Supplementary Material: Two Sword Lengths Apart: Credible Commitment Problems and Physical Violence in Democratic National Legislatures

March 30, 2015

Examining Possible Measurement Error: Trends in Violence and Democracy

Section added.

As noted in the main text, data on incidents was primarily gathered using multiple key word searches of the Google News Archive, Google Search, and Youtube over a number of years. This method could have significant measurement error. The electronic availability of news and videos on legislative violence, as with material on almost all other phenomenon, could be positively correlated with time. I.e. more information is available for incidents in more recent periods.

There are more incidents in later periods of the data set than earlier periods. For example, there were only 8 incidents observed in the 1980s, but 65 in the sample's last ten years (2002-2012). However, there are good reasons to believe that this distribution of incidents in time is not simply the result of measurement error.

Primarily, there are many more countries with multi-party elected national legislatures–the criteria for inclusion–that could have violence later in the sample. The top panel of Figure 1 shows the number of countries in the sample with elected multi-party national legislatures. In 1981 there were only 65 countries. Between 1990 and 1995 a dramatic increase occurred such that by 1995 135 countries had multi-party elected legislatures. At the end of the sample period, almost double the original number 149 countries have multi-party elected national legislatures. In the bottom panel of Figure 1 we can see that the average observed number of violent incidents roughly follows the pattern of democratization. There is a noticeable increase in the average number of violent incidents from the mid-1990s. Furthermore,

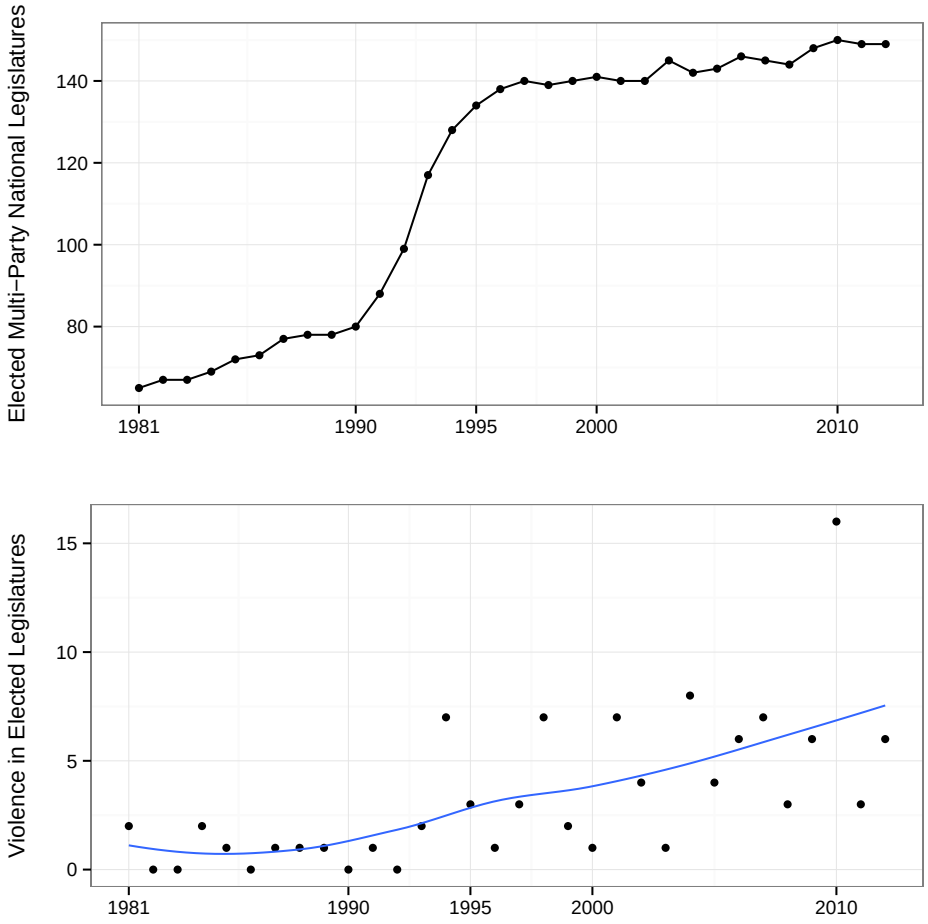

Figure 1: Comparing the Number of Multi-Party Elected National Legislatures to Observed Violence in These Legislatures Over Time

as the empirical evidence in this article has demonstrated newer democracies are more likely to have legislative violence. As such, we should expect to see more violence in the more recent period when there are many new democracies.

Measurement error caused by the electronic availability of information be an issue. Nonetheless, the increasing prevalence of young multi-party elected national legislatures is likely an important cause of there being more observed incidents of violence later in the sample.

Details on Prior Correction of the Rare Logistic Regression Models

UPDATE

For prior correction (see King and Zeng, 2001) in the models with the full sample of elected multi-party legislatures I used the observed proportion of all observations with legislative violence [c1]through 2012: i.e. [c2]2.2 percent of observations up until 2010 had violence ($\tau = \frac{117}{5360} = 0.022$). There were [c3]109 observed incidences of violence and [c4]3990 country-years from 1990 through [c5]2012 in the sample, so: $\tau = \frac{109}{3390} = 0.027$.

[c1] ~~up to 2010~~
[c2] ~~2.1~~
[c3] ~~63~~
[c4] ~~2654~~
[c5] ~~2009~~

Additional Right-hand Variables

This section was moved from the main paper at the editor's request

I examined a number of other legislative and societal-level variables to guard against omitted variable bias. Results from models with these variables are shown in tables I and II. The variables are described below. It is important to first note that overall these factors were not found to be statistically significantly associated with legislative violence nor did they substantively alter the article's core findings.

Variable Descriptions

Gender is closely correlated with violence in society generally. Though there are many possible reasons for this that are beyond the scope of this article, women tend to commit many fewer acts of violence than men (Schwartz, Steffensmeier and Feldmeyer, 2009). Previous research has found that women's participation in parliament has an impact on government decisions to go to war (Melander, 2005). Perhaps if a larger proportion of legislators are women there will be less violence in the parliamentary chamber. To examine this possibility, I gathered data on the *percentage of women in parliament* per country-year from two sources. Data from 1997 and after was from the Inter-Parliamentary Union (2013). Data from before 1997 was from Schwartz, Steffensmeier and Feldmeyer (2009).

I included a countries' *murder rate*, i.e. murders per 100,000 people, to measure a possible association between societal-level and legislative violence. The data was from United Nations (2013), which aggregated annual murder rates from a variety of national and international sources. The data is available from 1995 through 2011.[c0]

I also included standard measures of the *effective number of parliamentary parties* by votes and by seats (Laakso and Taagepera, 1979; Taagepera and Shugart, 1989). The data was taken from Carey and Hix (2011) before 2004 and from Gallagher (2015) afterwards. Both of these measures indicate how fragmented a parliamentary party system is. Higher scores indicate that there are more parties that win either votes or seats. Neither measure produced statistically significant results, so only the results for

[c0] Beyond truncating the sample somewhat, this data set unfortunately does not record Taiwan's murder rate separately from China's.

the effective number of parties by seats are shown below.

To examine whether or not national legislative losers may be dissuaded from legislative violence because there is a possibility of gaining power at a provincial-level, I include the *federalism* dummy variable from Carey and Hix (2011). I updated this from 2004 until the end of the observation period. In early models I also controlled for the government system type, i.e. if it had a presidential, parliamentary, or mixed assembly-elected presidential. This was from the DPI.

Conflict in more economically divided societies may be generally more intense. These conflicts may spill over into legislatures where they precipitate violence between members.To capture similar possible effects from economic divisions, I include *Gini coefficients of economic inequality* from UNU-WIDER (2015).[c0] Finally, as is common in cross-country analyses, I also include the natural logarithm (due to its right-skewed distribution) of *gross domestic product per capita*. This data is from the World Bank's International Development Indicators (2015) and is in thousands of 2005 United States dollars.

Results Discussion

Moved from main paper and changed for results with updated data.

Societal-level Variables In general the additional societal-level variables were found to be associated with legislative violence in any of the models. Countries' murder rates were not found to be associated with violence indicating that the link between societal and legislative violence is not strong. Ethnic fractionalization was not statistically associated with legislative brawls. GDP per capita was also not found to be associated with violence. The Gini coefficient was negatively associated with brawls–more inequality was associated with less violence. This finding runs counter to expectations and requires more research to fully understand.

Other Political and Institutional Variables Results for other political and institutional variables were largely not statistically significant. The effective number of parties variables and the basic continuous government fractionalization variable was statistically significant in the analyses. Likewise, federalism did not appear to be robustly related to legislative violence across the models. All of these variables are not as directly related to legislative fairness and an ability to make credible legislative commitments at a theoretical level, compared to disproportionality, democratic age and, to a lesser extent, governing

[c0]Note, for country-years with missing data I assumed that the Gini Coefficient remained constant from the last year there is data for the country, unless the span was ten years or more. If this was the case they were treated as missing.

majority size. So it should not come as too much of a surprise to find that they are more loosely, if not at all, associated with legislative violence.

Table I: Legislative Violence Rare Events Logistic Regression Results (Multi-Party Elected Legislature 1981-2012)

	Dependent variable:										
	Violent Incident										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lower Disproportionality	−0.765***	−0.754***	−0.763***	−0.730***	−0.596**	−0.820***	−0.883**	−0.766***	−0.650**	−0.714***	−0.589**
	(0.270)	(0.270)	(0.272)	(0.271)	(0.301)	(0.312)	(0.393)	(0.279)	(0.276)	(0.270)	(0.283)
Dem. Age (log)	−0.274**	−0.268**	−0.273**	−0.267**	−0.300**	−0.300**	−0.344**	−0.282**	−0.295***	−0.318***	−0.264**
	(0.107)	(0.106)	(0.108)	(0.106)	(0.129)	(0.123)	(0.162)	(0.120)	(0.113)	(0.106)	(0.130)
Majority Size	−0.026***	−0.026***	−0.027***	−0.024***	−0.024**	−0.026***	−0.028**	−0.030***	−0.030***	−0.027***	−0.023***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.010)	(0.010)	(0.014)	(0.009)	(0.010)	(0.009)	(0.009)
Internal Armed Conflict		0.576*	0.551*	0.560*	0.523	0.715**	0.189	0.570*	0.607**	0.649**	0.679**
		(0.304)	(0.304)	(0.304)	(0.352)	(0.337)	(0.547)	(0.310)	(0.309)	(0.308)	(0.317)
Leg. Immunity			−0.050								
			(0.260)								
Single Party Gov.			−0.146								
			(0.252)								
Political Constraints				−0.697							
				(0.931)							
Self Expression					2.295						
					(2.457)						
Ethnic Frac.					−0.557						
					(0.772)						
Perc. Women in Parl.						0.016					
						(0.018)					
Murder Rate							−0.002				
							(0.013)				
Federal								0.103			
								(0.358)			
Gov. Frac.								0.157			
								(0.470)			
No. of Parties by Seats									−0.091		
									(0.095)		
GINI										−0.037**	
										(0.015)	
GDP per Capita (log)											−0.060
											(0.120)
(Intercept)	−0.711	−0.802	−0.645	−0.616	−3.584	−0.918	−0.261	−0.567	−0.243	0.776	−0.936
	(0.537)	(0.541)	(0.636)	(0.604)	(3.070)	(0.627)	(0.807)	(0.576)	(0.740)	(0.837)	(0.582)
Observations	1,699	1,699	1,674	1,674	909	1,578	821	1,563	1,584	1,677	1,624
Log Likelihood	−275.532	−274.027	−272.986	−273.051	−200.555	−222.278	−134.936	−254.931	−259.651	−269.637	−244.331
Akaike Inf. Crit.	559.065	558.053	559.972	558.101	415.111	456.557	281.872	523.862	531.303	551.274	500.663

*p<0.1; **p<0.05; ***p<0.01
Standard errors are in parentheses. All models use robust (WEAVE) standard errors.

Table II: Legislative Violence Regression Results (Democratic Legislature from 1990-2012)

	Dependent variable:					
	Violent Incident					
	(1)	(2)	(3)	(4)	(5)	(6)
Lower Disproportionality	−0.675**	−0.883**	−0.671**	−0.563**	−0.603**	−0.492*
	(0.319)	(0.393)	(0.283)	(0.280)	(0.275)	(0.290)
Dem. Age (log)	−0.330**	−0.344**	−0.307**	−0.332***	−0.335***	−0.408***
	(0.132)	(0.162)	(0.129)	(0.121)	(0.112)	(0.141)
Majority Size	−0.025**	−0.028**	−0.028***	−0.029***	−0.026***	−0.023**
	(0.010)	(0.014)	(0.010)	(0.010)	(0.009)	(0.010)
Internal Armed Conflict	0.530	0.188	0.480	0.532	0.555	0.662*
	(0.388)	(0.547)	(0.353)	(0.352)	(0.351)	(0.359)
Perc. Women in Parliament	0.010					
	(0.019)					
Murder Rate		−0.002				
		(0.013)				
Federal			−0.079			
			(0.412)			
Gov. Frac.			0.029			
			(0.492)			
No. of Parties by Seats				−0.124		
				(0.099)		
Gini					−0.040**	
					(0.016)	
GDP per Capita (log)						0.122
						(0.132)
(Intercept)	−0.699	−0.154	−0.434	0.036	0.992	−0.773
	(0.655)	(0.807)	(0.599)	(0.774)	(0.858)	(0.614)
Observations	1,316	821	1,316	1,334	1,415	1,368
Log Likelihood	−199.278	−134.936	−231.295	−235.240	−244.874	−220.222
Akaike Inf. Crit.	410.557	281.872	476.591	482.479	501.748	452.445

*p<0.1; **p<0.05; ***p<0.01
Standard errors are in parentheses. All models use robust (WEAVE) standard errors.

Interactions

Section added

I examined a number of interactions between the article's key independent variables–lower disproportionality and democratic age–and a number of societal level and political variables. While I did not find evidence for additive relationships between most of the societal variables and legislative brawls, perhaps they mediate the effect of disproportionality or democratic age. For example, legislators in more homogenous societies might have fewer information asymmetries across partisan divides enabling them to establish credible commitments in new democracies.

Tables III and IV provide the raw estimates from these interactive models. We can see that some of the interactions contain statistically significant terms, though often only at the 10% level.

As in the main article, in order to evaluate the substantive significance of these findings I simulated expected probabilities for interactions that included statistically significant terms at the 5% level and

higher. I then plotted them in figures 2 and 3.[c0] The plots show expected probabilities for various levels of low disproportionality and democratic age at 'high' and 'low' values of the other variables in the interactions. Self-expression was high at 1.35 and low at 1.1. Ethnic fractionalization was high at 0.8 and low at 0.1. Finally, political constraints were high at 0.7 and low at 0.1. These fitted values are close to the variables' minimum and maximum values to enable the largest meaningful contrasts.

The substantive importance of these interactions is overall very weak. Plots of the simulations illustrate that there is considerable overlap in the uncertainty surrounding most of the estimates for substantively meaningful fitted values. This is especially true for interactions with the low disproportionality variable. To the extent that the estimates are suggestive of true interactive effects, overall it appears that factors creating credible commitment problems in new democracies are worsened by ethnic divisions and few constraints on altering policy. The top-panel of Figure IV suggests that perhaps in new democracies violence is more likely when there is more ethnic fractionalisation. Credible commitment problems between ethnic groups could be particularly strong in these countries. The bottom-panel of Figure IV suggests that high political constraints on policy change mediate the effect of democratic age on violence. Having more and more disperse veto players make it difficult for the current majority to enact policy change, perhaps improving their ability to make credible commitments.

It is important to reiterate that though these interactive effects have statistically significant terms, the substantive importance of these estimates for meaningful fitted values is very weak.

Ethnic fractionalization list-wise inclusion

Section added.

Table V shows models with ethnic fractionalization where key variables from the analysis are list-wise included. Ethnic fractionalization is statistically significantly associated with violence at the 10% level in two of these models. However, there are a number of reasons to be very sceptical of this result. First, the direction of the estimated effect runs strongly counter to our expectations in that more fractionalization is assocated with *less* legislative violence. Second, the effect is highly model dependent as it is not significant at the 10% level when lower disproportionality is included or in a model by itself.

[c0] See Figure 4 for marginal effects (Brambor, Clark and Golder, 2006). The substantive importance of the interactions is not conveyed as effectively in these plots. In addition, while the interaction between lower disproportionality and the Gini coefficient contains significant terms at the 5% level the effect is substantively meaningless and is not plotted.

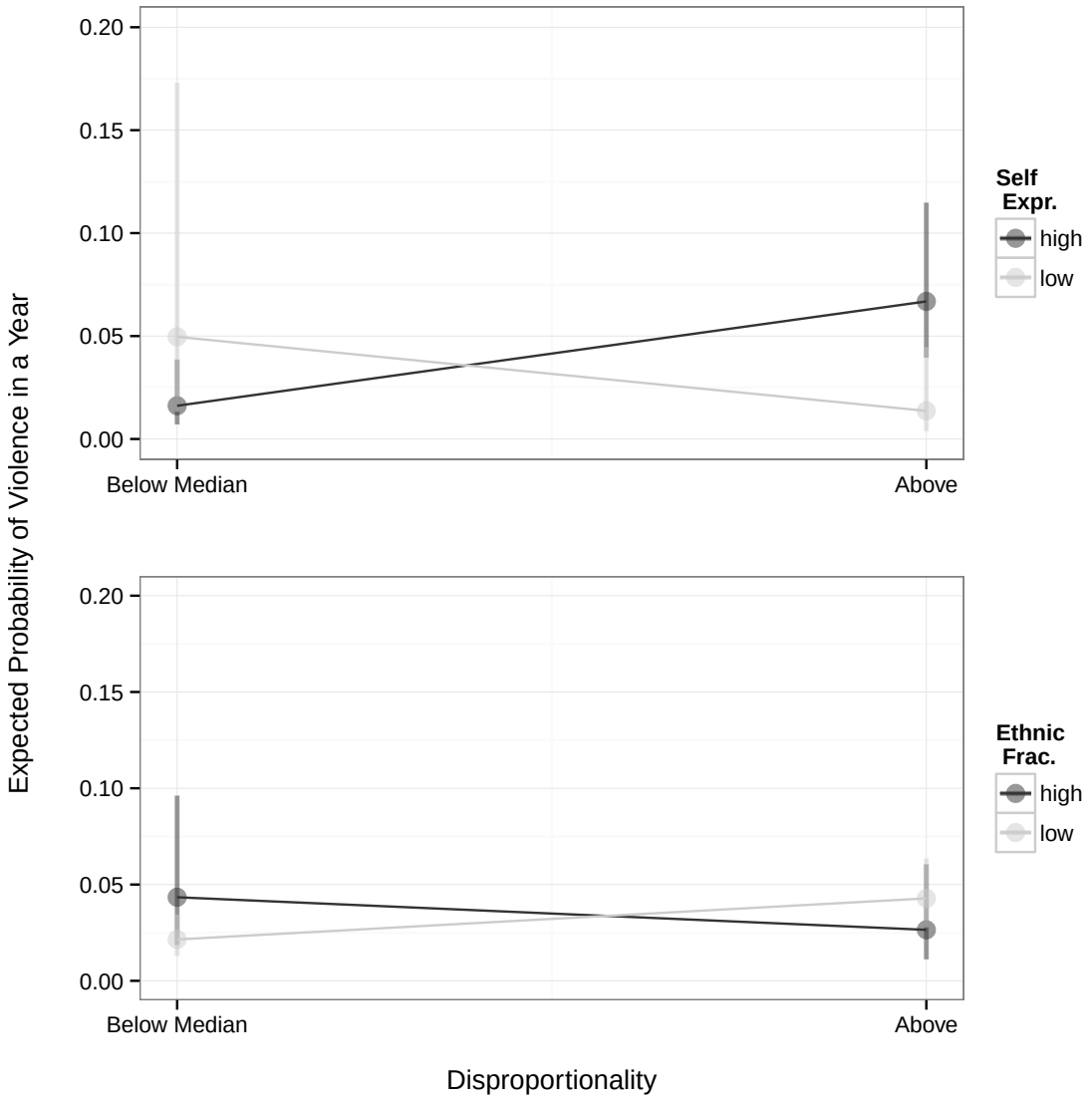

Figure 2: Expected Probability of Legislative Violence in Democratic Legislatures per Year (Interactions 1)

The graphs show the median and middle 95% of 1000 simulations at each fitted value of the variables. The simulations use estimates from tables III and IV. For each set of simulations all other variables were fitted at their means.

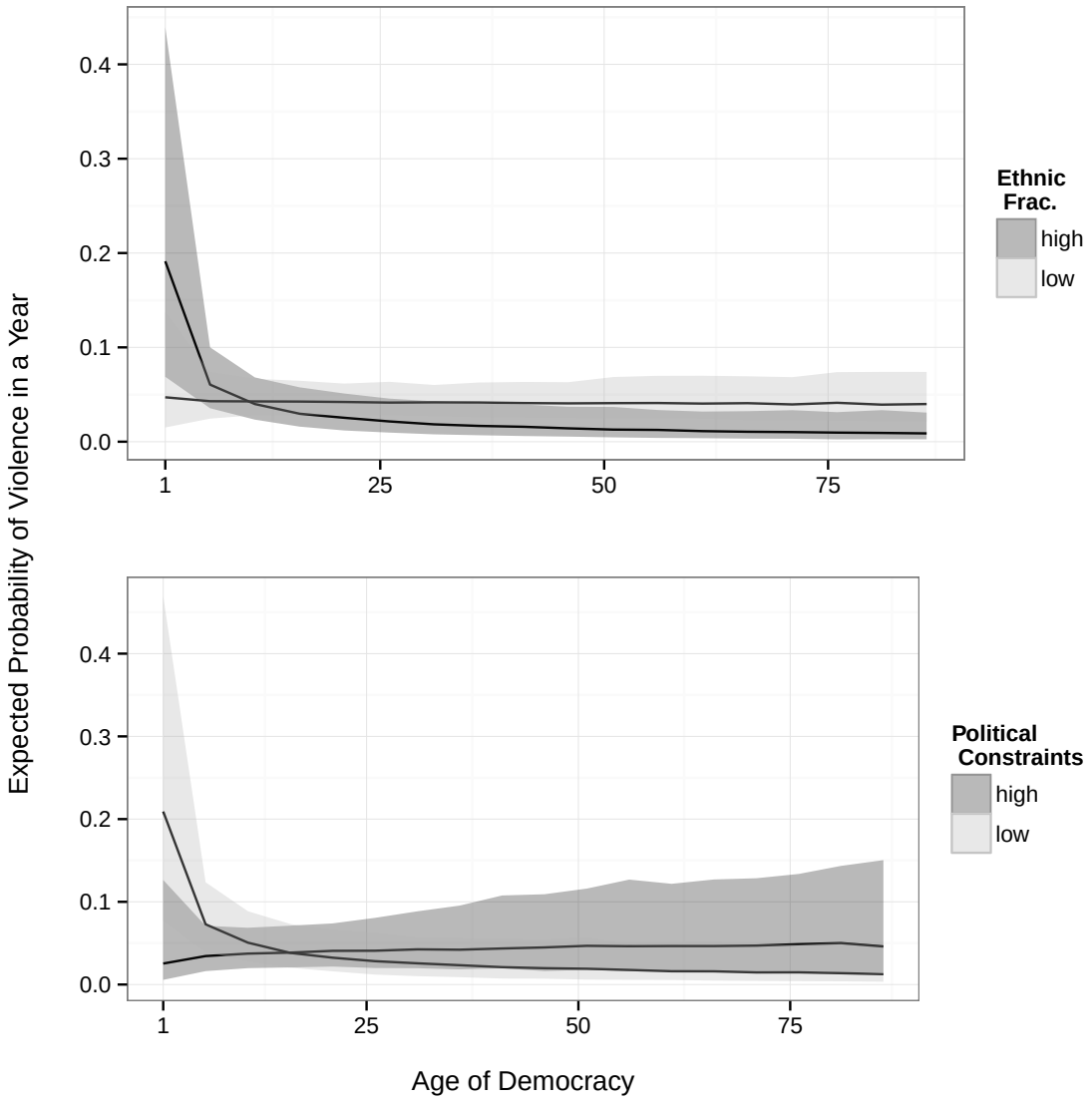

Figure 3: Expected Probability of Legislative Violence in Democratic Legislatures per Year (Interactions 2)

The graphs show the median and middle 95% of 1000 simulations at each fitted value of the variables. The simulations use estimates from tables III and IV. For each set of simulations all other variables were fitted at their means.

Table III: Legislative Violence Regression Results with Lower Disproportionality Interactions (Democratic Legislature from 1990-2012)

	Dependent variable:					
	Violent Incident					
	(1)	(2)	(3)	(4)	(5)	(6)
Majority Size	−0.025***	−0.022**	−0.025***	−0.026***	−0.021**	−0.023***
	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.009)
Dem. Age (log)	−0.247*	−0.337**	−0.304***	−0.340***	−0.369**	−0.300***
	(0.138)	(0.135)	(0.116)	(0.114)	(0.144)	(0.113)
Lower Disproportionality	−0.211	13.788**	−1.729***	−0.873	0.190	−0.180
	(0.687)	(6.543)	(0.601)	(1.191)	(0.438)	(0.783)
Lower Disp.*Dem. Age	−0.159					
	(0.240)					
Self Expression		6.594**				
		(3.185)				
Lower Disp.*Self Expression		−11.297**				
		(5.176)				
Ethnic Frac.			−1.173			
			(0.759)			
Lower Disp.*Ethnic Frac.			2.842**			
			(1.293)			
GINI				−0.040*		
				(0.021)		
Lower Disp.*GINI				0.007		
				(0.031)		
GDP per Capita (log)					0.218	
					(0.153)	
Lower Disp.*GDP Per Capita					−0.439*	
					(0.235)	
Political Constraints						−0.127
						(1.177)
Lower Disp.*Pol. Constraints						−1.117
						(1.916)
(Intercept)	−0.737	−9.076**	−0.189	1.060	−0.996	−0.662
	(0.599)	(4.064)	(0.660)	(0.994)	(0.649)	(0.723)
Observations	1,437	808	1,431	1,415	1,368	1,413
Log Likelihood	−250.221	−183.549	−247.633	−245.863	−219.705	−249.308
Akaike Inf. Crit.	510.442	379.097	507.266	503.726	451.411	510.616

*p<0.1; **p<0.05; ***p<0.01
Standard errors are in parentheses. All models use robust (WEAVE) standard errors.

Table IV: Legislative Violence Regression Results with Democratic Age Interactions (Democratic Legislature from 1990-2012)

	Dependent variable:				
	Violent Incident				
	(1)	(2)	(3)	(4)	(5)
Majority Size	-0.024^{**}	-0.026^{***}	-0.027^{***}	-0.023^{**}	-0.026^{***}
	(0.010)	(0.009)	(0.009)	(0.010)	(0.009)
Lower Disproportionality	-0.533^{*}	-0.644^{**}	-0.601^{**}	-0.473	-0.631^{**}
	(0.306)	(0.275)	(0.276)	(0.289)	(0.276)
Dem. Age (log)	-0.341	0.066	0.301	-0.320	-0.804^{**}
	(2.825)	(0.216)	(0.517)	(0.211)	(0.332)
Self Expression	3.292				
	(5.594)				
Dem. Age*Self Expression	-0.003				
	(2.195)				
Ethnic Frac.		2.330^{*}			
		(1.385)			
Dem. Age*Ethnic Frac.		-1.017^{**}			
		(0.497)			
GINI			0.005		
			(0.035)		
Dem. Age*GINI			-0.017		
			(0.014)		
GDP per Capita (log)				0.190	
				(0.290)	
Dem. Age*GDP Per Capita				-0.041	
				(0.094)	
Political Constraints					-3.731^{*}
					(2.134)
Dem. Age*Pol. Constraints					1.347
					(0.831)
(Intercept)	-4.776	-1.479^{*}	-0.544	-0.828	0.812
	(7.144)	(0.830)	(1.440)	(0.742)	(0.993)
Observations	808	1,431	1,415	1,368	1,413
Log Likelihood	-185.961	-248.197	-245.126	-221.445	-248.296
Akaike Inf. Crit.	383.923	508.394	502.252	454.889	508.591

*p<0.1; **p<0.05; ***p<0.01
Standard errors are in parentheses. All models use robust (WEAVE) standard errors.

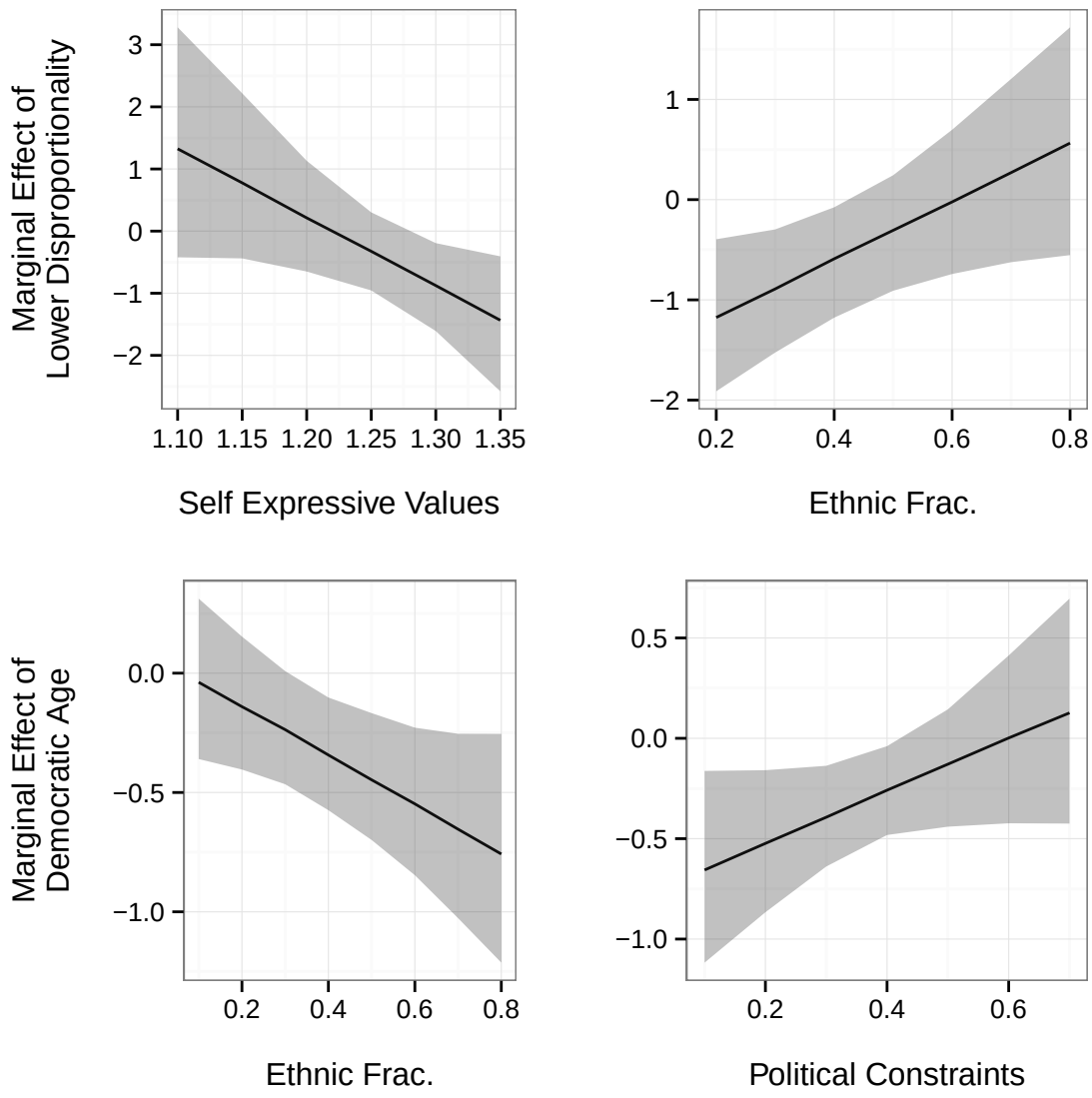

Figure 4: Marginal Effects of Lower Disproportionality and Democratic Age Given Representive Ranges of Interaction Variables

The graphs show the median and middle 95% of 1000 simulations at each fitted value of the variables. The simulations use estimates from tables III and IV.

Table V: Ethnic Fractionalisation list-wise inclusion (Democracies 1990-2012)

	Dependent variable:			
	Violent Incident			
	(1)	(2)	(3)	(4)
Ethnic Frac.	−0.218	−0.923*	−0.900*	−0.235
	(0.498)	(0.531)	(0.531)	(0.611)
Dem. Age (log)		−0.394***	−0.404***	−0.310***
		(0.101)	(0.103)	(0.116)
Majority Size			−0.018**	−0.025***
			(0.008)	(0.009)
Lower Disproportionality				−0.635**
				(0.275)
(Intercept)	−3.128***	−1.833***	−0.834	−0.596
	(0.213)	(0.365)	(0.554)	(0.650)
Observations	1,822	1,644	1,630	1,431
Log Likelihood	−321.979	−299.871	−296.353	−250.204
Akaike Inf. Crit.	647.957	605.743	600.706	510.408

*p<0.1; **p<0.05; ***p<0.01
Standard errors are in parentheses. All models use robust (WEAVE) standard errors.

Table VI: Variable Summary

Variable	Description	Source
Disproportionality	Gallagher Index of Electoral Disproportionality	Gallagher (2015) & Carey and Hix (2011)
ENPS	Effective number of parties by seats	Gallagher (2015) & Carey and Hix (2011)
ENPV	Effective number of parties by votes	Gallagher (2015) & Carey and Hix (2011)
Ethnic Fractionalization	Probability two randomly selected members of society are from the same ethnic group	Alesina et al. (2003)
Federal	Whether a country has a federal system or not	Carey and Hix (2011), updated from 2003 by the author
GDP/Capita	GDP per capita in thousands of US dollars	World Bank (2015)
Gov. Fractionalization	Probability that two members of the Government will be from different parties	Beck et al. (2001)
Gini	Gini Coefficient of income inequality averaged over reported sources	UNU-WIDER (2015)
Immunity	Whether a legislators are immune from arrest and/or criminal prosecution or not	Fish and Kroening (2009)
Internal Conflict	Internal armed conflict involving purely domestic as well as external combatants	UCDP/PRIO Armed Conflict Dataset (Themnér and Wallensteen, 2014)
LEIC	Legislative Indices of Electoral Competitiveness. Includes both the existence of a legislature and its level of electoral competitiveness.	Beck et al. (2001)
Lower Disproportionality	Gallagher Index below the sample mean (6.4)	Author's calculations based on Gallagher (2015) & Carey and Hix (2011)
Majority	Percentage of legislature controlled by governing parties	Beck et al. (2001)
Murder Rate	Murders per 100,000 population	United Nations (2013)
Political Constraints	POLCONIII measure of political constraints	(Henisz, 2004, updated through 2011)
Polity	Polity IV Score	Marshall and Jaggers (2009)
PR	Whether a country uses a proportional representation electoral system or a plurality system	Beck et al. (2001)
Self Expression	WVS self-expression indicator averaged across country-survey waves	World Values Survey Association (2009)
System	Government system (parliamentary, presidential, or mixed	Beck et al. (2001)
Trust	Average of WVS responses where 1 = most people can be trusted and 2 = you can't be too careful	World Values Survey Association (2009)
Violence	Incidences of violence between legislators in the national parliamentary chamber	author
Perc. Women in Parl.	Percentage of parliamentary seats held by women	Paxton, Green and Hughes (2008) & Inter-Parliamentary Union (2013)

Please contact the author for detailed summary statistics.
All of the data from Beck et al. (2001) was updated through 2012.

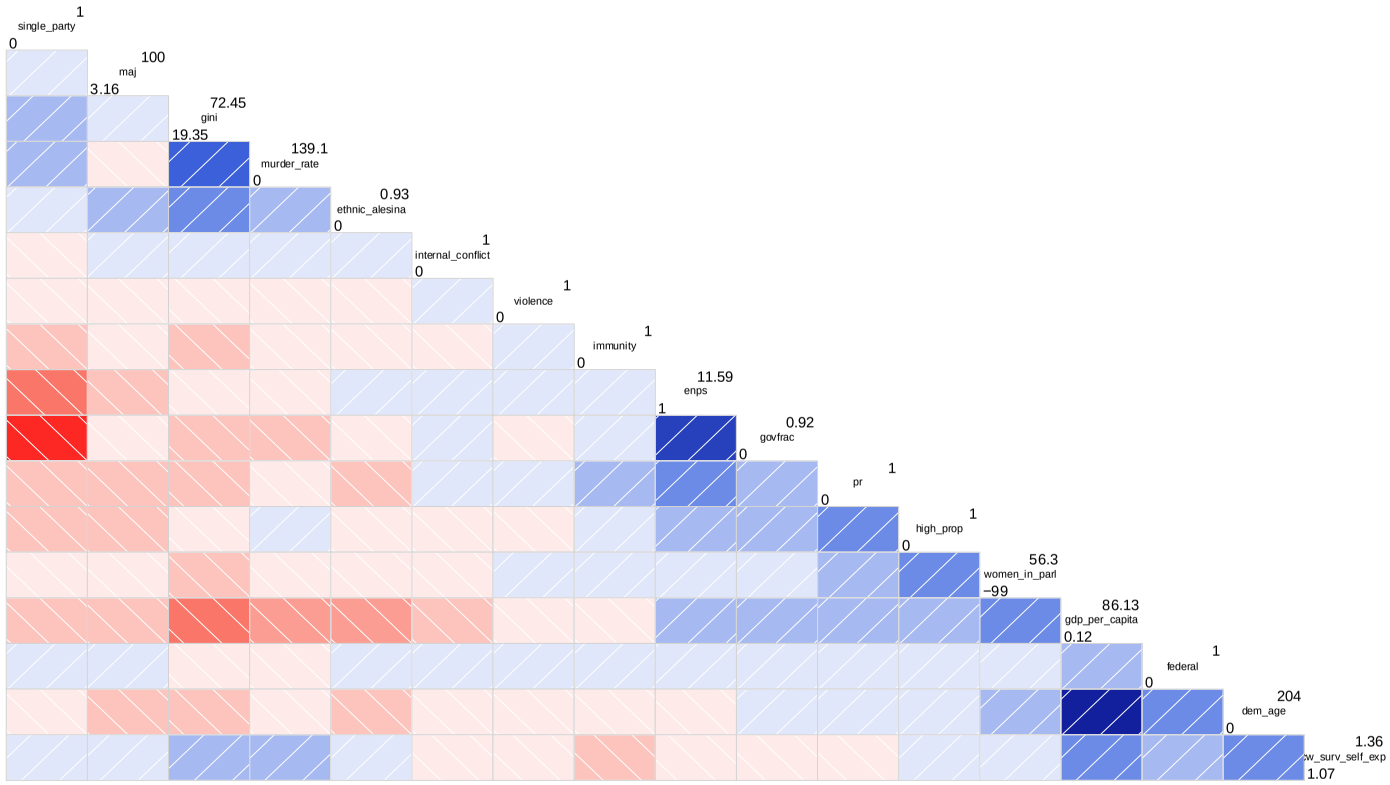

Figure 5: Correlation Matrix for Variables Included in the Analysis (Multi-Party Elected Legislatures)

Redder squares indicate stronger negative bi-variate correlations.

Bluer squares indicate stronger positive bi-variate correlations.

Numbers in the diagonal squares indicate the minimum and maximum observed values of the variables in the sample.

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