Web Appendix A for

"The Political Context and Duverger's Theory: Evidence at the District Level"

Alternative Specifications of Ethnic Heterogeneity

In our paper, we argue that the marginal impact of changes in district magnitude on the effective number of parties getting votes in a district is larger in ethnically heterogenous districts. This district-level finding extends and clarifies work done at the aggregate-level looking at the effect of the interaction between ethnic fragmentation and average district magnitude on the number of parties getting votes in the entire nation (e.g. Ordeshook and Shvetsova 1994, Mozaffar et al. 2003, Clark and Golder 2006). However, in a recent article Stoll (2008) argues that that aggregate evidence for this hypothesis depends upon the way in which ethnic heterogeneity is operationalized. She looks at indicators of ethnic heterogeneity developed by four scholars and only finds significant interactive effects with two of them.

In this web appendix, we replicate the results presented in our paper with indicators created by the other authors Stoll draws on. Specifically, we estimate the interactive models in Table 1 using data from Roeder (2001), Annett (2001), and Alesina (2003). In Table 2 we control for the maximum district magnitude while in Table 3 we control for the difference between first past the post and PR systems. As we note in fn26 of the manuscript, the evidence for the interactive hypothesis is consistent across the choice of indicators. None of the four indicators of ethnic heterogeneity indicate increased electoral fragmentation in small districts but changes in district magnitudes only have a significant effect in ethnically divided countries. Thus, we conclude that when we study electoral institutions at the appropriate level of analysis,

the empirical results become better specified and more robust to how societal variables are operationalized.

Table 2: District Magnitude, Country Characteristics and the Effective Number of Parties Getting Votes in a Constituency Using Different Ethnolinguistic Fragmentation Indices

Index Author	Fearon	Roeder	Annett	Alesina
Ln(M)	0.295	0.354*	0.253	0.260
	(0.169)	(0.163)	(0.170)	(0.177)
Ln(M)*Ethnolinguistic Fragmentation	1.570***	1.697***	1.750***	1.520**
	(0.442)	(0.444)	(0.467)	(0.476)
Ln(M)*Presidential System	-0.001	-0.018	-0.071	0.060
	(0.187)	(0.186)	(0.191)	(0.182)
Ln(M)*Federal Country	-0.095	-0.177	-0.104	0.049
	(0.193)	(0.201)	(0.203)	(0.189)
Ln(M)*New Democracy	-0.690**	-0.554*	-0.755**	-0.592*
	(0.240)	(0.232)	(0.255)	(0.242)
Ln(M)*Maximum District Magnitude	-0.009*	-0.010*	-0.010*	-0.008*
	(0.004)	(0.004)	(0.004)	(0.004)
Ethnolinguistic Fragmentation	-1.240	-1.579	-1.775	-1.511
	(0.975)	(0.931)	(0.992)	(1.091)
Presidential System	-0.207	-0.281	0.007	-0.103
	(0.458)	(0.454)	(0.449)	(0.442)
Federal Country	-0.226	-0.110	-0.138	-0.387
	(0.484)	(0.501)	(0.517)	(0.487)
New Democracy	1.574*	1.230	1.486*	1.319*
	(0.636)	(0.632)	(0.646)	(0.644)
Maximum District Magnitude	0.019*	0.019	0.017	0.021*
	(0.010)	(0.011)	(0.010)	(0.010)
Papua New Guinea	10.941***	11.097***	10.100***	10.001***
	(1.327)	(1.293)	(1.078)	(1.074)
Intercept	3.081***	3.283***	3.307***	3.192***
	(0.434)	(0.456)	(0.466)	(0.455)
Country-Level Variance	1.021	1.033	1.031	1.023
District-Level Variance	2.159	2.157	2.251	2.254
N Countries	44	44	44	44
N Districts	3291	3291	3291	3291

Hierarchical Linear Model, Standard Errors in Parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 3: District Magnitude, Country Characteristics and the Effective Number of Parties Getting Votes in a Constituency Using Different Ethnolinguistic Fragmentation Indices

Index Author	Fearon	Roeder	Annett	Alesina
Ln(M)	0.091	0.072	0.051	0.025
	(0.150)	(0.151)	(0.153)	(0.165)
Ln(M)*Ethnolinguistic Fragmentation	1.230**	0.852*	1.047*	0.985*
	(0.435)	(0.367)	(0.422)	(0.431)
Ln(M)*Presidential System	0.030	0.287	0.171	0.241
	(0.188)	(0.172)	(0.182)	(0.175)
Ln(M)*Federal Country	-0.066	0.053	0.014	0.098
	(0.193)	(0.199)	(0.201)	(0.188)
Ln(M)*New Democracy	-0.686**	-0.525*	-0.707**	-0.580*
	(0.239)	(0.220)	(0.259)	(0.240)
Ethnolinguistic Fragmentation	-0.538	-0.564	-0.551	-0.389
	(1.025)	(1.037)	(1.113)	(1.122)
Presidential System	-0.429	-0.684	-0.539	-0.609
	(0.472)	(0.460)	(0.476)	(0.454)
Federal Country	-0.301	-0.326	-0.347	-0.442
	(0.473)	(0.520)	(0.512)	(0.474)
New Democracy	1.502*	1.200*	1.402*	1.241
	(0.637)	(0.600)	(0.670)	(0.643)
FPTP	-1.028*	-1.135*	-1.096*	-1.224*
	(0.464)	(0.503)	(0.527)	(0.479)
Papua New Guinea	10.727***	10.713***	10.349***	10.351***
	(1.230)	(1.231)	(1.062)	(1.058)
Intercept	3.642***	3.781***	3.744***	3.782***
	(0.417)	(0.429)	(0.426)	(0.442)
Country-Level Variance	0.953	0.994	0.961	0.952
District-Level Variance	2.160	2.254	2.254	1.502
N Countries	44	44	44	44
N Districts	3291	3291	3291	3291

Hierarchical Linear Model, Standard Errors in Parentheses
* p<0.05, ** p<0.01, *** p<0.001

Web Appendix B for

"The Political Context and Duverger's Theory: Evidence at the District Level"

Predicted Effects of District Magnitude and Elf

In interpreting coefficients from a model with interacted terms (e.g. $Y=\beta_0 + \beta_1X + \beta_2Z + \beta_3X*Z + \varepsilon$), two quantities are of interest.[1] The first is the coefficient (e.g. β_3) testing the hypothesis that the marginal effect of X is dependent upon Z (and vice versa). The second is to combine β_1 and $Z*\beta_3$ to generate the predicted value of X at different values of Z along with the associated standard error of that predicted slope.[2] This latter test allows us to test under what conditions X's predicted marginal effect is statistically different from 0 at conventional levels.

In the text, we focus most of our attention on several interactive relationships. Each of these relationships reflects a significant interaction term in the model, which is the main evidence for our hypotheses.[3] However, in each case we describe under what conditions the main variable is statistically significant and we further illustrate this part of the hypothesis test here.

The first considers the effect of district magnitude on the marginal effect of ethnic fragmentation under different district magnitudes. In the text, we note that small district magnitudes prevent ethnic fragmentation from having a significant effect. We know this because the coefficient for the non-interacted ethnolinguistic fragmentation variable in Table1, column 3 is not significantly different from 0 at conventional levels which means that when ln(M)=0

[1] For one of many recent discussions this kind of model, see Cindy Kam and Robert Franzese. 2007. *Modeling and interpreting interactive hypotheses in regression analysis*. Ann Arbor: University of Michigan Press.
[2] The variance of the slope for all values of Z is $var(\beta_1) + Z^2var(\beta_3) + 2*Z*cov(\beta_1, \beta_3)$
[3] Though two of the relationships of interest stem from the same interaction term between Fearon's Index and district magnituide

(M=1) ethnolinguistic fragmentation does not have a consistent relationship with the number of parties in the district. However, the positive interaction term between ln(M) and the Fearon index means that as district magnitude gets larger, there is more electoral space for ethnic fragmentation to result in small parties being formed and supported. This can be illustrated by graphing the predicted effect of the Fearon index at different district magnitudes (see below) as well as the standard error of that prediction. As the graph illustrates and as we note in the text,

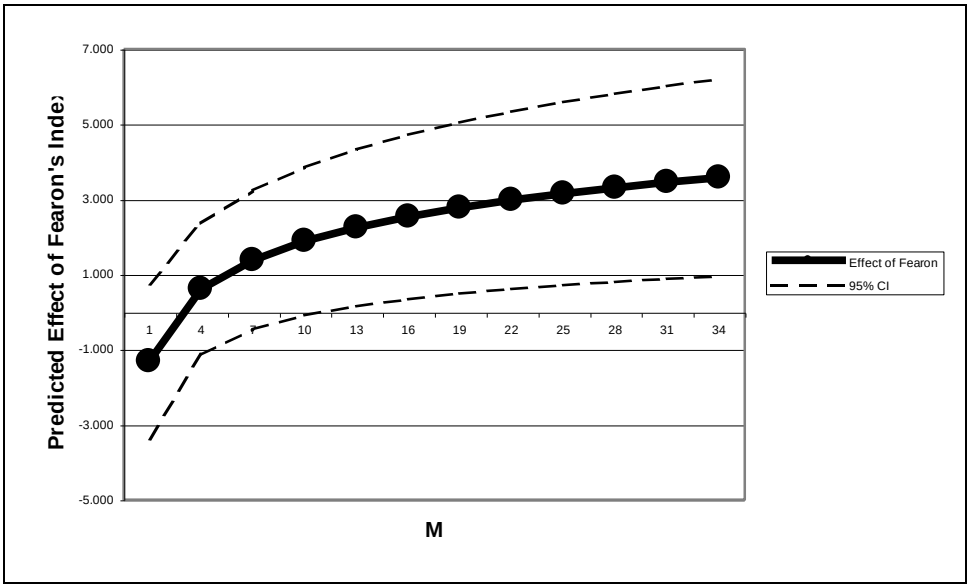

Figure 1

when district magnitude is between 10 and 11 seats, the effect of district magnitude becomes sufficiently large to be statistically significant at conventional levels. Thus in large districts, social fragmentation is expected to result in partisan fragmentation, but restricted district magnitudes can suppress that fragmentation.

The second interactive relationship we are interested in is the effect of district magnitude in different social contexts. In the text we argue that large districts should result in more parties only if there are latent cleavages that could fill the new electoral spaces created by making more seats available. This relationship is also captured by the interaction term, between ethnic

divisions and district magnitude; a positive coefficient is evidence for this hypothesis. The evidence for this proposition in established democracies comes when we graph the predicted marginal effect of Ln(m) under different ethnic conditions (below).[4] Ln(M) does not have a significant effect when Fearon's index=0, which is apparent from the insignificant value for the Ln(m) term in the model. However, as the graph below demonstrates, district magnitude's effect increases with social diversity and as a result, in countries with Fearon scores of about 0.14 the effect of district magnitude is statistically significant at conventional levels. It then continues to increase in even more fragmented societies.

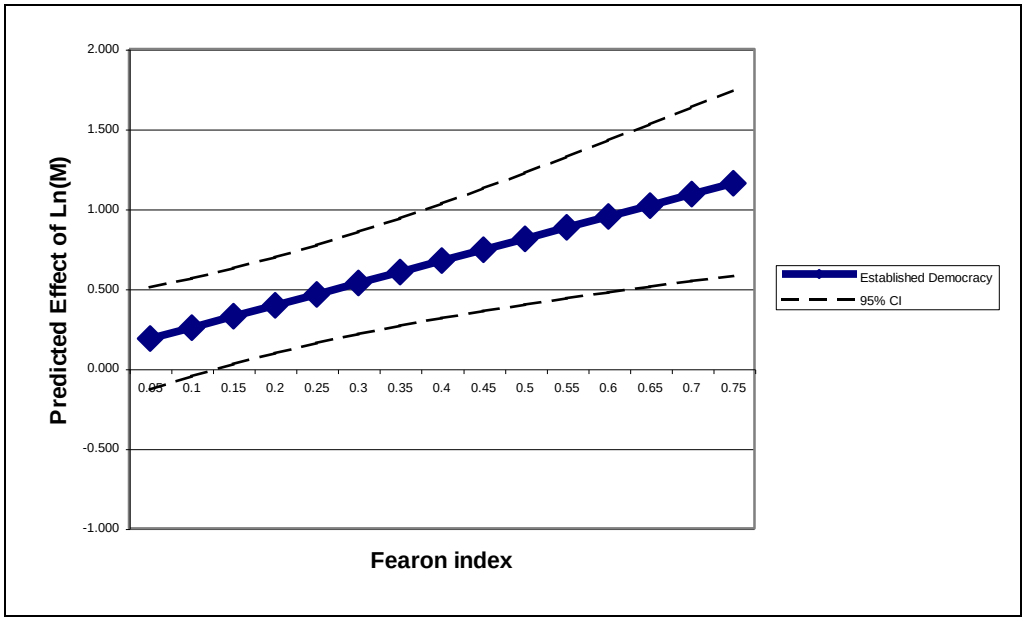

Figure 2

The effect of district magnitude is also conditioned upon the age of democracies. In established democracies, as highlighted above, district magnitude's effect is almost always significantly larger than 0. However, we find that the effect of district magnitude is significantly smaller in newer democracies. Thus while rising fragmentation still leads to district institutions

[4] In this and the next figure, we have estimated the effect of M in a country with a maximum district magnitude of 15.

having a larger effect (we did not find any evidence for a significant three way interaction between new democracy, ethnicity, and logged district magnitude in this sample) in new democracies, this effect only becomes significantly greater than 0 in very fragmented countries (see below). In fact, in many new democracies the predicted coefficient is negative, through not significantly so, which implies that small districts would have more parties in them than large districts. This finding has actually been observed in Russia's mixed system where independent candidates, movement parties localized on a few local notables, and otherwise charismatic individuals compete in small districts.[5]

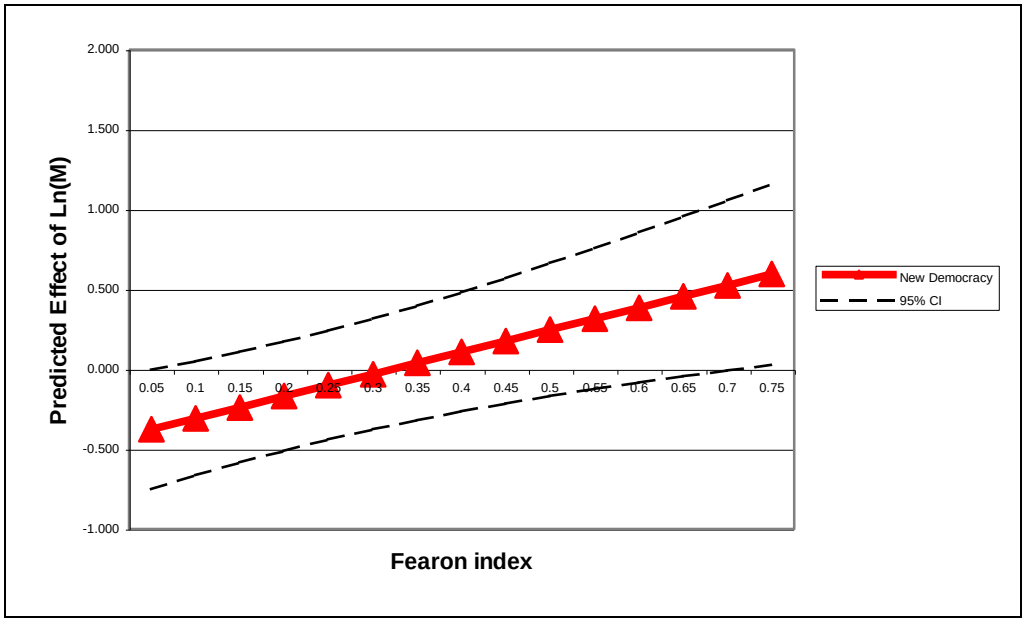

Figure 3

Finally, we consider the effect of district magnitude when the maximum M in the country varies. We find that in countries with large district magnitudes, the number of parties that exist in small districts increases from this contagion but then the marginal effect of subsequent

[5] Robert G. Moser. 2001. Unexpected Outcomes: Electoral Systems, Political Parties, and Representation in Russia. Pittsburgh, University of Pittsburgh Press.

increases in district magnitude is smaller. For example, Figure 2 considers the effect of M in an established democracy where the largest district has 15 seats available. If instead there were 35 seats in the largest district in that country, the estimated effect of changes in M is slightly smaller and thus only becomes significant at conventional levels when Fearon's index is greater than 0.24 (see Figure 4 below). However, because our primary interest in testing the contagion hypothesis is on its effect in small magnitude districts, we do not spend as much time discussing this finding.

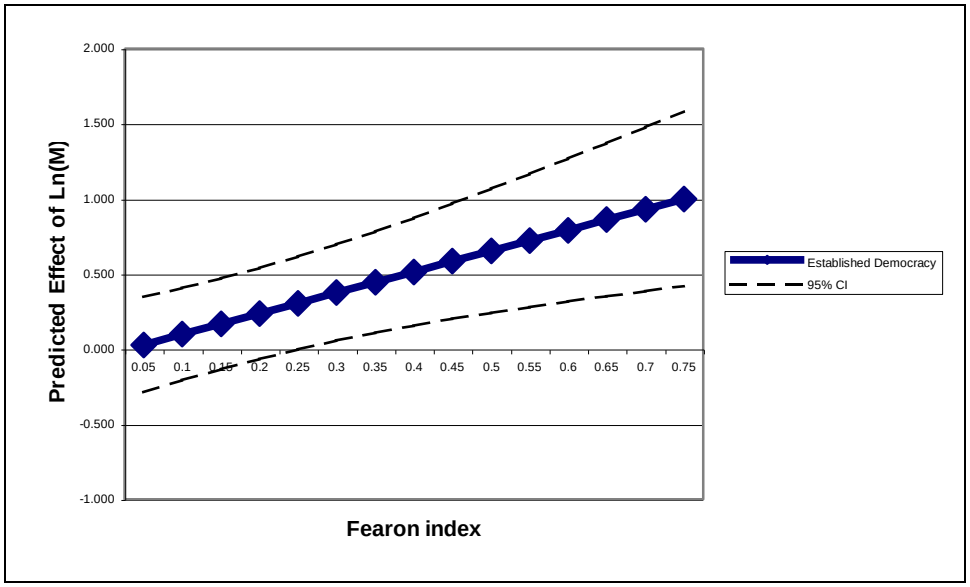

Figure 4