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# Country-level firearm availability and terrorism: A new approach to examining the gun- crime relationship

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## Abstract

**Objectives:** This study examines the association between a country's gun availability and firearm-related terrorism. **Methods:** Employing data from 140 countries, we assess the possible relationship between a country's rate of suicide by firearm and their count of terrorist attacks involving a firearm through a series of structural equation models. **Results:** Collectively, we find that there is a positive relationship between gun availability and firearm-related terrorism in 2016 and 2017. However, this result

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fails our robustness check and is sensitive to the inclusion of the U.S.

**Conclusion:** With important caveats, we believe the U.S. to be unique in terms of both gun availability and terrorism.

### **Keywords**

firearm, gun, firearm, structural equation modeling, terrorism, suicide

Worldwide trends in terrorism, defined as “the threatened or actual use of illegal force and violence to attain a political, economic, religious, or social goal through fear, coercion, or intimidation,” (LaFree and Dugan 2007:184) have indicated a 9 percent drop in 2016 from the previous year (Miller and Jensen 2017). Nonetheless, and even with this decrease, the incidence of global terrorism has remained historically high with over 13,400 terrorist attacks in 2016 alone. Tragically, this year represented upwards of 34,000 terrorism-related deaths.

One reason for this relatively<sup>1</sup> high number of fatalities resulting from terrorism is that guns have become a favored terrorist weapon (Gruenewald 2011; Legault and Hendrickson 2009; Miller 2015). Indeed, this preference for firearms has been correlated with enhanced lethality (Jones et al. 2020; Tessler et al. 2017), likely linked to their increased probability of completion based on either their ease of use (Klein et al. 2017; Mandala and Freilich 2018) or ability to avoid law enforcement interdiction (Gruenewald et al. 2016). While such completion metrics coupled with group-level factors are important to explaining terrorist weapon selection (Jackson and Frelinger 2008; Jones et al. 2020; Koehler-Derrick and Milton 2019), the main mechanism driving gun preference has appeared to be ease of accessibility (Boutwell and Klare 1999; Hamm 2007; Kinsella 2006; Legault and Hendrickson 2009).

Such accessibility is also identified as a key factor in Clarke and Newman’s (2006) *Outsmarting the Terrorists*, an increasingly favored application of situational crime perspective (SCP) to terrorism (Freilich et al. 2019). Summarized under the acronym “MURDEROUS,” the authors maintain that choice is driven by a weapon’s attributes, which include their ability to be “M: Multipurpose,” “U: Undetectable,” “R: Removable,” “D: Destructive,” “E: Enjoyable,” “R: Reliable,” “O: Obtainable,” “U: Uncomplicated,” and “S: Safe.” Yet despite this framework, coupled with the aforementioned ubiquity of firearms within this phenomenon, there has been little empirical evaluation of how these weapon

characteristics, and obtainability in particular (again, “O” from “MURDEROUS”), affects terrorism as an outcome (Freilich et al. 2019). Indeed, much of what we know about the effect of guns and gun policy has been derived from studies about crime, despite evidence that terrorism is a distinct offense (Hoffman 2017), which has been differentially affected by policy (Dugan et al. 2005).

Despite these important differences, the larger gun-crime literature is informative, particularly regarding how best to approach examining this relationship from a methodological standpoint. More specifically, critiques of this trajectory of research have attributed the considerable variation in findings due to studies’ limitations (Kleck 2015; Kovandzic et al. 2012, 2013). Such limitations include a reliance on descriptive and bivariate analyses despite the likelihood of feedback relationships (Kleck 2015; Kovandzic et al. 2012, 2013), the lack of non-firearm outcomes and other important controls (Britt et al. 1996; Kleck 2001), and measurement issues motivating the need for alternative variables (Kleck 2015; Kovandzic et al. 2012, 2013; LaFree 1999). The reliance on small sample sizes (Hemenway and Miller 2000; Killias 1993a; Kleck 2015) and less attention directed toward the potentially confounding influence of outliers (Rosenbaum 2012) have also been noted as important issues in prior research.

With these appraisals of the greater firearm-crime literature in mind, this study extends this research by examining the relationship between *gun availability* and *terrorism*. Beyond assessing key tenets of situational crime prevention and its application to terrorism, the findings from this study expand the scope of the broader impacts of firearm possession on violence. Given that terrorism is a global phenomenon occurring in 104 countries in 2016 alone (Miller and Jensen 2017), we do so through a comparative approach. Specifically, we inquire: *Does country-level gun obtainability affect firearm-related terrorism?* By addressing this important research question, we are able to: (1) explore whether such availability as a proxy for gun policy has a unique effect on terrorism rather than crime and, (2) do so through addressing several of the methodological issues presented in the greater gun-crime literature, particularly through establishing why our measure of terrorism is a more robust, cross-national indicator of violence. Informed by an SCP to test a two-tailed hypothesis using structural equation modeling (SEM) on a sample of 140 countries, we find a positive relationship between these two constructs. However, our results are sensitive to the exclusion of the U.S. suggesting its role as a “high leverage outlier” in not just with crime, but terrorism as well.

## **Situational crime prevention and terrorism**

Although an important debate surrounds whether SCP constitutes a theory given its lack of focus on offender motivation (Freilich and Newman 2017; Haywood 2007), there are clear ties to important philosophical underpinnings (Freilich and Newman 2017). Indeed, the principles of SCP have been linked to the works of Beccaria (1764) and Bentham (1789),<sup>2</sup> where offenders are viewed as self-interested actors who seek to increase pleasure and reduce pain (Freilich and Newman 2017; Newman and Marongiu 1997). Informed by these assumptions coupled with economic theories (), offenders are thought to be “rational” actors, where such rationality is considered limited given its basis on perception (Freilich and Newman 2017). Consequently, an individual’s decision-making is influenced by their *perceptions* of both the risks and rewards of a given criminal act. Additionally, inspired by place-based conceptualizations of crime (Brantingham and Brantingham 1990; Cohen and Felson 1979; Cozens 2011; Shaw and McKay 1942; Sherman, Gartin, and Buerger 1989), SCP is most concerned with the role of environment in creating opportunity rather than propensity, maintaining the former is causally linked to crime (Clarke and Newman 2009).

SCP focuses on the specific opportunity structure of a given crime to *increase said risk* and *reduce such rewards* (Clarke 1997; Freilich et al. 2017). In addition to these two strategies, SCP also looks to *increase the effort* associated with criminal activity, *reduce provocations* that induce crime, and *remove excuses* for offenders to comply (Clarke and Newman 2009). Within these five total categories, SCP proposes 25 techniques (Clarke 1997; Cornish 1994; Cornish and Clarke 2002) ranging from traditional target hardening strategies to increasing signage. In line with prior works describing the convergence of macro- and micro-level processes (e.g. Agnew 1999; Cohen and Felson 1979), structural-level variation in opportunity structures may influence individual-level opportunities and criminal motivations that can be observed in the form of aggregate counts of criminal outcomes.

Part of SCP’s uniqueness lies with its tailored approach to the unique “situational determinants” associated with each specific crime type (Cornish and Clarke 1986; Freilich and Newman 2017; Freilich et al. 2015), as with the application by Clarke and Newman (2006) to that of terrorism. While the authors acknowledge the differences between this phenomenon and more ordinary crime, they contend that both involve the same important element crucial to their reduction: that of opportunity.

Specifically, it is argued that terrorism-related SCP should involve a focus on four key pillars: targets, tools, facilitating conditions, and most germane to the current investigation, weapons (Clarke and Newman 2006; Freilich et al. 2017). As noted, Clarke and Newman (2006) highlight nine factors that affect a terrorist's weapon selection as denoted by the aforementioned "MURDEROUS" acronym. The authors contend that such "selection" is really driven by what is easily available, similar to past findings regarding terrorist targets (e.g. LaFree et al. 2009; Smith et al. 2006). Indeed, and of a weapon's MURDEROUS components, it is the "O" of obtainability that is most important, with firearms deemed high on this attribute. As Clarke and Newman (2006) describe, the world is, "awash in small arms," contributing to their ability to be easily obtained via both legal and illicit markets. In contrast, the authors describe the rarity of unconventional weapon used in terrorist attacks due to their lack of availability. This disparity provides ample face validity for examination of the extent to which the obtainability of firearms influences the frequency of terrorist attacks.

As demonstrated in Freilich and colleagues' (2019) systematic review, the effect of such obtainability on the outcome of terrorism has been particularly understudied. Thus, and given its connection to firearms specifically, we focus on this attribute of the MURDEROUS framework. Theoretically, SCP would expect one of two relationships as motivated by an outcome pattern matching approach<sup>3</sup> (Trochim, 1989; see Appendix A for a representation of these arguments).

First, gun availability could *increase the risk* related to committing an act of terrorism by *strengthening formal surveillance* (Clarke and Newman 2006; Cornish and Clarke 2003). More specifically, countries with higher gun availability could also have more armed security guards, who could theoretically prevent or mitigate terrorist attacks. For example, the use of such guards in Israeli shopping malls has been linked to said outcomes (Davis et al. 2006). Therefore, we hypothesize:

**H1a:** *Countries with higher gun obtainability will have fewer firearm-related terrorist attacks.*

Alternatively, if such obtainability is low in a given country than this could also *increase the effort* associated with committing an attack by *controlling weapons* (Clarke and Newman 2006; Cornish and Clarke 2003). This element of SCP relates directly to how and where weapons are used, which as noted, is in turn related to which types offenders have

access. In other words, if terrorists have difficulty obtaining a gun than they should be less likely to perpetrate a firearm-related attack. Thus, we posit:

**H1b:** *Countries with lower firearm obtainability will have fewer firearm-related terrorist attacks.*

As a whole, there appears to be no known examination of this two-tailed hypothesis, and we know little about gun-terrorism relationship outside of the ubiquity of use. Despite SCP's premise that the overlap between this outcome and crime is sufficient to apply its tenets, this particular gap in the research is considerable. As even Clarke and Newman (2006) denote, there are unique characteristics to that of crime, primarily regarding motivation. And as Hoffman (2017) identifies, this motivation is unique in that terrorism is intended to convey a larger message, with repercussions beyond the immediate victim.

This is likely why the policy has been found to have unique effects when it comes to terrorism. For instance, Dugan and colleagues (2005) determined that non-terrorist aerial hijackings were deterred by counter-measures, but not those committed by terrorists. In addition, these types of efforts have been met with backlash effects, where the behavior in question actually increases in response to the policy (Argomaniz and Vidal-Diez 2015; Carson 2017; Fisher and Becker 2021; Kattelman 2020; LaFree et al. 2009; Piazza and Choi 2018). In the case of targeted killing/drone strike programs, for example, a movement's base may rally around the cause after the death of a high-profile leader (Carson 2017; Fisher and Becker 2021).

Finally, counterterrorism policies have been shown to escalate terrorism during some periods yet reduce this activity in others (Dugan and Chenoweth 2012; Fisher and Asal 2020). All in all, it is possible that gun policy has its own type of distinct influence on that of terrorism.

Despite the deficit in the literature regarding the potential firearm-terrorism relationship, the effect of gun accessibility as it relates to *crime* is informative. In particular, critiques about previous methodological approaches are especially pertinent to the choices of the current investigation. This is principally relevant to why our measurement of terrorism represents a more reliable cross-national indicator of violence. The next section reviews what we know about the gun-crime relationship, with a focus on such critiques.

## Firearm-crime research

The comparative literature examining the reported relations between guns and crime, as operationalized through a variety of measures, has yielded inconsistent findings. On the one hand, disparities between nations in levels of gun violence and accessibility have led politicians and researchers alike to conclude such differences should be attributed to varying levels of firearm control (Clarke and Mayhew 1988; Lester 1991; Sloan et al. 1988). Indeed, the United Kingdom and Japan are often referenced as support for this premise as they both maintain strict gun control and have lower homicide rates than those observed in the U.S.—a country that allows the ownership of a broad range of firearms (Miron 2001; Rosenbaum 2012). This argument is certainly not novel; variation in gun policy has long been propped up as the “silver bullet” that explains differences in rates of violence between countries (Ajdacic-Gross et al. 2006; Ajdacic-Gross et al. 2010; Grabherr et al. 2010; Hurka and Knill 2020; Lankford 2016; Miron 2001). Yet other work has contended that countries maintaining less restrictive gun control laws, particularly Israel, Switzerland, and New Zealand, have exhibited low homicide rates (Kleck 1997; Miron 2001) or that violent events, mass-casualty or otherwise, are mitigated and deterred through permissive gun laws and widespread firearm availability (Kates 1989; Kates 1997; Kleck 1997; Lott 2003; Poe 2001; Tennenbaum 1992).

Although illuminating, this trajectory of research has encountered certain limitations that may explain such disparate results. These limitations are largely related to a reliance on small sample sizes and descriptive/bivariate analyses that preclude incorporation of potentially confounding variables (see Bangalore and Messerli 2014; Duggan 2001; Hemenway and Miller 2000; Hoskins 2001; Hurka and Knill 2020; Killias 1993a, 1993b; Killias et al. 2001; Kleck 1997; Sturup et al. 2019). Namely, factors such as demographics, ethnic diversity, income, and inequality have each been shown to contribute to country-level violence (Altheimer 2008; Altheimer and Boswell 2012; Kopel 1992; Miron 2001; Stamatiel et al. 2020). In addition, most comparative studies rely on homicide data for their studied outcomes (e.g. Hemenway and Miller 2000; Lester 1991; Miron 2001; Stamatiel et al. 2020). The limitations of the World Health Organization data and the like have been well-documented (e.g. LaFree 1999), which motivate the choice of other violence indicators.

Further, treating the presence or absence of gun control policy as a proxy for accessibility can be a misstep. There is often a gap between policy and practice given that governments frequently struggle to enforce laws

concerning gun control (Grillot 2011; Grip 2015; Hureau and Braga 2018; Killias et al. 2001; Kleck 1997; Kleck 2001). Similarly, cross-national studies frequently rely on survey responses from instruments including the International Crime Victimization Survey and Small Arms Survey to establish levels of firearm ownership (e.g. Altheimer 2008; Stamatel et al. 2020). This approach is problematic for several reasons, including the inability to gather information from transient populations, along with biased responses from participants who may be reluctant to report firearm possession. The existence of black markets is common, which often negates strict gun control in one nation if neighboring and proximal countries maintain relatively weaker gun laws (Gorea 2006; Grillot 2011; Grip 2015; Killias 1993b; Lankford 2016). As a consequence of these issues, scholars have asserted that the percent of suicides committed by firearm represents a much more valid measure of gun availability in comparison to gun policy (Grillot 2011; Kleck 2001; Kleck 2004; Kleck 2021; Miron 2001).

Another related issue that appears to be exacerbated in the comparative scholarship is sensitivity to outliers, often through the inclusion of the U.S. in study samples. Even among countries with comparatively higher rates of private gun ownership, the U.S. is a statistical anomaly in terms of gun availability (Lankford 2016; Rosenbaum 2012; Stamatel et al. 2020). As noted by Khalil (2017), U.S. citizens possess more than 300 million firearms, amounting to roughly 1 per capita—a number that nearly doubles that of Switzerland, the country with the second highest rate of firearms per capita in the developed world.

Much like the comparative literature, U.S.-based research on firearm availability and crime has demonstrated a similar degree of inconsistency, which may also be attributed to methodological limitations. Specifically, several studies have pointed to reductions in violence with increased firearm restrictions (Koper and Roth 2001a; Kwon and Baack 2005; Loftin et al. 1991; McDowall et al. 1996; Zimring 1972; Zimring and Hawkins 1997), while others have reported either a null (Black and Nagin 1998; Britt et al. 1996; Jung and Jason 1988; Kleck and Patterson 1993) or a negative relationship (Kleck 2001, 2015; Kleck and McElrath 1991; Lott and Mustard 1997). As with the comparative scholarship, these differences could be due to data limitations resulting in the omission of potentially important confounders (Britt et al. 1996; Kleck 2001) or difficulties in isolating the causal influence of policy given the distinctions between the official effective date and when the first violators are sentenced (Britt et al. 1996; Jung and Jason 1988; Kwon and Baack 2005). As with international studies, causal ordering and simultaneity bias are potential concerns in terms

of the likely two-way relationship between firearm availability and crime rates (Hauser and Kleck 2013; Kleck et al. 2011; Kleck and Patterson 1993).

As a whole, these issues are further compounded by the argument that the only valid measure of gun availability, the percent of suicides committed by firearm, has no application beyond cross-sectional analysis (Kleck 1997; Kleck 2004; Kovandzic et al. 2012, 2013). Addressing these concerns, Kovandzic and colleagues (2012, 2013) utilized generalized method of moments and localized average treatment effect approaches, which tackled endogeneity bias, proxy validity, and heterogeneity in criminality. In doing so, the authors reported a significant negative relationship between gun availability and homicide—a finding they attributed to the deterrent effect of firearm possession by law-abiding citizens. In contrast, similar methodological approaches adopted by Miller et al. (2002), Miller et al. (2007), and Siegel et al. (2013) resulted in the consistent finding that gun availability shared a statistically significant positive relationship with crimes of violence ranging from robbery to homicide within the U.S.

Collectively, our review of the gun-crime literature has demonstrated that the mixed findings may be due to the methodological limitations of cross-national studies. Small samples, a dependence on descriptive and bivariate analyses, and measure reliability/validity are of particular concern. Our research presents a mindful attempt at addressing many of these issues to better discern whether there is a connection between country-level gun availability and a specific, yet distinct form of violence: *firearm-related terrorism*. The next sections detail these efforts.

## Current study

### Data

The next subsections describe the data sources for our primary dependent variable (the Global Terrorism Database (GTD) from the National Consortium on Terrorism and Responses to Terrorism), our main independent variable (the Global Burden of Disease (GBD)Data from the Global Health Data Exchange (GHDx)), and control variables (the Quality of Government Data from the Institute at the University of Gothenburg).

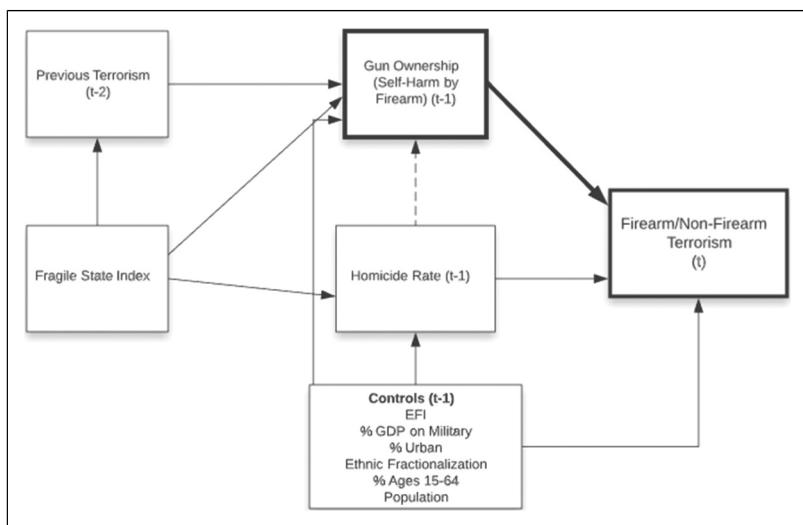
**Global terrorism database.** The GTD is an open-source database managed by the National Consortium for the Study of Terrorism and Responses to Terrorism. The GTD is the most comprehensive resource for information

on terrorist incidents, primarily due to its inclusion of both domestic and international terrorist attacks.

The GTD utilizes the aforementioned terrorism definition of, “the threatened or actual use of illegal force and violence to attain a political, economic, religious or social goal through fear, coercion or intimidation” (LaFree and Dugan 2007:186), which has been translated into a set of six criteria. Three of said criteria are mandatory; in sum, the incident must be an intentional threat/act of violence committed by a subnational actor (National Consortium for the Study of Terrorism and Responses to Terrorism 2017). In addition, there are three screening criteria a researcher can employ (essentially, that the act is motivated by a goal, for a larger audience, and that it targets civilians), although two of the three must be present for the incident to be represented in these data and in our sample. Given these data are consistently refined and updated, it is important to note that this investigation utilized a December 2018 download of the 2016 data (and then a September 2019 download of the 2015 and 2017 data for robustness checks). One part of such refinement is to ensure that that these criteria are consistently applied both over time and cross-culturally, providing a highly reliable and valid measure of comparative violence.

The GTD has historically coded for 206 countries<sup>4</sup> given these data go back to 1970; however, 12 of these states do not exist in 2016 under these names,<sup>5</sup> while another 11 have been subsumed as a territory for the purposes of our coding.<sup>6</sup> The Global Incidence of Firearm and Terrorism between 1970 and 2018 within the GTD is displayed in Figure 1. It should also be noted that the analytic sample also includes countries that experienced no recorded terrorist attacks in the years observed by this study (see also Table 1 below).<sup>7</sup> This is important for the generalizability of the findings from the analyses below, as the sample was not conditioned upon the presence of terrorism within a country.

**Global health data exchange.** The GHDx is supported by the Institute for Health Metrics and Evaluation at the University of Washington. GHDx’s goal is to provide “rigorous and comparable measurement of the world’s most important health problems” (<http://ghdx.healthdata.org/about-ghdx>, para 2) and includes a number of data sources with country-level indicators related to public health. This study specifically utilized the exchange’s GBD Study 2016 (and 2015/2017 for robustness checks), which has information on “diseases, injuries, and risk factors” that are “collected and analyzed by a consortium of more than 3,600 researchers” (<http://www.healthdata.org/gbd/>



**Figure 1.** The global incidence of firearm and terrorism between 1970 and 2018 global terrorism database (GTD).

Please note that GTD data are unavailable from 1993.

about, para 3). From our 2016 GTD sample, almost all states were included in the GBD data.<sup>89</sup>

**Quality of government.** The Quality of Government (QoG) Institute at the University of Gothenburg focuses on, “conduct(ing) and promot(ing) research on the causes, consequences and nature of Good Governance” (<https://qog.pol.gu.se/aboutus>, para 1). These data are one of the most inclusive collections of country-level indicators, primarily focused on governmental and conflict-related factors, which have been extracted from a variety of sources. Such sources include the United Nations Human Development Report, International Monetary Fund World Economic, and World Values Survey (Dahlberg et al. 2018).

## Measures

**Dependent variables.** Our main dependent variable was a count of a country’s firearm-related terrorist attacks in 2016 (2017 was used for robustness checks). In the GTD, the firearm is defined as a “weapon which is capable of

**Table 1.** Descriptive statistics for variables used in analysis.

Variable	Observations	$\bar{x}$	Std. Dev	Min	Max
2015 firearm terrorism	140	21.52	75.96	0.00	534.00
2016 firearm terrorism	140	18.76	64.46	0.00	404.00
2017 firearm terrorism	140	16.69	60.75	0.00	450.00
2015 non-firearm terrorism	140	42.89	129.42	0.00	766.00
2016 non-firearm terrorism	140	28.09	88.53	0.00	684.00
2017 non-firearm terrorism	140	28.62	85.96	0.00	696.00
2015 self-harm by firearm	140	0.82	0.91	0.04	7.53
2016 self-harm by firearm	140	0.81	0.92	0.04	7.67
2017 self-harm by firearm	140	0.81	0.92	0.04	7.69
Homicide rate	140	8.98	12.44	0.30	85.70
Economic freedom index	140	6.79	0.93	2.96	8.80
Percent GDP spent on military	140	1.95	1.83	0.00	13.50
Percent urban	140	59.24	22.39	12.08	100.00
Ethnic fractionalization	140	0.45	0.26	0.00	0.93
Percent ages 15–64	140	63.56	6.74	47.26	85.19
Fragile state index	140	67.69	24.68	18.80	112.10
Log population (millions)	140	2.16	1.83	-2.64	7.23

GDP: gross domestic product.

firing a projectile using an explosive charge as a propellant” (National Consortium for the Study of Terrorism and Responses to Terrorism 2017:28). An attack was considered firearm-related if one of the weapons used in the incident was a firearm.<sup>10</sup> We also examined a count of non-firearm-related incidents for our sensitivity analyses, which were coded as such if none of the weapons employed in an attack was a firearm.<sup>11</sup>

**Independent variable.** From the GBD, we acquired a country’s rate of deaths from “self-harm by firearm” (per 100,000)<sup>12</sup> based on Kleck’s (2015) indications that suicide by firearm is the most valid measure of gun availability for 2015 (and for 2016 and 2017 for robustness checks).

**Control variables**<sup>13</sup>. This research also included country-level predictors of general violence as designated in the gun literature (Kovandzic et al. 2012), mostly as motivated through a social support framework (Altheimer 2008), along with terrorism correlates (Fahey and LaFree 2015; Freytag et al. 2011; Lisanti 2010). We first utilized a country’s 2015 homicide rate<sup>14</sup> given the overlap that could occur between these trends and terrorism rates. This measure was the only control variable not

extracted from the QoG dataset and instead was obtained from the World Health Organization's Global Health Estimates (WHO 2016). Although the limitations with comparative homicide rates are well-documented as we acknowledge (and used as motivation for not including this as our primary outcome), we believe they are a useful control variable. In addition, we encompassed measures for a country's volatility as determined through the Fund for Peace's fragile state index (with the highest possible score of 120 for conflict-ridden states), Hadenius and Teorell's (2005) democracy scale that combines both the Freedom House and Polity IV measures (1–10, where 10 = most democratic), and Gibney and colleagues' (2013) Political Terror Scale (where 1 = country with little evidence of political imprisonment/execution/torture and 5 = represents countries with frequent occurrence of these same indicators). This study also incorporated controls for the percent of the urban population, the percent of the gross domestic product (GDP) that is spent on military expenditures, ethnic fractionalization, and age composition of the population (percent ages 15–64). *After including these control variables, the final analytic sample was 140 countries.<sup>15</sup>* In order to test for the potential that the omitted countries systematically varied from those in the analytic samples, *t*-tests were conducted for each of the key independent and dependent variables. Such tests indicated that the omitted countries were not observed to differ on average from the analytic sample based for all key independent or dependent variables.<sup>16</sup> Table 1 below provides the descriptive statistics for all 140 nations included in the analytic sample.

## Analysis

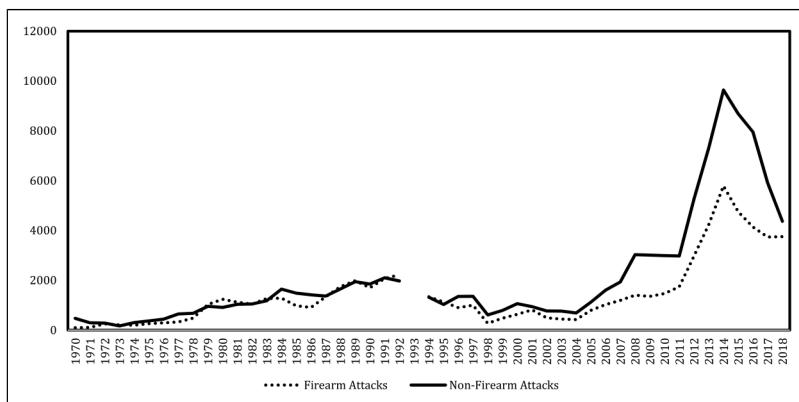
The above discussion identified several attributes that an analytic model should include in order to examine the impact of gun availability on terrorism. Firstly, due to the potential reciprocal nature of the relationship between these two constructs,<sup>17</sup> a temporal lag must be employed to ensure the correct ordering of events. Both gun accessibility and terrorism are also subject to a variety of political influences, including the previous incidence of terrorism and homicide (Cao et al. 1997; Smith and Uchida 1988; Stroebe et al. 2017). Each of these factors may also have both direct impacts on terrorism and indirect effects through gun availability and should therefore be accounted for in a modeling strategy. Consequently, due to the need to estimate these multiple and specific autoregressive requirements across several time periods simultaneously, the modeling strategy requires a quantitative method that is flexible enough to meet all these conditions. The

methodology should also impose correct and specific temporal ordering for all variables, along with mutually estimating the effects of gun availability on terrorism and terrorism on gun availability.

To analyze these data and account for such factors, this study uses SEM.<sup>18</sup> A structural equation model is a theoretically derived and hypothesized pattern of directional and nondirectional linear relationships that include a set of measured and latent variables (MacCallum and Austin 2000). The purpose of SEMs is to account for both variation and covariation of the measured variables, and these models allow for the specification of the directionality structure of relationships within a model (Gau 2010; Hayduk et al. 2007; Kline 2015). Addressing the previous concerns, the flexibility and structure within these models also allow SEMs to include autoregressive influences (Gollob and Reichardt 1991). As gun availability and terrorism are likely both influenced by previous terrorism and affect future terrorism (Cook and Ludwig 1998; Dugan et al. 2008; Stroebe et al. 2017), this feature further renders SEM as an analytic strategy that can account for all of the influences across multiple units of time simultaneously (Maxwell et al. 2011).

Model specification is crucial within SEM, as even theoretically meaningless models may be shown to have statistical value (Millsap 2007). Although prominent scholars traditionally advocate for a single primary model (see Bollen 1989), multiple models are often used in concert to reveal important insights, particularly through disconfirming hypotheses and triangulating findings (Bollen 1989; Malik et al. 2018; Piazza 2016). Additionally, for each of the following models, all predicted count variables are estimated using the negative binomial distribution.

The general theorized Structural Equation Model can be seen below in Figure 2. We proposed this model predicting that gun obtainability (self-harm by firearm) in 2015 would impact the number of firearm-related terrorist attacks in 2016 and began by producing a generic model that included the aforementioned temporal ordering and proposed reciprocal influence of gun availability on terrorism and terrorism on gun availability. The initial generic model also included control variables (discussed in detail below), and the exogenous variable Fragile State Index. After constructing the initial model, we improved model fit iteratively by adding one path at a time based upon the aforementioned theoretical considerations and preserving temporal order. While the initial model met the following criteria, this process was repeated until we reached the best fitting model with  $\chi^2 p > 0.05$ , the root mean squared error of approximation (RMSEA)  $< 0.05$ , comparative fit index (CFI), Tucker-Lewis Index (TLI), and the



**Figure 2.** General theorized structural equation model.

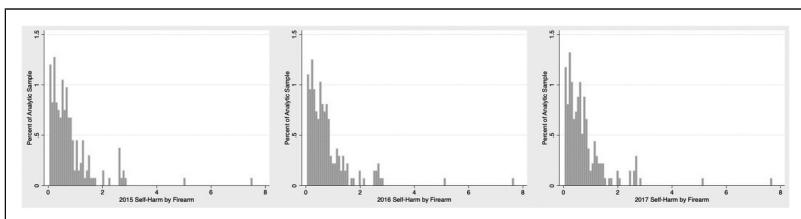
standardized root mean squared residual (SRMR)  $< 0.08$  (Folmer et al. 2012; Kline 2015). These values for the revised model used for the primary analysis were:  $\chi^2 p = 0.09$ , RMSEA = 0.04, CFI = 0.867, TLI = 0.798, and SRMR = 0.06.

Following from the observations of prior research (Khalil 2017; Kleck 1997; Miron 2001; Rosenbaum 2012), this study also conducted a series of sensitivity analyses.<sup>19</sup> These sensitivity analyses were designed to address whether findings were: (1) limited to firearm terrorism, (2) only observable using data from 2015 predicting terrorism in 2016, and (3) sensitive to the inclusion of outlier nations regarding gun-ownership. As such, the first set of sensitivity analyses that were conducted used non-firearm terrorism as the dependent variable. In order to provide a preliminary assessment as to whether any findings were limited to 2015 predictors on firearm terrorism in 2016, all models were also estimated with the primary independent variable from 2016 on the dependent variable from 2017 for the second suite of sensitivity analyses. For the third set of sensitivity analyses, following the previous discussion regarding the unique patterns of gun ownership in some countries, all previous models were run excluding the U.S., the U.K., Japan, New Zealand, and Switzerland individually and as a set to observe whether their omission from the sample influenced the findings. In addition, all final models were also analyzed using negative binomial and Poisson regression to compare the SEM findings to more commonly used regression techniques. In all cases, findings were robust across all three estimation techniques.<sup>20</sup>

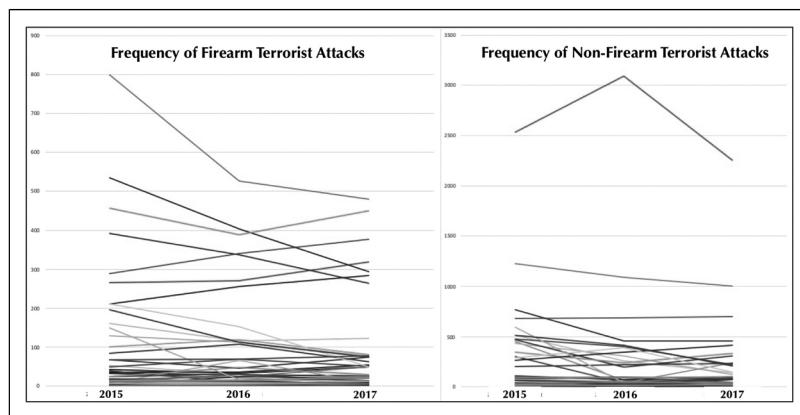
## Findings

Before turning to the primary analysis, this study sought to examine the stability and heterogeneity of the key independent and dependent variables. Particularly given previous attention that has been paid in the literature to the presence of influential outliers for both gun availability and terrorism, we expected both the key independent variable and dependent variable to have right-skewed distributions. Between 2015 and 2017, Table 1 above displays that the rate of self-harm by firearm was relatively stable, varying between 0.82 and 0.81 on average. This indicates that global-level firearm availability was quite stable during this period. In addition, Figure 3 below shows that the overall distribution of self-harm by firearm across these 140 countries was consistent as well. Importantly, Figure 3 also demonstrates the expected right-skewed distribution of self-harm by firearm, consistent with previous measures of national firearm availability. In all three histograms contained in Figure 3, the U.S. is the most extreme value for self-harm by firearm with values of 7.52 firearm suicides per 100,000 people in 2015, 7.67 in 2016, and 7.69 in 2017 respectively. For all three years, approximately three-quarters of selected countries had values for self-harm by firearm rate that were one or fewer ( $n \approx 105$ ). Consequentially, there is empirical reason to examine whether the omission of the U.S. from the analytic sample would influence the substantive findings regarding the relationship between firearm availability and terrorism.

Similar to firearm availability, the frequency of firearm and non-firearm terrorist attacks was also skewed (see Figure 4).<sup>21</sup> Figure 4 demonstrates that despite the overall global decrease in the frequency of terrorism observed in Figure 2 above, a monotonic decrease was not evident for all nations. Particularly for some of the nations that experienced the most terrorism during this period, it is important to note that the incidence of terrorism increased across all observed years. For firearm terrorism, 36 out of the



**Figure 3.** The distribution of self-harm by firearm 2015–2017.

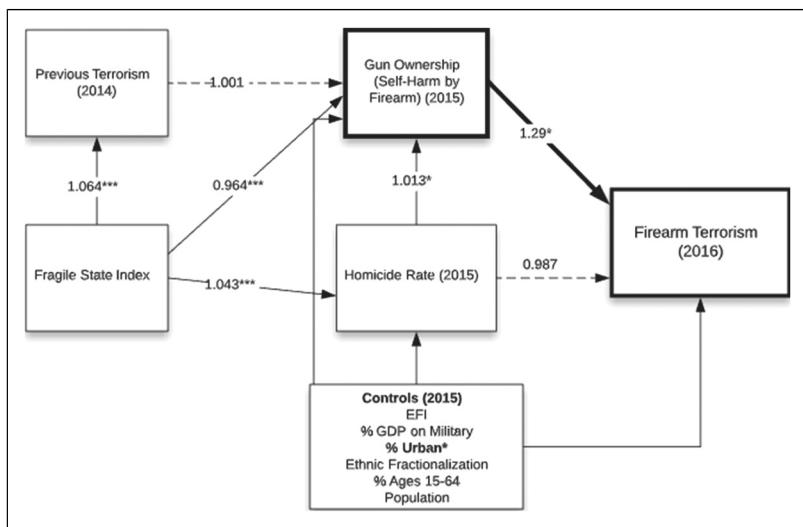


**Figure 4.** The Frequency of firearm and non-firearm terrorist attacks between 2015 and 2017.

140 nations (25.71 percent) saw an increase between 2015 and 2016, and 30 nations (21.43 percent) also experienced increased attacks in 2017 compared to 2016. Likewise, for non-firearm terrorism, 36 out of the 140 nations (25.71 percent) saw a growth between 2015 and 2016, and 51 countries (36.43 percent) had more non-firearm terror attacks in 2017 compared to 2016. As such, it is important to note that this variation and divergence within global terrorism trajectories has been observed in other time periods (see Fisher and Becker 2019; LaFree, Morris, and Dugan 2010; LaFree, Yang, and Crenshaw 2009), suggesting that despite the overall downward trend, the patterns and incidence of terrorism during this time is not idiosyncratic to the time period examined in this study.

### *Primary analyses*

Using the broad structure exhibited above in Figure 1, Figure 5 displays the findings for our initial test of hypotheses 1a (Countries with higher gun obtainability will have fewer firearm-related terrorist attacks) and 1b (Countries with lower firearm obtainability will have fewer firearm-related terrorist attacks) using self-harm by firearm from 2015 on firearm-related terrorist attacks in 2016 ( $\chi^2 p = 0.09$ , RMSEA = 0.04, CFI = 0.867, TLI = 0.798, and SRMR = 0.06). In all the following SEM figures, any statistically significant pathways are displayed with solid arrows with the estimated coefficients and standard errors. All relationships that are not statistically



**Figure 5.** Structural equation model examining the impact of gun ownership on firearm terrorism in 2016.

significant are displayed with dotted lines. In the interest of parsimony, the specific estimates generated for the control variables have been omitted from these figures and all statistically significant findings are discussed in the text.

Figure 5 displays that a positive and statistically significant relationship (internal rate of return (IRR) = 1.29, confidence interval (CI) = 1.01–1.61) was observed between gun ownership (rate of self-harm by firearm) and the incidence of firearm-related terrorism. This positive observed relationship is in line with the theoretical predictions of hypothesis 1b, where it was predicted that countries with lower gun obtainability will have fewer firearm-related terrorist attacks. This indicates that for each additional 1-unit decrease in gun ownership (1 self-harm by firearm incident per 100,000 people), the incidence rate of firearm-terrorism decreases by 29 percent. It should be noted however that this finding is also consistent with the unstated hypothesis that increased firearm ownership leads to increased firearm terrorism as this would also produce findings indicative of a positive relationship. This substantive finding was robust to both negative binomial and Poisson estimation procedures as separate regression analyses, suggesting that this result was not due to modeling or specific estimation procedures. In addition, when analyzed as a bivariate relationship, a negative and statistically significant relationship was observed (IRR = 0.70,

$CI = 0.54\text{--}0.91$ ), suggesting that the omission of these key control variables would have resulted in substantive omitted variable bias.<sup>22</sup>

Out of the control variables, only percent Urban was discovered to be statistically significant ( $IRR = 1.02$ ,  $CI = 1.00\text{--}1.05$ ). Contrary to the predictions above, this model also suggests that previous terrorism was not predictive of gun availability after accounting for other factors in the model ( $IRR = 1.00$ ,  $CI = 0.99\text{--}1.01$ ). This null finding persisted whether terrorism was measured as the count of all terrorism within that nation or the count of solely firearm-related terrorism. Contrary to expectations, the Fragile State Index was discovered to be negatively related to gun availability ( $IRR = 0.96$ ,  $CI = 0.95\text{--}0.98$ ), indicating that nations with greater instability had decreased firearm accessibility. The homicide rate was also found to be positively related to gun availability, suggesting that firearm accessibility is still linked to other forms of violence within these data and in line with previous observations. The proportion of the population between the ages of 15 and 64 years of age was found to be negatively related to firearm ownership in these 140 nations ( $IRR = 0.96$ ,  $CI = 0.94\text{--}0.99$ ). Consequently, while other measures of violence and conflict within a nation were evidenced to influence gun accessibility, net of these factors, previous terrorism was not among the observed relationships.

### **Sensitivity analyses<sup>23</sup>**

In order to examine how robust these findings were, a series of sensitivity analyses were conducted to examine whether the previously observed relationship was: (1) limited to firearm terrorism, (2) only observable using data from 2015 predicting terrorism in 2016, and (3) sensitive to the inclusion of outlier nations with regard to gun-ownership. Beginning with the sensitivity analyses concerning whether the previous finding is limited to firearm terrorism, a null relationship was observed between gun availability and non-firearm terrorism ( $IRR = 1.08$ ,  $CI = 0.60\text{--}1.95$ ). Similar to the previous analysis, this null finding was not limited to SEM estimations and was observed using both negative binomial and Poisson regression analyses. Also echoing the analysis above, the homicide rate was not discovered to be associated with non-firearm terrorism. Previous terrorism (in total or non-firearm terrorism) was also not predictive of gun accessibility in this SEM, and the Fragile State Index yielded a negative and statistically significant relationship with gun ownership ( $IRR = 0.96$ ,  $CI = 0.95\text{--}0.98$ ). In contrast with the previous model, however, both the homicide rate and all other control variables produced null findings with regards to gun availability. As such, while gun

availability was observed (irrespective of model specification) to be related to total terrorism and firearm terrorism, non-firearm terrorism was unrelated to gun accessibility in the full model.

The second set of sensitivity analyses examined whether the findings from the previous two models were unique to firearm terrorism and non-firearm terrorism committed in 2016. To test whether these findings were also evident in 2017, terrorism (firearm and non-firearm terrorism) was measured in 2017 and the proxy for gun ownership was measured in 2016. Overall, both SEMs that tested whether the findings were replicable in 2017 produced similar findings despite the divergent patterns in terrorism across these years (see Figure 3). Focusing firstly on firearm-related terrorism in 2017, the self-harm rate in 2016 once again produced a positive and statistically significant coefficient ( $IRR = 1.34$ ,  $CI = 1.02-1.76$ ). This model also produced null findings for the impact of previous firearm terrorism on firearm ownership ( $IRR = 0.99$ ,  $CI = 0.99-1.00$ ), reinforcing the substantive findings from Figure 5. Models that tested this relationship for non-firearm terrorism yielded null estimates for the relationship between gun accessibility in 2016 on non-firearm terrorism in 2017 ( $IRR = 1.21$ ,  $CI = 0.88-1.65$ ). Null findings were also observed for the influence of non-firearm terrorism on gun availability, further reinforcing previous findings and suggesting that the substantive findings from the primary analysis above were not limited exclusively to 2016.

The third set of sensitivity analyses sought to examine whether the previously observed findings were sensitive to the inclusion of outlier nations with regards to gun-ownership. Heeding the advice of previous examinations and the evidence above that the U.S., U.K., Japan, Switzerland, and New Zealand may all be influential outliers as noted in the literature review (Khalil 2017; Kleck 1997; Miron 2001; Rosenbaum 2012), the above models were also reestimated excluding each of these nations in turn and all together. In all four models (predicting firearm and non-firearm terrorism for both 2016 and 2017), null relationships were observed for the impact of gun availability on terrorism when the U.S. was excluded from the SEMs. While reducing the sample size does increase the likelihood of Type II errors, this influence was minimal, and the observed coefficients and  $p$ -values instead suggest that the previous positive relationship between gun ownership and terrorism was being driven by the inclusion of the U.S. (Firearm 2016:  $IRR = 0.92$ ,  $CI = 0.51-1.65$ ); Firearm 2017 ( $IRR = 0.76$ ,  $CI = 0.39-1.46$ ); Non-Firearm 2016: ( $IRR = 1.06$ ,  $CI = 0.61-1.83$ ); Non-Firearm 2017: ( $IRR = 1.09$ ,  $CI = 0.53-2.23$ ). When the U.K, Switzerland, Japan and New Zealand were removed there were no

substantive differences to the findings discussed above in any model. This provides further evidence that the null observed coefficients observed when the U.S. was excluded were not due to lost statistical power and reinforces that the U.S. has a strong influence over global estimates of the relationship between gun availability and its influence on terrorism.<sup>24</sup>

## **Discussion and conclusions**

The purpose of this study was to examine the potential relationship between gun availability and firearm-related terrorism using: (1) a comparative approach given the global nature of terrorism, (2) an SCP framework, which has been increasingly and successfully been applied to understanding terrorism, to motivate a two-tailed hypothesis. The recent finding by Kovandzic and Kleck (2021) that such availability was not associated with homicide rates in a multivariate analysis of a sample of 55 nations further motivates the need to examine terrorism as a distinct, and possibly more valid measure, of cross-national violence. Also influenced by the larger gun-crime literature and the resulting critiques of these studies, we carefully constructed a robust methodology to examine these delicate connections. Importantly, our findings represent a departure from the results of several prior studies, highlighting the unique nature of terrorism as an offense and demonstrating the significance of methodological decisions. In these respects, our study constitutes a substantive contribution to the SCP, terrorism/counterterrorism, comparative, and gun-crime literatures.

Collectively, our analyses demonstrated support for SCP's premise for part of our two-tailed hypothesis: that increasing the effort of offending should decrease terrorism. As posited by Clarke and Newman (2006), weapon control and thus, limiting accessibility, is one way to achieve this strategy. We did not, however, find support for the competing SCP prediction that more accessibility would increase the risk of terrorism and thus, decrease its prevalence. Specifically, countries with higher gun availability did not have fewer firearm-related attacks.

Interestingly, our findings were dependent on the inclusion of the U.S. in our models, which was consistently a "high-leverage outlier." Specifically, the influence of firearm availability on counts of firearm-related terrorist attacks is reduced to statistical nonsignificance when the U.S. is removed from the models. While not altogether surprising, this finding does merit further discussion. As described in prior works, the U.S. is an important outlier in terms of firearm ownership (Rosenbaum 2012). As noted by Khalil (2017), U.S. citizens possess more than 300 million firearms,

double that of Switzerland, the country with the second highest rate of firearms per capita in the developed world. Again, given the finding of Kovandzic and Kleck (2021) that the U.S. was *not* an influential outlier in terms of the relation between gun availability and homicide, our own results justify examination of the relation between such availability and other forms of violence. Indeed, it appears as if the U.S. is unique when it comes to firearm-related terrorism, again distinguishing the importance of this as a distinct outcome. Although outside the scope of this investigation, the lack of universal gun policy like that of background checks and waiting periods, the role of the gun lobby, arguments related to first amendment freedoms, and the relative economic prosperity of the United States contribute to such uniqueness (Kleck 2001, 2004, 2015).

However, a more nuanced consideration related specifically to firearm availability may also explain our results. The U.S. is unusual not only in terms of aggregate civilian firearm ownership, but also with the *types* of firearms available for civilian ownership. Indeed, in comparison to the other nations included in our models, civilians in the U.S. maintain legal access to a broad range of firearms, including semiautomatic pistols and rifles, as well as high-capacity magazines. Thus, while it is possible that our findings are simply a result of the sheer volume of firearms in circulation in the U.S., it is also plausible that they may, at least partially, be attributed to the types of guns and magazines available for civilian purchase. In other words, the very same guns and magazines available to law-abiding residents can also be obtained by would-be terrorists.

These types of weapons and accessories are comparatively more difficult to *legally* obtain in other nations and likely require reliance on international black market and smuggling operations (Boutwell and Klare 1999; Gorea 2006; Grillot 2011; Grip 2015; Kinsella 2006). Such markets feed on global firearm exports and facilitate the movement and proliferation of small arms between borders (Gorea 2006; Grillot 2011; Grip 2015). As noted by Taylor and Wu (2013), the top ten largest global exporters of firearms are the United States, Russia, Germany, France, United Kingdom, Netherlands, China, Spain, Italy, and Sweden. Such transfers often fuel political conflict in South Asia, sub-Saharan Africa, and the Western Balkans, but are generally unregulated and lack post-shipment verification (Gorea 2006; Grillot 2011; Grip 2015; Klare 1999; Latham 1999; Taylor and Wu 2013).

Further, as described by Kinsella (2006), the business of arms exporting tends to be profit driven rather than a product of shared political, religious, or ideological goals. China, in particular, has established itself as a major arms

exporter by focusing on the supply of cheap, low quality weaponry, often arming both sides of a conflict (Taylor and Wu 2013). Primary destinations for these shipments include such locales as Egypt, Algeria, Sudan, Tanzania, Nigeria, Zimbabwe, Ethiopia, Benin, Chad, Congo-Brazzaville, Gabon, Ghana, Kenya, Namibia, Niger, Rwanda, Sierra Leone, Uganda, and Zambia (Taylor and Wu 2013). Yet, the regimes and rebel groups receiving small arms do not represent final destination points (Boutwell and Klare 1999). Instead, black markets in South Africa and Angola, followed by Belgium, Romania, and Ukraine, act as the top brokers for the redistribution of small arms from Africa to India, Pakistan, Sri Lanka, Colombia, and Ireland (Grillot 2011; Kinsella 2006). It is therefore unsurprising, despite increased focus on small arms control post-9/11 (Cooper and Mutimer 2011), that Chinese-made weaponry has frequently been seized from the Taliban in Afghanistan, as well as insurgent groups in Iraq (Taylor and Wu 2013). In fact, most firearms used in terrorist and ethnic conflicts were *originally* legally produced, sold, and purchased (Brem and Rutherford 2001; Stohl et al. 2007).

In the U.S., such global mechanisms may be less necessary. This explanation remains consistent with the assertions of Clarke and Newman (2006) that, of the “MURDEROUS” attributes influencing weapon selection, the “O” of obtainability remains the most important. We strongly encourage future works to extend our methodology and explore this possibility, as it may yield a more robust understanding of the relationship between firearm availability and terrorism.

Despite its contribution to the literature, the current study does maintain certain limitations related to the unit of analysis. As has been noted by Kleck (2015), comparative studies that include the U.S. and treat countries as the unit of analysis are potentially problematic. In comparison to other nations, gun laws in the U.S. are not homogenous, but instead vary by state, county, and city. In addition, treating the presence or absence of gun legislation as a measure of firearm availability or control is a debatable methodological approach (e.g. Cook and Ludwig 1996; Hureau and Braga 2018; Khalil 2017; Killias et al. 2001; Kopel 1992). Similarly, firearm availability and terrorist attacks are unlikely to be uniformly distributed across smaller geographic units nested within a single country, including the U.S. (e.g. Dierenfeldt et al. 2017; LaFree and Bersani 2014). However, we do believe these issues to be partially addressed by using the rate of suicide by firearm as a proxy for gun availability. Relatedly, the use of SCP to inform a country-level study may be seen as a possible issue. Nonetheless, and as noted, macro-level variation in the form of aggregate crime counts is often utilized to operationalize individual-level criminal

motivation (e.g. Agnew 1999; Cohen and Felson 1979). At the same time, we encourage future studies to replicate our methods using smaller units of analysis coupled with hierarchical modeling, although data-related issues may severely hinder such efforts.<sup>25</sup>

We also caution that our findings should not be generalized beyond the time period examined. As has been reported elsewhere in the literature (e.g. Fisher and Becker 2019; LaFree et al. 2009, 2010) changes within global terrorism trajectories are not monotonic across all nations—a finding replicated here. Simply put, it should not be expected that the relationships described here are consistent across time and space.

As with the previous statistical attempts to examine the relationship between gun ownership and crime, the methods used also have important limitations that should be considered. As noted above, the value of SEM is dependent upon model specification (see Bollen 1989; Millsap 2007). As such, while this method is able to model and test for the presence of reciprocal relationships, it benefits from being augmented by adjacent methodological approaches to evaluate the robustness and value of the specified model. In this study, we found that the substantive findings were robust to sensitivity tests conducted using both negative binomial and Poisson estimation procedures, suggesting that these findings were not driven from the specific structural model that was used for the primary analysis. Consequently, despite the sensitivity analyses conducted here, we recommend further examination of the relationship between gun accessibility and terrorism using alternative structural models to further test the robustness our findings. Specifically, we highlight the value in investigating this relationship over longer periods of time using longitudinal methods. Longitudinal methods would be able to better assess the stability of the relationships observed in this study and could also assess whether changes in firearm ownership in addition to the level of firearm ownership impacts the incidence of terrorism. In addition, we suggest that future examinations into this topic examine the impact of firearm ownership on other key terrorism outcomes including fatalities from terrorist attacks. Furthermore, we also note our inability to control for group-level correlates given data availability, which can inform subsequent research.

With this in mind, and coupled with our limitations and calls for replication, we make three main suggestions. First, future investigations into terrorism and terrorism-related behavior should continue to explore the SCP framework. We agree with Freilich and colleagues' (2019) sentiment that, "SCP has much to contribute to both the academic study of terrorism and efforts to safeguard societies from terrorist

threats" (p. 1303). Here, we were only able to test one small element of its constructs as they relate to this unique crime type. We implore future studies to examine the MURDEROUS attributes, in particular, as they remain understudied.

Second, we maintain that firearm availability is important, but it is not the only global predictor. Instead, worldwide counterefforts would benefit from a focus on other country-level known correlates, such as the very ones controlled for in this study. Second and somewhat disparately, our study has demonstrated the uniqueness of the U.S. in respect to both gun accessibility, firearm-related terrorism, and the connection between the two. If terrorism is to be combatted effectively within the U.S., it should be done so with this in mind. Strategies aimed at increasing the effort of U.S. terrorists to obtaining weapons may very well be beneficial as counterterrorism.

Finally, research has shown what is considered to be terrorism, either in the media or by citizens, rarely represents the full spectrum of extremist behaviors and instead may be a reflection of biases (Betus et al. 2019; D'Orazio and Salehyan 2018; Huff and Kertzer 2018). We believe that this extends to weapon type given the common disconnect between the belief that a terrorist attack must involve explosives, when the U.S.'s timeline of "devastating events with far-reaching implications" (Miller 2016:11) would indicate otherwise. Awareness efforts, aimed at both law enforcement entities and the public alike, would benefit from inclusion of this important distinction.

All in all, we are keenly aware that any discussion of the relationship between firearms and terrorism is likely to prove contentious. These constructs are not, after all, merely subjects of scientific inquiry. Instead, they are topics at the center of several long-standing political, economic, and ideological debates across the globe. We only hope to add one small piece to the discussion here and encourage future efforts to examine the U.S. and its distinctive role.

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**Notes**

1. We use the word “relatively” here to acknowledge that while trends indicate a high number of deaths attributed to terrorism historically, such deaths are still rare in comparison to those caused by traffic accidents, for instance.
2. Although, as noted by Freilich and Newman (2017) and Freilich (2015), not all of SCP is consistent with the works of Beccaria and Bentham. In particular, the views on deterrent measures vary (Freilich et al. 2015).
3. As developed by Trochim (1989), this strategy “requires a theoretical pattern of expected outcomes, an observed pattern of effects, and an attempt to match the two” (p. 360).
4. International waters is coded uniquely and not included in our analysis. In addition, the following entities are in the GTD only as target/nationality and not as a state/territory or as part of a state/territory: Asian, Bermuda, Commonwealth of Independent States, Corsica, Great Britain, Greenland, Liechtenstein, Man, Isle of, Mongolia, Multinational, Northern Ireland, Oman, Puerto Rico, Sinhalese, St. Martin, and Tonga.
5. Czechoslovakia, East Germany, New Hebrides, North Yemen, Rhodesia, South Vietnam, South Yemen, the Soviet Union, West Germany, Yugoslavia, Zaire.
6. China (Hong Kong, Macau), France (French Guiana, French Polynesia, Guadeloupe, Martinique, New Caledonia, Wallis and Futuna), and Great Britain (Cayman Islands, Gibraltar, Falkland Islands).
7. In the final analytic sample, 81 countries experienced no terrorist attacks 2015, 71 countries experienced zero terrorist attacks 2016, and in 2017, 78 countries were recorded to have zero attacks according the GTD. The number of attacks in each nation also includes unsuccessful attacks. Out of the total number of global terror attacks between 2015 and 2017 ( $f=39,583$ ), 7,440 (18.8%) were unsuccessful according to the GTD.
8. Both the Ivory Coast and Republic of the Congo are referred to by their other names in the GHDx data; “Côte d’Ivoire” and “Congo” respectively (the latter was also formerly the “People’s Republic of Congo” with a unique country code). Although Kosovo, Saint Kitts/Nevis, Western Sahara, and Vatican City are included on the list of countries that GHDx collects data on, these states did not have available health data so they were removed from the sample. In addition, GHDx had data on states that the GTD does not collect data on (Cape Verde, Federated States of Micronesia, Kiribati, Saint Vincent and the

Grenadines, Samoa, and Sao Tome and Principe), includes only as a target/victim descriptor (as noted: Bermuda, Greenland, Marshall Islands, Mongolia, Oman, Tonga, U.S. Virgin Islands), or are subsumed under another entity (American Samoa, Guam, Northern Mariana Islands, and Puerto Rico) so these were not included separately. Finally, the GHDx includes Israel and Palestine separately, but we utilized the former's rate for our independent variable and for all controls.

9. We acknowledge that the original source of these data is the WHO, whose limitations with homicide outcomes are one of our motivations for the original selection of our dependent variable. Nonetheless, we still believe suicide to be the best choice for our independent variable as it is less susceptible to cross-cultural interpretation, coupled with its established validity over other measures of gun availability.
10. The GTD codes up to four weapon types.
11. Here, other and unknown were coded as “non-firearm” related. It should be noted that this different than coding the dependent variable equal to all other weapon types, but we believe that this is a less accurate way of distinguishing a firearm attack.
12. Given these data are consistently updated, we note the download date of December 11, 2019 here.
13. If not otherwise indicated, controls are for 2016 where data were available.
14. The homicide rate for Serbia and Montenegro were averaged since they were listed separately in these data.
15. The countries that were omitted from the final analytic sample due to missing data were: Afghanistan, Andorra, Antigua and Barbuda, Bahamas, Barbados, Belarus, Bhutan, Botswana, Comoros, Cuba, Djibouti, Dominica, East Timor, Equatorial Guinea, Eritrea, Grenada, Iraq, Israel (Including West Bank and Gaza), Ivory Coast, Maldives, Montenegro, North Korea, Qatar, Serbia, Serbia-Montenegro, Solomon Islands, Somalia, South Sudan, St Lucia, Sudan, Surinam, Swaziland, Syria, Taiwan, Turkmenistan, Uzbekistan, Vanuatu, and Yemen.
16. Self-harm by firearm in 2015 ( $t = 1.21, p = 0.23$ ), self-harm by firearm in 2016 ( $t = 1.26, p = 0.21$ ), firearm terrorism in 2015 ( $t = -0.97, p = 0.33$ ), non-firearm terrorism in 2015 ( $t = -1.32, p = 0.19$ ), firearm terrorism in 2016 ( $t = -1.07, p = 0.29$ ), non-firearm terrorism in 2016 ( $t = -1.35, p = 0.19$ ), firearm terrorism in 2017 ( $t = -1.10, p = 0.28$ ), or non-firearm terrorism in 2016 ( $t = -1.28, p = 0.21$ ).
17. For example, In April 2019, New Zealand lawmakers voted by a margin of 119 to 1 to change the nation’s gun laws following the murder of 50 people killed in a mass shooting at two mosques in Christchurch. The new law banned ownership of most semiautomatic weapons, magazines, and some shotguns. The shooter was an avowed white supremacist.

18. As no latent variables were used in any models, all following estimations used path analysis models. While latent variable models can address some forms of measurement error, particularly when multi-item scales are used (see Coffman and MacCallum 2005), this decreases model fit due to the higher number of estimated parameters in SEM models (Ayán et al. 2009). In order to additionally enhance replicability and interpretability (Henseler 2018), path model analysis was selected as the analytic strategy for this study.
19. We did not limit our outcomes to fatal incidents given fatalities in any country are unfortunately a function of the proximity to a hospital and the overall quality of medical care (Bertoli and Grembi 2017). Particularly as it has long been established that fatalities can have adverse impacts on the longevity of terrorist organizations (Dugan et al. 2008), there is little reason to examine this as a factor upon which to partition the analysis. However, with adequate evidence this would make for an interesting additional analysis for a future study.
20. The findings from these models are available from the authors upon request.
21. In interpreting Figure 3, please note that the scale of the y axis for the graph containing data on firearm terrorist attacks (left) ranges between 0 and 900, whereas the range for the y-axis for non-firearm attacks (right) spans between 0 and 3500.
22. As the magnitude of the coefficient did not increase with the addition of additional variables, this does not suggest that a bivariate relationship suppresses the relationship between firearm ownership and firearm terrorism (see MacKinnon et al. 2000). Instead, this suggests that this relationship was mediated or confounded by the other variables included in this analysis. The percent of the urban population, for example, is a statistically significant predictor of self-harm by firearm ( $IRR = 1.013$ , CI 1.005–1.021) and firearm terrorism ( $IRR = 0.963$ , CI = 0.941–0.986), fulfilling the three criteria for mediation outlined in MacKinnon et al. (2000), further demonstrating that the above observed bivariate relationship is not a function of suppression.
23. The results for the additional SEM, negative binomial and Poisson models are available upon request.
24. This was also reinforced in an additional sensitivity analysis that was run that excluded five randomly selected non-U.S. nations from the sample that yielded the same substantive findings.
25. For example, the suicide by firearm data was not consistently available by smaller geographic units.

## **References**

- Ajdacic-Gross, V., M. Killias, U. Hepp, E. Gadola, M. Bopp, C. Lauber, and W. Rossler. 2006. "Changing Times: A Longitudinal Analysis of

- International Firearm Suicide Data." *American Journal of Public Health* 96(10):1752-1755.
- Ajdacic-Gross, V., M. Killias, U. Hepp, S. Haymoz, M. Bopp, F. Gutzwiller, and W. Rossler. 2010. "Firearm Suicides and Availability of Firearms: The Swiss Experience." *European Psychiatry* 25(7):432-434.
- Altheimer, I. 2008. "Do Guns Matter? A Multi-Level Cross-National Examination of gun Availability on Assault and Robbery Victimization." *Western Criminology Review* 9(2):9-32.
- Altheimer, I. and M. Boswell. 2012. "Reassessing the Association Between gun Availability and Homicide at the Cross-National Level." *American Journal of Criminal Justice* 37:682-704.
- Argomaniz, J. and A. Vidal-Diez. 2015. "Examining Deterrence and Backlash Effects in Counter-Terrorism: The Case of ETA." *Terrorism and Political Violence* 27(1):160-181.
- Ayán, M., M. Ramírez, and M. Díaz. 2009. "Path Analysis Models Versus Latent variable Models: Examples From Educational and Health Approaches." *International Journal of Hispanic Psychology* 2(2):91-110.
- Bangalore, S. and F. H. Messerli. 2014. "Gun Ownership and Firearm-Related Deaths." *American Journal of Medicine* 126:873-876.
- Beccaria, C. 1764. An essay on crimes and punishments.
- Bentham, J. 1789. An Introduction to the Principles of Morals and Legislation.
- Bertoli, P. and V. Grembi. 2017. "The Life-Saving Effect of Hospital Proximity." *Health Economics* 26:78-91.
- Betus, Allison, Erin Kearns, and Anthony Lemieux. 2019. "'Terrorism' or 'Mental Illness?': Factors That Impact How Media Label Terrorist Attacks."
- Black, D. A. and D. S. Nagin. 1998. "Do Right-to-Carry Laws Deter Violent Crime?" *Journal of Legal Studies* 27:209-215.
- Bollen, K. A. 1989. "A New Incremental Fit Index for General Structural Equation Models." *Sociological Methods & Research* 17(3):303-316.
- Boutwell, J. and M. Klare. 1999. *Light Weapons and Civil Conflict*. Lanham, MD: Rowman and Littlefield.
- Brantingham, P. L. and P. J. Brantingham. 1990. "Situational crime prevention in practice". *Canadian journal of criminology* 32(1):17-40.
- Brem, S. and K. R. Rutherford. 2001. "The Landmine Ban and the Debate on Small Arms and Light Weapons: Walking Together or Divided Agenda?" *Security Dialogue* 32(2):169-186.
- Britt, C. L., G. Kleck, and D. J. Bordua. 1996. "A Reassessment of the D.C. Gun Law: Some Cautionary Notes on the Use of Interrupted Time Series Designs for Policy Impact." *Law & Society Review* 30(2):361-380.

- Cao, L., F. T. Cullen, and B. G. Link. 1997. "The Social Determinants of Gun Ownership: Self-Protection in an Urban Environment." *Criminology; An Interdisciplinary Journal* 35(4):629-658.
- Carson, J. V. 2017. "Assessing the Effectiveness of High-Profile Targeted Killings in the "War on Terror:" A Quasi-Experiment." *Criminology & Public Policy* 16(1):191-220.
- Clarke, R. V. G. (Ed.). 1997. *Situational Crime Prevention*. Monsey, NY: Criminal Justice Press.
- Clarke, R. V. and P. Mayhew. 1988. "The British Gas Suicide Story and its Criminological Implications." *Crime and Justice* 10:79-116.
- Clarke, R. V. G. and G. R. Newman. 2006. *Outsmarting the Terrorists*. Greenwood Publishing Group.
- Coffman, D. L. and R. C. MacCallum. 2005. "Using Parcels to Convert Path Analysis Models Into Latent Variable Models." *Multivariate Behavioral Research* 40(2):235-259.
- Cohen, L. E. and M. Felson. 1979. "Social change and crime rate trends: A routine activity approach". *American sociological review* 588-608.
- Cook, P. J. and J. Ludwig. 1996. *Guns in America*. Washington, D.C.: Police Foundation.
- Cook, P. J. and J. Ludwig. 1998. "Defensive Gun Uses: New Evidence From A National Survey." *Journal of Quantitative Criminology* 14(2):111-131.
- Cooper, N. and D. Mutimer. 2011. "Arms Control for the 21st Century: Controlling the Means of Violence." *Contemporary Security Policy* 32(1):3-19.
- Cornish, D. B. and R. V. Clarke. 2003. "Opportunities, Precipitators, and Criminal Decisions: A Reply to Wortley's Critique of Situational Crime Prevention." *Crime Prevention Studies* 16:41-96.
- Cozens, P. M. 2011. *Urban planning and environmental criminology: Towards a new perspective for safer cities*. *Planning practice and research* 26(4):481-508.
- Dahlberg, S., Sören Holmberg, Bo Rothstein, Natalia Alvarado Pachon, and Richard Svensson. 2018. The Quality of Government Basic Dataset, Version Jan18. University of Gothenburg: The Quality of Government Institute (<http://www.qog.pol.gu.se>, doi: 10.18157/QoGBasJan18).
- Davis, R. C., C. Ortiz, R. Rowe, J. Broz, G. Rigakos, and P. Collins. 2006. An Assessment of the Preparedness of Large Retail Malls to Prevent and Respond to Terrorist Attack. *A Report Submitted to US Department of Justice*.
- Dierenfeldt, R., T. C. Brown, and R. A. Roles. 2017. "Re-considering the Structural Covariates of Gun Crime: An Examination of Direct and Moderated Effects." *Deviant Behavior* 38(2):208-225.
- D'Orazio, V. and I. Salehyan. 2018. "Who Is A Terrorist? Ethnicity, Group Affiliation, and Understandings of Political Violence." *International Interactions* 44(6):1017-1039.

- Dugan, L. and E. Chenoweth. 2012. "Moving Beyond Deterrence: The Effectiveness of Raising the Expected Utility of Abstaining From Terrorism in Israel." *American Sociological Review* 77(4):597-624.
- Dugan, L., LaFree, G., & Piquero, A. R. (2005). Testing a rational choice model of airline hijackings. *Criminology* 43(4):1031–1065.
- Dugan, L., J. Y. Huang, G. LaFree, and C. McCauley. 2008. "Sudden Desistance From Terrorism: The Armenian Secret Army for the Liberation of Armenia and the Justice Commandos of the Armenian Genocide." *Dynamics of Asymmetric Conflict* 1(3):231-249.
- Duggan, M. 2001. "More Guns, More Crime." *Journal of Political Economy* 109:1086-1114.
- Fisher, D. and V. Asal. 2020 "Before and During Iraq: Was Insurgent Lethality Impacted by the Invasion of Iraq?" in *Post-ISIS Era: Regional and Global Implications. NATO Science for Peace and Security Series*, edited by S. Cubucku and S. Ozeren. Berlin: Springer.
- Fisher, D. and M. H. Becker. 2019. "The Heterogeneous Repercussions of Killing Osama Bin Laden on Global Terrorism Patterns." *European Journal of Criminology*, Online First. doi: 10.1177/1477370819850103
- Folmer, E. O., M. van der Geest, E. Jansen, H. Olff, T. M. Anderson, T. Piersma, and J. A. van Gils. 2012. "Seagrass–Sediment Feedback: An Exploration Using A non-Recursive Structural Equation Model." *Ecosystems* 15(8):1380-1393.
- Freilich, J. D. 2015. "Beccaria and situational crime prevention". *Criminal Justice Review* 40(2):131-150.
- Freilich, J. D., S. M. Chermak, and H. Y. Hsu. 2018. "Deterring and Preventing Terrorism." Pp. 434-443 in *Routledge Handbook of Terrorism and counterterrorism*.
- Freilich, J. D., J. Gruenewald, and M. Mandala. 2019. "Situational Crime Prevention and Terrorism: An Assessment of 10 Years of Research." *Criminal Justice Policy Review* 30(9):1283-1311.
- Freilich, J. D. and G. R. Newman. 2017. "Situational Crime Prevention." in *Oxford Research Encyclopedia of Criminology and Criminal justice*.
- Gau, J. M. 2010. "Basic Principles and Practices of Structural Equation Modeling in Criminal Justice and Criminology Research." *Journal of Criminal Justice Education* 21(2):136-151.
- Gollob, H. F. and C. S. Reichardt. 1991. "Interpreting and Estimating Indirect Effects Assuming Time Lags Really Matter." in *Best Methods for the Analysis of Change: Recent Advances, Unanswered Questions, Future Directions*, edited by L. M. Collins and J. L. Horn. Washington, DC: American Psychological Association.
- Gorea, R. K. 2006. "Impact of Proliferation of Small Arms and Light Weapons in South Asia." *Medicine, Conflict and Survival* 22(3):199-206.

- Grabherr, S., S. Johner, C. Dilitz, U. Buck, M. Killias, P. Mangin, and T. Plattner. 2010. "Homicide-suicide Cases in Switzerland and Their Impact on the Swiss Weapon law." *The American Journal of Forensic Medicine and Pathology* 31(4):335-349.
- Grillot, S. R. 2011. "Guns in the Balkans: Controlling Small Arms and Light Weapons in Seven Western Balkan Countries." *Southeast European and Black Sea Studies* 10(2):147-171.
- Grip, L. 2015. "History Never Repeats? Imports, Impact and Control of Small Arms in Africa." *Contemporary Security Policy* 36(1):79-103.
- Gruenewald, J. 2011. "A Comparative Examination of Homicides Perpetrated by far-Right Extremists." *Homicide Studies* 15(2):177-203.
- Gruenewald, J., B. R. Klein, J. D. Freilich, and S. Chermak. 2016. "American Jihadi Terrorism: A Comparison of Homicides and Unsuccessful Plots." *Terrorism and Political Violence*: 1-20.
- Hamm, M. S. 2007. *Terrorism as crime: from Oklahoma City to Al-Qaeda and beyond*. Vol 7, NYU Press.
- Hauser, W. and G. Kleck. 2013. "Guns and Fear: A one-way Street?" *Crime and Delinquency* 59(2):271-291.
- Hayduk, L. A., H. P. Robinson, G. G. Cummings, K. Boadu, E. L. Verbeek, and T. A. Perks. 2007. "The Weird World, and Equally Weird Measurement Models: Reactive Indicators and the Validity Revolution." *Structural Equation Modeling: A Multidisciplinary Journal* 14(2):280-310.
- Haywood, K. 2007. "Situational Crime Prevention and its Discontents: Rational Choice Theory Versus the "Culture of now." *Social Policy & Administration* 41-(3):232-250.
- Hemenway, D. and M. Miller. 2000. "Firearm Availability and Homicide Rates Across 26 High-Income Countries." *The Journal of Trauma, Injury, Infection, and Critical Care* 49:985-988.
- Henseler, J. 2018. "Partial Least Squares Path Modeling: Quo Vadis?" *Quality & Quantity* 52(1):1-8.
- Hoffman, B. and J. Forest. 2017. *Inside Terrorism (Revised Edition)*. Columbia University Press.
- Hoskins, A. W. 2001. "Armed Americans." *Justice Quarterly* 18:569-592.
- Huff, C. and J. D. Kertzer. 2018. "How the Public Defines Terrorism." *American Journal of Political Science* 62(1):55-71.
- Hureau, D. M. and A. A. Braga. 2018. "The Trade in Tools: The Market for Illicit Guns in High-Risk Networks." *Criminology; An Interdisciplinary Journal* 56-(3):510-545.
- Hurka, S. and C. Knill. 2020. "Does Regulation Matter? A Cross-National Analysis of the Impact of gun Policies on Homicide and Suicide Rates." *Regulation & Governance* 14:787-803.

- Jackson, B. A. and D. R. Frelinger. 2008. "Rifling Through the Terrorists' Arsenal: Exploring Groups' Weapon Choices and Technology Strategies." *Studies in Conflict & Terrorism* 31(7):583-604.
- Jones, S. G., C. Doxsee, and N. Harrington. 2020. The tactics and targets of domestic terrorists. Center for Strategic and International Studies. Accessed at: (<https://www.csis.org/analysis/tactics-and-targets-domestic-terrorists>).
- Jung, R. S. and L. A. Jason. 1988. "Firearm Violence and the Effects of gun Control Legislation." *American Journal of Community Psychology* 16:515-524.
- Kates, D. B. 1989. "Firearms and Violence: Old Premises and Current Evidence." Pp. 197-215, Vol. 1 in *Violence in America: The History of Crime*, edited by T. R. Gurr. Newbury Park, CA: Sage.
- Kates, D. B. 1997. "Making A Case for Gun Ownership: Israeli-US Contrasts." *Christian Science Monitor* 90:15-18.
- Kattelman, K. T. 2020. "Assessing Success of the Global War on Terror: Terrorist Attack Frequency and the Backlash Effect." *Dynamics of Asymmetric Conflict* 13(1):67-86.
- Khalil, U. 2017. "Do More Guns Lead to More Crime? Understanding the Role of Illegal Firearms." *Journal of Economic Behavior & Organization* 133:342-361.
- Killias, M. 1993a. "International Correlations Between Gun Ownership and Rates of Homicide and Suicide." *Canadian Medical Association Journal* 148(10):1721-1725.
- Killias, M. 1993b "Gun Ownership, Suicide, and Homicide: An International Perspective." in *Understanding Crime: Experiences of Crime and Crime Control*, edited by A. del Frate, U. Zvekic, and J. J. M. van Dijik (pp. 289-303). Rome: UNICRI.
- Killias, M., J. van Kesteren, and M. Rindlisbacher. 2001. "Guns, Violent Crime, and Suicide in 21 Countries." *Canadian Journal of Criminology* 43:429-448.
- Kinsella, D. 2006. "The Black Market in Small Arms: Examining A Social Network." *Contemporary Security Policy* 27(1):100-117.
- Klare, M. 1999 "An Overview of the Global Trade in Small Arms and Light Weapons." Pp. 3-10 in *Small Arms Control: Old Weapons, new Issues*, edited by L. Lumpe and T. Gabelnick. New York, NY: Ashgate.
- Kleck, G. 1997. *Targeting Guns: Firearms and Their Control*. New York, NY: Aldine de Gruyter.
- Kleck, G. 2001. "Impossible Policy Evaluations and Impossible Conclusions: A Comment on Koper and Roth." *Journal of Quantitative Criminology* 17(1):75-80.
- Kleck, G. 2004. "Measures of Gun Ownership Levels for Macro-Level Crime and Violence Research." *Journal of Research in Crime and Delinquency* 41(1):3-36.
- Kleck, G. 2015. "The Impact of Gun Ownership Rates on Crime Rates: A Methodological Review of the Evidence." *Journal of Criminal Justice* 43:40-48.

- Kleck, G. 2021. "The Cross-National Association of Gun Ownership Rates and Suicide Rates: An Analysis of 194 Nations." *Archives of Suicide Research*: 1-9. DOI: 10.1080/13811118.2021.1922110
- Kleck, G., T. Kovandzic, M. Saber, and W. Hauser. 2011. "The Effect of Perceived Risk and Victimization on Plans to Purchase A Gun for Self-Protection." *Journal of Criminal Justice* 39(4):312-319.
- Kleck, G. and K. McElrath. 1991. "The Effects of Weaponry on Human Violence." *Social Forces* 69(3):669-692.
- Kleck, G. and B. Patterson. 1993. "The Impact of Gun Control and Gun Ownership Levels on Violence Rates." *Journal of Quantitative Criminology* 9:249-287.
- Klein, B. R., J. Gruenewald, and B. L. Smith. 2017. "Opportunity, Group Structure, Temporal Patterns, and Successful Outcomes of Far-Right Terrorism Incidents in the United States." *Crime & Delinquency* 63(10):1224-1249.
- Kline, R. B. 2015. "The Mediation Myth." *Basic and Applied Social Psychology* 37-(4):202-213.
- Koehler-Derrick, G. and D. J. Milton. 2019. "Choose Your Weapon: The Impact of Strategic Considerations and Resource Constraints on Terrorist Group Weapon Selection." *Terrorism and Political Violence* 31(5):909-928.
- Kopel, D. B. 1992. *The Samurai, the Mountie, and the Cowboy: Should America Adopt the Gun Controls of Other Democracies?* Amherst, NY: Prometheus Books.
- Koper, C. S. and C. S. Roth. 2001a. "The Impact of the 1994 Federal Assault Weapon Ban on Gun Violence Outcomes: An Assessment of Multiple Outcome Measures and Some Lessons for Policy." *Journal of Quantitative Criminology* 17(1):33-74.
- Kovandzic, T. and G. Kleck. 2021. "The Impact of Firearm Levels on Homicide Rates: The Effects of Controlling for Cultural Differences in Cross-National Research." *American Journal of Criminal Justice*: 1-15. (Online First).
- Kovandzic, T., M. E. Schaffer, and G. Kleck. 2012. "Gun Prevalence, Homicide Rates and Causality: A GMM Approach to Endogeneity Bias." in *The Sage Handbook of Criminological Research Methods*, edited by D. Gadd, S. Karstedt, and S. F. Messner (pg. 1-57). Thousand Oaks, CA: Sage.
- Kovandzic, T., M. E. Schaffer, and G. Kleck. 2013. "Estimating the Causal Effect of Gun Prevalence on Homicide Rates: A Local Average Treatment Effect Approach." *Journal of Quantitative Criminology* 29:477-541.
- Kwon, I. G. and D. W. Baack. 2005. "The Effectiveness of Legislation Controlling Gun Usage: A Holistic Measure of Gun Control Legislation." *American Journal of Economics and Sociology* 64(2):533-547.
- Lafree, G. 1999. "A summary and review of cross-national comparative studies of homicide". *Homicide: A sourcebook of social research* 1:125.

- LaFree, G. and B. E. Bersani. 2014. "County-Level Correlates of Terrorist Attacks in the U.S." *Criminology & Public Policy* 13(3):455-481.
- LaFree, G. and L. Dugan. 2007. "Introducing the Global Terrorism Database." *Terrorism and Political Violence* 19(1):181-204. doi: 10.1080/09546550701246817
- LaFree, G., L. Dugan, and R. Korte. 2009. "The Impact of British Counterterrorist Strategies on Political Violence in Northern Ireland: Comparing Deterrence and Backlash Models." *Criminology: An Interdisciplinary Journal* 47(1):17-45.
- Lankford, A. 2016. "Public Mass Shootings and Firearms: A Cross-National Study of 171 Countries." *Violence and Victims* 31(2):187-199.
- Latham, A. 1999. "Light Weapons and Human Security—A Conceptual Overview." Pp. 13-14 in *Small Arms Control: Old Weapons, New Issues*, edited by L. Lumpe and T. Gabelnick. New York, NY: Ashgate.
- Legault, R. L. and J. C. Hendrickson. 2009. "Weapon Choice and American Political Violence: A Comparison of Terrorists and Other Felons in Federal Custody." *Criminology & Public Policy* 8(3):531-559.
- Lester, D. 1991. "Crime as Opportunity: A Test of the Hypothesis With European Homicide Rates." *British Journal of Criminology* 31(2):186-188.
- Loftin, C., D. McDowall, B. Wiersema, and J. C. Talbert. 1991. "Effects of Restrictive Licensing of Handguns on Homicide and Suicide in the District of Columbia." *New England Journal of Medicine* 325:1615-1620.
- Lott, J. R. 2003. *The Bias Against Guns: Why Almost Everything You've Heard About Gun Control Is Wrong*. Washington, D.C.: Regnery Publishing.
- Lott, J. R. and D. B. Mustard. 1997. "Crime, Deterrence, and Right-to-Carry Concealed Handguns." *Journal of Legal Studies* 26:1-68.
- MacCallum, R. C. and J. T. Austin. 2000. "Applications of Structural Equation Modeling in Psychological Research." *Annual Review of Psychology* 51(1):201-226.
- MacKinnon, D. P., J. L. Krull, and C. M. Lockwood. 2000. "Equivalence of the Mediation, Confounding and Suppression Effect." *Prevention Science* 1(4):173-181.
- Malik, O. F., A. C. Schat, M. M. Raziq, A. Shahzad, and M. Khan. 2018. "Relationships Between Perceived Risk of Terrorism, Fear, and Avoidance Behaviors among Pakistani University Students: A Multi-Group Study." *Personality and Individual Differences* 124:39-44.
- Mandala, M. and J. D. Freilich. 2018. "Disrupting Terrorist Assassinations Through Situational Crime Prevention." *Crime & Delinquency* 64(12):1515-1537.
- Maxwell, S. E., D. A. Cole, and M. A. Mitchell. 2011. "Bias in Cross-Sectional Analyses of Longitudinal Mediation: Partial and Complete Mediation Under an Autoregressive Model." *Multivariate Behavioral Research* 46(5):816-841.

- McDowall, D., C. Loftin, and B. Wiersema. 1996. "Using Quasi-Experiments to Evaluate Firearm Laws: Comment on Britt et al.'s Reassessment of the D.C. Gun Law." *Law & Society Review* 30(2):381-392.
- Miller, E. 2015. Use of Firearms in Terrorist Attacks the U.S. 1970–2014. START, College Park, MD. July. ([http://www.start.umd.edu/pubs/START\\_FirearmsinTerrorism\\_BackgroundReport\\_July2015.pdf](http://www.start.umd.edu/pubs/START_FirearmsinTerrorism_BackgroundReport_July2015.pdf)).
- Miller, E. 2016. *Patterns of Terrorism in the United States, 1970-2014*. College Park, MD: START.
- Miller, M., D. Azrael, and D. Hemenway. 2002. "Firearm Availability and Unintentional Firearm Deaths, Suicide, and Homicide among 5–14 Year Olds." *Journal of Trauma and Acute Care Surgery* 52(2):267-275.
- Miller, M., D. Hemenway, and D. Azrael. 2007. "State-level Homicide Victimization Rates in the US in Relation to Survey Measures of Household Firearm Ownership, 2001–2003." *Social Science & Medicine* 64(3):656-664.
- Miller, E. and M. Jensen. 2017. American Deaths in Terrorist Attacks, 1995–2016. Study of Terrorism and Responses to Terrorism (START). University of Maryland. Retrieved from: ([http://start.umd.edu/pubs/START\\_AmericanTerrorismDeaths\\_FactSheet\\_Nov2017.pdf](http://start.umd.edu/pubs/START_AmericanTerrorismDeaths_FactSheet_Nov2017.pdf)).
- Millsap, R. E. 2007. "Structural Equation Modeling Made Difficult." *Personality and Individual Differences* 42(5):875-881.
- Miron, J. A. 2001. "Violence, Guns, and Drugs: A Cross-Country Analysis." *The Journal of Law and Economics* 44:615-633.
- National Consortium for the Study of Terrorism and Responses to Terrorism (START). 2017. Global Terrorism Database [Data File and Codebook]. Retrieved from (<https://www.start.umd.edu/gtd>).
- Newman, G. and P. Marongiu. 1997 *Situational crime prevention and the Utilitarian theories of Jeremy Bentham. Rational Choice and Situational Crime Prevention: Theoretical Foundations* 137-62.
- Piazza, J. A. 2016. "Oil and Terrorism: An Investigation of Mediators." *Public Choice* 169(3-4):251-268.
- Piazza, J. A. and S. W. Choi. 2018. "International Military Interventions and Transnational Terrorist Backlash." *International Studies Quarterly* 62(3):686-695.
- Poe, R. 2001. *The Seven Myths of gun Control: Reclaiming the Truth About Guns, Crime, and the Second Amendment*. Roseville, CA: Forum.
- Regens, J. L., A. Schultheiss, and N. Mould. 2015. "Regional Variation in Causes of Injuries among Terrorism Victims for Mass Casualty Events." *Frontiers in Public Health* 3:198.
- Rosenbaum, J. E. 2012. "Gun Utopias? Firearm Access and Ownership in Israel and Switzerland." *Journal of Public Health Policy* 33(1):46-58.

- Shaw, C. and H. Mckay. 1942. *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press.
- Siegel, M., C. S. Ross, and C. King. 2013. "The Relationship Between Gun Ownership and Firearm Homicide Rates in the United States, 1981–2010." *American Journal of Public Health* 103(11):2098-2105.
- Sloan, J. H., A. L. Kellermann, D. T. Reay, J. A. Ferris, T. Koepsell, F. P. Rivara, and J. LoGergo. 1988. "Handgun Regulations, Crime, Assaults, and Homicide: A Tale of Two Cities." *New England Journal of Medicine* 319(19):1256-1262.
- Smith, D. A. and C. D. Uchida. 1988. "The Social-Organization of Self-Help-A Study of Defensive Weapon Ownership." *American Sociological Review* 53(1):94-102.
- Stamatel, J., K. Ratajczak, and R. Hoekstra. 2020. "Do Gun Policies Really Protect Women? A Cross-National Test of the Relationship Between Gun Regulations and Female Homicide Victimization." *Journal of Mediterranean Knowledge* 5(1):19-46.
- Stohl, R., M. Schroeder, and D. Smith. 2007. *The Small Arms Trade*. Oxford, UK: Oneworld.
- Stroebe, W., N. P. Leander, and A. W. Kruglanski. 2017. "The Impact of the Orlando Mass Shooting on Fear of Victimization and Gun-Purchasing Intentions: Not What One Might Expect." *Plos One* 12(8):e0182408.
- Sturup, J., A. Rostami, H. Mondani, M. Gerell, J. Sarnecki, and C. Edling. 2019. "Increased Gun Violence among Young Males in Sweden: A Descriptive National and International Comparison." *European Journal of Criminal Justice Policy Research* 25:265-378.
- Taylor, I. and Z. Wu. 2013. "China's Arms Transfers to Africa and Political Violence." *Terrorism and Political Violence* 25(3):457-475.
- Tennenbaum, A. 1992 "Israel has a Successful gun Control Policy." in *Gun Control: Current Controversies*, edited by C. P. Cozic and C. Wekesser. San Diego, CA: Greenhaven.
- Tessler, R. A., S. J. Mooney, C. E. Witt, K. O'Connell, J. Jenness, M. S. Vavilala, and F. P. Rivara. 2017. "Use of Firearms in Terrorist Attacks: Differences Between the U.S., Canada, Europe, Australia, and New Zealand." *JAMA Internal Medicine* 177(12):1865-1868.
- World Health Organization. 2016. *Global Health Estimates Summary Tables: Homicides by Country, Sex, and Age Group*. Geneva, Switzerland. Accessed at: ([http://www.who.int/healthinfo/global\\_burden\\_disease/en/](http://www.who.int/healthinfo/global_burden_disease/en/)) on 5/7/2020.
- Zimring, F. E. 1972. "The medium is in the Message: Firearm Caliber as a Determinant of Death From Assault." *Journal of Legal Studies* 1(1):97-123.
- Zimring, F. E. and G. Hawkins. 1997. *Crime Is not the Problem: Lethal Violence in America*. New York, NY: Oxford University Press.

## Appendix A. Pattern matching of SCP components.

SCP mechanism (Cornish and Clarke 2003)	SCP techniques (Cornish and Clarke 2003)	MURDEROUS attribute (Clarke and Newman 2006)	Hypothesis	Primary dependent variable	Primary independent variable
Strategies that <i>increase the risk of offending</i> should decrease crime.	Strengthening formal surveillance	If weapons are <i>more obtainable</i> this should <i>increase the risk to commit terrorism and thus, decrease terrorism.</i>	H1a: Countries with higher gun obtainability will have fewer firearm-related terrorist attacks.	Count of a country's firearm-related terrorism attacks in 2016.	A country's self-harm by firearm rate in 2016.
Strategies that <i>increase the effort of offending</i> should decrease crime.	Controlling weapons	If weapons are <i>less obtainable</i> this should <i>increase the effort to commit terrorism and thus, decrease terrorism.</i>	H1b: Countries with lower gun obtainability will have fewer firearm-related terrorist attacks.	Count of a country's firearm-related terrorism attacks in 2016.	A country's self-harm by firearm rate in 2016.