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Violent Video Games and Crime

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ABSTRACT

This study examines the change in crime observed in the weeks following the release (exogenous shocks to video game play) of top-selling video games between 2006 and 2011. We find that the release of violent (Mature-rated) video games is associated with an increase in overall crime in the weeks following release. Crime increases for both youth and adults following blockbuster Mature-rated releases, but the increase in crime among youth is approximately four times greater (8%) than the increase among adults (2%). Conversely, we find that the release of best-selling nonviolent (Everyone-rated) video games is not associated with a change in crime in the weeks directly following the release. Our results suggest that the release of violent video games increases crime in the United States, at least in the short-term, especially among the under-17 population for whom Mature-rated games are explicitly labeled as not "suitable." Interestingly, our results are completely moderated in U.S. counties that forbid alcohol sales, which suggests that alcohol is a necessary channel through which exposure to violent video games contributes to crime.

> *"Congress should fund research into the effects that violent video games have on young minds. We don't benefit from ignorance. We don't benefit from not knowing the science of this epidemic of violence."*, President Obama, 2013.

> *"We must stop the glorification of violence in our society. This includes the gruesome and grisly video games that are now commonplace. It is too easy today for troubled youth to surround themselves with a culture that celebrates violence. We must stop or substantially reduce this and it has to begin immediately"*, President Trump after massacres in El Paso, Texas, and Dayton, Ohio, killed at least 31 people in 2019.[1]

Introduction

The video game industry has grown considerably over the last decade – total annual consumer spending on video games has more than tripled between 2008 and 2018.[2] Much of this increased spending is attributable to violent video games. For example, the best-selling game in 2005 was Madden NFL 06 (a football game, rated Everyone), and first-person shooter games made up only 8.7% of total unit sales. By comparison, the best-selling game in 2018 was Call of Duty: Black Ops 4 (a first-person shooter game, rated Mature), and first-person shooter games made up roughly 20% of total unit sales. As the gaming industry grows and shifts toward more violent games, an increasing number of people are exposed to both video games and video game violence. This raises the question, how, if at all, does increased exposure to violent video games impact real-world crime in the United

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[1]https://www.nbcnews.com/politics/donald-trump/fact-check-trump-suggests-video-games-blame-mass-shootings-n1039411

[2]Essential Facts About the Computer and Video Game Industry – Published by The Entertainment Software Association.

States? To answer this question, we examine 59 exogenous shocks (game releases) to video game play between 2006 and 2011. We find that violent games are associated with an increase in crime and nonviolent games are mostly associated with no changes in crime.

Prior psychology research has found mixed results regarding the impact of violent video games on aggressive behavior. Correlational and longitudinal studies present a strong case that violent video games are associated with aggressive behavior, while some experimental studies fail to find short-term effects of playing violent video games. Anderson et al. (2010) performed an extensive meta-analysis of 136 psychology studies incorporating over 130,000 participants. They conclude that "exposure to violent video games is a causal risk factor for increased aggressive behavior, aggressive cognition, and aggressive affect and for decreased empathy and prosocial behavior." Prescott et al. (2018) performed their own meta-analysis of studies examining violent video game play and physical aggression. They conclude that "playing violent video games is associated with greater levels of overt physical aggression over time, after accounting for prior aggression." Nevertheless, some studies fail to find a significant association between violent video games and aggressive behavior (Kühn et al., 2019; McCarthy et al., 2016), while Bediou et al. (2018)'s meta-analysis reported that video games, especially first-person shooter games, can help develop cognitive skills.

Recent empirical work suggests that exposure to violent media (including violent video games) actually leads to a decrease in violent crime. Dahl and DellaVigna (2009) find that violent crime decreases on days when more people attend violent movies in the theater. They argue that voluntary incapacitation – the inability to engage in a particular activity because an individual has chosen to participate in a different activity – drives these results. Ward (2011) and Cunningham et al. (2016) examine video game sales (the latter) and proxies for play (both studies) and find that the play of violent games results in a decrease in observed weekly crime. Again, this result is consistent with "violent games having a cathartic or an incapacitation effect." Furthermore, Ferguson (2008) argues that the balance of research, both empirical and experimental, leans more toward the conclusion that video games do not impact real-world crime. Among other things, he highlights that while violent video games sales strictly increase between 1996 and 2005, the level of juvenile violent crime decreases over the same time period. However, in a more recent discussion (Ferguson, 2018), the same author underscores several of the complications involved in this research. On the empirical side he points to poorly designed studies and the inability to control for individual factors, such as family, environment, and mental health.

In summary, the increased-violent-behavior predictions based on psychology laboratory experimentation have not been confirmed through the analysis of observable empirical data. Cunningham et al. (2016) argue that this disconnect is due to the lack of external validity present in an experimental setting and conclude that although some short-term aggressive behavior may result from exposure to violent video games, the dominating effect is that of incapacitation – devoted video game players have less time in which to commit crimes when exposed to new video games – which leads to less crime as observed in real-world crime statistics.

We address these mixed findings, and the criticisms relating to experimental design and individual characteristics, by utilizing a simple but powerful event study approach that examines the changes in crime around the release of only top selling video games (in North America) between 2006 and 2011. We view a blockbuster video game release as an exogenous shock,[3] which allows us to analyze the differences in crime during event and nonevent windows. Our sample includes the release dates of all video games for which first-week sales exceeded 1,000,000 units in order to maximize our signal to

[3]Looking at top-selling game release dates allows us to capture the biggest "shocks." We consider this setting to be a type of natural experiment which allows us to hold all else constant while only changing video game exposure. This methodology is powerful and is seen across disciplines. See for example Drago et al. (2009) which uses an exogenous shock to prison sentences to examine the effect of incarceration on the likelihood of recidivism. Beerthuizen et al. (2017) is the only paper we are familiar with that use the event study method in a setting similar to ours. Those authors observe a decrease in crime among Dutch youth in the weeks after the release of Grand Theft Auto 5.

noise ratio.[4] We know that for the vast majority of games, video games sales are highest in the week a game is released.[5] Interest in games is also highest immediately following release and consumers are more likely to be exposed to games and in-game content during this time. Gamers will often "binge" play a new game immediately upon acquisition, again leading to more game content exposure. For example, Bavelier and Davidson (2013) report that Call of Duty: Black Ops, a first-person shooter game, was played for the equivalent of 68,000 years in the first month after its release.[6]

Ferguson (2015) highlights that most psychology studies examining the relation between violent video game play and aggressive behavior are limited by two factors. First, most studies use college students as participants, which can limit generalizability. Second, the literature primarily focuses on aggressive behavior as an outcome, while not considering violent outcomes. Our study overcomes both of Ferguson's critiques. We use the National Incident-Based Reporting System (NIBRS) crime dataset to analyze the impact of violent video games across all age ranges. It also allows us to look at violent outcomes, not just aggressive behavior.

Much, if not all, of the prior research examining the relation between video games and aggressive behavior is conducted under strict laboratory settings. This allows researchers to draw causal inferences (in their setting) but limits their ability to generalize findings to real-world settings – this is a common criticism of experimental laboratory studies in psychology. Thus, predicting real world effects based on laboratory findings can be difficult.

While we cannot unambiguously infer causality when examining real-world observable data, we can limit contamination from outside sources by examining a short window around the release of top-selling video games (and controlling for day, month, season, year, and weather effects). In addition, because we examine independent release events[7] and 50+ million individual crimes across 35 states,[8] we are able to mitigate the impact of possible confounding effects. In both univariate and multivariate tests, we show that overall crime increases in the weeks following the release of a blockbuster violent video game, but not the release of a blockbuster nonviolent game. This result is consistent with prior psychology studies which find that violent video games lead to an increase in violent and antisocial behavior. When we examine this result in the cross-section of U.S. counties, we see that this jump in crime after violent video game releases is completely moderated in counties that forbid alcohol sales. This suggests that alcohol is an important channel through which video game violence spurs real-world crime.

When we separate crime into different age categories (under 17, 17 and older) we see that the increase in overall crime is larger for youth than adults by a factor of four.[9] Further examination of the different age groups allows us to determine which types of crime are driving the above results. For the under 17 group, the increases in crime are driven by increases in violent (10.74%), drug (15.26%), and property crimes (3.15%) – the same types of crime that are treated as routine and trivial in violent video games. We observe increases in some of these categories for adults but the magnitude is much lower (drug crime increases by 2.74%). No such increase in crime categories is observed after the release of nonviolent video games for either the under 17 or 17 and older age groups (several categories

[4]We conduct sensitivity analysis in which we examine all release dates for games that had lifetime sales exceeding 1,000,000 units. The results are directionally and statistically identical (see section 4.3.4).

[5]Wii Sports is a notable exception with relatively few units sold in the first few weeks but 80+ million units sold over the life of the game.

[6]We validate this supposition – video game releases result in abnormally high interest in video games – by examining Google searching activity around the release of top-selling games. In untabulated tests, we find that the month a game is released corresponds to the highest search volume for that game and searching drops off precipitously immediately (beginning the following month). Thus, interest in a game appears to be heavily concentrated immediately upon its release. This gives us confidence that examining release events is appropriate.

[7]24 events in our main sample, and 59 events in the expanded sample.

[8]States are not required to report information for use in the NIBRS database.

[9]We choose these age categories because the Entertainment Software Rating Board (ESRB) has established 17 as the cutoff age for Mature-rated games.

of crime decrease for both age groups). Furthermore, we find that the increase in crime following the release of a violent video game is positively related to the level of sales (violent games with greater sales generally induce larger increases in crime).

This latter relation highlights the differences between our methods and those of Cunningham et al. (2016) who observe a slight negative relation between violent video game sales and violent crime. In their sample period, video game sales grew while crime trended downwards. By construction, this will lead to a negative association between changes in violent video game sales and changes in violent crime in a longitudinal analysis. Both Cunningham et al. (2016) and our study use video game sales made available by VGChartz.com. However, this sales data is admittedly noisy, as sales figures are based on extrapolation from hard sales data covering about 3% of the North American market.[10] Accordingly analyses like that in Cunningham et al. (2016), which exploit changes in this data, may be documenting spurious relations. By comparison, we use the sales data only to identify top-selling video games. We treat these best-selling releases as exogenous shocks to the level of exposure individuals have to video games, and then examine (via time series regression models) whether these shocks predict crime in the following days (and whether the direction of this prediction differs based on a best-selling video game's content, be it violent or nonviolent).

Using this empirical strategy, we contribute to the literature in two ways. First, we bridge the gap between prior laboratory experimental psychology research and more recent empirical studies. Existing empirical papers in economics that examine the relation between violent video game exposure and crime fail to exploit the exogenous shocks to video game exposure that accompany blockbuster video game releases. We use this event study setting to identify short run crime effects in the weeks following popular video game releases. Second, we provide insight into which individuals are influenced by video games and how these people are being influenced (what types of crime are affected). Our results should be of special interest to video game manufacturers, consumers, and parents.[11] Furthermore, in 2013 U.S. President Barack Obama issued a call for additional research on the effects of violent video games on youth as part of a broader campaign against gun violence.[12] We view our study as a response to this call, and accordingly we believe our findings could be of interest to policy makers as well.

The paper proceeds as follows. Section 2 contains a review of the literature and a statement of the hypotheses. Section 3 contains a description of the data and the research design, and Section 4 presents the empirical results. Section 5 concludes the paper.

Background and hypotheses

Violent video games have the potential to both increase and decrease crime. On one hand, exposure to violent video games can increase crime by increasing aggression and arousal in players. This could lead them to become more violent and engage in more violent activities (crime). On the other hand, violent video games can lead to decreases in crime by incapacitating players (constraining them from engaging in other activities) or serving to fulfill their desire to commit violent acts, leading to less desire and/or ability to commit crime. We discuss each of these effects below.

[10] See http://www.gamesetwatch.com/2008/06/analysis_what_vgchartz_does_and.php

[11] Not surprisingly, prior literature supports the notion that less parental guidance is perhaps the largest contributing factor to the higher levels of crime in urban areas (Glaeser & Sacerdote, 1999).

[12] See http://www.forbes.com/sites/insertcoin/2013/01/16/obama-calls-for-government-funded-research-into-violent-video-games/.

Arousal/desensitization

Researchers have investigated the link between brain activity and violent video games. Through the use of MRI, they have found that video game players show less brain activity in areas involving emotion, attention, and inhibition (Hummer et al., 2010). Researchers using MRI have also found that video game players have a larger ventral striatum, a pleasure center associated with addiction (Kühn et al., 2011). Further, evidence suggests that completing video game tasks increases the level of dopamine, stimulating this pleasure center (Koepp et al., 1998). Engelhardt et al. (2011) find that conditional on prior exposure to violent video games, participants exhibited a reduction in the brain's response to real-life violence. Given the hands-on nature of video game play, (Funk et al., 2004) this raises the interesting question – will players of violent video games escalate to commit similar real-world violent acts in order to achieve the same `high' experienced while gaming?

Anderson and Dill (2000) find that participants who were exposed to a violent video game selected a more severe level punishment for their peers (noise and duration of a siren) than those exposed to a nonviolent video game. In their meta-analysis, Greitemeyer and Mügge (2014) concluded that violent video games do affect the gamer's social behavior and stated "violent video game play should be regarded as a risk factor for aggressive behavior." Using a survey of college students, Holz et al. (2017) observe that video game violence predicts suicidal and violent thoughts. Greitemeyer (2018, 2019) find that violent video game play increases aggression not only for the player of the game, but also for individuals within the player's social network. In a recent study (Prescott et al., 2018), researchers found that prolonged exposure to violent video games (over the course of several years) was associated higher levels of aggression over time. They state that this did not arise from selection (inherently violent people are not more likely to choose to play violent video games), indicating that prolonged exposure to video game violence had an incremental effect on aggression even after controlling for other factors known to lead to higher levels of aggression (family life). A 4-year longitudinal study (Hull et al., 2014) finds evidence that video games increase measures of behavioral defiance. These effects were strongest for individuals reporting large amounts of mature-rated video-game play.

Other research also indicates that video game play is associated with increased alcohol consumption (Gilbert et al., 2018; Padilla-Walker et al., 2010). Prior literature has established a positive relation between alcohol consumption and crime (Carpenter, 2007; Carpenter & Dobkin, 2009; Rees & Schnepel, 2009). Dahl and DellaVigna (2009) argue that the restriction of alcohol consumption (through incapacitation) in movie theaters could be a contributing factor to the decrease in crime associated with violent movies. Thus, if playing video games leads to increased consumption of alcohol, the effect of playing any game (even nonviolent everyone rated games) could lead to increased crime.

Similar to the arousal effect, which induces players to engage in more violent thoughts and behaviors, desensitization can also induce players to be more violent. However, desensitization acts through a different mechanism. Although arousal increases the level of aggressive thoughts, desensitization makes violence seem like a more acceptable form of behavior. Funk et al. (2004) find that children (fourth and fifth graders) display less empathy and have a greater tolerance for violence after they are exposed to violent video games. Interestingly, this decrease in empathy and increased tolerance for violence is not observed after exposure to other forms of violent media. Funk et al. speculate that it is the hands-on nature of video games that leads to this desensitization. Carnagey et al. (2007) document an actual physiological desensitization to violence. Participants who had played violent video games had a smaller physiological response to a subsequent real-world violent video clip than did participants who had played nonviolent video games. Although long-term effects are more difficult to confirm (because of the need for large-sample longitudinal studies), the short-term arousal effects are not disputed.[13]

These streams of research suggest, in general, that consumers of violent media (players of violent video games) are more likely to engage in violent activities.

Incapacitation

When individuals choose (or are forced) to engage in a particular activity, they forego the opportunity to engage in other activities. For example, criminals who are incarcerated cannot simultaneously commit crimes outside of prison (Levitt, 1996). In this vein, Jacob and Lefgren (2003) use school calendar information to demonstrate that when school is in session there are lower levels of juvenile property crime.[14] The authors attribute this to the incapacitation of juveniles – they are unable to commit property crimes because they are otherwise engaged.

Further evidence of the incapacitation effect is presented in Dahl and DellaVigna (2009). They find that the release of violent movies is associated with an overall decrease in crime. They show that there is an arousal effect (crime is higher for violent than for nonviolent movies), but they then show that the voluntary incapacitation effect (leading to a reduced amount of time to commit crimes) dominates the arousal effect, resulting in an overall decrease in crime. Ward (2011) examines a proxy for video game play (number of video game stores in a county) and finds that this proxy is associated with fewer crimes in a given area. His interpretation is also that video game play results in incapacitation, leading to lower levels of crime.[15] Finally, Nelson et al. (2016), find that youth who consume more "problematic media" (i.e. violent games or pornography) become less likely to go out and socialize than those who consume less.

Hypotheses

It is unclear from the above discussion which effect will dominate (arousal or incapacitation) when violent video games are played in the real world. As such, we cannot determine if the overall effect of violent video game play will increase, decrease, or have no effect on the level of crime. Accordingly, we state our first hypothesis in the null form.

H1: There is no change in overall crime following the release of a violent video game.

The Entertainment Software Rating Board (ESRB) assigns a rating to each video game released in the United States. The ratings range from C (early childhood) to A (adults only).[16] Ratings of E (everyone) and M (mature) are the most common and are the focus of this study. Everyone-rated games contain "content generally suitable for all ages" and can include mild fantasy violence and mild language.[17] Mature-rated games contain "content generally suitable for ages 17 and up" and can include intense violence, blood, gore, sexual content, and strong language.[18] These ratings exist to

[13]Both Cunningham et al. (2016) and Dahl and DellaVigna (2009) concede that there is a short-term arousal effect associated with violent media. However, they argue that in non-laboratory settings this effect is dominated by both incapacitation and catharsis.

[14]Oddly, Jacob and Lefgren (2003) also find that violent crimes increase when school is in session. They argue that the high concentration of children leads to this increase (more fighting).

[15]The effects of incapacitation are also observable in a non-crime setting. Stinebrickner and Stinebrickner (2008) find that when students cohabitate with other students who own video games, they engage in less studying activity – consistent with the idea that video games incapacitate them and keep them from engaging in other activities, such as studying.

[16]See Table 1 for a more detailed description of video game ratings.

[17]Prior research finds that globally, different video game content rating regimes are generally uniform in classifying games at the particularly nonviolent and particularly violent ends of the spectrum. There is considerable discrepancy in ratings for games in the intermediate range of violence, however. Accordingly, we focus on games that most rating regimes and independent raters would classify as clearly violent or clearly nonviolent (Dogruel & Joeckel, 2013; Funk et al., 1999).

[18]http://www.esrb.org/ratings/ratings_guide.jsp

Table 1. Video game ratings.

Rating	Description
Early Childhood	Content is intended for young children.
Everyone	Content is generally suitable for all ages. May contain minimal cartoon, fantasy or mild violence and/or infrequent use of mild language.
Everyone 10 +	Content is generally suitable for ages 10 and up. May contain more cartoon, fantasy or mild violence, mild language and/or minimal suggestive themes.
Teen	Content is generally suitable for ages 13 and up. May contain violence, suggestive themes, crude humor, minimal blood, simulated gambling and/or infrequent use of strong language.
Mature	Content is generally suitable for ages 17 and up. May contain intense violence, blood and gore, sexual content and/or strong language.
Adults Only	Content suitable only for adults ages 18 and up. May include prolonged scenes of intense violence, graphic sexual content and/or gambling with real currency.

This table summarizes the desciptions for video game ratings.

limit the exposure of young users to game content that may be disturbing or imitable. Therefore, to the extent that young people (under 17) play games with an M rating, we expect these players to be more influenced by the content. Ward (2010) finds generally that video game play is not associated with measures of adolescent fighting. However, he does find an association when adolescents report playing four or more hours a day. Thus, if adolescents are prone to binge playing immediately following the release of a violent game we would also expect to see an increase in violent activity.

Most retailers have policies in place to limit the purchase of mature content by underage individuals, and the effectiveness of these policies has increased over time.[19] However, even if a parent is unwilling to buy an M-rated game for an underage child, young people are easily able to obtain these games without the help of their parents.[20] For example, a popular wikiHow article highlights ways to circumvent the current policies in place to prevent youth from purchasing M-rated video games.[21] [*a*)]The suggestions include: buying the game from an independent shop without sales restrictions, renting the game from Redbox where no ID is required, and purchasing a prepaid credit card at a retailer and simply ordering the game online using the prepaid card. Therefore, it seems likely that these games will end up in the hands of underage individuals who have the desire to play them. We state our second hypothesis in the alternative form:

H2: There is an increase in crime among youth following the release of a violent video game.

As stated above, not all game releases are violent games (though top-selling games skew in this direction). Nonviolent video games are not expected to evoke the same arousal responses from players. Thus, the only expected effect from these games is incapacitation. We make no formal predictions with respect to how these games will affect players (this would require making assumptions about the underlying player base's propensity to commit crime). Rather, for completeness, we also test the relation between top-selling nonviolent game releases and changes in crime. These results are presented alongside our tests of H1.

[19]See http://www.ftc.gov/news-events/press-releases/2013/03/ftc-undercover-shopper-survey-entertainment-ratings-enforcement

[20]Many anecdotes and articles exists to support parents' willingness to purchase M-rated games for their children. For example see http://www.bostonglobe.com/lifestyle/style/2013/01/08/parents-cringe-even-they-hand-over-credit-cards-for-call-duty-and-other-violent-video-games/BjldlLVWH2kJuIKY1fR7QP/story.html

[21]http://www.wikihow.com/Buy-M-Rated-Games

Data and methodology

Data

Crime data were obtained from the National Incident Based Reporting Systems (NIBRS); these data are collected by the U.S. Federal Bureau of Investigation (FBI). These data are also made accessible to researchers via the Interuniversity Consortium for Political and Social Research (ICPSR) database, hosted by the University of Michigan.[22] These data describe, among other things, the type and date of the crime as well as demographic information about the person(s) who committed the crime. These data include all crimes reported to the FBI for every day from 1 January 1990 through 31 December 2011. For our tests we consolidate the data by category across each day in our sample. We begin with roughly 50 million individual crimes reported by 35 states during our period of interest.[23] We further separate crime into ten different categories based on their crime-classification code.[24]

Video game data were obtained from VG Chartz.[25] This website provides an estimate of weekly unit sales starting from the day of a video game release as well as the cumulative, to-date total of video game sales. The site also contains a list of the best-selling games by region (United States, Europe, Japan, etc.). We include in our sample all Mature- and Everyone-rated games (games that can clearly be classified as violent or nonviolent, respectively) with sales of more than 1,000,000 units in the first week after release. We collect this list of best-selling video games primarily via web scraping, and we manually check each weekly best-seller list to add games omitted by the web scraping (for formatting errors, typos, etc.).

As mentioned above, our main analysis is not focused on the actual number of sales.[26] Rather, we use the available sales data as a guide to determine which event dates to include in our analysis. After identifying the dates of best-selling video game releases, we can then examine in our time series models whether these dates correspond to changes in crime.

While our main analysis is at the national level, we also conduct county-level analyses to ensure that our results are not driven by anomalous local effects. Additionally, we follow prior research (Ranson, 2014) in controlling for the effect of weather on crime, within a locality. We include three weather variables of interest: temperature, precipitation, and wind speed. Temperature is measured as the average daily temperature (in Fahrenheit), precipitation is total daily rain or snow measured in inches, and wind speed is the average daily wind speed in mph. The data is provided by the National Climactic Data Center (NCDC). This government agency provides weather data for 915 ground-based weather stations across the United States. For each county, we use data from the nearest weather station within a 100 mile radius from the geographical center of the county. Additionally, we include controls for county-level fixed effects to capture the impact of other county-specific variations (i.e. unemployment, Raphael and Winter-Ebmer (2001).

Methodology

Figure 1 reports the distribution of sales for all Mature- and Everyone-rated games that appear in the top 30 sellers in each week. Mature-rated games see much higher sales in the first weeks after release, relative to Everyone-rated games. This difference is clearly illustrated in Figure 1 for both the proportion (Figures 1a and 1b) of total video game sales. In our tests, we limit our examination to those games for which reported sales exceed 1 million units during the first week after release. In effect, this limits our sample of Everyone-rated games to those popular titles that exhibit sales distributions

[22]http://www.icpsr.umich.edu/icpsrweb/NACJD/NIBRS/
[23]States are not required to submit data to NIBRS. Thus, not all states are included in the database.
[24]See Table 5 for details and Appendix A for code definitions.
[25]Vgchartz.com.
[26]Sales data are incomplete. For example, Madden NFL 2007 has weekly sales reported for the Xbox 360 but not for the Playstation 2 even though twice as many games were sold for the Playstation (overall).

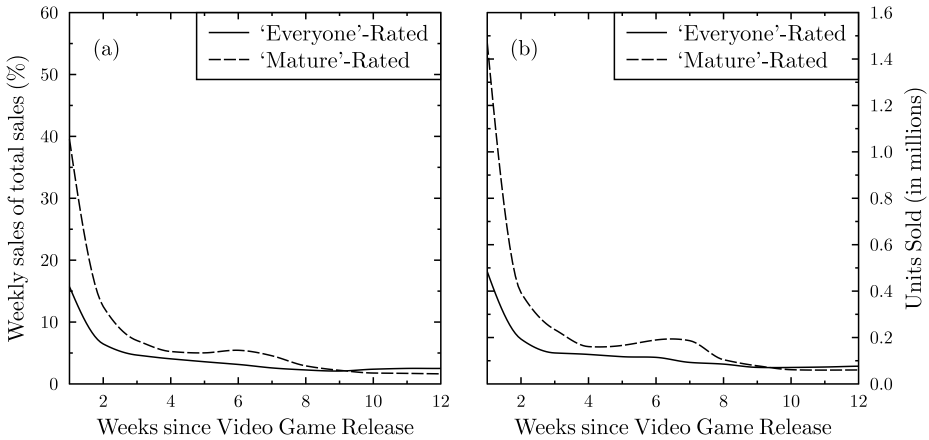

Figure 1. Weekly sales after video game release.

similar to those observed in Mature-rated games. Table 2 reports the release dates and distribution of sales for this sample of events with the game releases for the main sample in panel A and the extended sample in panel B.

We begin our analysis by examining the average level of daily crime during the two weeks following the release of a Mature-rated video game compared to the average level of daily crime during the remaining days in our sample.[27]

In multivariate tests we use time-series regression analysis to test the overall relation between daily crime rates and Mature video games releases. We employ the following model specification:

$$Crime_t = \beta_0 + \beta_1 Mature_{t,-6,0} + \beta_2 Mature_{t,-13,-7} + \beta_3 Everyone_{t,-6,0} +$$

$$\beta_4 Everyone_{t,-13,-7} + \Gamma(Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}) + \qquad (1)$$

where $Crime_t$ is the dependent variable, measured as the natural log of the total national-level crime incidents on a given day (t). We construct two variables ($Mature_{t,-6,0}$ and $Mature_{t,-13,-7}$) that count the number of best-selling Mature game releases relative to day t. $Mature_{t,-6,0}$ counts the number of Mature game releases in days $t-6$ through t, thus capturing the association between crime and Mature game releases within the first 7 days after release. Similarly, $Mature_{t,-13,-7}$ captures this association for the second week after release. Combined, these variables capture the association between blockbuster Mature game releases and crime in the following 14 days. We construct corresponding variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ for Everyone game releases.[28]

We also include day, month, and year indicators ($Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}$) (not reported). The standard errors are robust.[29]

In order to test H2 and examine the effect of video games on adolescent crime, we utilize the same model as above, but break our sample into 2 different age groups: under 17, and 17 and older. We construct $Crime_{t,\leq 16}$ ($Crime_{t,\geq 17}$) as the natural log of daily crime that involves at least one offender that is under 17 (17 or older). The first group allows us to examine the effect that video game releases have on adolescent crime, while the second allows us to examine the corresponding effect for adults.

[27]This is not to suggest that we expect crime spurred by video game violence only occurs in the first weeks after the release. However, the strength of our event study approach is in identifying changes in crime rates around date-related shocks. Given that high levels of video game play occur in the weeks after release (Bavelier & Davidson, 2013), our ability to identify crime associated with video games is strongest in the very short run after release.

[28]Results are very similar when we do not use a count but use indicator variables instead (1 if one or more games has been released, 0 otherwise).

[29]We obtain essentially the same results when using Newey-West standard errors using a lag of one day, as well as seven days.

Table 2. Game releases.

Game	Released	Game	Released
Panel A: Main sample			
Madden 2007	22 August 2006	Halo 3	25 September 2007
Pokemon Diamond and Pearl	28 April 2007	COD 4: Modern Warfare	5 November 2007
Madden 2008	14 August 2007	GTA 4	29 April 2008
Mario Kart Wii	27 April 2008	COD: World at War	1 November 2008
Madden 2009	12 August 2008	Gears of War 2	7 November 2008
Madden 2010	14 August 2009	Halo 3: ODST	22 September 2009
Madden 2011	10 August 2010	COD: Modern Warfare 2	10 November 2009
Pokemon Black and White	6 March 2011	Red Dead Redemption	18 May 2010
Madden 2012	30 August 2011	Halo Reach	14 September 2010
		COD: Black Ops	9 November 2010
		Gears of War 3	20 September 2011
		Battlefield 3	25 October 2011
		COD: Modern Warfare 3	8 November 2011
		The Elder Scrolls V: Skyrim	11 November 2011
		Assassin's Creed: Revelations	15 November 2011
Panel B: Extended sample			
Brain Age	17 April 2006	Gears of War	7 November 2006
NCAA Football 07	18 July 2006	God of War 2	13 March 2007
Madden 2007	22 August 2006	Halo 3	25 September 2007
Zelda: Twilight Princess	19 November 2006	Assassin's Creed	13 November 2007
Pokemon Diamond and Pearl	28 April 2007	GTA 4	29 April 2008
Mario Party 8	29 May 2007	Fable 2	21 October 2008
Madden 2008	14 August 2007	COD: World at War	1 November 2008
Brain Age 2	20 August 2007	Gears of War 2	7 November 2008
Zelda: Phantom Hourglass	2 October 2007	Resident Evil 5	13 March 2009
Mario and Sonic: Olympic Games	6 November 2007	Halo 3: ODST	22 September 2009
Mario Kart	27 April 2008	COD: Modern Warfare 2	10 November 2009
Madden 2009	12 August 2008	Assassin's Creed 2	17 November 2009
Pokemon Platinum	22 March 2009	Left 4 Dead 2	17 November 2009
EA Sports Active Bundle	19 May 2009	Battlefield: Bad Company 2	2 March 2010
Wii Sports Resort	26 July 2009	Red Dead Redemption	18 May 2010
Madden 2010	14 August 2009	Halo: Reach	14 September 2010
Mario and Luigi: Bowser's (. . .)	14 September 2009	Fallout: New Vegas	19 October 2010
Wii Fit Plus	4 October 2009	Assassin's Creed: Brotherhood	16 November 2010
NBA 2K10	6 October 2009	Mortal Kombat	19 April 2011
New Super Mario	15 November 2009	L.A. Noire	17 May 2011
Just Dance	17 November 2009	Gears of War 3	20 September 2011
Pokemon Soulsilver Version	14 March 2010	Battlefield 3	25 October 2011
Super Mario Galaxy	12 May 2010	COD: Modern Warfare 3	8 November 2011
Madden 2011	10 August 2010	The Elder Scrolls V: Skyrim	11 November 2011
NBA 2K11	5 October 2010	Assassin's Creed: Revelations	15 November 2011
Just Dance 2	12 October 2010		
Zumba Fitness: Join the Party	18 November 2010		
Donkey Kong Country Returns	21 November 2010		
Pokemon Black and White	6 March 2011		
Lego Star Wars 3	22 March 2011		
NCAA Football 12	12 July 2011		
Madden 2012	30 August 2011		
NBA 2K12	4 October 2011		
Just Dance 3	7 October 2011		

Panel A includes the name and release date of games released in 2006–2011 with units sales exceeding 1 million in the first week of release, which are included in our main sample. Panel B shows the name and release date of games released in 2006–2011 with lifetime sales exceeding 1 million copies, which are included in our extended sample. Game sales data is retrieved from www.vgchartz.com. Some game names have been abbreviated: COD stands for Call of Duty, and GTA is short for Grand Theft Auto.

Table 3. Video games sales by genre.

Genre	2006	2007	2008	2009	2010	2011	2012	2013	Average
Action	27.5	22.3	20.0	19.5	21.7	19.0	22.3	31.9	23.0
Sport Games	17.0	14.1	15.3	19.6	16.3	14.8	15.3	12.7	15.6
Shooter	10.6	12.1	10.9	12.2	15.9	18.4	21.2	20.0	15.2
Family Entertainment	9.3	17.6	19.3	15.3	9.1	11.0	8.6	5.5	12.0
Role Playing	9.5	7.6	5.4	5.8	7.7	7.2	6.5	7.0	7.1
Racing	10.8	8.3	8.4	6.7	5.8	5.8	5.8	4.6	7.0
Adventure	3.4	4.3	5.3	6.6	7.5	9.5	8.3	6.9	6.5
Fighting	4.6	4.5	5.1	4.1	3.0	3.7	3.9	3.9	4.1
Strategy	2.7	4.7	6.2	6.4	3.8	2.8	2.3	3.4	4.0
Other Games	2.0	2.3	2.2	2.0	2.7	2.1	1.7	1.2	2.0
Casual	0.0	0.0	0.0	0.0	5.2	4.0	3.0	2.3	1.8
Children's Entertainment	1.6	1.0	0.9	0.9	0.7	0.8	0.5	0.3	0.8
Flight	0.9	0.7	0.5	0.4	0.4	0.6	0.3	0.1	0.5
Arcade	0.9	0.5	0.5	0.3	0.2	0.2	0.2	0.2	0.4

This table reports the breakdown of units sold of the best-selling video game sales by genre over 2006–2013, as reported by the Entertainment Software Association (ESA) in their yearly `Essential Facts' publications. We also include the 2006–2013 average in the last column, which is used to sort the genres.

Table 4. Crime by year and age group.

Measure	2006	2007	2008	2009	2010	2011
$Crime_t$	14,121	14,420	14,437	14,588	14,603	14,669
$Crime_{t,NA}$	7,003	7,062	7,037	6,952	6,962	6,945
$Crime_{t,\leq 16}$	911	917	907	864	829	800
$Crime_{t,\geq 17}$	6,442	6,689	6,736	7,019	7,059	7,146

Crime ($Crime_t$) is measured as the number of offenses recorded on a certain day. For roughly half the offenses there is data available on the age of the offenders involved. We construct $Crime_{t,\leq 16}$ and $Crime_{t,\geq 17}$ to partition the crime by age group. $Crime_{t,NA}$ measures offenses with no data on offenders' age. $Crime_{t,\leq 16}$ ($Crime_{t,\geq 17}$) is the number of offenses on a certain date, where one of the offenders was 16 years or younger (17 years or older). The sum of $Crime_{t,NA}$, $Crime_{t,\leq 16}$, and $Crime_{t,\geq 17}$ is slightly more than $Crime_t$ as some offenses include multiple offenders and these offenders fall in both the $\leq$ 16 and $\geq$ 17 age groups. The crime measures have been winsorized by year at 1% and 99%.

We further test this relation by breaking crime into different categories (Property, Violent, Drug, Destruction of Property, and Confidence Crimes) and examine the effect of video game releases on crime for each age group by crime category.[30]

Results

Main results

Table 3 breaks video game industry sales into categories – each value represents the percent of total units sold (category sales divided by total industry sales) for a given year in the indicated category. Of note, we see that shooter games double (relative to all other sales) from 2006 to 2013 and Family/Children's Entertainment go down by half (relative to all other sales). Table 4 shows all crimes by each age category for each year in our sample. Overall, crime increases over the years of our sample. However, this increase is driven by increases in adult crime (17 and over). We actually see a decrease in youth crime (16 and under) during our sample period. The pattern seen in Tables 3 and 4 is similar to that documented in Ferguson (2008), p. – youth crime, overall, is decreasing while violent game sales are increasing.

[30]Several types of crime do not change after the release of any type of game: Confidence (tabulated), Incest, Bribery, and Gambling. We note that these types of crimes are less prevalent in popular violent video games.

Table 5. Summary statistics.

	Full sample					
Total crime	Min	Median	Mean	Max	Stdev.	N
$Crime_t$	9,916. 0	14,582. 0	14,473. 0	20,229. 0	1,595. 0	2, 191
Crime by category						
$Crime_{t,Property}$	3,977. 0	6,413. 0	6,363. 8	9,516. 0	882. 0	2, 191
$Crime_{t,Violent}$	2,544. 0	3,437. 0	3,453. 4	4,647. 0	411. 5	2, 191
$Crime_{t,DestructionofProperty}$	1,386. 0	2,449. 0	2,430. 1	3,280. 0	362. 6	2, 191
$Crime_{t,Drugs}$	606. 0	1,215. 0	1,200. 1	1,766. 0	217. 9	2, 191
$Crime_{t,Con}$	374. 0	1,034. 0	949. 4	1,895. 0	263. 1	2, 191
$Crime_{t,Prostitution}$	0. 0	29. 0	31. 8	141. 0	19. 8	2, 191
$Crime_{t,Non-ViolentSexual}$	4. 0	25. 0	27. 4	176. 0	14. 8	2, 191
$Crime_{t,Incest}$	0. 0	3. 0	3. 4	36. 0	3. 0	2, 191
$Crime_{t,Gambling}$	0. 0	3. 0	3. 2	65. 0	3. 0	2, 191
$Crime_{t,Bribery}$	0. 0	1. 0	0. 9	11. 0	1. 1	2, 191
$Crime_{t,Missing}$	0. 0	0. 0	0. 0	4. 0	0. 2	2, 191

This table reports descriptive statistics for our sample of daily crime over 2006–2011 for the United States. $Crime_t$ is the daily total number of offenses, crime by category lists the number of offenses in each category, sorted in descending order. The variables are winsorized by year at 1% and 99%. As a result of winsorizing, the sum of mean crime by category only approximates total crime. The crime categories are based on the offense codes included in the crime data of the National Incident-Based Reporting System (NIBRS). See appendix which offenses are included in each of the categories. When a NIBRS record includes multiple offenses that fall in the same category, we consider that a single crime. When a NIBRS record includes multiple offenses that fall in different categories, we consider each of the offenses a crime.

Table 6. Univariate test mature-Rated game releases.

	$Mature_{1-14} = 0$			$Mature_{1-14} \geq 1$			Difference ($\geq$ 1–0)	
	Median	Mean	N	Median	Mean	N	Median	Mean
$Crime_t$	14,575. 0	14,448. 1	2, 010	14,656. 0	14,749. 2	181	81. 0	301. 1**
$Crime_{t,NA}$	7,011. 5	6,979. 4	2, 010	7,095. 0	7,149. 4	181	83. 5*	170. 0**
$Crime_{t,\leq16}$	872. 0	867. 2	2, 010	961. 0	916. 9	181	89. 0**	49. 7**
$Crime_{t,\geq17}$	6,847. 0	6,842. 0	2, 010	6,925. 0	6,921. 3	181	78. 0	79. 3

* and ** indicate significance at 5% and 1%, respectively.

This table reports descriptive statistics for daily crime where we partition the sample in fourteen days following a `Mature' rated game ($Mature_{t,1-14} \geq 1$) versus other days ($Mature_{t,1-14}$ equals 0). Crime ($Crime_t$) is measured as the number of offenses recorded on a certain day. $Crime_{t,NA}$ measures offenses with no data on offenders' age for day t. $Crime_{t,\leq16}$ ($Crime_{t,\geq17}$) is the number of offenses on a certain date, where one of the offenders was 16 years or younger (17 years or older). Differences in medians (means) are tested with Wilcoxon-Mann-Whitney ranked test (t-test). The variables are winsorized by year at 1% and 99%.

Table 5 reports summary statistics of daily crime for each category. Property, violent, destruction of property, drug, and confidence crime make up the vast majority of crime incidents reported during our sample period. We limit our later tests to these five main categories. Table 6 reports univariate tests of H1 and H2 (the effect of violent game releases on crime overall and youth crime, respectively). We see that crime is higher in the two weeks following the release of a best-selling violent video game for all age categories. This increase is statistically significant overall (in the combined sample containing youth and adults) and for youth, but not for adults. This is preliminary evidence that the release of a violent video game is followed by an increase in crime in the subsequent weeks.

In H1 we predict that the release of a violent video game is not associated with any significant change in overall crime. Column 1 in Table 7 contains our main test of hypothesis 1. Overall, we see that crime is higher in the first week after the release of a Mature-rated game. Specifically, we interpret the coefficient for $Mature_{-6,0}$ to mean that in the week following the release of a best-selling violent video game, total crime at the national level increases by roughly 2%.[31] These results indicate that either the arousal or desensitization effect dominates the incapacitation effect for violent video games. Our models detect no such increase in crime after the release of a blockbuster nonviolent video game.

In H2 we predict that to the extent young people (under 17) play Mature-rated video games, these games will lead to an increase in crime in the under 17 age group. Column 2 in Table 7 presents results for this age group. In the week following the release of a best-selling violent video game, there is roughly a 6% increase in crime nationally for youth. However, after the release of a nonviolent video game there is no corresponding change in the level of crime among the under 17 age group in either the first or the second week after release. This is consistent with violent video games inducing criminal behavior in adolescents. We also see that crime for adults increases in the week following the release of a violent game (1.7%), but that this increase is considerably smaller than that observed for youth.

We further examine which types of crime are driving the changes in crime identified above. Table 8 reports results of analysis for each type of crime for the under 17 age group. The increase in overall teen crime following the release of a popular violent video game is driven by increases in violent crime,

Table 7. All crimes – Full sample and age groups.

	All	Age Groups	
	$Crime_t$	$Crime_{t,\leq 16}$	$Crime_{t,\geq 17}$
Panel A: Mature game releases			
$Mature_{t,-6,0}$	0. 020	0.062	0. 017
	(3. 630)**	(6. 100)**	(3. 370)**
$Mature_{t,-13,-7}$	0. 008	0. 020	0. 010
	(0. 950)	(1. 160)	(1. 440)
Day of the week Fixed Effects	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
N	2. 191	2, 191	2, 191
R^2	0. 683	0. 696	0. 701
Panel B: Mature and Everyone game releases			
$Mature_{t,-6,0}$	0. 020	0. 062	0. 017
	(3. 640)**	(6. 060)**	(3. 350)**
$Mature_{t,-13,-7}$	0. 008	0. 020	0. 010
	(0. 970)	(1. 150)	(1. 460)
$Everyone_{t,-6,0}$	−0. 004	0. 007	0. 002
	(−0. 400)	(0. 510)	(0. 300)
$Everyone_{t,-13,-7}$	−0. 009	0. 005	−0. 005
	(−1. 530)	(0. 410)	(−0. 860)
Day of the week Fixed Effects	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
N	2, 191	2, 191	2, 191
R^2	0. 683	0. 696	0. 702

* and ** indicate significance at 5% and 1%, respectively.

This table reports OLS regressions explaining daily crime over the period 2006–2011. The dependent variable in Model 1 is $Crime_t$, which is the natural log of one plus the total number of offenses recorded for each day. The dependent variables in Models 2 and 3 are $Crime_{t,\leq 16}$ and $Crime_{t,\geq 17}$, respectively. $Crime_{t,\leq 16}$ ($Crime_{t,\geq 17}$) is the number of offenses on a certain date, where one of the offenders was 16 years or younger (17 years or older). The relation between video games and crime is tested with variables *Mature* and *Everyone*. Variable $Mature_{t,-6,0}$ ($Mature_{t,-13,-7}$) captures the number of Mature games released in the seven day window – day t-6 through t (day t-13 through t-7). Similary, variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ count the Everyone game releases. Panel A includes *Mature* variables, panel B includes both *Mature* and *Everyone* variables. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included in both panels but not reported.

[31]Percentages are calculated by raising e to the coefficient value obtained from estimating our regression equation.

Table 8. Crime by category for offenders $\leq$ 16 Years.

	Crime Category				
	Property	Violent	Prop. Destr.	Drugs	Con
$Mature_{t,-6,0}$	0. 030	0. 093	0. 031	0. 127	0. 026
	(3. 050)**	(5. 420)**	(2. 140)*	(6. 390)**	(0. 960)
$Mature_{t,-13,-7}$	0. 017	0. 023	−0. 009	0. 057	0. 000
	(1. 260)	(0. 800)	(−0. 590)	(1. 780)	(0. 010)
$Everyone_{t,-6,0}$	−0. 005	0. 016	−0. 003	−0. 006	0. 027
	(−0. 360)	(0. 650)	(−0. 170)	(−0. 190)	(0. 830)
$Everyone_{t,-13,-7}$	031	0. 049	−0. 030	0. 034	−0. 057
	(−2. 410)*	(2. 200)*	(−2. 050)*	(1. 360)	(−1. 900)
Day of the week Fixed Effects	Yes	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	2. 191	2, 191	2,191	2, 191	2, 191
R^2	0. 599	0. 681	0. 650	0. 660	0. 308

* and ** indicate significance at 5% and 1%, respectively.

This table reports OLS regressions explaining daily crime involving offenders aged 16 or younger ($Crime_{t,\leq16}$) over the period 2006–2011 by crime category. The dependent variables for Models 1–5 are $Crime_{t,\leq16,Property}$, $Crime_{t,\leq16,Violent}$, $Crime_{t,\leq16,DestructionofProperty}$, $Crime_{t,\leq16,Drugs}$, $Crime_{t,\leq16,Con}$, respectively. These are constructed as the natural log of one plus the number of offenses of that category, where one of the offenders is aged 16 or younger ($Crime_{t,\leq16}$). The relation between video games and crime is tested with variables *Mature* and *Everyone*. Variable $Mature_{t,-6,0}$ ($Mature_{t,-13,-7}$) captures the number of Mature games were released in the seven day window – day *t*-6 through *t* (day *t*-13 through *t*-7). Similary, variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ count the Everyone game releases. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included but not reported.

Table 9. Crime by category for offenders $\geq$ 17 Year.

	Crime Category				
	Property	Violent	Prop. Destr.	Drugs	Con
$Mature_{t,-6,0}$	0. 025	0. 010	0. 012	0. 024	0. 018
	(3. 940)**	(1. 830)	(1. 910)	(3. 040)**	(1. 350)
$Mature_{t,-13,-7}$	0. 016	0. 004	0. 005	0. 023	0. 015
	(1. 550)	(0. 620)	(0. 640)	(1. 940)	(0. 730)
$Everyone_{t,-6,0}$	−0. 004	0. 003	0. 010	0.005	−0. 007
	(−0. 370)	(0. 350)	(1. 120)	(0. 680)	(0. 340)
$Everyone_{t,-13,-7}$	−0. 015	−0. 002	−0. 009	0. 011	−0. 010
	(−2 100)*	(−0. 260)	(−1. 040)	(1.310)	(−0. 620)
Day of the week Fixed Effects	Yes	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	2, 191	2, 191	2, 191	2, 191	2, 191
R^2	0. 736	0. 818	0. 779	0. 770	0. 734

* and ** indicate significance at 5% and 1%, respectively.

This table reports OLS regressions explaining daily crime involving offenders aged 17 or older ($Crime_{t,\geq17}$) over the period 2006–2011 by crime category. The dependent variables for Models 1–5 are $Crime_{t,\geq17,Property}$, $Crime_{t,\geq17,Violent}$, $Crime_{t,\geq17,DestructionofProperty}$, $Crime_{t,\geq17,Drugs}$, $Crime_{t,\geq17,Con}$, respectively. These are constructed as the natural log of one plus the number of offenses of that category, where one of the offenders is aged 17 or older ($Crime_{t,\geq17}$). The relation between video games and crime is tested with variables *Mature* and *Everyone*. Variable $Mature_{t,-6,0}$ ($Mature_{t,-13,-7}$) captures the number of Mature games were released in the seven day window – day *t*-6 through *t* (day *t*-13 through *t*-7). Similary, variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ count the Everyone game releases. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included but not reported.

destruction of property crime, and drug crimes. Furthermore, we see no increase in crime following the release of nonviolent video games, but rather a decrease in several types of crime (Property, Destruction of Property).

Table 10. Crime by gender and age.

	Female		Male	
	$Crime_{t,\leq 16}$	$Crime_{t,\geq 17}$	$Crime_{t,\leq 16}$	$Crime_{t,\geq 17}$
$Mature_{t,-6,0}$	0. 052	0. 020	0. 061	0. 015
	(4. 770)**	(3. 240)**	(5. 370)**	(2. 980)**
$Mature_{t,-13,-7}$	0. 007	0. 007	0. 021	0. 011
	(0. 380)	(0. 800)	(1. 260)	(1. 750)
$Everyone_{t,-6,0}$	0. 003	0. 001	0. 011	0. 004
	(0. 180)	(0. 080)	(0. 790)	(0. 450)
$Everyone_{t,-13,-7}$	0. 002	−0. 007	0. 005	−0. 003
	(0. 140)	(−1. 020)	(0. 420)	(−0. 640)
Day of the week Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
N	2, 191	2, 191	2, 191	2, 191
R^2	0. 637	0. 729	0. 689	0. 700

* and ** indicate significance at 5% and 1%, respectively.

This table reports OLS regressions explaining daily crime over the period 2006–2011 by gender and age group. The dependent variable in Models 1 and 2 (3 and 4) is the natural log of one plus the number of offenses where at least one of the offenders is female (male), which is further split by age. Models 1 and 3 (2 and 4) include offenses where at least one of the offenders is aged 16 or younger (17 or older). Variable $Mature_{t,-6,0}$ ($Mature_{t,-13,-7}$) captures the number of Mature games were released in the seven day window – day t-6 through t (day t-13 through t-7). Similary, variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ count the Everyone game releases. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included but not reported.

Table 9 reports changes by type of crime for the 17 and older group. This group sees an increase in property crime and drug crime after the release of a violent video game. Consistent with results reported in Table 7, the percentage change in crime for this older group is much smaller than the percentage change in crime observed for adolescents. On average, youth crime increases about four times as much as adult crime after the release of a best-selling violent video game. In Table 10 we see no statistically significant difference in the change in crime between males or females of any age. This is consistent with prior work in psychology.

Finally, to provide some benchmark for our results, we note that Gould et al. (2002) find that reducing unemployment by 1% or 2% would also lead to a decrease in crime among non-college educated men by about 3% to 6%. Likewise, Moca and Tekin (2006) and Grogger (2002) find that reduced access to firearms and implementing injunctions against street gangs, respectively, also decrease crime by about 5% among youth. Anderson (2014) finds that increasing the minimum high school dropout age from 16 or 17 to 18, which reduces dropout rates by about 20%, also substantially decreases youth crime by about 15%. Collectively, these findings suggest that playing violent video games leads to increased crime among youth in similar magnitudes as unemployment, easier access to guns, gang activity, and dropping out of school. While our econometric strategy is only able to identify short-horizon effects, our results are indicative of exposure to video game violence being as harmful, in some cases, as other societal ills typically considered much more serious.

Jackknife procedure

In our research design, we capitalize on the fact that major mature video game releases sell many millions of units in the first two weeks after the release date. By focusing on major releases – and ignoring video game sales of less popular releases – it is most likely that we can detect changes in crime. One drawback of focusing on major releases is that we limit the number of events in our study. To investigate if our results are driven by a single event, and are therefore not generalizable to the population of mature video game releases, we perform a Jackknife procedure for the under 17 results.

First, we estimate the following regression:

Table 11. Jackknife procedure for youth crime ($Crime_{\leq 16}$).

Estimate	t-value	*p*-value	Release date	Game	Sales week 1
0.038	3.48	0.0005	20 September 2011	Gears of War 3	1,828,803
0.039	2.89	0.0039	8 November 2011	Call of Duty: Modern Warfare 3	5,983,587
0.039	3.57	0.0004	25 September 2007	Halo 3	N.A.
0.040	3.84	0.0001	9 November 2010	Call of Duty: Black Ops	5,637,333
0.040	3.86	0.0001	5 November 2007	Call of Duty: Modern Warfare	N.A.
0.040	3.89	0.0001	10 November 2009	Call of Duty: Modern Warfare 2	4,196,478
0.041	3.74	0.0002	1 November 2008	Call of Duty: World at War	1,128,503
0.041	3.76	0.0002	14 September 2010	Halo Reach	2,399,908
0.042	3.98	<.0001	25 October 2011	Battlefield 3	2,553,374
0.043	3.87	0.0001	7 November 2008	Gears of War 2	1,111,510
0.043	3.91	<.0001	29 April 2008	Grand Theft Auto 4	3,007,425
0.044	4.04	<.0001	22 September 2009	Halo 3: ODST	1,425,843
0.045	4.14	<.0001	18 May 2010	Red Dead Redemption	1,001,211
0.053	4.97	<.0001	11 November 2011	The Elder Scrolls V: Skyrim	1,841,343
0.055	5.23	<.0001	15 November 2011	Assassin's Creed: Revelations	1,012,624

This table reports the sensitivity of the results for the individual Mature-rated game releases on crime involving offenders age 16 or younger ($Crime_{\leq 16}$), reported in Table 7, column 2. We first estimate the regression $Crime_{t,\leq 16} = \beta_0 + \beta_1 Mature_{t,-13,0} + \beta_2 Everyone_{t,-13,0} + \Gamma(Controls_1, Controls_2, \ldots, Controls_k) +$, where $Mature_{t,-13,0}$ ($Everyone_{t,-13,0}$) captures the association between Mature-rated (Everyone-rated) video game releases and youth crime in the 14 day period following the release, while controlling for day of the week, month, and year indicators ($Controls_1, Controls_2, \ldots, Controls_k$). The coefficients for $Mature_{t,-13,0}$ and $Everyone_{t,-13,0}$ are 0.0412 and 0.0063, with t-values 3.95 and 0.62, respectively. To assess the sensitivity of the individual game releases to the coefficient of $Mature_{t,-13,0}$ we repeat this regression for each Mature-rated game while excluding the 14 day period following the game release (thus excluding the game from the sample). Game release events with a positive (negative) impact on crime should result in a lower (higher) coefficient for $Mature_{t,-13,0}$ when excluded from the sample. The coefficient for $Mature_{t,-13,0}$, as well as t-value and *p*-value are tabulated for each Mature-rated game. The table is sorted by the coefficient (low to high). For games released in 2008 or later, we include the first week sales following the game release. The Pearson (Spearman rank) correlation between the estimate of $Mature_{t,-13,0}$ and first week game sales is –0.48 (–0.60) – significant at 10% (5%).

$$Crime_{t,\leq 16} = \beta_0 + \beta_1 Mature_{t,-13,0} + \beta_2 Everyone_{t,-13,0} +$$

$$\Gamma(Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}) + \quad (2)$$

where we combine $Mature_{t,-6,0}$ and $Mature_{t,-13,-7}$ ($Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$) into a single variable $Mature_{t,-13,0}$ ($Everyone_{t,-13,06}$) counting the best-seller Mature (Everyone) releases in the 2-week period (days −13 through day 0) relative to day t. We include day-of-the week, month, and year indicator variables ($Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}$) (not reported). For the sample including all games, the coefficients for $Mature_{t,-13,0}$ and $Everyone_{t,-13,0}$ are 0.0412 and 0.0063, with t-values 3.95 and 0.62, respectively. We interpret the former coefficient to mean that for the fourteen days following a popular Mature-rated game's release, youth crime is 4.21%[32] per Mature game release higher than during other (nonevent) weeks in our sample period.

We repeat this regression excluding each game release, one at a time. Thus, for each game we assess the impact on the full-sample coefficients, where games with the greatest impact on crime will result in a lower coefficient on $Mature_{t,-13,0}$ when left out. In order to show that our results are not driven by one event, we must find that for each estimation the coefficient on $Mature_{t,-13,0}$ remains both directionally the same and statistically significant.

Results are reported in Table 11. The coefficient for $Mature_{t,-13,0}$, as well as t-values and p-values are tabulated for each Mature-rated game. The table is sorted by the coefficient of $Mature_{t,-13,0}$, thus listing the games in order of their impact on crime. The game with the largest impact on crime is Gears of War 3. When this game is excluded from the sample, the coefficient for $Mature_{t,-13,0}$ drops from 4.1% to 3.9%, which is still significantly different from 0 (t-value 2.89). This suggests that none of the

[32]Calculated as $e^{0.0412} - 1$.

games individually drives the results.[33] We test if there is a relation between the coefficient for $Mature_{t,-13,0}$ and the first-week sales of each game. Assuming the games are equally violent, higher sales would impact crime more, ceteris paribus. The Pearson (Spearman rank) correlation between the estimate of $Mature_{t,-13,0}$ and first week game sales is −0.48 (−0.60) – significant at 10% (5%). This is consistent with higher-selling Mature-rated games having a greater impact on the estimated association between Mature-rated game releases and crime.

Sensitivity analyses

Controlling for weather

Previous research has shown that the weather is an important determinant of crime (Ranson, 2014). Because we aggregate crime at the national level in our main tests, the possibility exists that local weather conditions could be driving the observed changes in crime. Accordingly, our main results may be biased if video game play is correlated with weather. In this section, we repeat our analyses controlling for temperature, precipitation, and wind speed. Because weather conditions vary by location, we perform these analyses at the county level. There are 1,297 unique counties for the 35 states in our dataset.

Because crime between counties varies widely, we compute a daily crime index (*CCrime*) for each county-year. For each county, we divide the number of daily crimes by the daily average (total number of crimes per year divided by 365). By construction the average ratio will be equal to 1 for each county-year. This allows us to compare changes in crime across counties. Also, this controls for factors such as demographics that explain crime and vary between counties, but are constant within counties. We include only county-years where the average number of offenses per day exceeds 1. We construct *CCrime* for the full sample, as well as for two subsamples based on the offenders age. $CCrime_{\leq 16}$ ($CCrime_{\geq 17}$) are constructed similarly by only including offenses where at least one of the offenders was 16 years or younger (17 or older).

We estimate the following regression:

$$CCrime_{i,t} = \beta_0 + \beta_1 Mature_{t,-6,0} + \beta_2 Mature_{t,-13,-7} + \beta_3 Everyone_{t,-6,0} +$$

$$\beta_4 Everyone_{t,-13,-7} + \beta_5 Temperature_{i,t} + \beta_6 Precipitation_{i,t} + \beta_7 Wind_{i,t} +$$

$$\mathbf{\Gamma}(Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}) + \qquad (3)$$

CCrime is the dependent variable previously discussed, and *Temperature*, *Precipitation* and *Wind* are the weather control variables. The test variables (*Mature* and *Everyone*) and control variables ($Controls_{t,1}, Controls_{t,2}, \ldots, Controls_{t,k}$) are the same as used in the main analysis. We also include county fixed effects.

Results for our weather sensitivity analysis are reported in Table 12. We run this county-level regression both with and without the weather control variables, tabulated in panel A and B, respectively. Consistent with prior research (Ranson, 2014) and our expectations, we find that crime is positively related to temperature and negatively related to both precipitation and wind speed. The effect of video game releases on crime is slightly smaller after controlling for weather conditions, but the signs and significance remain unchanged from our main results. In addition, we also run Poisson and Negative Binomial (count) regressions using the daily county data without constructing an index (to predict the number of crimes committed per day). Results are very similar to those reported in our main tests. In summary, aggregating crime to the national level without controlling for weather does not seem to have biased the results.

[33]This is particularly important for the Grant Theft Auto 4 release, given that it overlaps with the Mario Kart Wii release. See Table 2.

Table 12. County level regressions.

	All	Age Groups	
	$CCrime$	$CCrime_{\leq 16}$	$CCrime_{\geq 17}$
Panel A: Controlling for weather			
$Mature_{t,-6,0}$	0. 016	0. 041	0. 014
	(6. 580)**	(6. 460)**	(4. 810)**
$Mature_{t,-13,-7}$	0. 006	0. 018	0. 009
	(2. 410)*	(2. 830)**	(3. 240)**
$Everyone_{t,-6,0}$	0. 002	0. 004	0. 004
	(0. 580)	(0. 520)	(1. 080)
$Everyone_{t,-13,-7}$	−0. 012	0. 010	−0. 008
	(−3. 820)**	(1. 130)	(−2. 020)*
Temperature	0. 005	0. 004	0. 004
	(83. 880)**	(24. 640)**	(56. 610)**
Precipitation	−0. 070	−0. 101	−0. 067
	(−35. 140)**	(−18. 500)**	(−27. 670)**
Wind	−0. 003	−0. 005	−0. 003
	(−16. 920)**	(−12. 990)**	(−16. 220)**
N	1,710,545	341, 092	1,323,801
R^2	0. 027	0. 043	0. 016
Panel B: Not controlling for weather			
$Mature_{t,-6,0}$	0. 021	0. 046	0. 018
	(8. 860)**	(7. 230)**	(6. 410)**
$Mature_{t,-13,-7}$	0. 011	0. 021	0. 013
	(4. 490)**	(3. 270)**	(4. 570)**
$Everyone_{t,-6,0}$	0. 001	0. 000	0. 003
	(0. 280)	(−0. 010)	(0. 770)
$Everyone_{t,-13,-7}$	−0. 015	0. 010	−0. 009
	(−4. 660)**	(1. 150)	(−2. 380)*
N	1,743,108	346, 451	1,347,054
R^2	0. 023	0. 040	0. 013

* and ** indicate significance at 5% and 1%, respectively.

This table reports Fixed Effects regressions results explaining daily crime over the period 2006–2011, where crime is measured at the county-day level for the age groups (≤ 16 and ≥ 17) as well as the total offenses regardless offenders' age. We first compute average daily crime for each county-year, and scale daily total county crime by that average. The average county daily crime is 1, but varies with the actual crime on any given day. The dependent variable in Model 1 is $CCrime_{i,t}$, which is the crime index based on all offenses for each county-day. The dependent variables in Models 2 and 3 are $CCrime_{i,t,\leq 16}$ and $CCrime_{i,t,\geq 17}$, respectively, which are constructed similarly, but satisfying the corresponding age constraints. In Panel A, we control for average temperature (*Temperature*), precipitation (*Precipitation*) and wind speed (*Wind*), which are measured daily and are taken from the nearest weather station, which we require to be within a 100 mile distance from the county-center. Counties that have no weather station are included in the sample used in panel B. Indicator variables for county, the day of the week, month and year effects are included but not reported.

The influence of alcohol

Next, we extend the county-level test by interacting alcohol use with the violent game release variables. The National Alcohol Beverage Control Association (NABCA) has data available on which counties have no alcohol sales of any kind. We construct an indicator variable *Dry* which is 1 for such counties, 0 otherwise.[34] We interact this variable with $Mature_{t,-6,0}$ and $Mature_{t,-13,-7}$. If alcohol consumption increases the effect of violent gameplay on crime these interaction variables should be negative. As reported in Table 13 we find a negative coefficient for *Dry*, suggesting that crime is lower in counties with no alcohol sales, and we also find negative and significant coefficients (at 1%) for the two interaction variables when using all datapoints (first column).

In fact, the magnitude of these interaction terms indicates that in dry counties, the main effect of violent games on crime is completely moderated. This suggests that alcohol is a necessary channel through which exposure to violent video games contributes to crime. Notably, this corresponds to the intuition of Dahl and DellaVigna (2009), who attribute the reduction in crime around the release of violent films to the fact that moviegoers do not have access to alcohol in most cinemas. Also related,

[34]Out of 3,221 counties, 148 are 'dry'.

Table 13. County level regressions – Dry counties.

	All	Age Groups	
	CCrime	$CCrime_{\leq 16}$	$CCrime_{\geq 17}$
$Mature_{t,-6,0}$	0. 019	0. 042	0. 016
	(7. 880)**	(6. 550)**	(5. 570)**
$Mature_{t,-13,-7}$	0. 010	0. 022	0. 012
	(3. 960)**	(3. 340)**	(4. 020)**
$Everyone_{t,-6,0}$	0. 002	0. 004	0. 004
	(0. 540)	(0. 500)	(1. 060)
$Everyone_{t,-13,-7}$	−0. 013	0. 009	−0. 008
	(−3. 980)**	(1. 120)	(−2. 110)*
Dry	−0. 015	−0. 015	−0. 014
	(−6. 720)**	(−1. 250)	(−4. 600)**
$Dry \times Mature_{t,-6,0}$	−0. 026	0. 050	−0. 017
	(−2. 810)**	(1. 040)	(−1. 340)
$Dry \times Mature_{t,-13,-7}$	−0. 028	−0. 102	−0. 010
	(−2. 970)**	(−2. 130)*	(−0. 840)
Temperature	0. 003	0. 002	0. 003
	(65. 210)**	(18. 740)**	(43. 710)**
Precipitation	−0. 070	−0. 102	−0. 067
	(−35. 450)**	900)**	(−27. 900)**
Wind	−0. 001	−0. 004	−0. 002
	(−9. 590)**	(−10. 010)**	(−11. 100)**
N	1,710,545	341, 092	1,323,801
R^2	0. 026	0. 042	0. 015

* and ** indicate significance at 5% and 1%, respectively.

This table reports regressions results explaining daily crime over the period 2006–2011, where crime is measured at the county-day level for the age groups (≤ 16 and ≥ 17) as well as the total offenses regardless offenders' age. We add an indicator variable *Dry*, which is 1 for counties that are 'dry,' meaning there no alcohol sales of any kind within their borders (nabca.org), and include interactions with Mature game release variables. We first compute average daily crime for each county-year, and scale daily total county crime by that average. The average county daily crime is 1, but varies with the actual crime on any given day. The dependent variable in Model 1 is $CCrime_{i,t}$, which is the crime index based on all offenses for each county-day. The dependent variables in Models 2 and 3 are $CCrime_{i,t,\leq 16}$ and $CCrime_{i,t,\geq 17}$, respectively, which are constructed similarly, but satisfying the corresponding age constraints. We control for average temperature (*Temperature*), precipitation (*Precipitation*) and wind speed (*Wind*), which are measured daily and are taken from the nearest weather station, which we require to be within a 100 mile distance from the county-center. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included but not reported. There are no indicator variables included for county fixed effects.

Trendl et al. (2021) document that the surge in domestic abuse associated with TV soccer viewership in England is completely driven by alcohol-related incidents. Together, our result in conjunction with this prior research suggests that alcohol consumption boosts crime in general, and that policy makers concerned with any activity predictive of crime would be well served to consider whether moderating related alcohol consumption is a viable intervention.

Approximate randomization

In our main analyses we examine nine Everyone-rated and 15 Mature-rated game release events. There is a possibility that our results are driven by randomness, as the number of events is limited. In order to assess the likeliness of this, we conduct an approximate randomization test (Noreen, 1989) as follows. We draw 24 pseudo dates randomly from 2006–2011 (our event window), consisting of 9 Everyone-rated and 15 Mature-rated game release pseudo dates, and match the pseudo release dates with the actual crime data. We repeat this 10,000 times and for each sample we regress youth crime ($Crime_{t,\leq 16}$) on $Everyone_{t,-13,0}$ and $Mature_{t,-13,0}$ (and control variables).[35] The distribution of the coefficient for $Mature_{t,-13,0}$ using the pseudo samples has a mean of −0.0002 and a standard deviation of 0.0193. The coefficient for $Mature_{t,-13,0}$ using the actual game release data as reported in Table 11 is 0.0412. Relative to the distribution of pseudo coefficients, the coefficient for $Mature_{t,-13,0}$ using the actual

[35]This is the same regression specification used in the Jackknife procedure in section 4.2.

Table 14. Extended game release sample.

	All	Age Groups	
	$Crime_t$	$Crime_{t,\leq 16}$	$Crime_{t,\geq 17}$
$Mature_{t,-6,0}$	0. 013	0. 035	0. 010
	(2. 730)**	(3. 580)**	(2. 350)*
$Mature_{t,-13,-7}$	−0. 002	−0. 030	−0. 003
	(−0. 230)	(−1. 960)	(−0. 420)
$Everyone_{t,-6,0}$	−0. 005	0. 001	−0. 001
	(−1. 060)	(0. 060)	270)
$Everyone_{t,-13,-7}$	−0. 006	−0. 002	−0. 008
	(−1. 270)	(−0. 160)	(−1. 950)
N	2, 191	2, 191	2, 191
R^2	0. 682	0. 695	0. 701

* and ** indicate significance at 5% and 1%, respectively.

This table reports OLS regressions explaining daily crime over the period 2006–2011. We expand the sample of game releases by including only the top 4 Mature and 4 Everyone Game Releases. The dependent variable in Model 1 is $Crime_t$, which is the natural log of one plus the total number of offenses recorded for each day. The dependent variables in Models 2 and 3 are $Crime_{t,\leq 16}$ and $Crime_{t,\geq 17}$, respectively. $Crime_{t,\leq 16}$ ($Crime_{t,\geq 17}$) is the number of offenses on a certain date, where one of the offenders was 16 years or younger (17 years or older). The relation between video games and crime is tested with variables *Mature* and *Everyone*. Variable $Mature_{t,-6,0}$ ($Mature_{t,-13,-7}$) captures the number of Mature games were released in the seven day window – day *t*-6 through *t* (day *t*-13 through *t*-7). Similary, variables $Everyone_{t,-6,0}$ and $Everyone_{t,-13,-7}$ count the Everyone game releases. An intercept and indicator variables to control for day of the week-effect, monthly as well as yearly effects, are included in both panels but not reported.

release dates has a t-value of 2.13 ($p < .05$). Therefore, our main result of increased youth crime following the release of top-selling violent games is unlikely to be the product of random variation in crime levels.

Extended set of video game releases

As an additional robustness test, we rerun the analyses including all game releases that have lifetime sales exceeding 1 million units (as opposed to first week sales exceeding this amount). This results in 59 events (34 everyone game and 25 mature game releases). As more games are released in later years, and total crime increased over the sample period, we only include the top four selling Mature and top four selling Everyone games for each year in our sample to address a potential spurious mechanical relation between crime and game releases. This results in 22 Mature and 24 Everyone game releases.[36] See Table 14 for the results. These coefficients are generally smaller than in our main analysis, but remain statistically significant in the same direction. The coefficient for the increase in crime in the week following release of a Mature-rated video games ($Mature_{t,-6,0}$) is 0.013 compared to 0.02 in our main analysis, and the corresponding increase in crime among youth is 0.035 compared to 0.062 in our main analysis. The increase in crime for offenders 17 and older drops to 0.0110.[37] These results indicate that the mature-rated game releases are associated with crime increases, and that this association is related to the popularity of the game being released.

Conclusion

We find that the release of top-selling violent video games is associated with an increase in crime in the subsequent week. This increase is far larger among youth than adults. We also find that the release of nonviolent video games is not associated with a change in crime. The fact that youth seem to exhibit a larger increase in criminal behavior following the release of violent video games furthers concerns that young people (under age 17) are especially susceptible to the influence of video game violence.

[36]There are 3 Mature game releases for years 2006 and 2007.
[37]These coefficients remain significant at 5% level or better.

Our findings are also consistent with the results of prior psychology experiments examining the effects of violent video games on the thoughts and actions of subjects. However, our results are not consistent with the findings of prior empirical research (most notably Dahl and DellaVigna (2009) in that we do not find evidence that the incapacitation effect dominates the arousal effects associated with violent video games. The implication is that the impact of violent video games, especially on teenagers, may be dissimilar to the impact of other forms of violent media such as movies (as in the findings of Funk et al. (2004).

Unlike many of these prior psychology studies based on laboratory experiments, we, like most researchers using observational data, are unable to establish causality with complete certainty. Most of the violent video game releases, for example, occur in the run-up to the Christmas season, whereas the nonviolent games are more evenly released throughout the year. Perhaps some annual, spurious surge in crime in the months prior to Christmas coincidentally aligns with our violent video game releases and underlies our result. Crime tends to decline in colder weather, which would argue against such a spurious correlation (Ranson, 2014), but we cannot rule out these possibilities of spurious correlations or correlated omitted variables. Our Table 13 models suggesting that our results are driven by crime in counties where alcohol is easily accessible, however, offer perhaps the strongest support for a causal interpretation of our findings. Those tests suggest that either individuals in dry counties (where alcohol sales are restricted) are either not exposed to violent video games as much as peers in counties where alcohol is freely available, or that the intersection of alcohol and violent video games directly contributes to more crime. Again, we are unable to rule out all possible threats to causality, but spurious correlation and viable correlated omitted variable problems are particularly difficult to envision with respect to our results in the cross-section of alcohol accessibility. Consequently, we believe our results support at least a limited causal interpretation.

Our results indicate that much of the increase in crime is in a group of people (teens) who should not being playing these violent games in the first place, at least according to the industry self-regulator, the ESRB. Notably, several Canadian provinces have outlawed the sale of Mature-rated video games to youth under the age of 17. Our results suggest that such policy could prove effective. The situation is different in the U.S., as a similar California law was struck down by the U.S. Supreme Court ruling in Brown v. Entertainment Merchants Association. The ruling, loosely, classifies video games as a type of art. This classification allows video games protection under the First Amendment as protected speech (similar to books), and not subject to legal restrictions (as is pornography).

However, most U.S. retailers prohibit the sale of Mature-rated video games to minors as a matter of policy. The FTC has probed the efficacy of such retailer restrictions and found them to be strong.[38] This puts the onus on parents, as they are the most effective monitor of their children's video game acquisition and play. There is no substitute for this parental monitoring, as states cannot (legally) act to prevent such purchases, and large retailers are generally successful in preventing youth from purchasing Mature-rated games on their own.

Finally, we acknowledge this limited regulatory environment in the U.S., as well as our U.S. data, perhaps curbs the generalizability of our results to other countries. Cross-country differences in youth crime and alcohol access, for example, may converge to generate different outcomes outside of the U.S. (Beerthuizen et al., 2017; Junger-Tas et al., 2009; Paschall et al., 2009). Accordingly, we urge future research to consider country-level comparisons to further investigate the effect of video games on violence, with specific attention paid to the channels we identify as important (e.g., youth crime and alcohol access).

[38]http://arstechnica.com/gaming/2008/05/ftc-report-retailers-clamping-down-on-m-rated-game-sales/

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Appendix A – Crime Codes in Categories

This Appendix summarizes the grouping of the NIBRS offenses into the crime categories used. The arrest offense code is included in parentheses. The categories are presented in the same order as they appear in Table 5.

Category	Description (Arrest Code)
$Crime_{Property}$	Arson (200)
	Extortion/Blackmail (210)
	Burglary/Breaking and Entering (220)
	Pocket-picking (231)
	Purse-snatching (232)
	Shoplifting (233)
	Theft From Building (234)
	Theft From Coin-Operated Machine or Device (235)
	Theft From Motor Vehicle (236)
	Theft of Motor Vehicle Parts/Accessories (237)
	All Other Larceny (238)
	Motor Vehicle Theft (240)
$Crime_{Violent}$	Murder/Nonnegligent Manslaughter (91)
	Negligent Manslaughter (92)
	Justifiable Homicide (93)
	Kidnaping/Abduction (100)
	Forcible Rape (111)
	Forcible Sodomy (112)
	Sexual Assault With An Object (113)
	Forcible Fondling (114)
	Robbery (120)
	Aggravated Assault (131)
	Simple Assault (132)
	Intimidation (133)
	Weapon Law Violations (520)
$Crime_{DestructionofProperty}$	Destruction/Damage/Vandalism of Property (290)
$Crime_{Drugs}$	Drug/Narcotic Violations (351)
	Drug Equipment Violations (352)
$Crime_{Con}$	Counterfeiting/Forgery (250)
	False Pretenses/Swindle/Confidence Game (261)
	Credit Card/Automatic Teller Machine Fraud (262)
	Impersonation (263)
	Welfare Fraud (264)
	Wire Fraud (265)
	Embezzlement (270)
	Stolen Property Offenses (280)
$Crime_{Prostitution}$	Prostitution (401)
	Assisting or Promoting Prostitution (402)
$Crime_{Non-ViolentSexual}$	Statutory Rape (362)
	Pornography/Obscene Material (370)
$Crime_{Incest}$	Incest (361)
$Crime_{Gambling}$	Betting/Wagering (391)
	Operating/Promoting/Assisting Gambling (392)
	Gambling Equipment Violations (393)
	Sports Tampering (394)
$Crime_{Bribery}$	Bribery (510)