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ORIGINAL ARTICLE

Hold your fire! Influence of female legislators on gun legislation in the United States

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Abstract

Objective: This article considers the influence of female legislators on gun legislation across U.S. states. Females have behavioral differences with males and likely different exposure to gun-related violence.

Method: Using data from 1991 to 2020, we estimate the drivers of gun legislation across U.S. states. The dependent variables are alternately the total number of gun laws enacted and 5-year differences in gun laws.

Results: We find that female legislators in state houses significantly increase the supply of gun laws. Female senators, on the other hand, were no different from their male counterparts. In other results, states with greater population density had more gun laws, while economic prosperity, race, and the elderly population did not generally have significant effects. Finally, when special interest aspects, involving gun ownership, mass shooting episodes, and states with single-party control of the legislative and executive branches are considered, mass shootings and single-party control increase laws, while gun owners have the opposite effect. These findings show significance when 5-year differences in gun laws are used.

Conclusions: Our findings suggest that when it comes to gun legislation and female legislator representation, it matters which chamber of the legislature females are elected to. Furthermore, different interest groups can significantly bear upon gun legislation.

KEYWORDS

gun control, gun laws, gender, firearms, legislatures, mass shootings, gun ownership

The proliferation of guns and resulting gun violence has attained alarming proportions in some nations worldwide in recent years (https://www.amnesty.org/en/what-we-do/arms-control/gun-violence/). In many nations, high gun ownership rates can be tied to historical precedents related to freedom and hunting cultures. According to DiRienzo and Das (2023), there are approximately one billion small arms and light weapons (rifles, pistols, and light machine guns) in circulation worldwide. Among the developed nations, the United States figures prominently in the list of nations with high deaths

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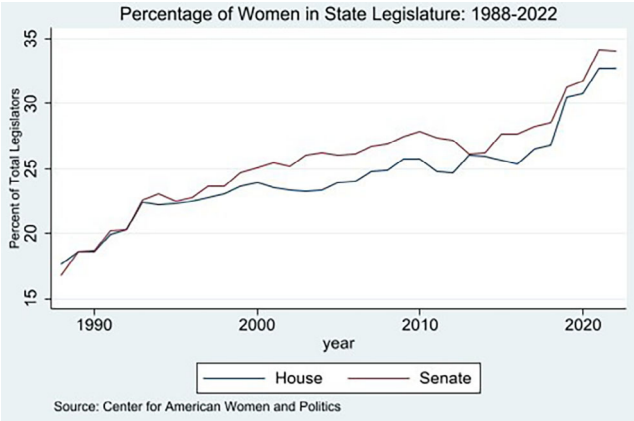


FIGURE 1 Percentage of women in U.S. state legislatures: 1988–2022.

from gun violence (https://www.pewresearch.org/short-reads/2023/04/26/what-the-data-says-about-gun-deaths-in-the-u-s/; Utter and True 2000).

The gun-related violence has resulted in tougher laws for the sale, ownership, and carrying of firearms, also including the type of forearms (e.g., assault rifles) that can be made legally available to the general public (https://www.npr.org/2023/04/29/1172890034/colorado-governor-signs-gun-control-bills). The ability of lawmakers in democratic nations to enact gun legislation (including legislation facilitating or checking the possession, sale, and display of firearms) is subject to the ability and composition of different constituencies or interest groups. These constituencies may be internal or external to the legislatures or the rulemaking bodies. The internal constituencies include the composition of the legislature (political party affiliation, gender, etc.), while the external constituencies relate to the characteristics of the voting population (Tatalovich and Haider-Markel 2022). Other external constituencies include special interest groups such as the National Rifle Association and the Brady Campaign to Prevent Gun Violence in the United States.

This article examines the effectiveness of female legislators (both in state houses and state senates) across U.S. states in enacting gun legislation. There are some significant institutional differences in the composition of state houses and state senates, and these differences exist both within and across states. For instance, these include the lengths of terms of state legislators (https://ballotpedia.org/Length_of_terms_of_state_representatives), whether there are term limits in place (https://www.ncsl.org/about-state-legislatures/the-term-limited-states) and so on. These differences impact the time legislators have to form coalitions to pass legislation and how responsive legislators would be to the demands of the electorate in passing legislation. Females in general might have different attitudes toward gun control than men because of their greater vulnerability to certain crimes or the fact that they have some behavioral differences from their male counterparts (Barber and Odean 2001; Booth and Nolen 2012). Lizotte (2019) notes the behavioral differences of females in their attitudes toward gun control. Are states with a greater share of female legislators more likely to enact gun legislation?

Figure 1 depicts the trend in the percentage of all seats in U.S. state legislatures occupied by women since 1988, reported separately for the House and Senate legislative chambers. The trends for both generally track upward from the start of the period through 2010, reaching around 25% in the House and 22% in the Senate, and then stabilized at those levels until around 2015. Following that, women's share of legislative seats in both chambers spiked upward, reaching about one-third of House seats and slightly less than 30% in the Senate by 2022 (most recent data available at the time of this writing). These data mask considerable variations among the individual states. For example, in 2022, the share of House legislative seats held by women ranged from a low of 14% (West Virginia) to a high of 67% (Nevada). On the Senate side, the corresponding range for that year was from 11% (South Carolina) to 53% (Arizona).[1]

[1] The state of Nebraska has only one legislative chamber and was excluded from the analysis.

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To put the gender-legislature composition in context, it is useful to dwell on the relative power of legislative groups. For instance, what proportion of legislative seats needs to be held by women for them to have a "critical mass" sufficient to have an influence on public policy on general issues directly relevant to women in particular is a matter of some debate? Advocates for gender quotas for legislative bodies typically argue that women need to have "critical minority" in the range of 30–40% of the total seats.[2] Others have concluded that the threshold can be lower, even as low as 10% (Park 2017). Under any circumstances, the trends depicted in Figure 1 show that in recent decades, many legislative bodies in the United States may well exceed the level of female participation necessary to have a meaningful policy impact, including legislation pertaining to firearms.

We also consider another dimension of internal (to the legislatures) constituency by controlling for states where the governor and both houses are of the same political party. This relates to the efficiency of pushing legislation via relatively lower political transaction costs (Mulligan 2011; Reeping et al. 2019).

For the external interest groups bearing on gun legislation, state-level data on membership in organizations such as the National Rifle Association are unavailable. Instead, we account for this indirectly using estimates of state household firearm ownership. Further, we also consider the impact that mass shootings (impacting victims, risk-averse populations, etc.) might have on gun control. Such events may lead to greater public support for gun control legislation (Luca et al. 2020; Newman and Hartman 2019) and potentially raising gun sales (Iwama and McDevitt 2021). Overall, are internal constituencies relatively more effective at pushing gun legislation than external constituencies?

While there has been a significant amount of research on gender and guns in the United States and elsewhere (see DiRienzo and Das 2023; Goss 2003; Hill et al. 2021; Kelley 2021; Lizotte 2019; Middlewood et al. 2019; Schwartz 2019; Stucky et al. 2008), this article uniquely considers the relative influences of female state legislators, distinguishing between female state house members and female senators, on the supply or proliferation of gun/firearm-related legislation in the United States over a long span of three decades.[3]

Our main finding is that it is the share of female legislators in state houses that significantly increases the supply of gun laws. Female senators (share), on the other hand, were no different from their male counterparts. These findings are robust to several model specifications, and with respect to two alternative estimation strategies. Thus, when it comes to gun legislation and the presence of female legislators, it matters which chamber of the legislature females are elected to. Other considerations include a focus on the influence of different special interest groups on gun legislation.

The layout of the rest of the paper includes the background and the model in the next section, followed by data and estimation, results, and conclusions.

BACKGROUND AND THE MODEL

Background

As the above discussion shows, firearm ownership and related violence have drawn the attention of the public, policymakers, and academics. This has resulted in nations strengthening laws on the ownership, sale, and carrying of firearms, with differences in how certain types of weapons are regulated (e.g., assault rifles). However, the continuing episodes of violence suggest that policymakers could use additional guidance in the framing of additional laws. This article is an attempt to understand the determinants of the supply of

[2] https://www.idea.int/data-tools/data/gender-quotas/quotas.

[3] Given the legislative lags involved, government secrecy, legislative coalitions and lobbying (Goel 2014, 2021), and so on, it is unclear from the popular press reports that a certain gun legislation(s) came about mainly due to increased women's legislative presence. However, among others, Senator Diane Feinstein was widely acknowledged for her advocacy for gun control (https://www.politico.com/news/2023/09/29/dianne-feinstein-lawmakers-reaction-00119048; also see https://www.womenspress.com/bills-to-protect-victims-of-gender-based-violence/ for evidence from Minnesota; and https://www.americanprogress.org/article/state-womens-leadership-continue-changing-face-u-s-politics/ for a broader discussion of the influence of women's leadership).

gun laws. Broadly speaking, the research can be seen as fitting into the discussion of the politics of gun control (see Spitzer 2020), with a primary focus on gender empowerment in politics.

As we provide a brief overview of the related literature to highlight the contribution of this work, scholars have considered different dimensions of the gender, political representation, and gun legislation nexus.

Using a global index of arms risk, DiRienzo and Das (2023) hypothesize that greater female political representation (i.e., the proportion of seats in national parliaments held by women) affects arms risk. Their mediation analysis shows that greater female political representation has both a direct and an indirect effect in reducing a country's arms risk. A somewhat related aspect in a different context has been recently considered by Goel and Nelson (2023), where the authors compare the influence of females in the legislative versus executive branches of the government in combating global corruption (also see Goel and Nelson (2021).

The influence of special interest groups, especially gun rights groups on women's attitudes toward guns, has been considered by Goss (2017), also see Goel (2014). This general line of inquiry is also taken by Kelley (2021) in examining the link between feminism and gun ownership. Another interesting angle is considered by Middlewood et al. (2019), where they examine the attitudes of gun-owning women. The authors find that gun-owning women show greater political participation in gun policy and a greater willingness to engage in political discussions about gun control than non-owning women. Finally, Goel (2020) studies whether institutional quality matters in the recording/classification of terror incidents.

In all this body of cross-disciplinary work on gender, political representation, and gun control, perhaps the closest work to this study is an earlier work by Stucky et al. (2008). Using the 2000 National Political Awareness Test data, they find that female legislators in the United States are more likely to indicate support for gun control policies.[4] In contrast, our study is broader and different in many respects. First, we distinguish between female legislators and female senators at the state level (and the results below do find differences in the influences of the two groups). Second, we consider all firearm laws, not just anti-gun laws. This allows for the possibility that in some states, female legislators could be instrumental in repealing anti-gun laws or in helping pass laws to promote gun ownership. Third, our data set covers nearly all states over a period of three decades.

Based on the discussion above, we formulate our main hypothesis:

Hypothesis H1: A greater share of females in state legislatures would increase the proliferation of gun-control laws, ceteris paribus.

Next, we outline our empirical model to test the above hypotheses, using time series data across U.S. states.

The model

Note that we are using gun legislation, rather than gun control, in the title of the article and the analysis because laws in some states over time involve the repeal of earlier laws and are thus not related to gun control (rather, are anti-gun control).

Based on the above discussion and to test hypothesis H1, we outline our empirical model. The general form of the model is the following (with individual observations being at the state level—see Table 1):[5]

$$\text{Gunlaws}_j = \text{f}\,(\text{femalehousemembers (FemHOUSE)}, \text{femalesenatemembers (FemSENATE)}, \text{Z},$$
$$\text{Race (BLACK)}, \text{Age (ELDERLY)}, \text{M}) \ldots \quad (1)$$

[4] Specifically, their data set contained 664 observations (177 female and 487 male state legislators) representing 37 states.

[5] The models with LAWtotal as the dependent variable include state fixed effects.

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TABLE 1 Variable definitions, summary statistics, and data sources.

Variable	Mean (standard deviation)	Source
Total firearms-related laws in place, by U.S. state. [LAWtotal]	24.03 (22.8)	[1]
Five-year change in total firearms-related laws for periods ending in 2000, 2005, 2010, 2015, and 2020, by state. [LAWdiff]	1.77 (5.2)	[1]
Percentage of total seats in state legislature (House) held by women. [FemHOUSE]	24.01 (8.1)	[2]
Percentage of total seats in state Senate held by women. [FemSENATE]	20.66 (9.7)	[2]
Per capita state personal income (in thousands of 1982–1984 dollars) [INCOMEpc]	17.47 (3.31)	[3]
Population density in a state (people per sq. miles of land area) [PopDensity]	160.94 (199.78)	[4]
Percentage of state population African American alone or in combination with another race. [BLACK]	10.96 (9.5)	[5]
Percentage of state population aged 65 and older. [ELDERLY]	13.41 (2.3)	[6]
Total number of mass shootings in a state. [MASSshoot]	0.16 (0.4)	[7]
Governor and state legislature—House and Senate—are controlled by the same political party (= 1 if yes, = 0 if no) [SAMEparty]	0.55 (0.5)	[8]
Dummy variable identifying states and years with Republican Governors (= 1 if yes; 0 otherwise) [RepGOV]	0.55 (0.5)	[8]
Dummy variable identifying states and years when the Republican party controlled the Governorship and both houses of the legislature (= 1 if yes; 0 otherwise) [RepDOMINATE]	0.34 (0.5)	[8]
Estimates of state household firearm ownership rates (based on factor scores for household gun ownership latent factor). Data are available from 1980 to 2016 [GUNowners]	0.42 (0.1)	[9]

Notes: Statistics pertain to observations used in the first model that the variable appears. Years of data cover 1991–2020. The state of Nebraska has only one chamber in the legislature and is excluded from the analysis.

Sources: [1]: State Firearms Laws (https://statefirearmlaws.org/resources). [2]: Center for American Women and Politics (https://cawpdata.rutgers.edu/women-elected-officials/position?current=1&yearend_filter=All&level[]=State%20Legislative&items_per_page=50). The strength of state legislatures data are from The Book of the States (https://issuu.com/csg.publications/stacks/46495f12f95847e6935d331969ed650a). [3]: Bureau of Economic Analysis (https://www.bea.gov/data/income-saving/personal-income-by-state), Federal Reserve Economic Data, CPI for all urban consumers: All items in U.S. city average 1982–84 = 100, https://fred.stlouisfed.org. [4]: US Census Bureau (https://www.census.gov/geographies/reference-files/2010/geo/state-area.html). [5]: https://en.wikipedia.org/wiki/List_of_U.S._states_and_territories_by_African-American_population#References. Data are for census years. non-census year data are interpolated. [6]: Kaiser Family Foundation (https://www.kff.org/other/state-indicator/distribution-by-age/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D). Some data are interpolated before 2008. [7]: https://www.theviolenceproject.org/mass-shooter-database. [8]: https://ballotpedia.org/State_government_trifectas#Historical_trifecta_numbers (includes Nebraska with a unicameral legislature). [9]: Rand Corporation (https://www.rand.org/pubs/tools/TL354.html); Schell et al. (2020).

j = LAWtotal, LAWdiff; Z = INCOMEpc, PopDensity; M = MASSshoot, SAMEparty, GUNowners. Equation (1) can be expanded in the following form:

$$\text{LAWtotalorLAWdiff} = g\left(\text{FemHOUSE}, \text{FemSENATE}, \text{INCOMEpc}, \text{PopDensity}, \text{BLACK}, \text{ELDERLY}, \text{MASSshoot}, \text{SAMEparty}, \text{GUNowners}\right) \ldots \quad (2)$$

The dependent variable is the total gun laws in a state in any given year. On average, there were 24 laws in place per state over the 1991–2020 period. Since many laws (and other controls variable) change slowly over time, we also use 5-year differences in gun laws (LAWdiff) as another dependent variable.

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TABLE 2 Correlation matrix of key variables.

	LAWtotal	FemHOUSE	FemSENATE
LAWtotal	1.00		
FemHOUSE	0.22	1.00	
FemSENATE	0.19	0.65	1.00

Note: See Table 1 for variable details.
N = 1470.

The main explanatory variables of interest include the share of female legislators across states, including the percentage of females in state houses (FemHOUSE), and the corresponding percentage in state senates (FemSENATE).

The correlation between FemHOUSE and FemSENATE in our sample is 0.7, consistent with the trend over time for these variables as depicted in Figure 1. The positive correlation of LAWtotal with females in the state houses is somewhat greater than that between LAWtotal and females in state senates (Table 2). The formal analysis will reveal the relative strengths of these relations, test hypothesis H1, and determine whether the influences of females in state houses and those in state senates on gun legislation are alike. As stated above, the share of females accounts for an internal legislative interest group.

Economic prosperity (INCOMEpc) and population density (PopDensity) are controls that are accounted for in all models. More prosperous states, ceteris paribus, would have better governance, perhaps reducing the need for additional laws, while greater population density is related to information flows about the pros and cons of guns which would, in turn, impact the demand for legislation. In addition, there is some evidence that firearm laws impact gun-related crimes differently in urban and rural areas (Siegel et al. 2016).

We also account for social or demographic aspects by including controls for the elderly and the share of African Americans in the state population. The elderly would be more likely to be a somewhat passive special interest group and also more likely to vote as a block, while African Americans might have different attitudes toward gun legislation, given their history of interactions with law enforcement and crime. The role of culture and race in the gun debate has been noted by Blanco (2016), Hayes et al. (2020), and Schwartz (2019), among others.

Finally, extended models account for additional interest groups that could bear upon the propensities to legislate guns across states. These include gun-owning households, incidents of mass shootings, and instances where the executive body in a state (i.e., both chambers and the Governor) belongs to the same political party. The role/influence of a divided government has been recognized in other contexts (Mulligan 2011), and the gun ownership-legislation nexus has been the focus of a number of studies (Burton et al. 2021; Kelley 2021; Middlewood et al. 2019; Reeping et al. 2019).[6]

DATA AND ESTIMATION

Data

Data on individual state firearm-related related laws are drawn from the State Firearm Laws organization and cover the period from 1991 to 2020. In all, 133 firearm laws across U.S. states are included in the data set, and for each law and year, a binary code is assigned to each state indicating either the presence or absence of the law in that state. The laws included in the analysis are comprehensive and include the following 14 categories of state gun law policy:

[6] Urbatsch (2019) notes the possibility of undercounting in tracking gun ownership.

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• Dealer regulations	• Possession regulations	• Stand your ground legislation
• Buyer regulations	• Concealed carry permitting	• Preemption of local regulations
• Domestic violence	• Assault weapons ban	• Gun manufacturer immunity
• Background checks	• Child access prevention	• Prohibitions for high-risk gun possession (e.g., mental health considerations)
• Ammunition regulations	• Gun trafficking	

The average number of firearm laws across all states nearly doubled over the time period analyzed, and there was wide variation among the individual states. For example, Idaho had only one law in 2020, while California had 111 in the same year. [7]

Data on the number of women holding legislative seats as state representatives and senators are drawn from the Center for American Women and Politics. No distinction is made as to the political party of the officeholder. Annual data on the number of mass public shootings by state are taken from The Violence Project, a nonprofit research group. They use a narrow definition of mass shootings, adopted from the Congressional Research Service, to include situations where a shooter kills four or more strangers in a public place. Annual data on household firearm ownership rates state are drawn from the Rand Corporation and are available up until 2016.

Data for the remainder of the variables in the model are drawn from standard sources, commonly used in empirical research involving the 50 U.S. states. Complete details about the data, including variable names, definitions, and data sources are provided in Table 1. A correlation matrix for the key variables in the analysis can be found in Table 2.

Estimation

Models using LAWtotal as the dependent variable will be estimated using all annual data for the U.S. states over the 1991−2020 period with the exception of Nebraska which has a unicameral legislature, resulting in a total sample size of 1469.[8] All right-hand side regressors will be lagged 1 year in order to account for the implementation time between the passage of any gun law legislation and the date that it actually officially becomes law and is so recorded in our data set. To mitigate concerns about omitted variable bias and unobserved heterogeneity, individual state fixed effects will be included in all model setups. Each model is fit using feasible generalized least squares that allow for the presence of AR(1) autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels.[9]

To obtain a different perspective on the possible dynamics between female participation in state legislatures and firearm-related legislation, 5-year windows of legislative enactments (LAWdiff) are analyzed for the periods ending in 2000, 2005, 2010, 2015, and 2020. For example, the 2000 period reflects the net change in gun laws over the 1996–2000 time period in a given state.[10] In these models, beginning-of-the-period values are used as right-hand-side regressors. For example, in the analysis of the changes in state gun laws over the 1996–2000 period, the proportion to total legislative seats held by women in 1996 is used. Estimation of these models is accomplished via ordinary least squares.

[7] For further details on the methodology used to determine state firearm policy in each state, see Siegel et al. (2017).

[8] Data on the percentage of senate seats held by women in Louisiana in 1991 were missing, resulting in that observation also being dropped from the data set.

[9] As a check, we also ran the baseline Models 2.1a and 2.2a from Table 2 in OLS by including both time and state fixed effects. The main findings, especially with respect to the sign and statistical significance of FemHOUSE and FemSENATE variables, remained unaffected. Additional details are available upon request.

[10] Over the entire 1991–2020 period in our data set, there are 116 instances/years where a state repealed one (or more) gun laws.

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TABLE 3 Female legislators and gun legislation: Baseline models.

Dependent variable→	LAWtotal		LAWdiff	
	(2.1a)	(2.2a)	(2.1b)	(2.2b)
FemHOUSE	0.047**	0.046**	0.114**	0.116**
	(3.7)	(3.4)	(2.0)	(2.0)
FemSENATE	0.000	0.001	0.014	0.013
	(0.0)	(0.1)	(0.4)	(0.3)
INCOMEpc	−0.074	−0.095	0.055	0.053
	(1.3)	(1.4)	(0.4)	(0.4)
PopDensity	0.153**	0.147**	0.007**	0.007**
	(8.1)	(7.3)	(2.7)	(2.5)
BLACK		0.352		−0.001
		(1.3)		(0.03)
ELDERLY		−0.062		0.062
		(0.6)		(0.5)
Observations	1469	1469	245	245
Wald χ^2	2272.6**	2509.1**		
R^2			0.14	0.14
F-value			9.0**	6.3**

Note: See Table 1 for variable details. All models include a constant term. Models 2.1a and 2.1b include state fixed effects (not reported to conserve space). Models are estimated in STATA using xtgls. This estimator uses feasible generalized least squares that allows for the presence of AR(1) autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels. Models 2.1b and 2.2b, with LAWdiff as the dependent variable are estimated via OLS. The numbers in parentheses are absolute *t*-statistics/*z*-statistics based on robust standard errors in the case OLS regressions, and * and **, respectively, statistical significance at the 10% and 5% (or better) levels.

RESULTS

Baseline models

Table 3 reports our baseline models, with two models each for LAWtotal and LAWdiff as the dependent variable, respectively. The results show that the share of females in state legislators in state houses increases gun legislation. This is true whether the dependent variable is total gun laws (LAWtotal) or 5-year differences in laws (LAWdiff). On the other hand, the effect of female senators in state houses is statistically insignificant. Thus, hypothesis H1 is supported, with the qualification that when it comes to gun legislation, it matters where the share of female legislators (i.e., state houses vs. state senates) is changing.

Quantitatively, the parameter estimate associated with the FemHOUSE variable (0.047), using Model 2.1a, implies that increasing the female share of members in the state legislature from 10% to the "critical mass" range of 30%−40% of total seats discussed above would translate into approximately one additional firearms-related law in place in a state, other things equal.

Furthermore, greater population density at the state level, ceteris paribus, increases the proliferation of gun laws. This finding is consistent with greater awareness (demand for) gun legislation in areas with greater population concentration. More prosperous states were generally no different from other states in terms of gun legislation, with the resulting coefficient achieving marginal statistical significance in one of the four models estimated.

When social variables (see Blanco 2016; Burton et al. 2021; Hayes et al. 2020), including race (BLACK) and age (ELDERLY), are introduced in Models 2.2a and 2.2b, the resulting coefficients fail to achieve

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TABLE 4 Female legislators and gun legislation: Additional considerations.

Dependent variable→	LAWtotal			LAWdiff			
	(3.1a)	(3.2a)	(3.3a)	(3.1b)	(3.2b)	(3.3b)	(3.4b)
FemHOUSE	0.047**	0.047**	0.052**	0.128**	0.055	0.108*	0.106*
	(3.7)	(3.9)	(3.9)	(2.3)	(1.0)	(1.9)	(1.8)
FemSENATE	0.000	−0.004	0.002	−0.003	0.057	−0.004	0.012
	(0.0)	(0.5)	(0.2)	(0.1)	(1.3)	(0.1)	(0.3)
INCOMEpc	−0.075	−0.073	−0.057	0.025	0.286**	−0.014	−0.019
	(1.3)	(1.3)	(1.1)	(0.2)	(2.3)	(0.1)	(0.1)
PopDensity	0.152**	0.125**	0.126**	0.008**	0.003	0.004	0.005*
	(8.1)	(6.3)	(6.8)	(2.8)	(1.6)	(1.4)	(1.8)
MASSshoot	0.143			1.374**			
	(1.2)			(2.9)			
SAMEparty		−0.045			1.080*		
		(0.5)			(1.9)		
GUNowners			0.041			−7.345**	
			(0.1)			(2.1)	
LAWtotalLAG							0.040*
							(1.8)
Observations	1469	980	1322	245	196	245	245
Wald χ^2	2304.5**	10994.1**	2729.5**				
R^2				0.17	0.17	0.15	0.15
F-value				9.8**	7.2**	7.8**	7.4**

Note: See Table 3.

statistical significance at the usual levels. The baseline models inform us about the potential variables to include in the extended analysis to which we turn next.

Additional considerations: Effects of different interest groups

Table 4 considers the influences of different interest groups on gun legislation across U.S. states. Specially, we include the number of mass shootings (MASSshoot) and gun ownership (GUNowners) to account for external interest groups, and the variable SAMEparty identifies states/years when a state legislature had the governor and both houses of the same political party to account for (another dimension of) internal interest group.[11] Stated differently, the SAMEparty variable captures states where the government was not divided.

A greater share of female legislators in state houses again showed a positive effect on gun legislation, with stronger relative statistical support when LAWtotal was the dependent variable in Models 3.1a–3.3a. Furthermore, the magnitudes of the coefficients on FemHOUSE in Models 2.1a and 3.1a are nearly identical. On the other hand, all the models estimated showed the coefficient on FemSENATE to be statistically insignificant.

[11] The National Rifle Association (NRA) is a well-known and powerful pro-gun group in the United States (Schwartz 2019). However, information on NRA membership over time does not seem to be publicly available, preventing us from including the influence of this group in the analysis. Religious groups might be another relevant interest group in this context (see Upenieks et al. 2023).

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The three additional special interest variables, MASSshoot, SAMEparty, and GUNowners, were all statistically insignificant in Models 3.1a–3.3a when LAWtotal is the dependent variable. However, Models 3.1b–3.3b show greater statistical traction when LAWdiff is the dependent variable. Specifically, consistent with intuition, more mass shootings and legislators/governor of the same party made gun legislation more likely, while more gun owners made gun legislation less likely.

Additionally, to account for the persistence or positive spillovers from legislations, Model 3.4b includes total gun laws (LAWtotal) as a regressor. The coefficient on LAWtotal was positive and significant at the 10 percent level.

Finally, the results for population density were mostly positive and significant (especially with LAWtotal as the dependent variable), and those for economic prosperity were mostly statistically insignificant. These are largely consistent with the findings in Table 3.

Robustness check: Considering the role of House and Senate female membership separately

The models considered above used both House and Senate female legislative membership. As a robustness check, we also ran the models separately with either FemHOUSE or FemSENATE as the main regressor, using the same general format of Table 3.

Running the models separately, FemHOUSE always holds statistical significance, FemSENATE never does, using LAWtotal as the dependent variable. However, with LAWdiff as the dependent variable, FemHOUSE is again significant, and FemSENATE attains significance in some cases. These results are not reported but are available upon request. Some of the difference might be due to the differences within and across states in the lengths of House versus Senate legislative terms (https://ballotpedia.org/Length_of_terms_of_state_senators), which would have implications for coalition formation and the elected officials' response to different interest groups. This would all impact their voting behavior on gun legislation.

Robustness check: Accounting for the role of political ideology

The political ideology of the legislators in the government might influence legislation (Potrafke 2018)—both the propensity and speed of laws, in this case gun legislation. To address this, we reran the baseline models by including a variable identifying states and years with Republican Governors (RepGOV), and another variable, RepDOMINATE, indicating states and years with both houses and the governorship belonging to the Republican party (see Table 1). The Republican party in the United States is generally viewed as being more pro-gun ownership (e.g., https://www.nytimes.com/2022/05/26/us/republicans-gun-control.html). The corresponding results, with LAWtotal and LAWdiff as alternate dependent variables, are presented in Table 5.

The results showed that the pro-gun ideology of the Republican party was associated with fewer gun laws, ceteris paribus. Specifically, the coefficients on RepGOV and RepDOMINATE were negative in all instances and statistically significant when LAWtotal was the dependent variable. The results for the other controls were qualitatively similar to what is reported earlier.

Robustness check: Checking for the influence of outliers

It is possible that outliers in the data set might be unduly influencing our findings. To test for this, we reran the baseline models in Table 3 by excluding the states with the highest (California) and the lowest (Idaho) number of gun laws in our sample. The main findings from Table 3 remain unaffected (additional details are available upon request).

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TABLE 5 Female legislators and gun legislation: The role of political ideology.

Dependent variable→	LAWtotal		LAWdiff	
	(4.1a)	(4.2a)	(4.1b)	(4.2b)
FemHOUSE	0.049**	0.051**	0.060	0.055
	(3.8)	(4.0)	(1.1)	(1.0)
FemSENATE	−0.010	−0.010	0.044	0.043
	(1.1)	(1.1)	(1.1)	(1.0)
INCOMEpc	−0.074	−0.074	0.265**	0.271**
	(1.3)	(1.3)	(2.1)	(2.2)
PopDensity	0.139**	0.136**	0.003	0.003
	(7.5)	(7.3)	(1.6)	(1.3)
RepGOV	−0.221**		−0.630	
	(2.0)		(1.1)	
RepDOMINATE		−0.311**		−0.784
		(2.7)		(1.4)
Observations	980	980	196	196
Wald χ^2	15,847.2**	14,838.3**		
R^2			0.16	0.16
F-value			6.9**	7.2**

Note: See Table 3.

CONCLUDING REMARKS

Gun control continues to be a pressing political issue in the United States and elsewhere (https://www.cfr.org/backgrounder/us-gun-policy-global-comparisons; https://www.pbs.org/newshour/nation/how-do-u-s-gun-laws-compare-to-other-countries), with academics trying to inform the debate via formal investigations based on different aspects of the issue, data, and jurisdictions. This article considers the influence of female legislators in influencing the supply or proliferation of gun or firearm legislation across U.S. states. Females have some different behavioral attributes from their male counterparts and might also have different exposure to gun-related violence or to the recreational use of guns. Furthermore, the separate consideration of Senate and House legislative memberships allow us to consider the correlates of relative institutional differences related to term limits and the length of elected tenure, and how these might impact the relative voting propensities of legislators.

The gender composition of legislatures has been changing over time in the United States. In recent decades, many legislative bodies in the United States have exceeded the level of female participation necessary to have a meaningful policy impact on legislation (Figure 1).

Using data on state-level gun-control laws over the 1991–2020 period, we find that it is the share of female legislators in state houses that significantly increases the supply of gun-control laws. Female senators (share), on the other hand, were no different from their male counterparts. These findings are true whether total gun laws are considered, or 5-year differences in laws are used over the time period in question. The relatively greater ability of female House members to enact gun legislation might be due to their greater responsiveness to the demands of special interest groups (because of the relatively shorter term in office of House members compared to Senate members—https://ballotpedia.org/Length_of_terms_of_state_representatives).

Thus, when it comes to gun legislation and the presence of female legislators, it matters which chamber of the legislature females are elected to—political empowerment of women across U.S. states has dissimilar

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effects of gun legislation. The effect of female state house legislators is substantial quantitatively as well—a 10 percent increase in the strength of female state House members would, ceteris paribus, increase the number of gun laws by about half a percent.[12] Another policy-relevant finding is that the political ideology in state legislatures might play an important role in anti-gun legislation being enacted.

In other results, states with greater density of population had more gun-related laws, while economic prosperity, race, and the elderly population did not generally have significant correlates. Finally, when special interest groups and related incidents involving gun ownership, the number of mass shootings, and states-years with a politically uniform executive are considered, mass shootings and a uniform executive increase the supply of laws, while gun owners have the expected opposite effect. These findings, however, show significance only when 5-year differences in gun laws are employed.

From a policy perspective, this research underscores the point that as the gender composition of state legislatures changes over time, it would have impacts on the frequency of gun legislation. However, female legislators in not all chambers of the legislatures are likely to be equally effective in pushing/enacting such laws.

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[12] Obviously, this number should be interpreted keeping in mind the qualitative differences across individual laws.

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