling four-week average stock return:

$$ln(1 + DV\ rate)_{i,s,t} = \alpha_0 + \alpha_1 \times \Delta Return_{s,t} + \beta \times X_{i,s,t} + \epsilon_{i,t} \tag{5}$$

where $\Delta Return_{s,t}$ is the current week stock return less the average weekly return of the last four weeks. This specification thus uses the rolling four-week average return as a time-variant reference point, against which current week's gains or losses are measured.[16]

The results, shown in Panel B of Table 3, also show a consistently negative and statistically significant relationship between stock returns relative to recent past returns and domestic violence. The most striking difference between the results for raw stock returns, reported in Panel A, and reference-dependent stock returns in Panel B, is the consistency of the magnitude of the estimated effect. In Panel A, the estimated coefficients are substantially higher for the models with a smaller number of fixed effects and decrease when including agency-time fixed effects at shorter intervals. In contrast, the estimated coefficient for reference-dependent stock returns are remarkably stable across all model specifications. This suggests that the regression model shown in Panel B appears to fit our model in Section 2.3 better than the regression using raw stock returns. In other words, reference point in the

[16]Of course, we cannot directly observe the expected stock return and hence cannot tell whether four weeks is the right period for calibrating expectations, but it seems like a reasonable proxy.

form of expected stock returns does matter for the impact of current stock return.

In Table 4, we perform the same regressions including lagged and forward returns. We see that only concurrent week returns are statistically significantly related to levels of domestic violence, while the coefficients estimated for neither lagged nor forward returns are statistically significant. This result gives strong support for a causal interpretation of the same-week effect, as it is unlikely that the relevant economic factors that might be correlated with stock returns would change rapidly enough to not be reflected in the surrounding weeks' stock returns. This result holds for both raw stock market returns, as well as returns relative to four-week average.

To better understand the nature of the relationship between stock returns and domestic violence, we perform an analysis with returns separated into positive and negative ones. The results, shown in Table 5, indicate that the effect of stock returns is stronger for negative stock returns. This is consistent with our model predictions.

For raw stock market return, the the estimated coefficient for positive returns is also negative, suggesting that higher returns are associated with lower levels of domestic violence, but this relationship for positive returns is weaker in both magnitude and statistical significance. Interestingly, when using returns relative to four-week average, the directionality of the result becomes significantly stronger. The estimated coefficient for positive returns is entirely insignificant, while the coefficient for negative returns is large and highly statistically significant.

To further explore the relationship between exceptionally low stock returns and domestic violence, we include an analysis with dummies for weeks where the state-level stock market exhibits negative returns of at least a given magnitude. For example, the variable *Drop 7%* takes the value one if the weekly stock market return is negative 7% or lower. We include several different magnitudes of negative returns. We also perform this analysis using drops relative to four-week average to investigate the impact of having a reference point.

The results are shown in Table 6. For raw stock market returns, the estimated coefficients

for the drop dummies increase in an almost monotone fashion with the magnitude of loss. This means that the larger the loss, the larger an increase in domestic violence it is associated with. For instance, the effect of a 13% drop in weekly return on domestic violence is nearly four times as big as that of a 7% drop in weekly return. This relationship becomes even clearer when using returns relative to four-week average. The estimated coefficients for stock market drops relative to past returns increase in perfectly monotone fashion, and all of the estimates are statistically significant.

5 Additional analysis

5.1 Stock returns and regional wealth level

As we discuss in Section 2.2, a causal interpretation of the relationship between stock returns and domestic violence is only plausible if an adequate number of households are exposed to the stock market. The rate of stock market participation is positively correlated with income level, as shown by, e.g., Chien and Morris (2017). Conversely, domestic violence is more prevalent among households at lower income levels, as discussed by, e.g., Benson et al. (2003). Our data confirm the latter observation, as shown in Figure 2, which plots the monthly observations of the rate of domestic violence against the average personal income level.

Given these opposite correlations of domestic violence and stock market participation with income level, it seems logical to ask from which income groups the relationship between stock returns and reported domestic violence comes from. Intuitively, we expect the strongest relationship in the middle part of the income distribution, where households are likely to have a large enough exposure to the stock market, and where they also represent a high enough proportion of the reported rates of domestic violence. It should also be noted that domestic violence exists even in the highest income categories. Furthermore, even in the lowest income categories, a meaningful proportion of households have some stock investments.

To test for the role of wealth level, we first divide the agencies in our sample into three categories each year, based on the average personal income per capita at the agency location, and then include dummies indicating these wealth categories in our regressions. Table 7 shows the results of these regressions including interactions of stock returns with dummies indicating the wealth level of the agency location. The estimated coefficients are negative for all wealth levels, but only the middle tertile exhibits a statistically significant relationship between stock returns and domestic violence. The relationship is not significant in the top and bottom tertiles, and the estimated coefficients are also substantially smaller in magnitude, providing corroborative evidence in support of our hypothesis.

5.2 Google search volume as an alternative indicator of domestic violence

A potential concern related to data on domestic violence bases on incidents reported to police agencies is that not all incidents get reported. This may lead to understating true incidence levels of domestic violence, and possibly result in a bias in the results, in case there are systematic differences in the propensity to report. To mitigate this concern, we construct an alternative proxy for the incidence of domestic violence based on Google search volumes. We obtain an index of daily search volumes from Google Trends for the keyword "domestic violence" for each U.S. state. It seems plausible that victims (or perpetrators) of domestic violence might conduct online searches involving this phrase following incidents of domestic violence. Unlike with reporting to police, there is no reason why this indicator would understate the incidence of domestic violence. Also, while reporting incidents to the police may be less likely in the case of wealthier households, such households are more likely to have access to the internet and to actively use it to search for information. Hence, the search volume is likely to capture some part of the domestic violence within the wealthier population that may be missing in the police report data.

This methodology provides us with a state-level daily panel dataset of search volumes.

Google Trends data is available from 2004 onward, but the quality of the daily state-level data appears to be weaker within the earliest periods, with a large number of zero values. To mitigate this issue, we begin our search volume sample from 2005, and in cases where there are periods of at least 30 consecutive days with only zero values, we exclude all data for the given state prior to such periods. This means that for a few states the sample begins later than 2005.

For our analysis, we then construct a weekly panel dataset that includes the combined Google search volume for Friday, Saturday, and Sunday, of each week. As we collect the search volume data state by state, the basis of the index for each state is arbitrary and does not enable comparing the levels of domestic violence between states. Hence, we rescale each weekly state-level index to have a mean value of 100 over the sample period. We then perform OLS regressions of the following form:

$$ln(1 + Google\ volume)_{s,t} = \alpha_0 + \alpha_1 \times Return_{s,t} + \beta \times X_{s,t} + \epsilon_{i,t} \tag{6}$$

where $ln(1 + Google\ volume)_{i,s,t}$ is the natural logarithm of one plus the Google search volume index ($Google\ volume$) in state s during week t.

The results, shown in Panel A of Table 8, show a statistically significant negative relationship between the weekly stock return and google search volume for "domestic violence" during the weekend. This finding is consistent with our main results using reported incidents of domestic violence. In terms of economic magnitude, the relationship between stock return and domestic violence based on Google search volume is much stronger than that based on reported incidents. The estimated coefficient (Model 4) suggests that a 13%-point decrease in stock return would result in 15% increase in domestic violence around the mean rate. Panel B of Table 8 shows the results using stock return relative to the four-week average, instead of raw stock return, as the explaining variable. The estimated coefficients also indicate a significant negative relationship between stock return relative to past average and the incidence of domestic violence.

5.3 Confounding local economic factors

It could be possible that our results are driven by actions by firms that simultaneously affect local communities and stock prices. The most obvious candidates would be layoffs or facility closures by firms, which could result in increased levels of domestic violence and negative stock price reactions. This would mean that the channel is not stock-market-related financial stress but other economic stress. To address this concern, we first note that the results in the literature on layoff announcement returns are mixed. For example, Blackwell, Marr, and Spivey (1990) find a negative stock-market reaction to plant-closing announcements, while Palmon, Sun, and Tang (1997) find that the direction of announcement returns depends on the reason cited for the layoffs. Furthermore, the magnitude of announcement returns is relatively modest. Chalos and Chen (2003) find a positive market reaction to layoff announcements related to revenue refocusing, insignificant reaction to layoffs involving cost cutting, and weak evidence of a negative market reaction to layoffs related to plant closings.

To address the issue empirically, we construct a state-level stock index for each police agency, excluding the companies based in any county which the police agency covers. We then perform our baseline regression analysis using these indices excluding local companies as the proxy for stock market return.

The results, shown in Table 9, are consistent with the main results. In fact, the estimated coefficients are somewhat larger in magnitude and statistically slightly more significant than those using state-level stock indices that include all companies. These results suggests that our findings are not driven by local economic factors, but remain consistent with our hypothesis that negative stock returns can trigger incidents of domestic violence via increased stress levels.

5.4 Other offense rates

As discussed above, we find a significant negative relationship between weekly stock returns and domestic violence during the weekend. To verify that our findings are specific to domestic

violence and not a reflection of other general patterns in crime rates, we construct similar incidence rates for other offenses that might conceivably be correlated with stock returns. We include analysis on (i) *assaults*, defined as aggravated assault, assault, or intimidation, where the victim is unknown to the perpetrator, (ii) *murders*, (iii) *sex offenses*, including rape, sodomy, sexual assault with an object, and fondling, (iv) *robberies*, and (v) *drug offenses*, including drug/narcotic violations and drug equipment violations.

The results, shown in Table 10, provide no evidence of a similar significant relationship between weekly stock returns and offense rates during the weekend for any of the other types of offense. These results support our hypothesis that stock returns are relevant due to the stress they induce in relationships and hence trigger incidents of domestic violence. Such changes in stress levels do not appear to translate into differences in the other offense rates we analyze.

6 Conclusion

We show a significantly negative relation between weekly local stock returns and the incidence of domestic violence from Friday to Sunday in the same week. This effect is immediate and significant only for the concurrent week stock returns, meaning that lagged or forward stock returns have no significant correlation with the level of domestic violence. It is also robust to controlling for local economic conditions at the monthly level. These findings support a causal interpretation of the effect, i.e., stock market movements triggering incidents of domestic violence.

Stock market movements, especially large ones, represent both financial and emotional shocks, which can affect stress levels within families and trigger and escalate arguments. This represents a very specific but important externality of stock investments. When stock returns also trigger incidents of domestic violence, they also affect household utility beyond the financial shock. This, possibly together with other externalities of stock-market-induced

stress, could help explain the seemingly high risk aversion implied by the realized stock market returns and return volatility, often referred to as the equity premium puzzle (Mehra and Prescott, 1985). If the volatility of the stock market causes variation in utility that is larger than that caused by the purely financial component of utility, then standard economic models measuring utility only by wealth will underestimate the total "risk" of stock investments.

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Figure 1: Number of incidents by weekday and hour

Shows the number of incidents in our data by incident weekday and hour. The weekly *DV rate* we use in our analysis includes the incidents taking place between Friday, 4pm, and Sunday, 12pm (midnight), highlighted in the chart.

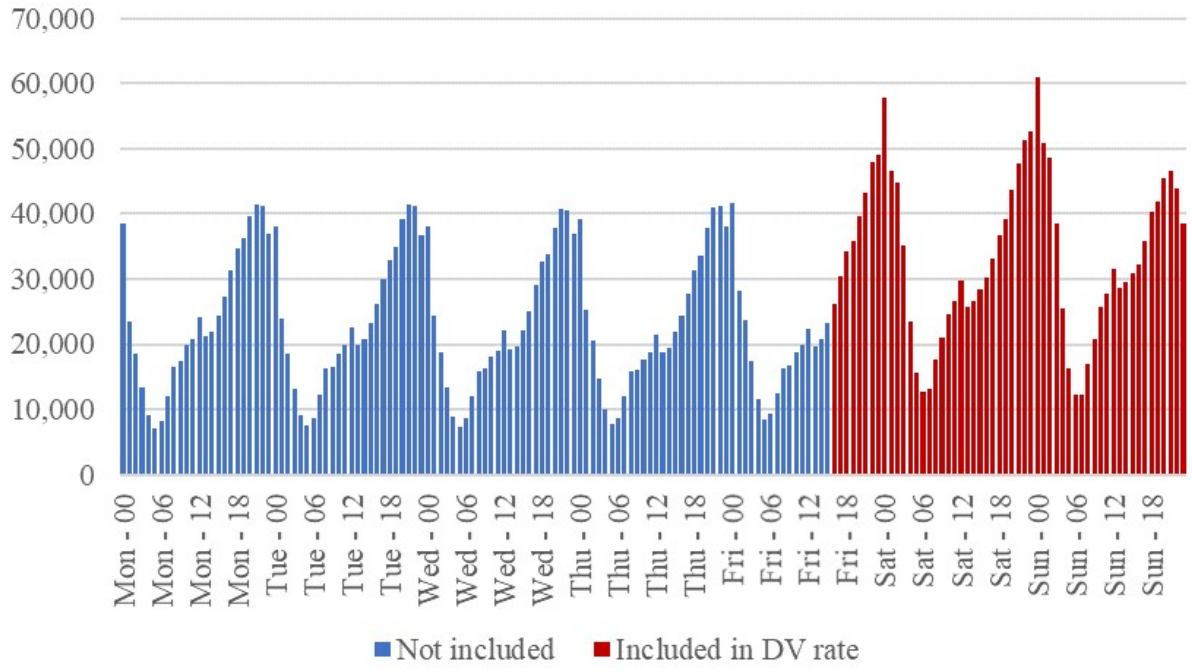

Figure 2: Average domestic violence rate vs. PI per capita

Simple agency-week observations plotted based on the rate of domestic violence, calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week, against the agency location average Personal Income (PI) per capita. PI per capita is measured at the county level. For agencies covering areas within multiple counties, the PI per capita is calculated as the covered-population-weighted average of the counties.

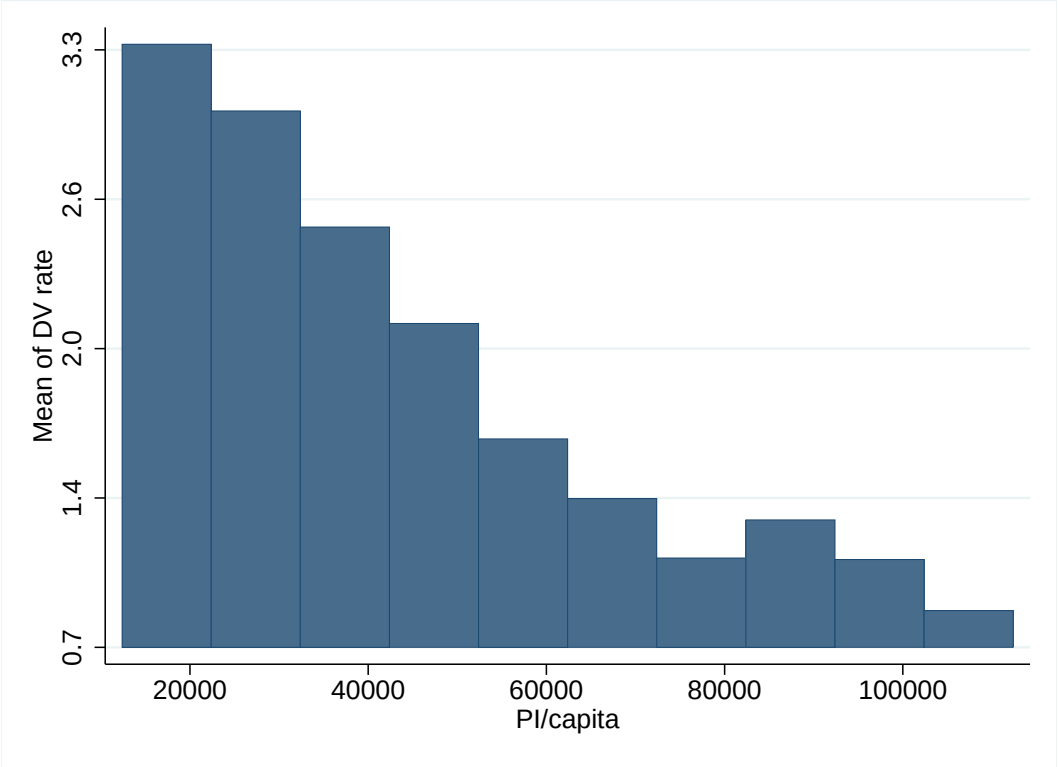

Table 1
Number of police agencies

This table shows the number of police agencies included in our sample for each year, and the population covered by them. Number of states is the number of distinct states in which we have police agencies in our data.

Year	Population covered	Number of agencies	Average population	Number of states
1996	11,233,438	360	31,204	8
1997	17,214,875	504	34,156	12
1998	20,815,169	602	34,577	16
1999	26,012,759	753	34,545	16
2001	39,038,231	1,005	38,844	20
2002	42,316,107	1,066	39,696	21
2003	45,700,878	1,173	38,961	23
2004	50,203,468	1,254	40,035	25
2005	55,875,711	1,354	41,267	28
2006	59,243,478	1,401	42,287	32
2007	61,376,689	1,449	42,358	33
2008	64,198,753	1,524	42,125	33
2009	68,153,097	1,645	41,430	34
2010	70,098,939	1,661	42,203	34
2011	72,220,825	1,729	41,770	34
2012	75,658,735	1,807	41,870	34
2013	77,773,582	1,834	42,407	34
2014	79,546,541	1,865	42,652	35
2015	80,671,537	1,889	42,706	34

Table 2
Summary statistics - weekly observations

Domestic violence (DV) rate and other offense rates rates are calculated as the number of incidents occurring between Friday 4pm and Sunday 12pm (midnight) of each week. Stock market return variables are calculated on a weekly basis. *Population* is the population covered by the given police agency. *PI per capita* is the average Personal Income per capita at the agency location. *IU rate* is the weekly insured unemployment rate measured at the state level.

	Mean	Std	Min	p10	p50	p90	Max
Incidents (per 100,000)							
DV rate	2.645	4.249	0.000	0.000	0.000	8.130	92.120
Assault rate	0.638	1.894	0.000	0.000	0.000	2.403	104.682
Murder rate	0.019	0.287	0.000	0.000	0.000	0.000	19.885
Sex offense rate	0.400	1.404	0.000	0.000	0.000	1.126	144.161
Robbery rate	0.356	1.329	0.000	0.000	0.000	0.880	48.012
Drug offense rate	2.950	5.071	0.000	0.000	0.000	8.714	468.512
Raw stock return							
Return	0.002	0.030	-0.428	-0.031	0.003	0.033	0.361
Positive	0.554	0.497	0.000	0.000	1.000	1.000	1.000
Negative	0.446	0.497	0.000	0.000	0.000	1.000	1.000
Drop 5%	0.040	0.196	0.000	0.000	0.000	0.000	1.000
Drop 7%	0.018	0.133	0.000	0.000	0.000	0.000	1.000
Drop 9%	0.009	0.093	0.000	0.000	0.000	0.000	1.000
Drop 11%	0.004	0.065	0.000	0.000	0.000	0.000	1.000
Drop 13%	0.002	0.050	0.000	0.000	0.000	0.000	1.000
Relative to 4-week avg							
Δ Return	-0.000	0.034	-0.434	-0.035	-0.001	0.036	0.349
Positive	0.481	0.500	0.000	0.000	0.000	1.000	1.000
Negative	0.519	0.500	0.000	0.000	1.000	1.000	1.000
Drop 5%	0.050	0.218	0.000	0.000	0.000	0.000	1.000
Drop 7%	0.020	0.139	0.000	0.000	0.000	0.000	1.000
Drop 9%	0.009	0.092	0.000	0.000	0.000	0.000	1.000
Drop 11%	0.005	0.067	0.000	0.000	0.000	0.000	1.000
Drop 13%	0.003	0.053	0.000	0.000	0.000	0.000	1.000
Agency variables							
Population ('000)	40.902	66.686	10.000	11.608	22.880	77.200	1106.066
PI/capita ('000)	36.454	12.232	12.384	23.964	34.261	51.134	128.184
IU rate (%)	2.375	1.139	0.230	1.120	2.190	3.940	11.520
N	1,296,275						

Table 3
Domestic violence and state-level stock returns

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency fixed effects*, *Agency-Year*, *Agency-Quarter*, or *Agency-Month joint fixed effects*, to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

Panel A: Raw state-level stock market return

	(1)	(2)	(3)	(4)
Return	−0.1073***	−0.0678***	−0.0677***	−0.0535**
	(0.0000)	(0.0048)	(0.0059)	(0.0445)
Weekly IU control	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Agency FE	Yes	No	No	No
Agency-Year FE	No	Yes	No	No
Agency-Quarter FE	No	No	Yes	No
Agency-Month FE	No	No	No	Yes
Week of Year FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.291	0.338	0.384	0.489

Panel B: Relative to 4-week-average return

	(1)	(2)	(3)	(4)
Δ Return	−0.0460**	−0.0507**	−0.0474**	−0.0495**
	(0.0234)	(0.0148)	(0.0238)	(0.0280)
Weekly IU control	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Agency FE	Yes	No	No	No
Agency-Year FE	No	Yes	No	No
Agency-Quarter FE	No	No	Yes	No
Agency-Month FE	No	No	No	Yes
Week of Year FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.291	0.338	0.384	0.489

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 4
Domestic violence vs. lagged and forward stock returns

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency-Month joint fixed effects* to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	Raw stock market return			Relative to 4-week average		
	(1)	(2)	(3)	(4)	(5)	(6)
Return	−0.0535**	−0.0629**	−0.0645**			
	(0.0445)	(0.0234)	(0.0250)			
Return (t-1)		−0.0360	−0.0369			
		(0.2018)	(0.1971)			
Return (t+1)			−0.0058			
			(0.8350)			
Δ Return				−0.0495**	−0.0558**	−0.0529**
				(0.0280)	(0.0155)	(0.0246)
Δ Return (t-1)					−0.0333	−0.0315
					(0.1557)	(0.1836)
Δ Return (t+1)						0.0139
						(0.5552)
Weekly IU control	Yes	Yes	Yes	Yes	Yes	Yes
Agency-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Week of Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.489	0.489	0.489	0.489	0.489	0.489

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 5
Domestic violence and directional state-level stock returns

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency-Quarter joint fixed effects* to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	Raw stock market return		Relative to 4-week average	
	(1)	(2)	(3)	(4)
Return x Positive	−0.0522	−0.0603		
	(0.2395)	(0.1931)		
Return x Negative	−0.0826*	−0.0752		
	(0.0564)	(0.1094)		
Δ Return x Positive			0.0075	0.0140
			(0.8353)	(0.7163)
Δ Return x Negative			−0.1217***	−0.1216***
			(0.0030)	(0.0054)
Weekly IU control	Yes	Yes	Yes	Yes
Agency-Year FE	Yes	No	Yes	No
Agency-Quarter FE	No	Yes	No	Yes
Week of Year FE	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.338	0.384	0.338	0.384

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 6
Domestic violence and weekly drops in state stock market index

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency-Month joint fixed effects* to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	Raw stock market return					Relative to 4-week average				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Drop 5%	−0.0014					0.0087**				
	(0.7407)					(0.0206)				
Drop 7%		0.0112*					0.0142**			
		(0.0848)					(0.0151)			
Drop 9%			0.0175*					0.0191**		
			(0.0561)					(0.0336)		
Drop 11%				0.0347***					0.0218*	
				(0.0079)					(0.0682)	
Drop 13%					0.0441**					0.0308**
					(0.0111)					(0.0484)
Weekly IU control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Agency-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week of Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.489	0.489	0.489	0.489	0.489	0.489	0.489	0.489	0.489	0.489

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 7
Domestic violence and stock returns vs. wealth level

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency-Quarter joint fixed effects* to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	Raw stock market return		Relative to 4-week average	
	(1)	(2)	(3)	(4)
High PI/capita x Return	−0.0307	−0.0455		
	(0.4480)	(0.2708)		
Medium PI/capita x Return	−0.0850**	−0.0830**		
	(0.0344)	(0.0434)		
Low PI/capita x Return	−0.0656	−0.0526		
	(0.1350)	(0.2414)		
High PI/capita x Δ Return			−0.0238	−0.0240
			(0.4960)	(0.4954)
Medium PI/capita x Δ Return			−0.0688**	−0.0652*
			(0.0475)	(0.0627)
Low PI/capita x Δ Return			−0.0468	−0.0386
			(0.2220)	(0.3158)
Weekly IU control	Yes	Yes	Yes	Yes
Agency-Year FE	Yes	No	Yes	No
Agency-Quarter FE	No	Yes	No	Yes
Week of Year FE	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes
N	1,244,573	1,244,573	1,244,573	1,244,573
R^2	0.334	0.381	0.334	0.381

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 8
Google search volume for "domestic violence" by state

The dependent variable is $ln(1 + Google\ volume)$, where *Google volume* is calculated as the weekly state-level index of Google search volume index for the keyword "domestic violence" during Friday, Saturday, and Sunday of each week, and scaled to have a mean of 100 for each state during the sample period of 2005-2016. In cases where the state has at least 30 consecutive days of zero search volume, we exclude any period prior to such zero periods from the data. p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by state-year.

Panel A: Raw state-level stock market return

	(1)	(2)	(3)	(4)
Return	−0.9885**	−1.0161**	−0.9475**	−1.1984**
	(0.0218)	(0.0201)	(0.0340)	(0.0175)
Weekly IU control	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State FE	Yes	No	No	No
State-Year FE	No	Yes	No	No
State-Quarter FE	No	No	Yes	No
State-Month FE	No	No	No	Yes
Week of Year FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
N	24,024	23,977	23,977	23,974
R^2	0.165	0.225	0.271	0.387

Panel B: Relative to 4-week-average return

	(1)	(2)	(3)	(4)
Δ Return	−0.8277**	−0.8307**	−0.8234**	−1.0485**
	(0.0324)	(0.0351)	(0.0345)	(0.0152)
Weekly IU control	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
State FE	Yes	No	No	No
State-Year FE	No	Yes	No	No
State-Quarter FE	No	No	Yes	No
State-Month FE	No	No	No	Yes
Week of Year FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
N	24,024	23,977	23,977	23,974
R^2	0.165	0.225	0.271	0.387

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 9
Domestic violence and state-level stock returns (exc. agency county)

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency fixed effects*, *Agency-Year*, *Agency-Quarter*, or *Agency-Month joint fixed effects*, to capture any differences in local economic and other conditions, as well as any other location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	(1)	(2)	(3)	(4)
Return (exc. county)	−0.1133***	−0.0695***	−0.0727***	−0.0600**
	(0.0000)	(0.0037)	(0.0031)	(0.0246)
Weekly IU control	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Agency FE	Yes	No	No	No
Agency-Year FE	No	Yes	No	No
Agency-Quarter FE	No	No	Yes	No
Agency-Month FE	No	No	No	Yes
Week of Year FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
N	1,284,324	1,284,324	1,284,324	1,284,324
R^2	0.291	0.338	0.385	0.491

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table 10
Other offense rates vs. stock returns

The dependent variable is *ln(1+Offense rate)*, where *Offense rate* is calculated as the weekly number of incidents of the specified offense type per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. *Weekly IU control* is the state-level weekly insured unemployment rate. We include *Agency fixed effects* to capture any agency- and location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, *State-Month joint fixed effects*, and *Week of Year fixed effects* (52 weeks). p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

	(1) Assault	(2) Murder	(3) Sex offense	(4) Robbery	(5) Drug offense
Return	0.0016	0.0023	−0.0196	−0.0006	0.0131
	(0.9257)	(0.4915)	(0.1907)	(0.9610)	(0.6328)
Weekly IU control	Yes	Yes	Yes	Yes	Yes
Agency-Month FE	Yes	Yes	Yes	Yes	Yes
Week of Year FE	Yes	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.423	0.247	0.301	0.460	0.489

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

A Internet Appendix: Additional analysis

A.1 The role of gender and gender inequality

As Card and Dahl (2011) focus on male-on-female domestic violence occurring on an unexpected football home team loss day, we further explore the role of gender and gender inequality in our context. Panel A of Table A.1 shows a regression analysis with the dependent variable *DV rate* calculated separately for each gender. We see that the negative relationship between stock market returns and domestic violence holds for both genders, although the statistical significance is weaker for female perpetrators. This may be due to the substantially lower number of incidents of domestic violence perpetrated by women in our data.[17]

It seems plausible that the relationship between stock market returns and domestic violence depends on the cultural context. As discussed in Section 2.1, a number of studies suggest that the incidence of domestic violence is related to the relative economic power between men and women in families. Therefore, in states where gender inequality is higher, we might expect the dynamics of domestic violence to be different as well. We test this prediction using the updated version of the Gender Equality Index provided by Di Noia (2002), based on the methodology originally developed by Sugarman and Straus (1988). The index is available for each U.S. state. We include a *High inequality* dummy variable for each state, which takes value one if the state has a below-median index value, zero otherwise.

Panel B of Table A.1 shows a regression analysis including interaction terms between stock returns and the High inequality dummy separately for domestic violence perpetrated by men and women. This analysis shows some interesting differences between genders. From Models 3 and 4, we see that the negative relationship between stock market returns and domestic violence perpetrated women exists only in states with relatively low gender inequality. The relationship is highly statistically significant. In the above-median-inequality states, this

[17] Less than 20% of the incidents in our data are committed by women.

relationship appears to completely disappear, as can be seen by comparing the coefficients of the *Return* variable and its interaction with the *High inequality* dummy. These coefficients are similar in magnitude and have the opposite signs, effectively offsetting each other for the high-inequality states. For men, no such distinction between high- and low-inequality states seems to exist. The estimated coefficients for the interaction term are negative and not statistically significant.

A.2 Other determinants of domestic violence

To facilitate comparisons of our data with earlier studies of domestic violence, we include an additional regression analysis of other determinants of domestic violence. Table A.2 shows the results of this analysis. Panel A includes all domestic violence perpetrated by both genders. Model 1 does not control for agency fixed effects (or any other fixed effects), and therefore represents largely a cross-sectional comparison of different locations and their characteristics, showing their correlations with the incidence of domestic violence within them.

We see that locations with low male unemployment and high female uneployment tend to experience higher levels of domestic violence. This result is consistent with the findings of Anderberg et al. (2016), who use regional data from the United Kingdom. Controlling for agency fixed effects, higher male unemployment is still associated with lower levels of domestic violence, suggesting that increases in male unemployment tend to decrease domestic violence. Changes in female unemployment do not appear to have a statistically significant effect on domestic violence.

Poorer places, as measured by average personal income per capita at the county level, tend to experience higher levels of domestic violence, consistent with the findings of Benson et al. (2003). Larger cities, as measured by population, tend to have higher levels of domestic violence. On the other hand, when controlling for agency fixed effects, the estimated coefficient for population becomes negative, suggesting that population growth within a location

is actually associated with decreasing levels of domestic violence.

As might be expected by both economic models of household bargaining, as well as general intuition, states with higher gender equality tend to have lower levels of domestic violence. Decreases in the wage gap between genders seem to be associated with decreases in domestic violence, a finding that is consistent with the results of Aizer (2010). Times of higher investor sentiment appear to be associated with higher levels of domestic violence, a finding that is somewhat counter-intuitive and perhaps worth exploring in future research.

A.3 Daily patterns of domestic violence

Figure A.1 shows the average daily rates of domestic violence per 100,000 persons for our sample. It is clear that the levels of domestic violence are substantially higher during the weekend than during weekdays, and that the levels on Friday are higher than on other weekdays. This observation is confirmed more formally in Table A.3, which shows the results of a regression analysis of daily *DV rate* with dummies for each weekday as explaining variables. We exclude the dummy for Monday, so the estimated coefficients are relative to Monday.

Table A.4 shows the results of a regression analysis of daily *DV rate* for the entire sample period with dummies for major holidays and other significant celebration days as explaining variables. Most of these special days are associated with significantly higher levels of domestic violence, with New Year's day experiencing the highest levels of domestic violence. Easter Day is the notable exception, with significantly lower levels of domestic violence than other days.

Table A.1
Domestic violence by gender and state-level stock returns

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location occurring between Friday 4pm and Sunday 12pm (midnight) of each week. We include *Agency fixed effects* to capture any agency- and location-specific factors, *Holidays fixed effects*, including a set of dummies for major holidays in case they take place during the week, *State-Quarter or State-Month joint fixed effects*, and *Week of Year fixed effects* (52 weeks) to control for timing. p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

Panel A: Domestic violence by gender of perpetrator

	Male		Female	
	(1)	(2)	(3)	(4)
Return	−0.0544**	−0.0536**	−0.0268*	−0.0265*
	(0.0177)	(0.0229)	(0.0714)	(0.0827)
Weekly IU control	Yes	Yes	Yes	Yes
Agency-Year FE	Yes	No	Yes	No
Agency-Quarter FE	No	Yes	No	Yes
Week of Year FE	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.320	0.366	0.152	0.205

Panel B: Domestic violence vs. gender inequality

	Male		Female	
	(1)	(2)	(3)	(4)
High inequality x Return	−0.0417	−0.0156	0.0672**	0.0852***
	(0.3661)	(0.7417)	(0.0255)	(0.0057)
Return	−0.0379	−0.0474	−0.0535***	−0.0603***
	(0.1881)	(0.1084)	(0.0036)	(0.0013)
Weekly IU control	Yes	Yes	Yes	Yes
Agency-Year FE	Yes	No	Yes	No
Agency-Quarter FE	No	Yes	No	Yes
Week of Year FE	Yes	Yes	Yes	Yes
Holidays FE	Yes	Yes	Yes	Yes
N	1,296,275	1,296,275	1,296,275	1,296,275
R^2	0.320	0.366	0.152	0.205

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table A.2
Other determinants of domestic violence

The dependent variable is $ln(1 + DV\ rate)$, where *DV rate* is calculated as the weekly number of incidents per 100,000 persons for each agency location during Friday, Saturday, and Sunday of each week. *Unemployment (male)* and *Unemployment (female)* are the state-level unemployment rates for each gender. *Unemployment gap (M-F)* is the difference in unemployment between men and women at the state level. *Female/male wage* is the median wage for women divided the median wage for men at the state level. *Gender equality* is the Gender Equality Index calculated by Di Noia (2002). We include *Agency fixed effects* to capture any agency- and location-specific factors, *Year fixed effects*, *Week of Year fixed effects* (52 weeks), and *Holiday fixed effects*, including a set of dummies for major holidays in case they take place during the week. p-values have been calculated based on heteroscedasticity-consistent standard errors, clustered by agency-year.

Panel A: All domestic violence

	(1)	(2)	(3)	(4)
Return	−0.1732***	−0.0964***	−0.0830***	−0.0629**
	(0.0000)	(0.0001)	(0.0008)	(0.0124)
Unempl. (male) (%)	−0.0575***	−0.0024	−0.0070***	−0.0071***
	(0.0000)	(0.1509)	(0.0009)	(0.0009)
Unempl. (female) (%)	0.0898***	−0.0014	0.0018	0.0018
	(0.0000)	(0.5851)	(0.5448)	(0.5420)
ln(PI/capita)	−0.3254***	−0.1695***	0.2441***	0.2441***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ln(Population)	0.3228***	−0.0833***	−0.0537**	−0.0537**
	(0.0000)	(0.0008)	(0.0254)	(0.0255)
Gender equality	−0.0075***			
	(0.0000)			
Female/male wage (%)	0.0039***	−0.0047***	−0.0016**	−0.0016**
	(0.0000)	(0.0000)	(0.0160)	(0.0159)
Sentiment	0.0339***	0.0057*	0.0179***	0.0077*
	(0.0000)	(0.0722)	(0.0000)	(0.0791)
Agency FE	No	Yes	Yes	Yes
Holidays FE	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Week of Year FE	No	No	No	Yes
N	1,147,645	1,147,645	1,147,645	1,147,645
R^2	0.086	0.287	0.288	0.289

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Panel B: Domestic violence by gender

	Male			Female		
	(1)	(2)	(3)	(4)	(5)	(6)
Return	−0.1477***	−0.0794***	−0.0660***	−0.0536***	−0.0346**	−0.0334**
	(0.0000)	(0.0008)	(0.0052)	(0.0007)	(0.0229)	(0.0279)
Unempl. (male) (%)	−0.0503***	−0.0026*	−0.0068***	−0.0211***	0.0004	−0.0013
	(0.0000)	(0.0844)	(0.0005)	(0.0000)	(0.5767)	(0.1745)
Unempl. (female) (%)	0.0784***	−0.0010	0.0019	0.0311***	−0.0008	−0.0008
	(0.0000)	(0.6671)	(0.4624)	(0.0000)	(0.4873)	(0.5639)
ln(PI/capita)	−0.3153***	−0.1942***	0.2418***	−0.0662***	−0.0110*	0.0363**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0681)	(0.0236)
ln(Population)	0.2991***	−0.0967***	−0.0656***	0.1197***	−0.0049	−0.0013
	(0.0000)	(0.0000)	(0.0026)	(0.0000)	(0.6320)	(0.9028)
Gender equality	−0.0084***			−0.0025***		
	(0.0000)			(0.0000)		
Female/male wage (%)	0.0035***	−0.0047***	−0.0016***	0.0012***	−0.0008***	−0.0003
	(0.0000)	(0.0000)	(0.0093)	(0.0007)	(0.0031)	(0.3221)
Sentiment	0.0334***	0.0059**	0.0157***	0.0076***	0.0025*	0.0087***
	(0.0000)	(0.0442)	(0.0002)	(0.0015)	(0.0914)	(0.0003)
Agency FE	No	Yes	Yes	No	Yes	Yes
Holidays FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	No	Yes	No	No	Yes
N	1,147,645	1,147,645	1,147,645	1,147,645	1,147,645	1,147,645
R^2	0.084	0.271	0.272	0.035	0.115	0.115

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Figure A.1: Average daily DV incidents per 100,000 persons by weekday

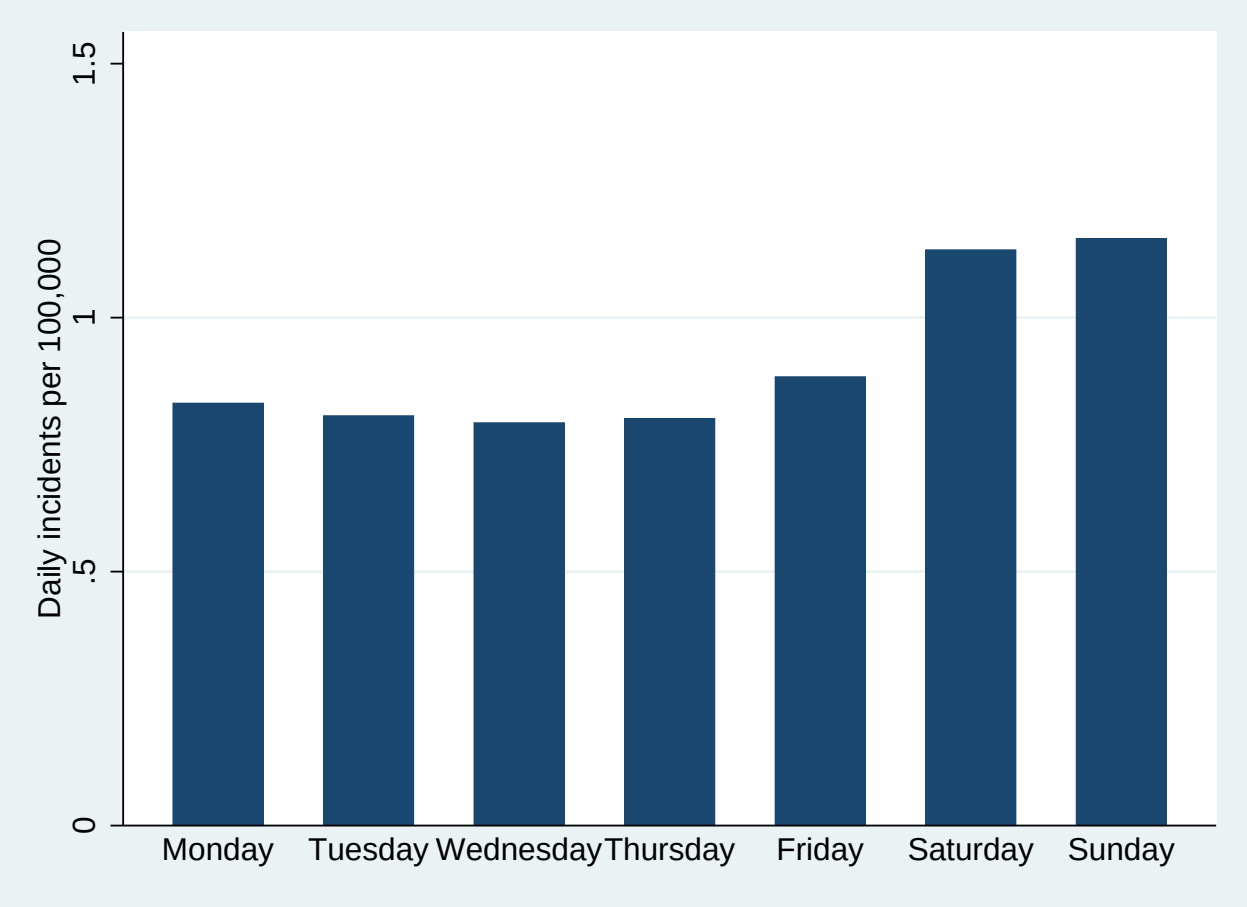

Table A.3
Domestic violence by weekday

The dependent variable is $ln(1 + DV\ rate)$, where $DV\ rate$ is calculated as the daily number of incidents per 100,000 persons for each agency location.

	(1)	(2)	(3)
Tuesday	−0.0081***	−0.0034***	−0.0035***
	(0.0000)	(0.0000)	(0.0000)
Wednesday	−0.0123***	−0.0077***	−0.0077***
	(0.0000)	(0.0000)	(0.0000)
Thursday	−0.0094***	−0.0063***	−0.0063***
	(0.0000)	(0.0000)	(0.0000)
Friday	0.0168***	0.0212***	0.0213***
	(0.0000)	(0.0000)	(0.0000)
Saturday	0.0920***	0.0967***	0.0968***
	(0.0000)	(0.0000)	(0.0000)
Sunday	0.1009***	0.1060***	0.1061***
	(0.0000)	(0.0000)	(0.0000)
Holidays FE	No	Yes	Yes
Year FE	No	Yes	No
Month FE	No	Yes	No
Year-Month FE	No	No	Yes
Agency FE	No	Yes	Yes
N	9,624,788	9,624,788	9,624,788
R-sqr	0.005	0.172	0.172

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**

Table A.4
Domestic violence and holidays

The dependent variable is $ln(1 + DV\ rate)$, where $DV\ rate$ is calculated as the daily number of incidents per 100,000 persons for each agency location.

	(1)	(2)	(3)
New Year Eve	0.0116***	0.0517***	0.0517***
	(0.0046)	(0.0000)	(0.0000)
New Year Day	0.2433***	0.2738***	0.2738***
	(0.0000)	(0.0000)	(0.0000)
Martin Luther King, Jr. Day	−0.0459***	0.0103***	0.0104***
	(0.0000)	(0.0036)	(0.0034)
George Washington's Birthday	−0.0421***	0.0099***	0.0100***
	(0.0000)	(0.0054)	(0.0052)
Easter Day	0.0587***	−0.0202***	−0.0192***
	(0.0000)	(0.0000)	(0.0000)
2nd Easter Day	−0.0159***	0.0099***	0.0102***
	(0.0001)	(0.0069)	(0.0056)
Good Friday	0.0033	0.0092**	0.0102***
	(0.4253)	(0.0132)	(0.0065)
Ascension Day	−0.0148***	0.0033	0.0027
	(0.0003)	(0.3746)	(0.4602)
Whit Sunday	0.0972***	0.0004	−0.0004
	(0.0000)	(0.9156)	(0.9202)
Memorial Day	0.0912***	0.1036***	0.1036***
	(0.0000)	(0.0000)	(0.0000)
Independence Day	0.1233***	0.0861***	0.0861***
	(0.0000)	(0.0000)	(0.0000)
Labor Day	0.0897***	0.1145***	0.1145***
	(0.0000)	(0.0000)	(0.0000)
Columbus Day	−0.0357***	0.0046	0.0047
	(0.0000)	(0.1979)	(0.1943)
Veterans Day	−0.0254***	0.0030	0.0030
	(0.0000)	(0.4087)	(0.4069)
Thanksgiving Day	0.0032	0.0613***	0.0613***
	(0.4363)	(0.0000)	(0.0000)
Christmas Eve	−0.0028	0.0373***	0.0373***
	(0.5006)	(0.0000)	(0.0000)
Christmas Day	0.0025	0.0330***	0.0330***
	(0.5451)	(0.0000)	(0.0000)
Valentine's Day	−0.0134***	0.0068*	0.0069*
	(0.0010)	(0.0625)	(0.0622)
Halloween	0.0127***	0.0188***	0.0188***
	(0.0020)	(0.0000)	(0.0000)
Weekday FE	No	Yes	Yes
Year FE	No	Yes	No
Month FE	No	Yes	No
Year-Month FE	No	No	Yes
Agency FE	No	Yes	Yes
N	9,624,788	9,624,788	9,624,788
R-sqr	0.001	0.172	0.172

Significance levels: * 0.1, ** 0.05, * 0.01. p-values in parentheses.**