8 Online Appendix for Coups: Different Mechanisms and their Consequences for Institution Change

Table A1 provides simple prima facie evidence in support of hypotheses 1-3 by showing the percentage of nation-year observations that experienced a coup given coalition size, productivity, and tenure. Coups are much more likely in small and medium sized coalitions than in large coalitions. The greatest risk within the large coalition setting is for new leaders in low productivity environments (2.11%), and this risk is substantially lower than for any small or medium coalition. Leaders in low-productivity settings face a much higher coup risk than leaders in high-productivity settings. With the exception of long-established leaders in medium-sized coalition environments (for whom the risk is similar), moving from low to high productivity reduces the risk of coup by more than a factor of 2. Established leaders face much lower coup risks than new leaders. For leaders in small and medium coalition settings, for whom the coup risk is substantial, becoming long-established in office cuts the incidence of coup by more than half.

Table A1: Coalition Size, Productivity, Leader Tenure, and the Occurrence of Coups

		W			
		Small	Medium	Large	Obs.
Low Productivity	New Leader	19.21%	14.09%	2.11%	1923
	Established Leader	6.18%	3.84%	1.33%	4067
High Productivity	New Leader	9.92%	8.11%	0.83%	2609
	Established Leader	3.44%	3.94%	0.26%	3383
Observations		3154	4653	4175	11982

Coalition sizes are W $\leq$ 0.4, 0.4 $<$ W $\leq$ 0.75, and W $>$ 0.75. Productivity is defined as above or below median per capita GDP. Leader tenure is divided by less that 5 years or 5 or more years.

Table A2 is similar to Table 3 in the main text. However, rather than using data from year t to predict coups and leader change in years t and $t+1$, Table A2 uses data from year $t-1$. The results are similar, with coup and irregular leader changing being more likely when policy

deviate from expectations. That data from $t-1$ can predict future coups demonstrates the ability of arguments to identify observations at high risk of future instability. Table A3 has a similar

Table A2: How Under, Over or Expected Provisions of Policy in Year t-1 Affect the Occurrence of Coups, Leader Change, and Leader Change by Irregular Means in Year t or t+1

Policy Provision		Coup	Leader Change	Irregular LC	Observations
Public Goods	Under Provision	7.4%	28.2%	5.2%	1,193
	Expected Provision	7.0%	29.2%	4.6%	7,969
	Over Provision	7.1%	27.3%	4.2%	1,289
Assembly	Under Provision	8.8%	27.4%	6.1%	1,389
	Expected Provision	5.8%	28.3%	4.0%	7,623
	Over Provision	11.6%	32.1%	6.6%	1,404
Private Goods	Under Provision	10.4%	27.0%	6.8%	1,217
	Expected Provision	6.0%	30.6%	4.1%	8,108
	Over Provision	11.2%	18.8%	5.6%	1,210

The table reports the proportion of nation-year observations that experience the event in year t or year t+1. Under-provision indicates the policy is at least one standard deviation less than the expected level of policy provision. Over-provision indicates policy more than a standard deviation larger than the expected level of policy provision. The number of observations reported is based on coup data; the number of observations for leader change data are similar but not identical.

structure to Tables A2 and 3. However, this table distinguishes between different types of coup events. The second column labeled Successful Coup looks at the occurrence of a coup in year t or $t+1$ that succeeds. The columns labeled SHCoups and CHCoups correspond to the different types of coups identified by Chin, Carter and Wright (2021). SHCoups are shuffling coups that correspond to attempts to replace the leader without a major overhaul of institutions. CHCoups are coups designed to change institutions as well as replace the incumbent leadership. As with the main analyses, each of these coup events is less likely when policy provisions are close to expectation.

8.0.1 Logit Analyses of the Occurrence of Coups

The main text developed a bivariate latent variable approach to capture the under and over provision mechanisms. Here we use a more standard approach, logit analysis, to demonstrate that coups are more likely when policy provisions deviate from expectation. Table A4 presents logit analyses of the occurrence of coups. The unit of observation is the nation-year. The first column corresponds to the occurrence of any coup in year t. The second model assesses the occurrence of a coup in either year t or $t+1$. The third model examines the occurrence of a successful coup either in year t

Table A3: How Under, Over or Expected Provisions of Policy Affect the Occurrence of Coups ,Successful Coup, Leader Shuffling Coups (SHCoup) and Regime Change Coups (CHCoup) in Year t or t+1 (Chin et al 2021 data)

Policy Provision		Coup	Successful Coup	SHCoups	CHCoups	Observations
Public Goods	Under Provision	7.5%	4.3%	5.2%	2.8%	1,194
	Expected Provision	7.1%	4.0%	5.2%	2.2%	7,971
	Over Provision	7.2%	3.4%	5.4%	2.1%	1,289
Assembly	Under Provision	10.9%	6.8%	8.7%	3.0%	1,391
	Expected Provision	5.8%	3.1%	4.2%	1.8%	7,620
	Over Provision	10.4%	5.6%	7.0%	4.0%	1,410
Private Goods	Under Provision	10.4%	5.8%	7.6%	3.4%	1,217
	Expected Provision	5.5%	3.1%	4.0%	1.7%	8,125
	Over Provision	15.3%	8.9%	10.7%	5.7%	1,202

The table reports the proportion of nation-year observations that experience the event in year t or year t+1. Under-provision indicates the policy is at least one standard deviation less than the expected level of policy provision. Over-provision indicates policy more than a standard deviation larger than the expected level of policy provision. The number of observations reported is based on coup data; the number of observations for revolution and leader change data are similar but not identical.

or $t+1$. The fourth and fifth models examine coups classified as regime change coups (CHcoup) or leader shuffling coups (SHcoup) by Chin, Carter and Wright (2021), again in either year t or $t+1$.

The theory predicts that a small or intermediate sized coalition, low economic productivity, and a relatively new leader increase the likelihood of coup and the analyses support that these background effects are major determinants of the occurrence of coups. We discuss the first model, coup in year t, but the results are similar for the other models. The coefficient estimates in model 1 indicate that coups are most likely when coalition size is around $W_{t-1} = 0.4$. Smaller and larger coalition systems are less susceptible to coups. The negative coefficient on the Log(GDPpc$_{t-1}$) supports the previously well established finding that poor nations are coup prone (Londregan and Poole, 1990). The results are consistent with the theoretical argument that low productivity nations face an elevated coup risk. The significant negative coefficient estimates on the leader tenure variables indicates that well established leaders face a lower coup risk than leaders new to office, although the effect is diminished, as expected, in large coalition systems. To assess the extent to which under-provision or over-provision of policy leads to coups, the analyses include the residual variables and the square of the residual variables. For instance, if we examine the coefficient estimates for Res(Assembly) and Res(Assembly)^2 we see that the first estimate is small and insignificant, while

Table A4: Occurrence of Coups

	(1) Coup(t)	(2) Coup(t or t+1)	(3) Success Coup	(4) Coup(regime change)	(5) Coup(leader shuffle)
main					
W_{t-1}	8.601***	9.194***	10.90***	12.85***	3.829
	(2.223)	(2.232)	(2.153)	(2.745)	(2.849)
W^2_{t-1}	-10.76***	-11.21***	-12.29***	-13.82***	-7.655**
	(1.831)	(1.814)	(1.752)	(2.076)	(2.392)
Res(Public)	0.925	0.421	0.122	1.770	-3.008+
	(1.195)	(1.267)	(1.533)	(1.300)	(1.608)
Res(Public)^2	-9.961	-9.959	-19.00	-8.665	-18.83+
	(9.084)	(10.92)	(12.47)	(11.71)	(10.45)
Res(Assembly)	-0.283	0.259	-0.135	-0.787	1.874+
	(0.737)	(0.730)	(0.810)	(0.819)	(1.113)
Res(Assembly)^2	8.083*	8.147**	10.75***	5.311	13.48***
	(3.333)	(2.986)	(3.211)	(3.432)	(4.088)
Res(Private)	2.652*	1.445	0.771	0.636	3.492*
	(1.041)	(1.039)	(1.253)	(1.165)	(1.561)
Res(Private)^2	7.956	14.06+	8.096	12.63	14.18
	(7.962)	(8.481)	(9.171)	(9.277)	(10.64)
ΔRes(Private)	6.215***	4.582***	6.390***	5.120***	2.550
	(1.827)	(1.276)	(1.824)	(1.417)	(2.073)
Δ Res(Private)^2	31.69**	32.72***	30.71*	24.84**	32.76**
	(11.24)	(9.939)	(12.10)	(8.556)	(12.35)
Δ Res(Private)*Res(Private)	86.15**	35.60*	72.81**	31.59*	68.58+
	(26.46)	(17.71)	(24.38)	(16.03)	(36.26)
Δ Res(Private)*Res(Private)^2	4.778	3.714	38.74	32.10	-120.0
	(142.8)	(112.0)	(124.7)	(121.7)	(123.1)
ΔRes(Private)^2*Res(Private)	-136.7	-67.79	-137.6	-96.79	-55.38
	(164.4)	(103.4)	(130.9)	(109.1)	(127.6)
Δ Res(Private)^2*Res(Private)^2	-1646.8**	-984.5**	-1330.8**	-678.5**	-2361.3**
	(568.3)	(318.6)	(473.1)	(258.5)	(810.6)
Log(Tenure)	-0.646**	-0.691**	-0.332	-0.776*	-0.563*
	(0.225)	(0.220)	(0.287)	(0.310)	(0.286)
W_{t-1} *Log(tenure)	0.702	0.638	0.392	0.828	0.514
	(0.458)	(0.458)	(0.580)	(0.596)	(0.713)
Old or Sick	0.0740	0.0708	0.220	0.0504	0.211
	(0.154)	(0.154)	(0.189)	(0.170)	(0.227)
$Growth_{t-1}$	-0.0400***	-0.0376***	-0.0115	-0.0463***	-0.00666
	(0.0100)	(0.0103)	(0.0131)	(0.00975)	(0.0191)
$Log(GDPpc_{t-1})$	-0.214*	-0.246*	-0.225*	-0.322**	-0.0678
	(0.0952)	(0.0990)	(0.108)	(0.115)	(0.108)
$Log(Population_{t-1})$	0.0467	0.0340	0.0137	0.0177	0.0499
	(0.0510)	(0.0531)	(0.0575)	(0.0591)	(0.0643)
yr	-0.0258***	-0.0285***	-0.0244**	-0.0249***	-0.0360**
	(0.00641)	(0.00636)	(0.00799)	(0.00707)	(0.0114)
yr2	0.000210	0.000174	0.000746	0.000330	0.000211
	(0.000401)	(0.000397)	(0.000474)	(0.000440)	(0.000690)
yr3	0.00000933	0.00000987	0.0000191+	0.00000969	0.0000180
	(0.00000812)	(0.00000774)	(0.00000977)	(0.00000876)	(0.0000125)
Observations	10206	10206	10206	10206	10206
Number Nations	169	169	169	169	169
Years	1947-2022	1947-2022	1947-2022	1947-2022	1947-2022
Coup-Years	375	725	401	530	232
Nation FE	N	N	N	N	N
Year FE	N	N	N	N	N
Fit: ROC	0.818	0.803	0.807	0.815	0.804

Standard errors in parentheses
Standard Errors Clustered by Country
$^+$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

the square term is large and significant. These estimates imply that deviating from the expected provision of Assembly, whether that is allowing too few freedoms (Res(Assembly)< 0) or too many freedoms (Res(Assembly)> 0), increases the risk of coup. The analyses indicate that the provision of public goods has relatively little impact on coup risk.

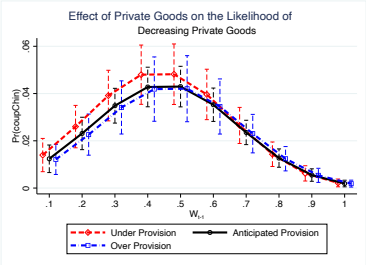
The theory predicts that supporters should be particularly attentive to the risk that a purge is in the offing if private goods provisions not only exceed expectations, but are also increasing. Table A4 includes the variable ΔRes(Private), and its interactions with Res(Private). Unfortunately the inclusion of so many interaction terms makes a direct comparison of the effects difficult so we present a graphical interpretation. Figure A1 shows four graphs that illustrate the impact of policy provision on the occurrence of a coup based on Model 1 of Table A4. The corresponding figures for the other models in the table look very similar. The first panel examines the provision of private goods relative to expectation (Res(Private)) when the provision of private goods is decreasing (ΔRes(Private)$\approx -.04$ is at the 5th percentile). In this panel, and the other panels, the solid black line corresponds to an anticipated policy provision, in this case Res(Private)$= 0$, 50th percentile. The red dashed line corresponds to an under-provision of policy (Res(Private)$\approx -.09$, 5th percentile), while the blue dot-dash line corresponds to an over-provision of policy relative to expectations (Res(Private)$\approx .09$, 95th percentile). The first panel indicates that, consistent with the under-provision hypothesis, if private goods are under-provided and the provision is falling, then leaders face a slightly increased risk of deposition, although the effect is small.

The second and third panels of Figure A1 examine under, appropriate, and over provision of private goods when those provisions are essentially remaining constant (panel b) or are increasing over time (panel c). The over-provision of private goods (shown by the dot-dash blue line) increases the risk of coup, substantially so when the provision of private goods is also increasing. For an intermediate size coalition system the risk of coup is predicted to be greater than 10% when private goods are increasing and over-provided. This risk is substantially greater than the risk in any other circumstance (note that the y-axes of the graphs vary in scale). If leaders are under-providing private goods, but adjusting the misallocation by increasing it (red dashed line), then the risk of coup is less than 5%.

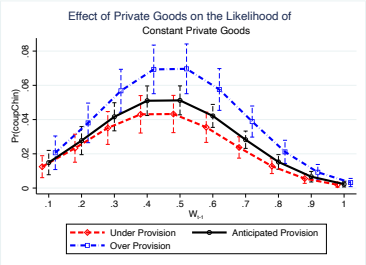
The fourth panel of Figure A1 shows the impact of the under, appropriate or over provision of assembly using an analogous setup to that in the other panels. As discussed above, the over or under-provision of assembly induces a higher risk of coup than does a provision commensurate with expectations.

Figure A1: Impact of the Under, Appropriate, or Over Provision of Policy on the Likelihood of Coup (Model 1, Table A4)

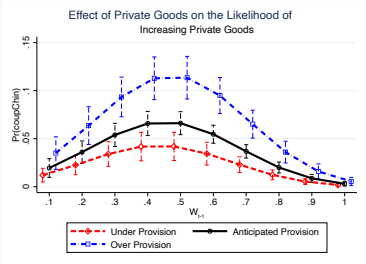
(a) Decreasing Private Goods



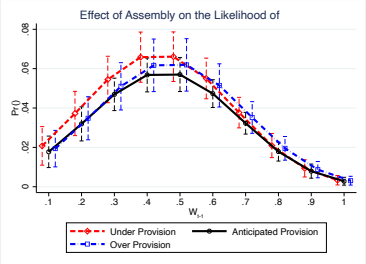
(b) Constant Private Goods



(c) Increasing Private Goods



(d) Assembly



8.1 Bivariate latent variable approach

The analysis in Table A5 replicates the second model in Table 4, with the constraint that the nation and year fixed effects are the same for both mechanisms. Table A6 examines the coups that did not have outside assistance (first model) with those coups that did not have outside assistance, based on the code of Chin, Carter and Wright (2021). While policy deviations matter in both cases, the magnitudes of coefficient estimates are larger in the no assistance case. Presumably, outsiders have considerations between the policy concerns that motivate insiders.

Table A7 replicates the bivariate latent variable model using coup data from Powell and Thyne

(2011) and Marshall and Marshall (2022).

8.2 Institution Change

Table A8 replicates several of the analyses in Table 6. Model 1 includes the variable Coup, which in this analysis is coded as 1 if a coup occurs in either year t or year $t+1$. Model 2 repeats this specification with the inclusion of nation and year fixed effects. Models 3 and 4 repeat model 1 but restricts the sample to cases where there is no leader change in either year t or $t+1$ (model 3) and cases where leader change occurs in one of those years (model 4).

Table A5: Two Mechanisms for Coups: Under-Provision and Over-Provision Coups (Fixed effects for nation and year with the restriction that the fixed effects are the same for each mechanism.)

	Under-provision	Over-provision
W_{t-1}	2.289	4.213
	(2.472)	(3.211)
W^2_{t-1}	-3.634^{+}	-3.630
	(1.923)	(2.552)
S_{t-1}	-1.357*	-0.457
	(0.679)	(0.769)
Res(Private)	-2.596***	6.272***
	(0.747)	(1.092)
ΔRes(Private)	-1.369	7.033***
	(1.335)	(1.345)
Res(Public)	-0.262	0.260
	(1.139)	(1.543)
Res(Assembly)	1.271^{+}	-1.640^{+}
	(0.654)	(0.969)
Log(Tenure)	-0.127	-0.503
	(0.277)	(0.362)
W_{t-1} *Log(tenure)	0.180	0.891
	(0.614)	(0.597)
Old or Sick	0.0462	0.202
	(0.170)	(0.166)
Growth_{t-1}	-0.0271*	-0.0316**
	(0.0121)	(0.0106)
$\text{Log(GDPpc}_{t-1})$	-0.181	0.248
	(0.210)	(0.337)
W_{t-1} *$\text{Log(GDPpc}_{t-1})$	0.157	-0.601
	(0.420)	(0.632)
$\text{Log(Population}_{t-1})$	0.414	0.239
	(0.318)	(0.311)
Observations	3501	
Number Nations	53	
Years	1947-2022	
Nation-years experiencing coup	309	
Nation FE	Y	
Year FE	Y	

Standard errors in parentheses

Standard Errors Clustered by Country

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A6: Two Mechanisms for Coups: Under-Provision and Over-Provision Coups: With and Without Outside Help (as coded by Chin, Carter and Wright (2021))

	No Outside Assistance		Outside Assistance	
	Under-provision	Over-provision	Under-provision	Over-provision
W_{t-1}	3.132*	3.686+	5.576**	3.682*
	(1.553)	(2.100)	(2.068)	(1.866)
W^2_{t-1}	-3.598**	-3.177+	-5.126***	-4.459**
	(1.268)	(1.822)	(1.423)	(1.559)
S_{t-1}	-0.531	-0.0468	-0.808*	-0.0187
	(0.388)	(0.559)	(0.379)	(0.577)
Res(Private)	-2.042*	3.637***	-0.745	2.960***
	(0.825)	(0.713)	(1.190)	(0.725)
ΔRes(Private)	-2.359*	7.955***	-2.825*	6.796***
	(1.149)	(1.144)	(1.373)	(0.941)
Res(Public)	-0.0735	0.573	0.849	-0.174
	(0.775)	(0.991)	(0.853)	(1.122)
Res(Assembly)	1.629**	-2.997***	1.138+	-2.114**
	(0.522)	(0.668)	(0.624)	(0.794)
Log(Tenure)	-0.0941	-0.266	-0.0443	-0.784**
	(0.164)	(0.231)	(0.277)	(0.270)
W_{t-1} *Log(tenure)	-0.104	0.225	-0.387	1.106**
	(0.348)	(0.403)	(0.568)	(0.426)
Old or Sick	0.0578	0.161	-0.00573	0.133
	(0.123)	(0.131)	(0.130)	(0.125)
$Growth_{t-1}$	-0.0186*	-0.00811	0.00302	-0.0247***
	(0.00824)	(0.00615)	(0.0134)	(0.00623)
$Log(GDPpc_{t-1})$	-0.129	0.172	-0.0251	0.0959
	(0.112)	(0.108)	(0.0942)	(0.132)
W_{t-1} *$Log(GDPpc_{t-1})$	-0.00126	-0.518*	-0.154	-0.317
	(0.206)	(0.231)	(0.187)	(0.226)
$Log(Population_{t-1})$	0.0557	-0.0623	0.0440	-0.0370
	(0.0354)	(0.0420)	(0.0354)	(0.0460)
Observations	10,205		10,205	
Number Nations	169		169	
Years	1947-2022		1947-2022	
Coup-years	246		239	
Nation FE	N		N	
Year FE	N		N	

Standard errors in parentheses

Standard Errors Clustered by Country

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A7: Two Mechanisms for Coups: Under-Provision and Over-Provision Coups: Data from Powell and Thyne (2011) and Marshall and Marshall (2022)

	Powell & Thyne Data		CSPS DATA	
	Under-provision	Over-provision	Under-provision	Over-provision
W_{t-1}	3.751**	3.037+	4.027+	0.915
	(1.401)	(1.680)	(2.327)	(1.870)
W^2_{t-1}	-4.312***	-4.013**	-4.688	-2.295+
	(1.139)	(1.438)	(3.183)	(1.394)
S_{t-1}	-0.854*	-0.187	-0.129	-0.373
	(0.390)	(0.469)	(0.747)	(0.758)
Res(Private)	-1.460*	3.926***	-0.724	2.662***
	(0.682)	(0.700)	(0.746)	(0.705)
ΔRes(Private)	-3.314**	8.541***	-2.278+	8.391***
	(1.118)	(1.067)	(1.291)	(0.975)
Res(Public)	0.357	0.308	-0.0683	0.868
	(0.751)	(1.071)	(1.969)	(2.348)
Res(Assembly)	1.183*	-1.998**	1.058	-2.124
	(0.523)	(0.742)	(0.794)	(1.454)
Log(Tenure)	-0.0567	-0.594**	-0.162	-0.541*
	(0.152)	(0.213)	(0.183)	(0.255)
W_{t-1} *Log(tenure)	-0.185	0.849*	-0.112	0.871*
	(0.347)	(0.375)	(0.512)	(0.372)
Old or Sick	0.0489	0.106	-0.0304	0.0724
	(0.106)	(0.115)	(0.234)	(0.218)
$Growth_{t-1}$	-0.0124	-0.0181**	-0.0192	-0.0235+
	(0.00925)	(0.00608)	(0.0144)	(0.0127)
$Log(GDPpc_{t-1})$	-0.140	0.0325	-0.0432	-0.137
	(0.0895)	(0.102)	(0.131)	(0.171)
W_{t-1} *$Log(GDPpc_{t-1})$	0.0336	-0.310	-0.339	-0.114
	(0.173)	(0.208)	(0.437)	(0.444)
$Log(Population_{t-1})$	0.0679*	-0.0407	-0.0179	-0.0613
	(0.0316)	(0.0380)	(0.0805)	(0.0929)
Observations	9917		9653	
Number Nations	167		165	
Years	1950-2022		1947-2021	
Coup-years	360		384	
Nation FE	N		N	
Year FE	N		N	

Standard errors in parentheses

Standard Errors Clustered by Country

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A8: How the Likelihood of Coup by Each Mechanism Affects Institution Change: $\Delta W = W_{t+2} - W_{t-1}$

	(1) All Obs.	(2) Fixed Effects	(3) Absent LC	(4) With LC
W_{t-1}	-0.0235***	-0.168***	-0.0180***	-0.116***
	(0.00588)	(0.0158)	(0.00509)	(0.0224)
$\widehat{Coup}_{under}$	0.912***	1.011***	0.565***	1.011***
	(0.0830)	(0.0859)	(0.0959)	(0.132)
$\widehat{Coup}_{over}$	-0.321***	-0.262***	-0.249***	-0.391***
	(0.0358)	(0.0337)	(0.0337)	(0.0573)
Coup	-0.0272**	-0.0230**	-0.0134*	-0.0621***
	(0.00827)	(0.00709)	(0.00666)	(0.0121)
Observations	10209	10209	7185	3022
Number Nations	169	169	168	167
Years	1947-2021	1947-2021	1947-2021	1947-2021
Nation FE	N	Y	N	N
Year FE	N	Y	N	N
Fit: R2	0.168	0.325	0.097	0.261
Fit: R2 within		0.256		

Standard errors in parentheses
Standard Errors Clustered by Country
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$