

Production and Conflict in Risky Elections⁺

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Abstract

An incumbent allocates in period 1 of a two period game, a resource into production, fighting with the challenger, and producing public goods, which impact the probability of winning an election. In period 2 the incumbent may accept the election result, or a coalition or standoff may follow. We analyze the strategic choices. Econometric analysis of 653 African elections 1960-2010 shows that the incumbent wins with no contestation 64%, coalition 6%, and standoff 2%. The incumbent loses and accepts defeat 16%, coalition 12%, and standoff 0%. The impact of economic performance, education, political factors, natural resources, former-colonizer, etc, are scrutinized.

Keywords: Risk, production, fighting, conflict, cardinal utility

Journal of Economic Literature classification numbers: C72, D72, D74, D8

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1 Introduction

Globally, transmission to a democratic political system, while widespread, is best captured by three events since the 1980s. These are the fall of communism in late 1980s and subsequent democratic election of new leaders that followed; the various elections in Sub-Saharan Africa that have established democracy in some countries but have caused reversals in others; and indeed the post 2011 fall or transformation of autocracies in North Africa and Middle East and the unsteady transition to democracy, post the various revolutions in 2011 and 2012. However, Africa stands out as one region that has been slowest in establishing democratic institutions and has seen some notable reversals of democratic processes. Election outcomes in most African countries have been challenged as not having been free and fair. Indeed some of the elections have been violent and also followed by more violence once the outcome is known.

Table 1 below shows various elections in all African countries during the period 2006-2011+Eritrea 1993. The table also gives information on whether there was an outright winner, who won the election, were the election results challenged, whether the dispute on the results was violent, was a coalition created, when the next elections will take place, and the change in GDP growth before and after the election. From Table 1, there were 51 elections¹ that took place during the period the period 2006-2011+Eritrea 1993. The incumbent won 34, the challenger won 17. Of the 34 wins, 21 were uncontested, 11 caused standoff, and 2 caused coalition. Of the 17 losses, in 11 the incumbent conceded defeat, 0 caused standoff, and 6 caused coalition. A cursory glance on the pattern of GDP growth before and after each election does not seem to give a consistent story about the impact of the election on the real economy.

Table 1: Outcomes of Elections in Africa 2006-2011+Eritrea 1993*

	Elections in Africa	Election Date	Winner	Case	Dispute Violent	Coalition	Population 2012 (Millions)	GDP 2012 (Billions US\$ Current)	Free Press
N°	Country								
1	Algeria	4/9/2009	Incumbent	WP	No	No	35.980	187.412	No
2	Angola	9/6/2008	Incumbent	WP	No	No	19.618	103.930	Semi
3	Benin	3/13/2011	Incumbent	WP	No	No	9.100	7.504	Semi
4	Botswana	10/16/2009	Incumbent	WP	No	No	2.031	15.031	Semi
5	Burkina Faso	11/21/2010	Incumbent	WP	No	No	16.968	10.132	Semi
6	Burundi	6/28/2010	Incumbent	WP	No	No	8.575	1.678	Semi
7	Cameroon	9/30/2007	Incumbent	WP	No	No	20.030	26.414	Semi
8	Cape Verde	2/12/2006	Incumbent	WP	No	No	0.501	2.228	Semi
9	Central African Rep.	1/23/2011	Incumbent	WS	No	No	4.487	2.042	Semi
10	Chad	4/25/2011	Incumbent	WS	No	No	11.525	11.959	Semi
11	Comoros	12/26/2010	Challenger	LP	No	No	0.754	0.633	semi
12	Congo, Dem. Rep. of	1/19/2007	Incumbent	WP	No	No	67.758	15.176	No
13	Congo, Republic of	7/12/2009	Incumbent	WS	No	No	4.140	15.777	Semi
14	Côte d'Ivoire	11/28/2010	Challenger	LP	Yes	No	20.153	22.413	Semi
15	Djibouti	4/8/2011	Incumbent	WS	No	No	0.906	1.244	Semi

¹ Libya is excluded as there were no elections during this period. Swaziland is also excluded, as the elections do not involve any political parties.

16	Egypt	11/28/2010	Incumbent	WP	No	No	82.537	228.958	No
17	Equatorial Guinea	11/29/2009	Incumbent	WS	No	No	0.720	19.041	No
18	Eritrea	5/24/1993	Incumbent	WP	No	No	5.415	2.596	No
19	Ethiopia	5/23/2010	Incumbent	WP	No	Yes	84.734	34.613	No
20	Gabon	8/30/2009	Incumbent	WC	Yes	Yes	1.534	16.992	Semi
21	Gambia, The	9/22/2006	Incumbent	WS	No	No	1.776	1.239	Semi
22	Ghana	12/7/2008	Challenger	LP	No	No	24.966	39.220	Semi
23	Guinea	11/7/2010	Challenger	LP	No	No	10.222	5.911	Semi
24	Guinea-Bissau	7/29/2009	Challenger	LC	Yes	Yes	1.547	0.976	Semi
25	Kenya	12/27/2007	Challenger	LC	Yes	Yes	41.610	37.059	Semi
26	Lesotho	2/17/2007	Challenger	LC	No	Yes	2.194	1.854	Semi
27	Liberia	10/11/2005	Challenger	LP	No	No	4.129	1.662	Semi
28	Madagascar	9/23/2007	Challenger	LC	No	Yes	21.315	9.484	Semi
29	Malawi	5/19/2009	Challenger	LC	Yes	Yes	15.381	5.890	Semi
30	Mali	7/22/2007	Incumbent	WS	No	No	15.840	10.770	Semi
31	Mauritania	7/18/2009	Challenger	LP	Yes	No	3.542	5.409	Semi
32	Mauritius	5/5/2010	Challenger	LP	No	No	1.307	11.319	Semi
33	Morocco	9/7/2007	Challenger	LP	No	No	32.273	105.575	No
34	Mozambique	10/28/2009	Incumbent	WC	No	Yes	23.930	14.314	Semi
35	Namibia	11/28/2009	Incumbent	WP	No	No	2.324	12.859	Yes
36	Niger	3/12/2011	Challenger	LP	No	No	16.069	6.478	Semi
37	Nigeria	4/16/2011	Incumbent	WS	Yes	No	162.471	241.517	No
38	Rwanda	8/9/2010	Incumbent	WP	No	No	10.943	6.090	No
39	Sao Tomé & Príncipe	8/7/2011	Challenger	LP	No	No	0.169	0.253	Semi
40	Senegal	2/25/2007	Incumbent	WS	No	No	12.768	12.875	Semi
41	Seychelles	5/21/2011	Incumbent	WP	No	No	0.087	1.114	Semi
42	Sierra Leone	8/11/2007	Challenger	LP	No	No	5.997	2.220	Semi
43	Somalia	1/30/2009	Incumbent	WS	Yes	No	9.557	5.896	No
44	South Africa	5/6/2009	Incumbent	WP	No	No	50.460	378.135	Free
45	Sudan	4/15/2010	Incumbent	WS	No	No	44.632	63.329	No
46	Tanzania	10/31/2010	Incumbent	WP	No	No	46.218	25.562	Semi
47	Togo	3/4/2010	Incumbent	WP	No	No	6.155	3.345	Semi

48	Tunisia	10/25/2009	Incumbent	WP	No	No	10.594	47.123	No
49	Uganda	2/18/2011	Incumbent	WP	No	No	34.509	18.907	Semi
50	Zambia	10/30/2008	Incumbent	WP	No	No	13.475	23.411	Semi
51	Zimbabwe	3/29/2008	Challenger	LC	Yes	Yes	12.754	6.368	Semi

*Libya did not hold elections. Swaziland holds “no party” elections. Both have been excluded.
Source: African Development Bank Statistics Department, 2012.

An incumbent government facing elections choose a multiplicity of strategies. Before the election it can ensure that the country becomes productive, it can fight with the challenger (opposition), or it can produce public goods. After the election it can accept the election result, it can form a coalition with the challenger, or it can refuse to leave office causing a standoff with the challenger. This paper seeks to understand how an incumbent makes such choices.

Looking again at Table 1, some examples on post election coalitions in Africa stand out. Kenya, Zimbabwe and Ivory Coast (Côte d’Ivoire) were characterized by violent elections and more violence post the election. The elections in Kenya took place in December 2007 and the incumbent was unable to win outright and won 102 out of 210 parliamentary seats. The closeness of the election results resulted in both parties claiming victory and the right to form a new government. The dispute caused serious violence among their supporters. Subsequently, some of the leadership individuals in both parties have been charged by the International Criminal Court as having instituted the violence. As of April 2012 they had not yet stood trial. After the violent dispute, the two parties came together to form a coalition government. The example of Zimbabwe was similar to that of Kenya, where there was a violent dispute on the election results in March 2008. A run-off between the two leading candidates was to take place to decide the outright winner. The opposition did not take part in the run-off due to fear of a violent and unfair election process. This all resulted in a coalition government being negotiated between the two parties. The example of the Ivory Coast election in November 2010 was more extreme. After a seemingly professional process running up to the election, after the election the losing incumbent refused to cede power to the challenger. An armed civil conflict ensued, which had to be resolved partly through an external military intervention.

In all these examples, the incumbent leader exerted effort in fighting, production, and exerted effort on public goods. The contestation for power had economic consequences. The Zimbabwe economy grew at -5% on average over an 8-year period during the political standoff 2000-2008. The Ivory Coast economy is expected to grow at -7% in 2011 due to the political standoff. The Zimbabwe economy recovered after the political resolution, growing at about +8% annually

over the period 2009-2011. The incumbent, realizing it had more to lose, compromised and co-opted the challenger in a government of national unity. This caused some economic recovery, shifting effort from fighting to production. However, effort was needed in keeping the coalition going. Zimbabwe 2011 presented a situation where the incumbent was willing to break the coalition because it discovered new natural resources where it received rent which then increased its appetite and resources for fighting to keep the rent. The Ivory Coast 2011 presented a scenario with an external agent of restraint, the US and the international community, who refused the coalition and cooption option, and tried to force the incumbent to leave power. In all these 3 situations we have a two period scenario, one period before the election, and one period after the election.

In the literature, such flawed elections, typically held by autocrats usually involve violence and manipulation as we have already stated (Schmitter 1978, Schedler 2007, Ashworth and De Mesquita 2008, among others). The cost to citizenry of these elections is quite high. The elections result in loss of life, physical and mental injury which could be permanent, and suppression of freedom of speech, and general human rights violations. The election process is meant to strengthen democratic institutions, but could worsen conflict (Collier, 2009). The strength of democratic institutions does seem to have colonial origins, and perhaps the violent nature of the election process and post election reaction has links to the colonial roots (Acemoglu and Robinson, 2006). Ellman and Wantchekon (2000) consider situations where one strong party controls sources of political unrest. This party is likely to win if there is asymmetric information about its ability to cause unrest. Other related studies include Alesina (1988), Alesina and Rosenthal (1995) and Calvert (1985). See Lindberg (2006) for analysis of democracy and elections in Africa.

In order to understand the dynamics of the post election political process, in this paper we analyze a two period game. To increase the endogenously determined probability of winning the election, the incumbent can fight² with the challenger or produce public goods to appease the population. Winning the election is especially important if the period 2 utility is low, for example if a costly standoff follows in period 2. More generally, we quantify how an incumbent strikes a balance between fighting, production, and producing public goods in period 1, which

² The term “fighting” is to be understood as a metaphor. As Hirshleifer (1995:28) puts it, “falling also into the category of interference struggles are political campaigns, rent-seeking maneuvers for licenses and monopoly privileges (Tullock 1967), commercial efforts to raise rivals’ costs (Salop and Scheffman 1983), strikes and lockouts, and litigation – all being conflictual activities that need not involve actual violence.” Fighting can be

impacts whether or not the election is won after period 1, and is impacted by whether the incumbent chooses to accept the election result, choose a coalition, or choose standoff in period 2.

Section 2 presents the model. Section 3 analyzes the model. Section 4 illustrates the solution with simulations. Section 5 distinguishes theoretically and empirically between the six outcomes that emerge post-election. Section 6 presents an econometric analysis. Section 7 concludes.

2 The model

Consider two players and two time periods. In the first period player 1 is the incumbent enjoying being in power, and player 2 is the challenger. As formulated by Hirshleifer (1995:30), each player has a resource transformable into multiple kinds of efforts, which can be capital and labor of various kinds. The first is productive effort, E_{ij} and E_{cj} in period j , $j=1,2$, for the incumbent and the challenger, designed to generate production from resources currently controlled. The second is fighting effort, F_{ij} and F_{cj} in period j for the incumbent and the challenger, designed to acquire the joint production of the two players, which is a common assumption (Hirshleifer 1995; Hausken 2005). For the incumbent we assume a third effort G_{ij} in period j designed to generate public goods for the population.

The incumbent and challenger have resources R_{ij} and R_{cj} in period j , $R_{ij} > R_{cj}$. The incumbent has unit conversion costs e_i , f_i and g of transforming R_i into E_{ij} , F_{ij} and G_{ij} . The challenger has unit conversion costs e_c and f_c of transforming R_c into E_{cj} and F_{cj} . This gives

$$\begin{aligned} R_{ij} &= e_i E_{ij} + f_i F_{ij} + g G_{ij} \\ R_{cj} &= e_c E_{cj} + f_c F_{cj} \end{aligned} \tag{1}$$

The incumbent has two strategic choice variables F_{ij} and G_{ij} , where E_{ij} follows from (1). The challenger has one strategic choice variable F_{cj} , where E_{cj} follows from (1). The incumbent controls the military and general security apparatus and thus is already ‘‘armed’’ and competent and has lower unit cost of fighting, $f_i \leq f_c$. We also assume that the incumbent’s advantageous position translates into a production advantage so that $e_i \leq e_c$. Hence in the first period the incumbent enjoys a much larger utility than the challenger, and fights much more successfully, and thus expropriates most of the production in the country.

Assume a production function where the players produce E_{ij} and E_{cj} , which means that production increases linearly with effort. Both agents produce $E_{ij} + E_{cj}$. The production process is

perceived as a subcategory of appropriative and defensive competition. We prefer to use the narrower and therefore

such that the joint production is readily available to be fought for by both players, which mathematically means that it is placed in a common pool. The players fight with each other with contest intensity (decisiveness) $m \geq 0$. The incumbent gets a contest-ratio $F_{ij}^m / (F_{ij}^m + F_{cj}^m)$, and the challenger gets a ratio $F_{cj}^m / (F_{ij}^m + F_{cj}^m)$, known as contest success functions (Tullock 1980, Skaperdas 1996), of the total production.

For simplicity we assume risk neutral players.³ The players' expected utilities in period 1 are⁴

$$\begin{aligned} U_{11} &= \frac{F_{11}^m}{F_{11}^m + F_{21}^m} \left(\frac{R_{i1} - f_i F_{11} - g G_{11}}{e_i} + \frac{R_{c1} - f_c F_{21}}{e_c} \right), \\ U_{21} &= \frac{F_{21}^m}{F_{11}^m + F_{21}^m} \left(\frac{R_{i1} - f_i F_{11} - g G_{11}}{e_i} + \frac{R_{c1} - f_c F_{21}}{e_c} \right) \end{aligned} \quad (2)$$

where the incumbent without loss of generality is player 1 in period 1 earning utility U_{11} , and the challenger is player 2 in period 1 earning utility U_{21} . When $m=0$ whereas $F_{11} > 0$ and $F_{21} > 0$, F_{11} and F_{21} have no impact which gives contest ratio 0.5 to both players. When $0 < m < 1$, exerting more effort than one's opponent gives less advantage in terms of contest ratio than the proportionality of the players' efforts specify. When $m=1$, the efforts have proportional impact on the contest ratio. When $m > 1$, exerting more effort than one's opponent gives more advantage in terms of contest ratio than the proportionality of the players' efforts specify. Finally, $m = \infty$ gives a step function where "winner-takes-all".

The probability p of the incumbent winning the election after period 1 is endogenous and depends on the ability of the incumbent to convert its effort and fighting into a public good which the electorate then rewards it with through votes. The probability p increases in G_1 , $\partial p / \partial G_{11} \geq 0$. We assume that the incumbent is guaranteed to win the election if the entire resource is converted to public goods and fighting between the players is absent, i.e. $E_{i1} = F_{i1} = F_{c1} = 0$ causes $p=1$. Conversely, we assume that the incumbent is guaranteed to lose the election if no resource is converted to public goods and the incumbent does not fight, i.e. $F_{i1} = G_{11} = 0$ causes $p=0$. We assume $\partial p / \partial F_{i1} \geq 0$ and $\partial p / \partial F_{c1} \leq 0$. Fighting F_{i1} and F_{c1} include fraud to alter the probability of winning the election.

more precise word fighting, which can be substituted with synonyms such as struggle, conflict, battle, etc.

³ On the one hand, an incumbent may be risk adverse. However, if the incumbent controls some natural resources, like Charles Taylor in Sierra Leone, then the incumbent may exhibit some risk-preference propelling it to fight on. For research on risk attitude see e.g. Skaperdas (1991) and Hausken (2010).

⁴ Equation (2) means placing the total production in a common pool for capture. The author has analyzed the model where each agent defends his own production and appropriates the other agent's production. The results are qualitatively similar in many respects, though the FOCs are more complicated to discuss, with no analytical solutions.

Thus the endogenous probability of the incumbent winning the election is also given by the ratio form,

$$p = p(F_{11}, G_{11}, F_{21}) = \frac{F_{11} + \gamma G_{11}}{F_{11} + \gamma G_{11} + F_{21}} \quad (3)$$

where γ is a parameter that expresses the relative importance of providing public goods versus fighting to ensure winning. If the incumbent wins the election after period 1, it remains in power (WP) if the challenger accepts defeat, or a standoff (WS) or coalition (WC) ensues if the challenger does not accept defeat. If the incumbent loses the election after period 1, the challenger becomes the new incumbent (LP) if the incumbent accepts defeat, or a standoff (LS) or coalition (LC) ensues if the incumbent does not accept defeat. The six outcomes may occur regardless of whether p is small or large. Fig. 1 shows these six outcomes as a tree structure for the strategic form two-period game.

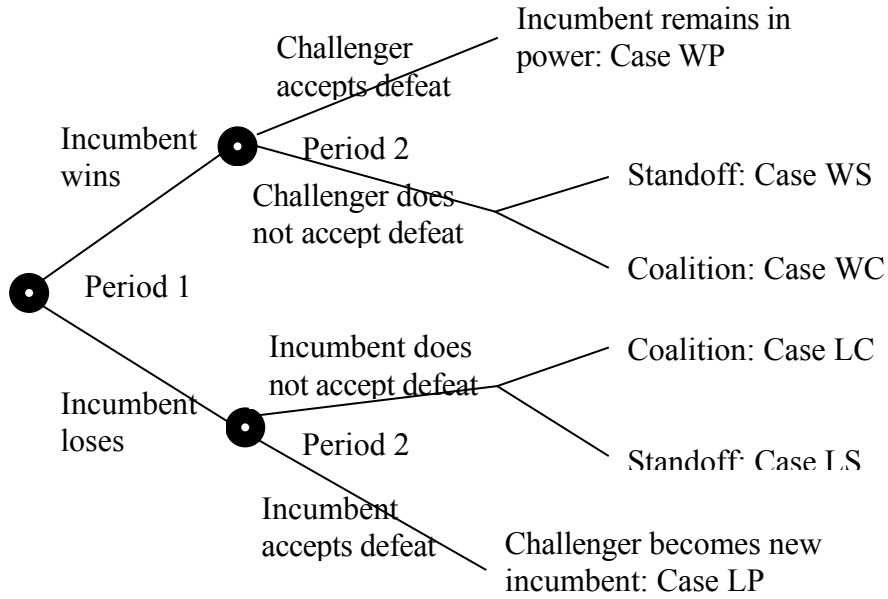


Fig. 1 Election outcomes as a tree structure for the strategic form two period game.

Case WP: If the incumbent wins the election it remains in power in period 2 as player 1. The second period then proceeds equivalently to the first period giving

$$U_{12WP} = \frac{F_{12}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{12} - g G_{12}}{e_i} + \frac{R_{c2} - f_c F_{22}}{e_c} \right),$$

$$U_{22WP} = \frac{F_{22}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{12} - g G_{12}}{e_i} + \frac{R_{c2} - f_c F_{22}}{e_c} \right) \quad (4)$$

where the first subscript on U denotes players 1 or 2, and the second subscript expresses period 2. For period 2 we consider G_{ij} as a parameter since we confine attention to a two period game. We express the second period utilities as U_{12k} and U_{22k} where k expresses which case arises in period 2.

Case LP: If the incumbent loses the election and accepts defeat, the roles of incumbent and challenger are reversed in period 2 giving

$$\begin{aligned} U_{12LP} &= \frac{F_{12}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{22} - g G_{22}}{e_i} + \frac{R_{c2} - f_c F_{12}}{e_c} \right), \\ U_{22LP} &= \frac{F_{22}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{22} - g G_{22}}{e_i} + \frac{R_{c2} - f_c F_{12}}{e_c} \right) \end{aligned} \quad (5)$$

Case WC or LC: If a coalition is formed (regardless who wins the election) we assume that the incumbent has a resource availability $r(R_{i2} + R_{c2}) \leq R_{i2}$ and the challenger has the remaining resource availability $(1-r)(R_{i2} + R_{c2}) \geq R_{c2}$. We assume $r \leq \text{Min}\{R_{i2}/(R_{i2} + R_{c2}), 1 - R_{c2}/(R_{i2} + R_{c2})\}$ so that with the coalition the incumbent gets less resources and the challenger gets more resources compared with no coalition⁵. When $r=1/2$, both players have equal resource availability in the coalition. We assume that the incumbent keeps its f_i and g_i from period 1, and that g remains unchanged. We assume that the challenger benefits from the coalition by getting lower unit costs of fighting and production expressed with ϕf_c and εe_c , where $f_i/f_c \leq \phi \leq 1$ and $e_i/e_c \leq \varepsilon \leq 1$ so that the challenger still has higher unit costs of fighting and production than the incumbent.⁶ This gives

$$\begin{aligned} U_{12C} = U_{12WC} = U_{12LC} &= \frac{F_{12}^m}{F_{12}^m + F_{22}^m} \left(\frac{r(R_{i2} + R_{c2}) - f_i F_{12} - g G_{12}}{e_i} + \frac{(1-r)(R_{i2} + R_{c2}) - \phi f_c F_{22}}{\varepsilon e_c} \right), \\ U_{22C} = U_{22WC} = U_{22LC} &= \frac{F_{22}^m}{F_{12}^m + F_{22}^m} \left(\frac{r(R_{i2} + R_{c2}) - f_i F_{12} - g G_{12}}{e_i} + \frac{(1-r)(R_{i2} + R_{c2}) - \phi f_c F_{22}}{\varepsilon e_c} \right) \end{aligned} \quad (6)$$

Case WS or LS: If a standoff ensues (regardless who wins the election) the players control their respective resources R_{i2} and R_{c2} , but the unit cost of production increases to e_s for both players, $e_s > e_c > e_i$, and the unit cost of producing public goods increases to g_s , $g_s > g$. The standoff can be non-violent causing moderately high e_s and g_s , or escalate to civil war causing extremely high e_s and g_s .

⁵ Some reports on Zimbabwe 2011 show that the incumbent had more resources than the challenger in the coalition arrangements. Such resources include access to diamond resource revenues which seem not to be managed by central government treasury.

⁶ For example, in Zimbabwe 2011, the opposition leader in a unity government was not supported by the military, which prevents f_c from decreasing to f_i .

In a non-violent standoff, both the incumbent and challenger could organize their political supporters to “take to the streets” to show support for their respective leader. Indeed, the incumbent could offer financial rewards and other rewards to their supporters in order to “buy them” to their side. This implies that the unit cost of production and unit cost of producing public goods both go up. If violence breaks out and escalates to armed conflict, where both sides invest in acquiring arms, the disruptive nature of civil war pushes the unit costs of production to extreme levels.⁷ We assume that the unit costs of fighting, f_i and f_c , remain unchanged. This gives

$$\begin{aligned} U_{12S} = U_{12WS} = U_{12LS} &= \frac{F_{12}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{12} - g_s G_{12}}{e_s} + \frac{R_{c2} - f_c F_{22}}{e_s} \right), \\ U_{22S} = U_{22WS} = U_{22LS} &= \frac{F_{22}^m}{F_{12}^m + F_{22}^m} \left(\frac{R_{i2} - f_i F_{12} - g_s G_{12}}{e_s} + \frac{R_{c2} - f_c F_{22}}{e_s} \right) \end{aligned} \quad (7)$$

Three cases are possible regardless who wins the election. Distinguishing between the nine possible combination of cases, player k 's utility, $k=1,2$, over the two periods is

$$U_k = \begin{cases} U_{k1} + \delta [pU_{k2WP} + (1-p)U_{k2LP}] & \text{if } WPLP \\ U_{k1} + \delta [pU_{k2WP} + (1-p)U_{k2LS}] & \text{if } WPLS \\ U_{k1} + \delta [pU_{k2WP} + (1-p)U_{k2LC}] & \text{if } WPLC \\ U_{k1} + \delta [pU_{k2WS} + (1-p)U_{k2LP}] & \text{if } WSLP \\ U_{k1} + \delta [pU_{k2WS} + (1-p)U_{k2LS}] = U_{k1} + \delta U_{k2S} & \text{if } WSLS \text{ which guarantees standoff} \\ U_{k1} + \delta [pU_{k2WS} + (1-p)U_{k2LC}] & \text{if } WSLC \\ U_{k1} + \delta [pU_{k2WC} + (1-p)U_{k2LP}] & \text{if } WCLP \\ U_{k1} + \delta [pU_{k2WC} + (1-p)U_{k2LS}] & \text{if } WCLS \\ U_{k1} + \delta [pU_{k2WC} + (1-p)U_{k2LC}] = U_{k1} + \delta U_{k2C} & \text{if } WCLC \text{ which guarantees coalition} \end{cases} \quad (8)$$

where δ and Δ are discount factors that weigh the importance of the second period relative to the first period. Analyzing the game means accounting for the nine cases in (8), each designated with four letters. If the incumbent wins, the three cases WP,WS,WC are possible, each designated with two letters. If the incumbent loses, the three cases LP,LS,LC are possible, each designated with two letters. We refer to case C as coalition and case S as standoff.

3 Analyzing the model

We solve with backward induction starting with period 2.

3.1 Second period solutions when the election outcome is known

3.1.1 Case WP: The incumbent wins and remains in power

Proposition 1: If the incumbent wins the election after period 1, then

$$\begin{aligned}
 F_{22} &= \frac{m (e_i R_{c2} + e_c (R_{i2} - g G_{12}))}{e_i f_c \left(1 + \left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{-m}{1+m}} \right) (1+m)}, & F_{12} &= \left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{1}{1+m}} F_{22} \\
 U_{12WP} &= \frac{\left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{m}{m+1}} (e_c (R_{i2} - g G_{12}) + e_i R_{c2})}{e_c e_i (m+1) \left(\left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{m}{m+1}} + 1 \right)} \\
 U_{22WP} &= \frac{e_c (R_{i2} - g G_{12}) + e_i R_{c2}}{e_c e_i (m+1) \left(\left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{m}{m+1}} + 1 \right)}
 \end{aligned} \tag{9}$$

Proof: The first order conditions for period 2 are

$$\begin{aligned}
 \frac{\partial U_{12WP}}{\partial F_{12}} &= \frac{F_{12}^{-1+m} (-e_c F_{12}^{1+m} f_i - F_{22}^m (e_i m (F_{22} f_c - R_{c2}) + e_c (F_{12} f_i (1+m) + m (g G_{12} - R_{i2})))}{e_c e_i (F_{12}^m + F_{22}^m)^2} = 0 \\
 \frac{\partial U_{22WP}}{\partial F_{22}} &= \frac{F_{22}^{-1+m} (-e_i F_{22}^{1+m} f_c - F_{12}^m (e_i F_{22} f_c (1+m) - e_i m R_{c2} + e_c m (F_{12} f_i + g G_{12} - R_{i2})))}{e_c e_i (F_{12}^m + F_{22}^m)^2} = 0
 \end{aligned} \tag{10}$$

QED.

We have assumed $f_i < f_c$ and $e_i < e_c$. This can cause the ratio $e_i f_c / e_c f_i$ to be around unity. If the incumbent enjoys a very low unit fighting cost f_i , then its fighting will be larger than for the challenger, $F_{12} > F_{22}$. The exponent $1/(1+m)$ makes F_{12} and F_{22} more similar as the fighting intensity m increases. The second order conditions are

$$\begin{aligned}
 \frac{\partial^2 U_{12WP}}{\partial F_{12}^2} &= \frac{f_c f_i (m+1)^2 \left(\frac{e_i f_c}{e_c f_i} \right)^{-\frac{1}{m+1}}}{m (e_c g G_{12} - e_c R_{i2} - e_i R_{c2})} < 0 \\
 \frac{\partial^2 U_{22WP}}{\partial F_{22}^2} &= \frac{f_c f_i (m+1)^2 \left(\frac{e_i f_c}{e_c f_i} \right)^{\frac{1}{m+1}}}{m (e_c g G_{12} - e_c R_{i2} - e_i R_{c2})} < 0
 \end{aligned} \tag{11}$$

which are satisfied since $R_{i2} > g G_{12}$.

3.1.2 Case LP: The incumbent loses and accepts election loss

Proposition 2: If the incumbent loses and accepts the loss of the election, then

⁷ In Ivory Coast 2012 both sides possessed fire-arms leading to armed conflict. The incumbent was defeated in the conflict and the challenger took over power. The economy slowed down and economic hardships ensued.

$$\begin{aligned}
F22 &= \frac{m (ei Rc2 + ec (-g G22 + Ri2))}{\left(ec fi + ei fc \left(\frac{ec fi}{ei fc} \right)^{\frac{1}{1+m}} \right) (1+m)}, \quad F12 = \left(\frac{ec fi}{ei fc} \right)^{\frac{1}{1+m}} F22 \\
U12LP &= \frac{\left(\frac{ec fi}{ei fc} \right)^{\frac{m}{m+1}} (ec (Ri2 - g G22) + ei Rc2)}{ec ei (m+1) \left(\left(\frac{ec fi}{ei fc} \right)^{\frac{m}{m+1}} + 1 \right)} = U22WP \\
U22LP &= \frac{ec (Ri2 - g G22) + ei Rc2}{ec ei (m+1) \left(\left(\frac{ec fi}{ei fc} \right)^{\frac{m}{m+1}} + 1 \right)} = U12WP
\end{aligned} \tag{12}$$

Proof: The first order conditions for period 2 are

$$\begin{aligned}
\frac{\partial U12LP}{\partial F12} &= \frac{F12^{-1+m} \left(-ei F12^{1+m} fc - F22^m (ei F12 fc (1+m) - ei m Rc2 + ec m (F22 fi + g G22 - Ri2)) \right)}{ec ei (F12^m + F22^m)^2} = 0 \\
\frac{\partial U22LP}{\partial F22} &= \frac{F22^{-1+m} \left(-ec F22^{1+m} fi - F12^m (ei m (F12 fc - Rc2) + ec (F22 fi (1+m) + m (g G22 - Ri2))) \right)}{ec ei (F12^m + F22^m)^2} = 0
\end{aligned} \tag{13}$$

QED.

The second order conditions are

$$\begin{aligned}
\frac{\partial^2 U12LP}{\partial F12^2} &= \frac{fc fi (m+1)^2 \left(\frac{ec fi}{ei fc} \right)^{-\frac{1}{m+1}}}{m (ec g G22 - ec Ri2 - ei Rc2)} < 0 \\
\frac{\partial^2 U22LP}{\partial F22^2} &= -\frac{fc fi (m+1)^2 \left(\frac{ec fi}{ei fc} \right)^{\frac{1}{m+1}}}{m (ec (Ri2 - g G22) + ei Rc2)} < 0
\end{aligned} \tag{14}$$

which are satisfied since $R_{i2} > gG_{i2}$.

3.1.3 Case WC or LC, i.e. case C: Coalition

Proposition 3: If the incumbent loses the election and a coalition is formed then,

$$F22 = \frac{m ((Rc2 + Ri2) (ei (1-r) + ec r \varepsilon) - ec g G12 \varepsilon)}{(1+m) \left(ei fc \phi + ec fi \varepsilon \left(\frac{ei fc \phi}{ec fi \varepsilon} \right)^{\frac{1}{1+m}} \right)}, \quad F12 = \left(\frac{ei \phi fc}{\varepsilon ec fi} \right)^{\frac{1}{1+m}} F22$$

$$\begin{aligned}
U_{12C} &= \frac{\left(\frac{e_i f_c \phi}{\varepsilon e_c f_i}\right)^{\frac{m}{m+1}} \left((R_{c2} + R_{i2}) (\varepsilon e_c r + e_i (1 - r)) - \varepsilon e_c g G_{12} \right)}{\varepsilon e_c e_i (m+1) \left(\left(\frac{e_i f_c \phi}{\varepsilon e_c f_i}\right)^{\frac{m}{m+1}} + 1 \right)} \\
U_{22C} &= \frac{(R_{c2} + R_{i2}) (\varepsilon e_c r + e_i (1 - r)) - \varepsilon e_c g G_{12}}{\varepsilon e_c e_i (m+1) \left(\left(\frac{e_i f_c \phi}{\varepsilon e_c f_i}\right)^{\frac{m}{m+1}} + 1 \right)}
\end{aligned} \tag{15}$$

Proof: The solution is the same as in section 3.1.1 (when the incumbent wins) replacing R_{i2} with $r(R_{i2} + R_{c2})$, replacing R_{c2} with $(1-r)(R_{i2} + R_{c2})$, replacing f_c with ϕf_c , and replacing e_c with εe_c . QED.

3.1.4 Case WS or LS, i.e. case S: Standoff

Proposition 4: If the incumbent loses causing a standoff then,

$$\begin{aligned}
F_{22} &= \frac{m (-G_{12} g_s + R_{c2} + R_{i2})}{\left(f_c + \left(\frac{f_c}{f_i}\right)^{\frac{1}{1+m}} f_i \right) (1+m)}, \quad F_{11} = \left(\frac{f_c}{f_i}\right)^{\frac{1}{1+m}} F_{22} \\
U_{12S} &= \frac{\left(\frac{f_c}{f_i}\right)^{\frac{m}{m+1}} (-G_{12} g_s + R_{c2} + R_{i2})}{e_s (m+1) \left(\left(\frac{f_c}{f_i}\right)^{\frac{m}{m+1}} + 1 \right)} \\
U_{22S} &= \frac{-G_{12} g_s + R_{c2} + R_{i2}}{e_s (m+1) \left(\left(\frac{f_c}{f_i}\right)^{\frac{m}{m+1}} + 1 \right)}
\end{aligned} \tag{16}$$

Proof: The solution is the same as in section 3.1.1 (when the incumbent wins), replacing e_i and e_c with e_s , and replacing g with g_s . QED.

3.2 First period solutions

When p is exogenous, the first period does not impact the second period and the first period solution is as the second period solution in section 3.1.1 replacing the subscript 2 for period 2 with subscript 1 for period 1. When $p=p(F_{11}, G_{11}, F_{21})$ is endogenous as in (3) and the second period utilities are fixed as U_{12WP} and U_{22WP} if the incumbent wins, and fixed as U_{12k} and U_{22k} if the incumbent loses causing case k , $k=LP, C, S$, the first order conditions for period 1 are

$$\begin{aligned}
\frac{\partial U_1}{\partial F_{11}} &= -\frac{F_{11}^{-1+m} F_{21}^m m (F_{21} f_c - R_{c1})}{e_c (F_{11}^m + F_{21}^m)^2} + \frac{F_{11}^{-1+m} (-F_{11}^{1+m} f_i - F_{21}^m (F_{11} f_i (1+m) + m (g G_{11} - R_{i1}))}{e_i (F_{11}^m + F_{21}^m)^2} + \frac{F_{21} (-U_{12k} + U_{12WP}) \delta}{(F_{11} + F_{21} + G_{11} \gamma)^2} = 0 \\
\frac{\partial U_1}{\partial G_{11}} &= -\frac{F_{11}^m g}{e_i (F_{11}^m + F_{21}^m)} + \frac{F_{21} (-U_{12k} + U_{12WP}) \gamma \delta}{(F_{11} + F_{21} + G_{11} \gamma)^2} = 0 \\
\frac{\partial U_2}{\partial F_{21}} &= \frac{F_{21}^{-1+m} (-F_{21}^{1+m} f_c + F_{11}^m (-F_{21} f_c (1+m) - m R_{c1}))}{e_c (F_{11}^m + F_{21}^m)^2} - \frac{F_{11}^m F_{21}^{-1+m} m (F_{11} f_i + g G_{11} - R_{i1})}{e_i (F_{11}^m + F_{21}^m)^2} - \frac{(U_{22k} - U_{22WP}) (F_{11} - G_{11} \gamma) \Delta}{(F_{11} + F_{21} + G_{11} \gamma)^2} = 0 \quad (17)
\end{aligned}$$

where U_{12WP} and U_{12k} are given by the equations in section 3.1. The three equations in (17) are solved to determine F_{11}, G_{11}, F_{21} , which are inserted into (2)-(8) to determine the utilities. The amount of public goods produced in period 2, G_{12} and G_{22} impact all variables including (17). Since we consider a two period game, the players have no interest in choosing positive G_{12} and G_{22} . We thus set $G_{12}=G_{22}=0$. Our objective in this paper is to consider public goods production in period 1.⁸

4 Illustrating the solution with simulations

We consider the benchmark parameter values $R_{ij}=2$, $R_{cj}=e_c=f_c=1$, $\delta=\Delta=m=1$, $e_i=0.8$, $f_i=0.5$, $g=0.05$, $\gamma=3$, $\phi=0.5$, $\varepsilon=0.95$, $r=0.5$, $e_s=g_s=3$, and vary the parameters systematically relative to this baseline. We plot the three effort variables F_{11} , G_{11} , F_{21} , the probability p of the incumbent winning the election, the utilities U_1 and U_2 , and the period 2 utilities in panel 4. We consider the three most interesting cases, out of the nine possible combinations of cases in (8). These are that the incumbent compares winning and remaining in power against losing and accepting the loss (WPLP), against losing causing standoff (WPLS), and against losing causing coalition (WPLC). This gives three panels. Panel 4 is omitted when the period 2 utilities are constant, and some of the panels are omitted when the variables are constant. The baseline is chosen so that the incumbent in period 2 earns lowest utility in the costly standoff case WPLS, intermediate utility if it loses the election case WPLP, and highest utility if a coalition is formed case WPLC.

Fig. 2 plots as functions of the incumbent's unit cost f_i of fighting. We plot only the interesting interval where $G_{11}>0$. For case WPLP, where the incumbent accepts the election loss, the public goods production G_{11} is inverse U shaped. Low f_i makes fighting efficient and the incumbent can ignore public goods due to strength. High f_i causes inefficient fighting and the resource constrained incumbent needs to strike a balance between fighting and public goods production (influenced by γ in (3) and the unit costs). As f_i increases this balance is eventually struck such that public goods are not produced, due to weakness, and the probability p of the

⁸ To consider G_{12} and G_{22} as variables a three period game can be analyzed, and the impact of G_{12} and G_{22} on period 3. For the two period game one alternative is to set G_{12} and G_{22} to positive values. Another alternative is to assume $G_{12}=G_{22}=G_{11}$ when solving (17).

incumbent winning the election thus eventually decreases strongly. The decreasing p is related to the increasing U_{121} . When the incumbent loses it has unit cost f_c in period 2, while the new incumbent suffers the increasing unit cost f_i . For intermediate f_i the incumbent chooses high fighting and high public goods production. For case WPLC in coalition the incumbent can ensure a large period 2 utility U_{122} when losing the election when f_i is low, and thus the incumbent does not produce public goods when f_i is low. Public goods production increases in f_i as the incumbent becomes more intent on winning the election. For case WPLS in standoff the incumbent earns a very low period 2 utility U_{123} when losing the election, except when f_i is very low. The incumbent thus becomes very intent on winning the election hence producing ample public goods as f_i increases.

<<insert figure 2 here>>

Fig. 3 plots as functions of the incumbent's resource R_{i1} in period 1, keeping $R_{i2}=2$ unchanged for period 2. As the incumbent becomes more resourceful facing case WPLP, it produces less public goods, instead using its resource on fighting. The same, and more detrimentally so, occurs for case WPLC where the incumbent gets a larger period 2 utility. For case WPLS the opposite logic applies. The incumbent faces a low period 2 utility in the standoff, and produces public goods to increase the probability of reelection. Plotting as a function of $R_{ij}=R_{i1}=R_{i2}$ gives increased public goods production for all the three cases as period 2 is then more attractive.

<<insert figure 3 here>>

Fig. 4 plots as functions of the incumbent's unit production cost e_i . For case WPLP decreasing e_i causes decreased public goods because of the incumbent's high period 2 utility, and because the incumbent can face an election loss with low e_i . Conversely, for case WPLC and especially case WPLS decreasing e_i causes increased public goods (unless e_i is extremely low) because of the incumbent's lower period 2 utility.

<<insert figure 4 here>>

Fig. 5 plots as functions of the incumbent's unit cost g of producing public goods. Public goods production decreases quickly for cases 1 and 2, and more slowly for case WPLS with the low period 2 utility.

<<insert figure 5 here>>

Fig. 6 plots as functions of γ , the relative importance in (3) of providing public goods versus fighting to ensure winning the election. Public goods production is inverse U shaped, again more pronounced for case WPLS, and approaches zero asymptotically as γ approaches infinity, and p approaches 1 asymptotically. When γ is too low, its role in (3) is negligible and the incumbent

chooses fighting instead. When γ is large in (3), the incumbent wins the election even with moderate public goods production, and thus G_{11} eventually decreases, while F_{11} remains at a certain level. Thus public goods production is highest for intermediate γ .

<<insert figure 6 here>>

Fig. 7 plots as functions of r , the incumbent's share of resources in case WPLC. The given baseline $r \leq \text{Min}\{R_{i2}/(R_{i2}+R_{c2}), 1-R_{c2}/(R_{i2}+R_{c2})\}$ implies $r \leq 2/3$. As r decreases, the incumbent produces more public goods to increase the probability of winning the election to avoid the low share of resources available if the election is lost and case WPLC follows.

<<insert figure 7 here>>

Fig. 8 plots as functions of ϕ , the challenger's fraction of unit fighting cost in case WPLC. As ϕ decreases, the challenger becomes advantaged in period 2. The incumbent responds by producing more public goods to increase the probability of winning the election to avoid the low period 2 utility.

<<Insert figure 8 here>>

Fig. 9 plots as functions of ε , the challenger's fraction of unit production cost in case WPLC. As ε decreases below 1, the challenger becomes advantaged in period 2, but the incumbent becomes even more advantaged because it can fight for more production in period 2. Consequently, the incumbent produces less public goods and accepts lower probability of winning the election because of the high period 2 utility in case WPLC.

<<insert figure 9 here>>

Fig. 10 plots as functions of both players' unit production cost e_s in case WPLS. As e_s decreases, both players benefit from case WPLS in period 2, and the incumbent produces less public goods since losing the election becomes more acceptable.

<<insert figure 10 here>>

Fig. 11 plots as functions of the contest intensity m . When m is low, efforts do not matter much in the fight between the players, and both players earn large utilities. The incumbent chooses low fighting and produce some public goods to win the election. As m increases to a moderate level, both players fight more, and the incumbent produces more public goods to win the election. As m increases above the moderate level, both players fight more intensely to ensure effort superiority or avoid effort inferiority. To enable such increased fighting the incumbent cannot afford extensive public goods and hence produces somewhat less public goods thus accepting a somewhat lower probability of winning the election.

<<insert figure 11 here>>

Fig. 12 plots as functions of the incumbent's discount factor δ , which expresses the weight assigned to period 2. Lower δ gives less public goods as the incumbent becomes less concerned about the future.

<<insert figure 12 here>>

Fig. 13 plots as functions of the challenger's discount factor Δ . The impact on public goods is almost negligible. For cases 1 and 2 lower Δ gives marginally less public goods, marginally larger p and marginally larger F_{11} , and opposite for case WPLS where public goods are more important.

<<insert figure 13 here>>

5 Distinguishing theoretically and empirically between cases

5.1 Theoretical determination when the incumbent wins the election

The incumbent may win the election regardless of whether p is small or large. To predict on theoretical grounds whether cases WP, WC, WS occur when the incumbent wins the election, we use triggers determined by the endogenous probability p . We assume case WC when $0 \leq p < LW$, which seems reasonable since a very low p may induce the incumbent to accept a coalition. We assume case WS when $LW \leq p \leq MW$, which seems reasonable since an intermediate p may induce the incumbent to insist on a standoff. We assume case WP when $MW < p \leq 1$, since a large p may induce the challenger to accept defeat. These triggers are shown in Fig. 15.

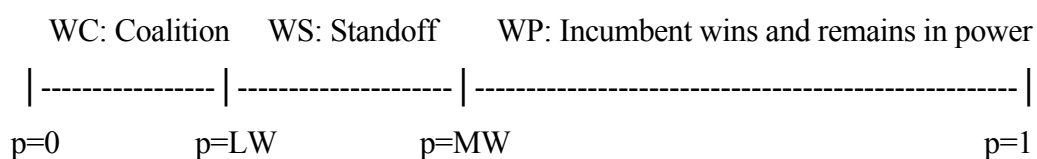


Fig. 14 Triggers determining cases WP, WC, WS if the incumbent wins the election.

Theoretical prediction may not be empirically justified. For example, a recalcitrant challenger may insist on standoff regardless of p .

5.2 Theoretical determination when the incumbent loses the election

The incumbent may lose the election regardless of whether p is small or large. To predict on theoretical grounds whether cases LP, LC, LS occur when the incumbent loses the election, we use triggers determined by the endogenous probability p . We assume case LP when $0 \leq p < LL$, which seems reasonable since a very low p may induce the incumbent to accept defeat. We assume case

LC when $LL \leq p \leq ML$, which seems reasonable since an intermediate p may induce the incumbent to be willing to accept power sharing with the challenger in a coalition. We assume case LS when $ML < p \leq 1$, since a large p , despite losing the election, seems to be the most likely event where the incumbent may refuse to leave office. These triggers are shown in Fig. 15.

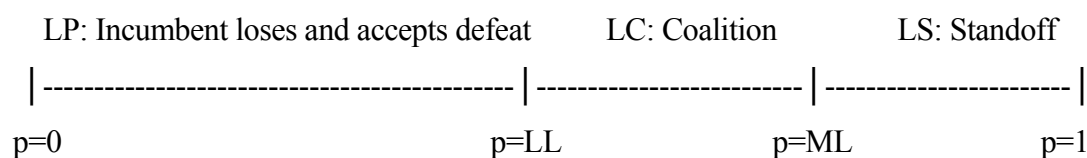


Fig. 15 Triggers determining cases LP,LC,LS if the incumbent loses the election.

Theoretical prediction may not be empirically justified. For example, a recalcitrant incumbent may insist on standoff regardless of p , and a submissive incumbent may accept an election loss even when p is close to 1. The endogenous character of p , which depends on the levels of fighting efforts by the incumbent and challenger, and the level of provision of public goods by the incumbent, means this probability varies across election events. This would determine how far p is from the trigger points 0, LL, ML, and 1. In case LP, which occurs when p is in the region 0 to LL, the incumbent accepts the loss. In this case a low unit cost of fighting makes fighting efficient and public goods provision can be ignored. As the cost of fighting increases, the incumbent is unable to offer public goods and accepts the loss. This is consistent with Figures 2 to 6 which show the decline in public goods as the unit cost of production and unit cost of producing public goods increase, all contributing to an election loss by the incumbent.

In case LC, when a coalition occurs, the probability p lies between LL and ML. In this case again the incumbent does produce public goods when the cost of fighting is low, as he receives higher utility in period 2. However, as the cost of fighting increases the incumbent produces more public goods so as to secure victory. If the unit cost of production is low this induces increased public goods production due to the incumbent's lower period 2 utility. This eventually leads to a coalition arrangement.

In case LS, a standoff occurs when the probability of winning the election is between ML and 1. Here the incumbent would feel he has done enough to win but the challenger does challenge the election as the result would be close. In this case the incumbent earns a low utility in period 2 and engages in the production of public goods as the cost of fighting goes up, and as the cost of production decreases. The incumbent stands fast and a standoff occurs.

5.3 Empirical Mapping of Cases

In this section we map the actual election outcomes in Africa to the various cases. This classification of outcomes is shown in Table 2 below, and extracted from Table 1.

Table 2: Classification of Recent Presidential election outcomes in Africa 2006-2011 + Eritrea 1993

Incumbent wins	Incumbent remains in power	Algeria 2009, Angola 2008, Benin 2011, Botswana 2009, Burkina Faso 2010, Burundi 2010, Cameroon 2007, Cape Verde 2006, Democratic Republic of Congo 2007, Eritrea 1993, Egypt 2010*, Ethiopia 2010, Namibia 2009, Rwanda 2010, Seychelles 2011, South Africa 2009, Tanzania 2010, Togo 2010, Tunisia 2009*, Uganda 2011, Zambia 2008
	Standoff	Central Africa Republic 2011, Chad 2011, Djibouti 201, Equatorial Guinea 2009, Gambia 2006, Mali 2007, Nigeria 2011, Republic of Congo 2009, Senegal 2007, Somalia 2009, Sudan 2010.
	Coalition	Gabon 2009, Mozambique 2009
Incumbent loses	Challenger becomes new incumbent	Sierra Leone 2007, Niger 2011, Sao Tome 2011, Morocco 2007, Mauritania 2009, Mauritius 2010, Ghana 2008, Guinea 2010, Comoros 2010, Liberia 2005, Côte d'Ivoire 2010**
	Standoff	
	Coalition	Guinea-Bissau 2009, Kenya 2007, Lesotho 2007, Madagascar 2007, Malawi 2009, Zimbabwe 2008

*Incumbents were later toppled in the revolutionary uprising of the Arab Spring in 2011.

**Challenger, who was the winner, only took over after a violent standoff of bloody conflict and some foreign military intervention.

A good starting point for empirical determination is Table 1 based on history. One may proceed to collect or estimate data about election results and related characteristics thus using history to predict which case is likely.

Let us assess what could be gleaned from Table 2 in terms of predicting future election outcomes. Looking at the numbers, the most likely event is that the incumbent wins. The second most likely event is a standoff (case S), the third most likely is a coalition (case C), and the least likely is that the challenger becomes the new incumbent (case LP).

We first consider the 34 events that the incumbent wins. First, for 21 countries, the incumbent remains in power. For these countries the incumbent's win probability is usually high and between MW and 1 in Fig. 14. Second, for 11 countries a standoff followed. If a standoff were to follow, we would expect the incumbent's win probability to be intermediate and between LW and MW in Fig. 14. In terms of the model above, these elections are consistent with the incumbent earning a low utility in period 2, and engaging in the production of public goods. The incumbent wins but is challenged. However, the incumbent stands fast against the challenge and a standoff occurs but the incumbent remains in power. Third, for Gabon and Mozambique a coalition was formed. For these countries we would expect the incumbent's win probability to be low and between 0 and LW in Fig. 14. In terms of the model above, these elections are consistent with having an incumbent who faces lower utility in period 2, and low unit cost of production, causing increased public goods provision to secure outright victory but without success. This would then have led to a coalition arrangement.

We second consider the 17 events that the incumbent loses. First, for 11 countries, where the challenger becomes the new incumbent, the probability of winning for the incumbent is usually low and between 0 and LL in Fig. 15. Here LL is a figure below 50% of votes. In this case, the challenger then received at least 50% of the votes and subsequently took over power. In these elections, the cost of fighting was likely to be initially low and therefore fighting was efficient and public goods provision may have been ignored. As the cost of fighting increased, the incumbent was then not able to offer public goods and then accepted the loss. Second, for six countries, where a coalition is formed, the probability of the incumbent winning is usually intermediate and between LL and ML in Fig. 15. Third, for no countries a standoff occurs. For such an event the probability of the incumbent winning is usually high and between ML and 1 in Fig. 15.

We also note that the various cases do not necessarily occur within the three mutually exclusive probability intervals in Figs. 14 and 15. In figures 2 to 13, we show that the probability p

can be high or low in all cases, though with tendencies as in Figs. 14 and 15. Indeed, the theory and the empirical observations could be divergent⁹.

6. Econometric Analysis

In this section, we conduct econometric analysis based on a discrete-choice multinomial probit model. This looks into how election outcomes relate to various country characteristics and political players.

6.1 The data

The database includes all 653 elections in Africa from 1960 to 2010, of which 299 (46%) are presidential and 354 (54%) are legislative. It covers all African countries except Libya, Sao Tome and Principe, Eritrea, Somaliland (not internationally recognized) and South Sudan, where no elections were held. Of the 299 legislative elections, the incumbent won 210 without the challenger's contestation. Only 5 elections where the incumbent won were contested. These are the cases of Kenya in 2002 and Guinea in 2010 where the contestation resulted in a coalition, and the cases of Malawi in 2009, Benin in 1991 and 2007 where the contestation resulted in a standoff. In 52 cases, the incumbent lost and accepted defeat while in 32 cases the incumbent lost, contested the results and negotiated a coalition with the challenger. The data are in Table 3 below.

Table 3: Classification of African election outcomes (frequency): 1960-2010

Outcomes	legislative	presidential	total
incumbent loses, accepts defeat	52	52	104
incumbent loses, contestation, coalition	32	48	80
incumbent loses, contestation, standoff	-	2	2
incumbent wins, contestation, coalition	2	40	42
incumbent wins, contestation, standoff	3	5	8
incumbent wins, no contestation	210	207	417
total	299	354	653

Of the 354 presidential elections, the incumbent president won 207 without contestation. On the other polar opposite, in 52 cases, the incumbent lost and conceded defeat. In 95 cases, the election results were contested by the loser. The incumbent lost, rejected the results and formed a coalition in 48 cases. The challenger lost, contested the results and formed a coalition with the incumbent in 40 cases. Seven elections resulted in a standoff. These are the cases of Benin in

⁹ While it would be useful to determine empirically L and M, the small sample of 51 elections in Africa, would not produce credible statistical results.

1991 and 2001, Togo 2005, Zimbabwe 2008 and Malawi 2009 where the challenger's contestation of the incumbent victory resulted in a standoff, and the cases of Somalia 2009 and Mauritania 2009 where the incumbent contestation of his loss also resulted in a standoff.

Table 4: Classification of African election outcomes (%): 1960-2010

Outcomes	legislative	presidential	total
incumbent loses, accepts defeat	17%	15%	16%
incumbent loses, contestation, coalition	11%	14%	12%
incumbent loses, contestation, standoff	-	1%	0%
incumbent wins, contestation, coalition	1%	11%	6%
incumbent wins, contestation, standoff	1%	1%	2%
incumbent wins, no contestation	70%	58%	64%
total	100%	100%	100%

Overall, during 1960-2010, 80% of the presidential and legislative elections results were accepted, 18% resulted in a coalition and 2% resulted in a standoff. This is shown in Table 4. Incumbent regimes tend to win elections they organize with a 71% probability. When the incumbent loses, he tends to reject the results (79% of the time). The challenger tends not to contest the results (contestation occurs in only 7% of the cases). However, the challenger's contestation rate is higher for presidential elections (12%) than for legislative elections (2%).

6.2 Descriptive analysis

The data shows that election standoffs are few. Because standoff cases are few we have reduced the number of outcomes from six to four by merging cases WS and WC to case WCS, and merging cases LC and LS to LCS. That is, we do not make distinction between a coalition and standoff, in the econometric analysis. The reason for this is not purely statistical. Some of the coalitions are formed after a certain period of standoff. And standoff may result from a broken coalition, or the coalition may be imposed by the international community while the political situation is a real standoff as in Zimbabwe. The cases WP and LP are as before.

The final outcome of an election depends on several factors including the economic performance of the incumbent, the provision of public goods, institutional factors, social factors, the incumbent characteristics, the challenger characteristics, the electoral system, historical and geographical factors and initial conditions, as we also stated above. The economic performance of the incumbent is measured by the real per capita GDP growth. For elections that took place at the beginning of a calendar year, citizens would judge the incumbent's economic achievement by the lagged real per capita GDP growth. As shown in Table 5, on average, the incumbent will lose the election if the economic performance is poor. Interestingly, LCS elections where the

incumbent loses and clings to power are those where the country recorded on average the worst economic performance. Highest economic performance is on average recorded for the WCS elections where the incumbent's victory is contested, though this is also the outcome with the largest standard deviation.

Table 5: Real per capita GDP

Outcomes	Growth		Lagged growth	
	mean	sd	mean	sd
LP	0.7268605	4.720912	1.417979	4.940245
LCS	-0.1974261	4.851998	0.2480947	4.498186
WCS	3.298996	13.83949	2.463653	8.60462
WP	1.721023	7.380211	1.336681	5.455691

Public investment as share of GDP grew by 0.67% and 3.54% on average respectively, a year before and the year of LP elections (see Table 6). For LCS elections, the average increase is higher: 8.66% the year before and 10.57% the year of the elections.

Table 6: Public investment as a share of GDP

	Growth			Lagged growth		
	mean	sd	Prob(<0)	mean	sd	Prob(<0)
LP	3.538136	32.7774	0.457019908	0.6714323	31.1541	0.491402673
LCS	10.572	44.96217	0.407053529	8.66837	39.48807	0.413123005
WCS	-5.798454	23.58011	0.597121901	1.770407	28.18244	0.474955116
WP	2.282698	33.3301	0.472698752	11.34125	61.55915	0.426915189

*** assuming normal distribution**

Despite these public investment increases the incumbent lost. WCS elections happened in periods of decline in the share of public investment in the GDP the year of the elections preceded by a 1.77% increase the year before the elections. Public investment growth as share of GDP was substantially high (11.34%) on average the year before WP elections. Taking into consideration the high standard deviation for each outcome, we see that LP and WCS elections, where the incumbent either loses and accepts defeat, or wins but is contested, are associated with the greatest probabilities of having a decline of the share of public investment in the GDP. This probability is lowest for LCS elections.

In the year of LP, WCS, and WP elections, the public consumption as a share of GDP, on average, increases. The year before LP, WCS, and WP elections, the public consumption also increases (see Table 7).

Table 7: Public consumption as a share of GDP

	Growth			Lagged growth		
	mean	sd	Prob(<0)	mean	sd	Prob(<0)

LP	1.042618	8.215567	0.44950676	0.7193151	13.32434	0.47847354
LCS	-0.3466147	8.117501	0.51702953	0.4373123	6.389229	0.47271561
WCS	1.054017	5.908831	0.4292123	-0.5772024	6.35427	0.53618892
WP	1.1817	9.773311	0.4518808	1.033623	7.786003	0.44719397

* assuming normal distribution

For LCS elections, public consumption as a share of GDP increases the year before the elections and decreases the year of the elections. For WCS elections the situation is opposite. On average, the share of public consumption in GDP decreases the year before the elections and increases the year of the elections. LCS elections correspond to the lowest average enrolment rate in tertiary education and lowest average language fractionalization (see Table 8). On the other hand, high enrolment rate in tertiary education corresponds to cases where the reelection of the incumbent is contested.

Table 8: Social factors (category average)

outcome	Enrolment in tertiary education (%)	Gini index	ethnic fraction- alization	Language fractionalization	religious fractionalization
LP	3.18572	45.4516	0.688641	0.643368	0.456417
LCS	2.60313	46.86885	0.679773	0.608705	0.462417
WCS	4.68302	42.90359	0.668176	0.687846	0.49313
WP	3.87274	46.13543	0.623375	0.622541	0.506454

Countries where WCS elections happened have on average the lowest Gini index, a measure of degree of inequality. Lowest average ethnic fractionalization is recorded in countries with WP elections. LP elections correspond to the lowest average religious fractionalization. The Chi-square tests show strong association between electoral outcomes and election types, number of rounds of the election, the political system (multi-party, single party or non-partisan) political coups, opposition strength, freedom of press, main religion in the country and the country's natural resource endowment (see Table 9).

Table 9: Association of other variables with election outcomes

Other variables	pr(Chi2)	Associations
Did incumbent come to power through a coup?	0.000	Yes with WP
Strong opposition	0.000	No with WP, Yes with LP
Freedom of press	0.000	Semi-freedom with LCS and WCS, No freedom with LP and WP
Number of rounds	0.000	One round with WP, Two rounds with LCS

Party system (multiparty or not)	0.001	Multiparty with LCS
Incumbent from military?	0.085	Yes with LCS and WP, No with LP and WCS
Main religion	0.000	Traditional with WCS, Islam with WP, Christianity with LCS
Country proximity to coast	0.538	-
Natural resource endowment	0.000	Abundant with LCS
Election type	0.000	Presidential associated with LCS and WCS Legislative associated with LP and WP
Former colonizer	0.000	France associated with LCS

Whether the incumbent president is from the military or not, and whether the country is coastal or not, do not seem to matter significantly. Using categorical analysis we have found that the WP elections are associated with political coups, weak opposition, no press freedom, one-round elections, military incumbent, Muslim majority in country, and legislative elections. WCS elections are related to semi-freedom of press, civil incumbent, traditional religions and presidential elections. LP elections are associated with strong opposition, no press freedom, civil incumbent and legislative elections. LCS elections are related to semi-freedom of the press, two round elections, incumbent from military, Christianity, abundant natural resources, presidential elections and France as a former colonizer.

6.3 Regression analysis

We use robust multinomial logit regression analysis to test which factors determine electoral outcomes. The multinomial logit model is given by

$$\ln \left(\frac{P(Y_i = j)}{P(Y_i = K)} \right) = \beta_j X_i + \alpha_j Z_i + u_{ji}, j = 1 \dots K - 1 \quad (18)$$

where Y_i is the outcome for election i , X_i is the set of regressors, Z_i is the set of control variables, and u_{ji} is the error term. The outcome variable Y has K possible outcomes. One outcome must be chosen as a pivot.

The data are not treated as a panel because every election tends to be a unique event in time. Electoral conditions even within the same country vary a lot from time to time. However, dummies for various decade-periods and country specific variables are included as control variables. The IIA assumption is always verified in this particular contest since every election has 4 and only 4 possible outcomes in the sense of our classification. The IIA assumption refers to the Independence of Irrelevant Alternatives, which asserts that if an additional outcome is included or one is excluded, this does not change the relative probabilities of the remaining

outcomes. In our analysis there is no additional outcome nor can we exclude any of the stated outcomes. The base outcome is WP, which is the most frequent outcome in Africa. Categorical regressors are included as set of dummies. Regressors that perfectly predict failure or success in some outcomes were excluded. A robust estimation technique is used to control for heteroscedasticity and possible outliers. In the above equation (18), the outcome WP was chosen as a pivot, against which the regression analysis is anchored.

6.3.1 Relative likelihood

Tables 10a, 10b and 10c report the relative likelihood of having respectively LP vs. WP, LCS vs. WP and WCS vs. WP for a unit increase in the regressor value (continuous regressors) or a category switch (categorical regressors). This relative likelihood (also referred to as risk) is calculated as the ratio of the probability of one outcome to the base outcome, for a one percentage change in the regressor. However, for a categorical regressor (qualitative variable) the relative likelihood is the ratio of the probability of one outcome to the base outcome, when the regressor switches from the base category to any of the remaining outcomes.

LP vs. WP

At a 5% level, only the number of years spent in power can significantly turn the odds in favor of WP instead of LP (see Table 10a). For an additional year spent in power by the incumbent, there is a relative likelihood of 0.08 that an election results in LP vs. WP. Economic performance and social factors do not seem to matter much for this likelihood.

Table 10a: Robust Multinomial logit regression results for LP election category

	Relative Likelihood	z	p>z
Economic Performance Variables			
Real per capita GDP growth	1.179175	1.45	0.148
Real per capita GDP growth(-1)	1.093019	0.71	0.478
Public investment as a share of GDP growth	1.01468	0.76	0.445
Public investment as a share of GDP growth(-1)	0.9743023	-0.73	0.468
Public consumption as a share of GDP growth	0.9291368	-0.3	0.760
Public consumption as a share of GDP growth(-1)	0.8109139	-1.45	0.148
Social factors			
enrollment in tertiary education	0.9625418	-0.14	0.889
Inequality	0.9126661	-0.93	0.352
ethnic fractionalization	78.6202	0.94	0.348
Religious fractionalization	0.0079636	-2.03	0.042
Other variables			
Number of years incumbent has been in power***	0.085349	-3.04	0.002
Strong opposition*	19.64509	1.66	0.097

Single party political system *	19.4085	1.65	0.099
Incumbent from military	0.4485358	-0.41	0.683
Coastal country	1.263784	0.09	0.925
Moderate natural resources	0.2945416	-0.8	0.423
Abundant natural resources	5.568181	0.66	0.508
Presidential elections*	6.546043	1.79	0.073

***significant at the 1% level; **significant at the 5% level; *significant at the 10% level

LCS vs. WP

If growth in the share of public investment in GDP the year before the election increases by 1%, the likelihood that the election results in WP or LCS is about the same (see Table 10b). Switching from multiparty elections to single party elections significantly turns the odds in favor of WP with a relative likelihood of 0.02. If the incumbent is from the military, the probability that the election results are LCS-type is nine times the probability that it results in WP. Military incumbents are to a higher degree expected to lose and cling to power than they are to win without contestation. If the country has a moderate natural resource endowment instead of no or few natural resources then the odds are higher that the outcome is WP than it is LCS. Social factors don't matter at a 5% level.

Table 10b: Robust Multinomial logit regression results for LCS election category

Economic performance variables	Relative Likelihood	z	p>z
Real per capita GDP growth	0.7994088	-1.67	0.094
Real per capita GDP growth(-1)	0.7992969	-1.29	0.196
Public investment as a share of GDP growth	1.01516	1.62	0.105
Public investment as a share of GDP growth(-1)**	1.02257	2.12	0.034
Public consumption as a share of GDP growth	0.9687683	-0.35	0.730
Public consumption as a share of GDP growth(-1)	0.9350947	-0.69	0.489
Social factors			
Enrollment in tertiary education	0.8453182	-1.39	0.164
Inequality	1.163716	0.54	0.592
Ethnic fractionalization	1313.097	1.28	0.202
Religious fractionalization*	0.0012344	-1.66	0.097
Others			
Number of years incumbent has been in power	0.8988326	-1.62	0.105
Strong opposition	0.0419288	-1	0.320
Single party political system **	0.0204111	-2.14	0.032
Incumbent from military**	7.49151	2.07	0.038
Coastal country	0.7866554	-0.18	0.854
Moderate natural resources***	0.0041545	-3.97	0.000
Abundant natural resources	13.89547	1.17	0.242
Presidential elections	3.464222	1.35	0.177

***significant at the 1% level; **significant at the 5% level; *significant at the 10% level

WCS vs. WP

Since WCS and WP outcomes are the two cases where the incumbent wins, the relative likelihood of WCS vs. WP is in fact the risk of contestation when the incumbent wins (see Table 10c). As expected, the likelihood of contestation is significantly high when the opposition is strong and economic performance is poor.

Table 10c: Robust Multinomial logit regression results for WCS election category

<i>Economic performance Variables</i>			
Real per capita GDP growth	0.9436423	-1.03	0.304
Real per capita GDP growth(-1)	0.9478922	-0.9	0.367
Public investment as a share of GDP growth***	0.9634736	-2.66	0.008
Public investment as a share of GDP growth(-1)*	1.016657	1.88	0.060
Public consumption as a share of GDP growth**	0.8198925	-2.26	0.024
Public consumption as a share of GDP growth(-1)	0.9163532	-1.35	0.178
Social factors			
Enrollment in tertiary education***	1.308708	3.36	0.001
Inequality	0.9932135	-0.1	0.919
Ethnic fractionalization***	1049.728	3.24	0.001
Religious fractionalization***	213.452	3.09	0.002
Others			
Number of years incumbent has been in power***	0.9248327	-0.98	0.328
Strong opposition***	43.93362	4.42	0.000
Single party political system	1.263435	0.2	0.840
Incumbent from military	1.537599	0.29	0.775
Coastal country***	14.08584	3.12	0.002
Moderate natural resources***	0.0151371	-4.3	0.000
Abundant natural resources***	0.0047783	-3.77	0.000
presidential elections	107.4596	3.35	0.001

***significant at the 1% level; **significant at the 5% level; *significant at the 10% level

A 1% increase in the growth of public consumption as a share of GDP the year of the election will put the relative likelihood of WCS vs. WP at 0.81. A 1% increase in the growth of public investment as a share of GDP the year of the election will put the relative likelihood of WCS vs. WP at 0.96. Lagged increase in public investment and public consumption do not significantly change the likelihood of contestation in the event of incumbent victory. Voters seem more concerned with their economic situation during the electoral period. Social factors such as tertiary education and ethnic and religious fractionalization also matter. Contestation is likely to occur when voters have more tertiary education. This is not surprising since country-wide contestations generally begin universities. The likelihood of contestation is also significantly high if ethnic and religious fractionalization increases.

6.3.2 Marginal effects

The marginal effects of each of regressors in the multinomial logit regression are reported in Table 11.

Table 11: Multinomial logit regression: Marginal effects

Variable	LP	LCS	WCS	WP
Economic performance Variables				
Real per capita GDP growth	0.0084**	-0.0137**	-0.0020	0.0073
Real per capita GDP growth(-1)	0.0056	-0.0131	-0.0012	0.0087
Public investment as a share of GDP growth	0.0006	0.0010*	-0.0020**	0.0003
Public investment as a share of GDP growth(-1)	-0.0013	0.0013***	0.0007*	-0.0009
Public consumption as a share of GDP growth	-0.0009	0.0007	-0.0089**	0.0091
Public consumption as a share of GDP growth(-1)	-0.0063	-0.0011	-0.0020	0.0095*
Social factors				
Enrollment in tertiary education	-0.00186	-0.0118	0.0151***	-0.0014
Inequality	-0.0046*	0.0095	-0.0011	-0.0039
Ethnic fractionalization	0.0409	0.3067	0.2414**	-0.5891**
Religious fractionalization	-0.1539	-0.3918***	0.3634***	0.1823
Others				
Number of years incumbent has been in power	-0.0872***	0.0168**	0.0154***	0.0549***
Strong opposition	0.0834	-0.1438***	0.2019***	-0.1415**
Single party political system	0.1282***	-0.2478***	0.0150	0.1046
Incumbent from military	-0.0454	0.1204**	0.0069	-0.0819
Coastal country	-0.0025	-0.0369	0.1082***	-0.0689
Moderate natural resources	0.0264	-0.1447***	-0.2204***	0.3387***
Abundant natural resources	0.0632	0.2332***	-0.3123***	0.0159
Presidential elections	0.0216	0.0161	0.2278	0.2278***

***significant at the 1% level; **significant at the 5% level; *significant at the 10% level

Real per capita GDP growth

Real per capita GDP growth has a significant effect on the likelihood of LP and LCS. If real per capita GDP growth increases with 1%, the probability of the LP outcome increases by 0.0084 while the probability the LCS outcome decreases by -0.0137. Overall, the probability that the incumbent loses decreases as expected by 0.0053 as per capita growth increases 1%,.

Provision of public goods

An increase in the growth rate of public investment or public consumption as a share of GDP the year of the election has a significant negative effect on the probability of WCS. Such a result can be explained by the fact that a significant increase in public investment or consumption will boost the chances for the incumbent to win and make contestations less likely, in the event of victory. Hence, WCS is less likely to be the election outcome. An increase by 1% in public investment as a share of GDP the year before the election will increase the likelihood of a LCS

outcome by 0.0013. In this case, the increase in public investment at the eve of the elections could be the sign of the incumbent's determination to remain in power.

Social factors

Social factors seem to have a strong effect on electoral outcomes. If the enrollment rate in tertiary education increases by with 1% the probability of the WCS outcome increases by 0.0151. Observing that the most frequent electoral outcome in Africa is WP, this suggests that when voters get access to higher education, and obtain a better understanding of the political, social and economic situation of their country, they are more likely to contest the re-election of the incumbent if they deem it fraudulent.

Ethnic fractionalization also significantly affects electoral outcomes. This seems expected, as conflicting ethnic interest is a strong additional motivation for the incumbent to fight for re-election. A 1% increase in the ethnic fractionalization index will increase the probability of WCS by 0.0024 while it will decrease the probability of WP by 0.0058. Overall it will decrease the probability to win by 0.0034.

Religious fractionalization also increases the probability of the WCS outcome (by 0.0036) but it does not have a significant effect on the likelihood of the WP outcome. Instead, 1% increase in the religious fractionalization index decreases the probability of LCS by 0.0039. Overall it decreases the probability for one side to reject the other side victory.

Political factors

An additional 5-year mandate in power significantly decreases the probability of the LP outcome by -0.43. However, it increases the probability of the WP outcome by 0.2745, WCS outcome by 0.077 and LCS outcome by 0.084. This is in line with the fact that the appetite for power increases with the time spent in power.

If the opposition is strong, the incumbent is less likely to cling to power or win without contestation as expected since the costs of electoral fraud and results rejection are high. Challengers have more freedom to campaign and contestation is more likely to occur. The marginal effects of switching from a weak to a strong opposition are -0.143, 0.201,-0.141 for LCS, WCS and WP, respectively.

Changing the political system from multiparty to single party decreases the probability of LCS by 0.24 while it increases the probability of LP by 0.12. Overall as expected, the probability to lose significantly decreases by 0.12. Accepting defeat is not a big deal in a single party

election since the power remains under the party control no matter the election outcome. For the same reason there is no need to cling to power when losing.

If the incumbent is from the military, the probability of the LCS outcome increases by 0.12. This result can be explained by the fact that military incumbents are more likely to come to power through political coup and govern by force causing voter-discontent in the long-run. To legitimize their power and demonstrate their popularity to the international community, military incumbents often organize “democratic elections”. Voters are likely to express their discontent through the ballot and the incumbent is likely to lose. Because the incumbent did not expect to lose and wants to hold power, he will not concede defeat.

Natural resources

Resource rich countries are more likely to experience the LCS outcome. The marginal effect of switching from few or no natural resource category to abundant natural resource category is 0.23. This is expected because of the resource-curse and the struggle to control the revenues from them. On the other hand, for countries with moderate natural resource endowment, natural resources are less likely to be of a political interest. These countries are more likely to experience a WP outcome. The marginal effects of switching from few or no natural resource category to moderate natural resource category is 0.33, -0.14 and -0.22 for the WP, LCS and WCS respectively.

Does former colonizer matter?

In this section we want to test the importance of former colonizer in predicting electoral outcomes. The work of Acemoglu and Robinson (2006) asserts that the colonial origins of a country impact the institutional framework that develops subsequently. To some extent, we would be testing the Acemoglu-Robinson assertion.

In our analysis, the variable for the former colonizer cannot be included in the list of regressors because of the multicollinearity it could generate. It has been widely demonstrated in the literature that former colonizer is a determinant of growth, educational level and quality of institutions in African countries. It is also widely accepted that geographic situations, natural resource endowment and religious factors are correlated with the type of colonizer. Therefore, an indicator of the former colonizer is highly correlated with the regressors.

In our methodology, we used the average of the regressors by former colonizer and then find the mean predicted probability of having each type of outcome at these average values, for each

former colonizer. Then we test the significance of these mean predicted probabilities. Categorical variables cannot be averaged. They are therefore excluded. However, this poses less of a problem because the categorical variables in our regression analysis are related to but are not determined by the former colonizer. The results are presented in Table 12.

Table 12: Mean expected probabilities by former colonizer

Former Colonizer	LP	LCS	WCS	WP
France	0.0002021	0.2436243***	0.1577884***	0.5983852***
UK	7.15E-08	0.1228762***	0.1877097***	0.689414***
Belgium	0.0134881	0.0750294	0.0608593***	0.8506231***
Portugal	0.0000175	0.2248267***	0.100267***	0.6748888***

***significant at the 1% level

Regardless of the former colonizer, the most likely outcome is WP and the least likely outcome is LP. What depends on the former colonizer is the second most likely outcome which is LCS for French and Portuguese former colonies and WCS for former British and Belgian colonies. The highest probability for WP is recorded by former Belgian colonies. WCS outcomes are more likely to occur in British colonies while LCS is the chosen field of French colonies.

The empirical and regression analysis above supports the categorization from the game-theoretic model and shows the role of public goods provision and other factors, in determining the election outcomes.

7 Conclusion

The paper analyses the choices of the incumbent and challenger prior to elections, accounting for various election outcomes. This is set up as a two period game where an incumbent government in period 1 allocates a resource into production, fighting with the challenger, and producing public goods, which impacts winning an election. In period 2 the incumbent may accept the election result, or a coalition or standoff may follow. We quantify and illustrate how the incumbent makes these choices. When choosing strategies in period 1, the incumbent assesses the period 2 utilities given winning, accepting the election loss, coalition, and standoff. When the period 2 utility is low, for example in a costly standoff, the incumbent may choose to increase the probability of winning the election, either by producing more public goods, or by fighting with the challenger if the unit cost of fighting is low or the incumbent is resourceful.

First, public goods production is inverse U shaped (case WPLP) or concave (cases WPLC and WPLS) in the incumbent's unit fighting cost. Low cost makes public goods unnecessary. High cost makes public goods unnecessary for case WPLP since the challenger faces the

increasing cost. Second, an incumbent earning a larger resource in period 1 produces less public goods in cases WPLP and WPLC, and more public goods in case WPLS to avoid the costly standoff. Third, decreasing unit production cost causes decreased public goods for case WPLP, because of the incumbent's high period 2 utility, and the incumbent can accept an election loss, and conversely increased public goods for cases WPLC and WPLS. Fourth, public goods decreases in the incumbent's unit cost of producing public goods, but more slowly for case WPLS with the low period 2 utility. Fifth, public goods production is inverse U shaped in the parameter governing the relative importance of providing public goods versus fighting to ensure winning the election. When the parameter is low, public goods do not impact the election. When the parameter is high, the incumbent wins the election even with moderate public goods production, and excessive public goods production is a waste of resources. Sixth, public goods production increases as the incumbent gets a lower share of the resources in case WPLC, and thus seeks to avoid case WPLC. Seventh, public goods production decreases in the challenger's fraction of unit fighting cost in case WPLC, which makes period 2 more acceptable for the incumbent. Eighth, public goods production increases in the challenger's fraction of unit production cost in case WPLC, which makes period 2 less acceptable for the incumbent. Ninth, public goods production increases in both players' unit production cost in case WPLS, which makes case WPLS less acceptable for the incumbent. Tenth, public goods production is inverse U shaped in the contest intensity. With low contest intensity, efforts do not matter much in the fight between the players, and both players earn large utilities. With high contest intensity, fighting becomes more important and the incumbent cannot afford public goods. Eleventh, public goods production increases in the incumbent's discount factor. Twelfth, public goods production is negligibly impacted by the challenger's discount factor.

The paper provides a tool for analyzing fighting versus public goods production depending on the three cases that may arise if the incumbent loses the election after period 1. The analytics of the model helps us understand the 2006-2011 Eritrean 1993 African elections in Table 1, and also other elections in e.g. Russia, Latin America, and parts of Asia. The model analytics helps us dissect dynamics of elections especially under autocratic regimes that try to seek legitimacy by holding fraudulent elections, while providing some level of public goods. Fraud is accounted for by the endogenous probability of the incumbent winning the election depending on both public goods provision and fights between the incumbent and the challenger which includes attempts to manipulate the election result.

We tested the model empirically using a discrete-choice logit model in order to determine what factors determine the election outcomes. The results show that the theoretical model categorization and analysis are supported empirically. We used a database on 653 elections in Africa over the period 1960-2010, of which 299 are presidential and 354 are legislative. Using descriptive analysis methods and robust multinomial logit regression, we found that the incumbent wins with no contestation 64%, coalition 6%, and standoff 2%. The incumbent loses and accepts defeat 16%, coalition 12%, and standoff 0%. That is, the most frequent outcome in Africa is the incumbent winning without contestation of the results. Out of the 653 elections held, 417 were won by the incumbent without contestation, of which 210 were legislative and 207 were presidential.

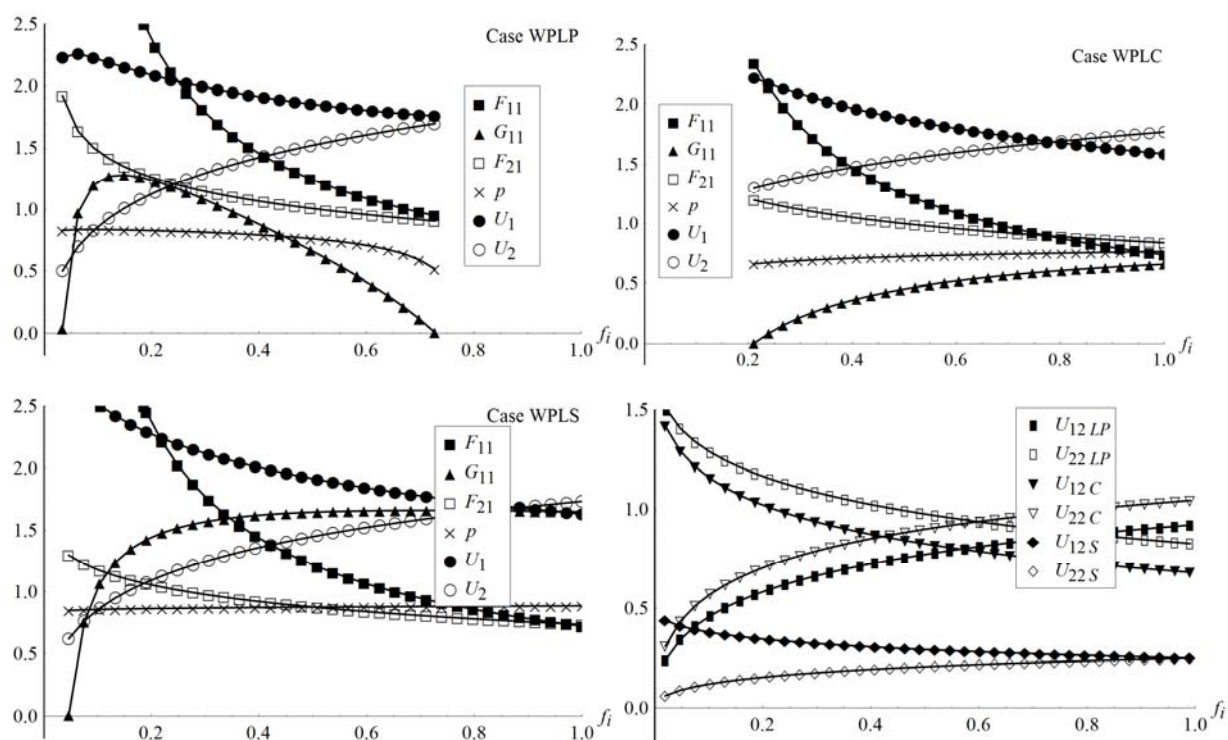
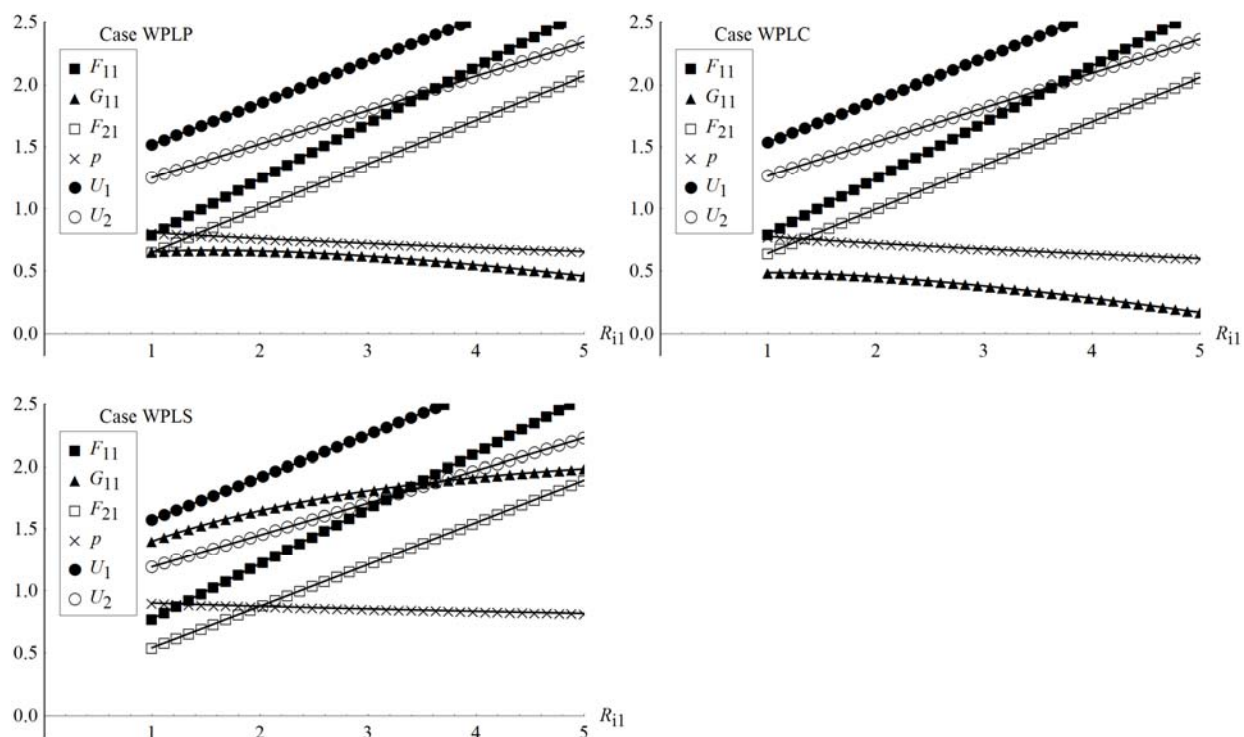
Good economic performance measure by 1% increase in GDP per capita decreases the probability of the incumbent losing by 0.0053. Thus doubling the per capita GDP decreases this probability with 0.53. A 1% increase in the provision of public goods a year before elections increases the probability of losing and not accepting defeat by 0.0013. A 1% increase in the ethnic fractionalization index decreases the probability of the incumbent winning by 0.0034. A 1% increase in the enrolment rate in tertiary education increases the probability of contesting elections when the incumbent has won by 0.0151, and a 1% increase in religious fractionalization increases the probability of contesting the incumbent's victory by 0.0036. An additional 5-year mandate in power decreases the probability of the incumbent losing power by 0.43 and increases his probability of winning outright by 0.084. If the incumbent has a military background this increases the probability of losing but not accepting defeat by 0.12. The marginal effect of switching from few to abundant natural resources increases the probability of the incumbent losing and not accepting defeat by 0.23. Colonial origins matter. French, Portuguese and Belgian colonial origins seem to increase the probability of the incumbent losing and not accepting defeat with, 0.24 and 0.22, respectively. On the other hand, British colonial origins have a probability of the incumbent winning, but the challenger not accepting defeat, of 0.19.

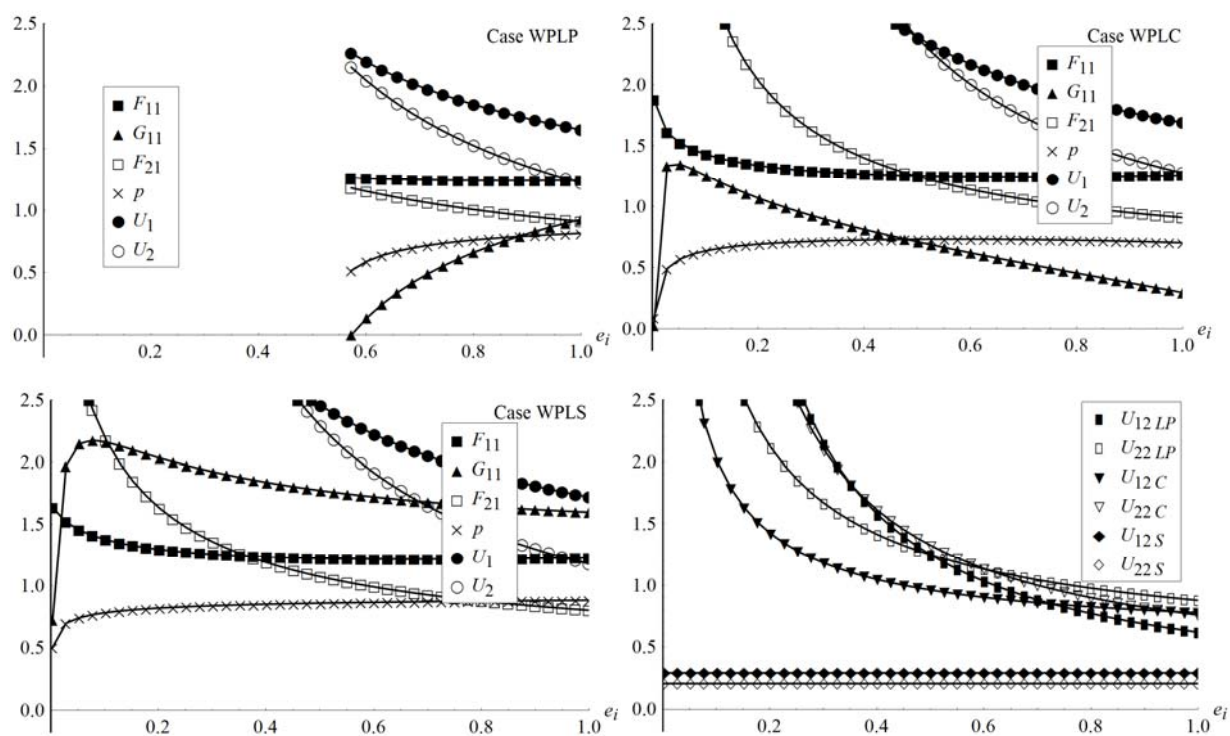
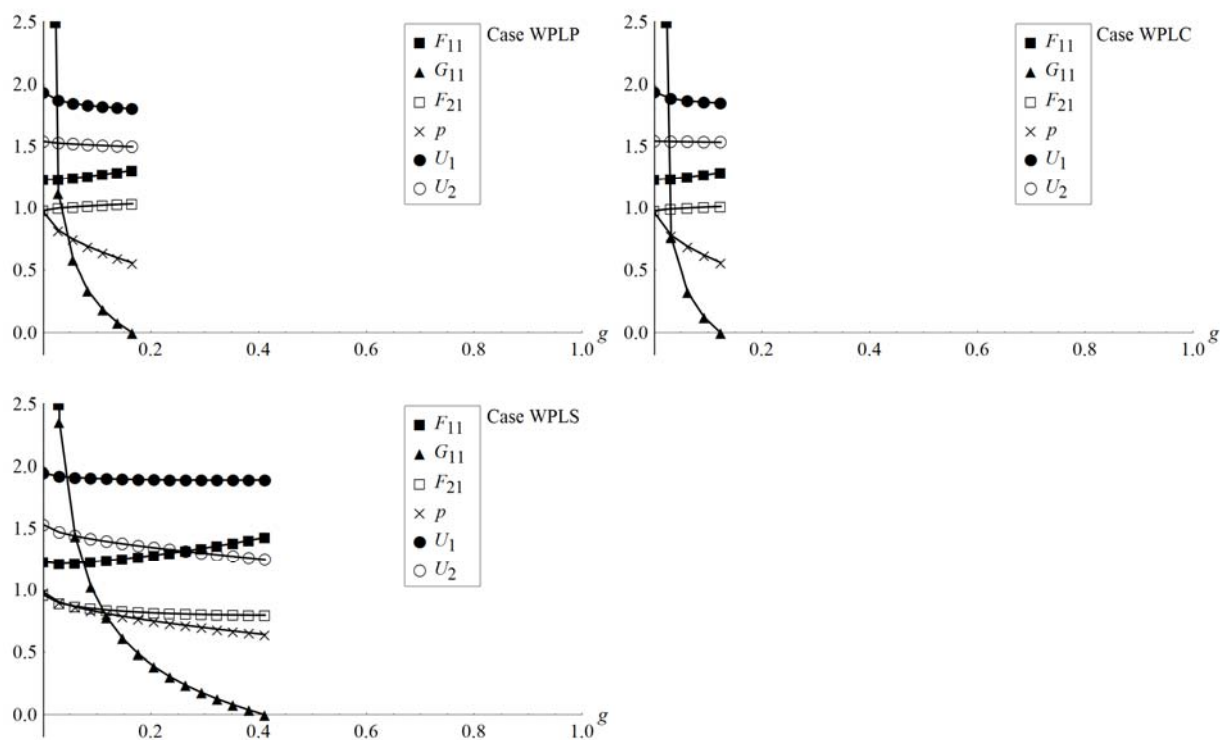
Future research could focus on analyzing the decision to hold elections in the first place by an autocrat. Follow up research could also focus on analyzing the incidence of revolutions where public goods are for the benefit of a few, and voice and accountability are suppressed.

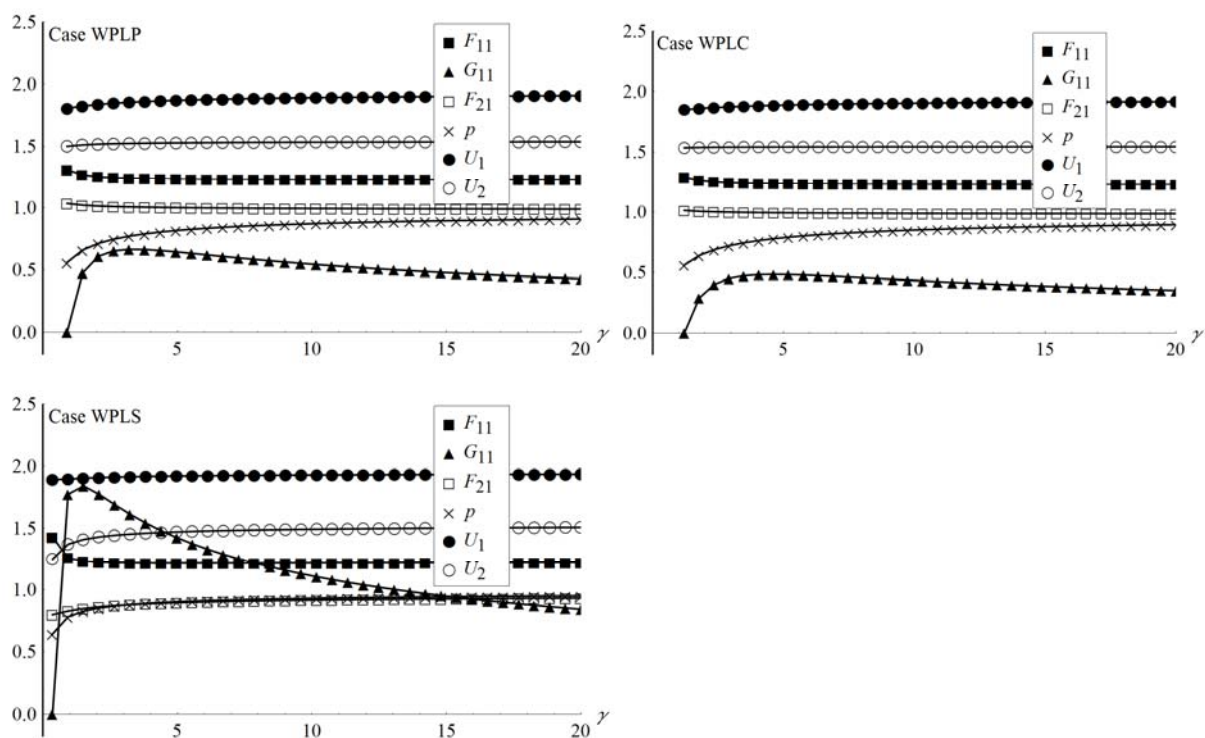
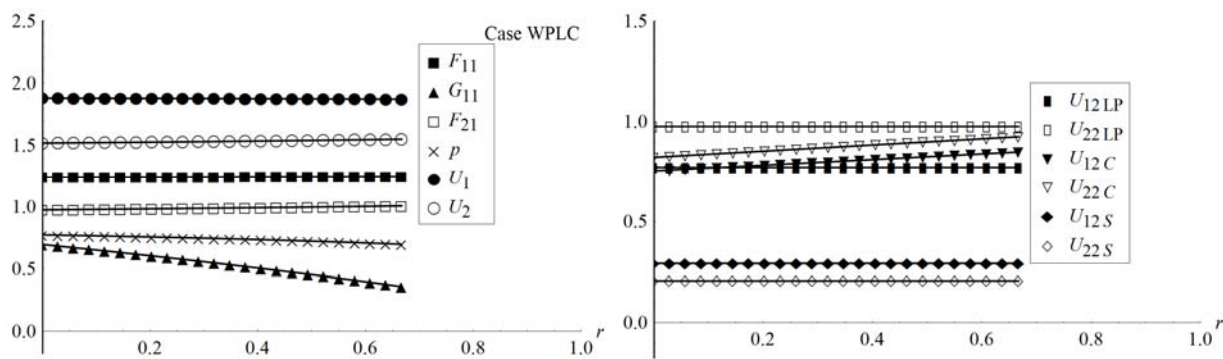
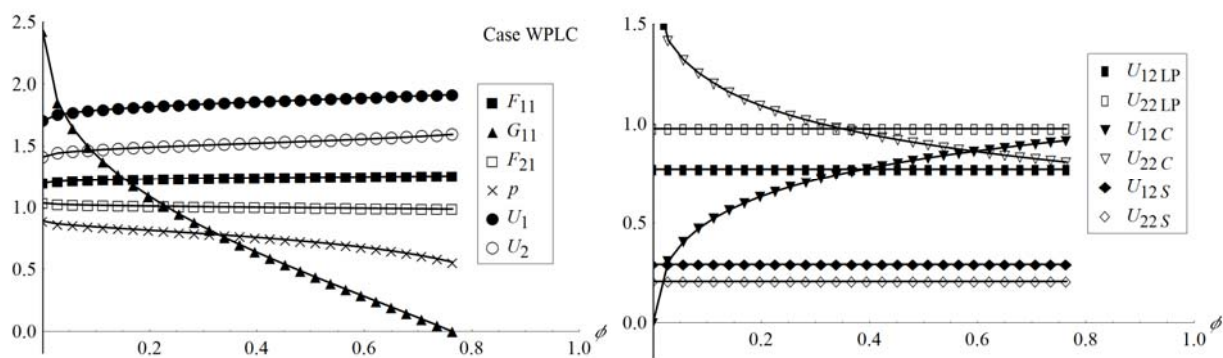
References

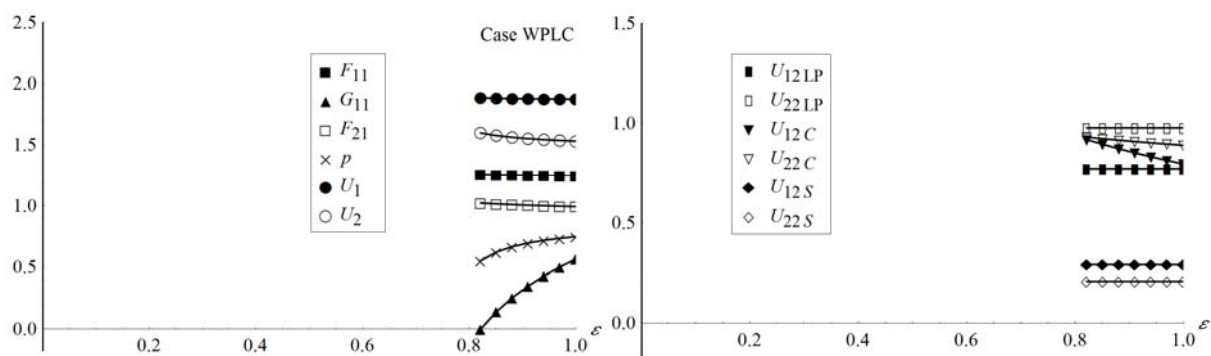
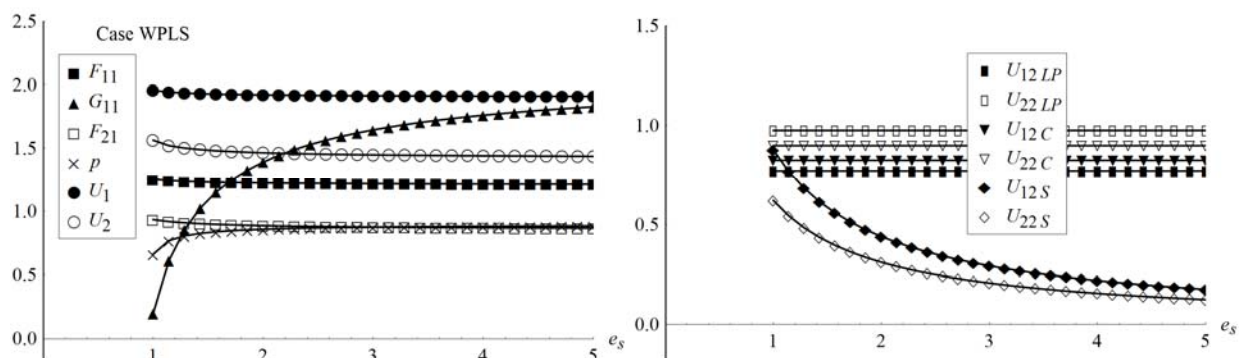
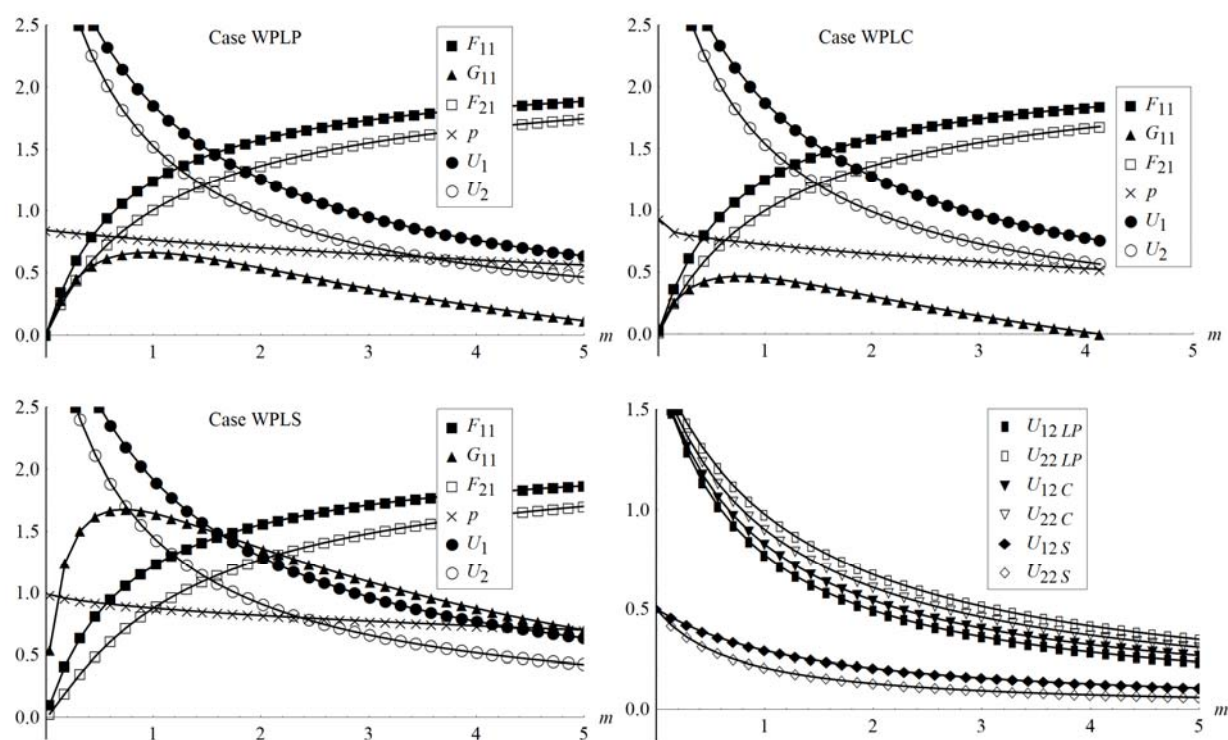
Acemoglu, D. and Robinson, J.A. (2006), *Economic Origins of Dictatorship and democracy*. Cambridge University Press, Cambridge.

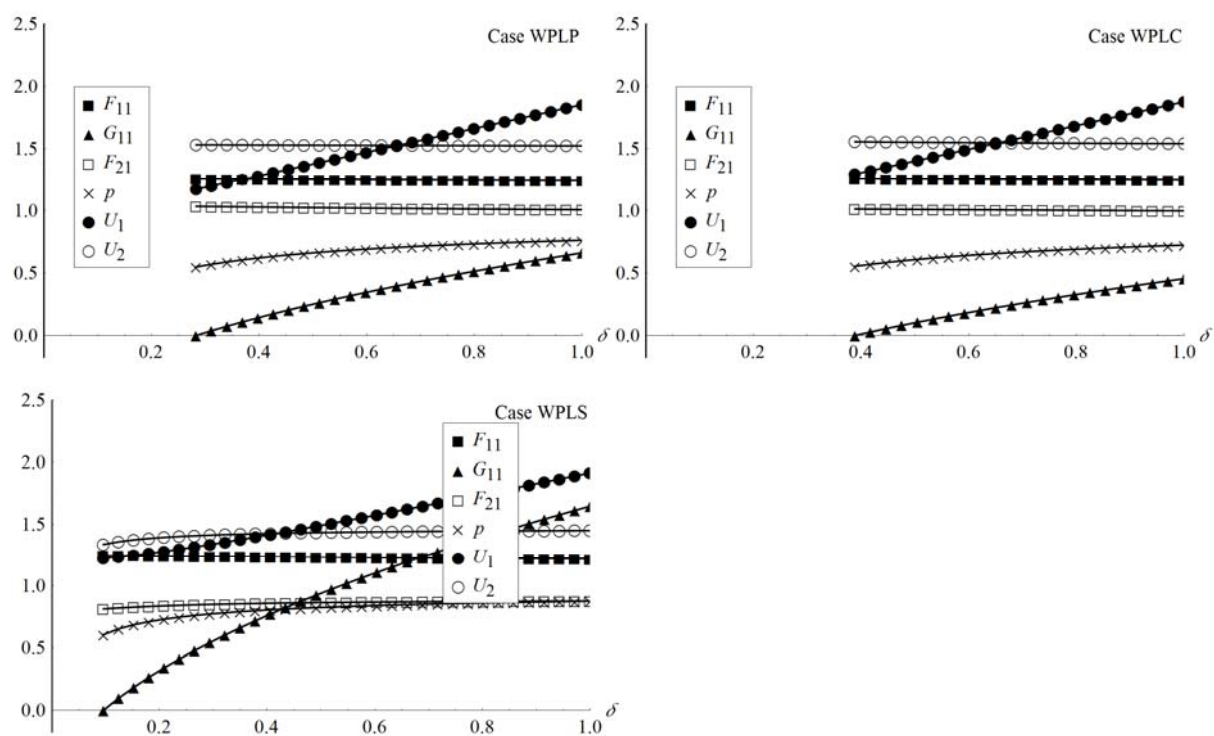
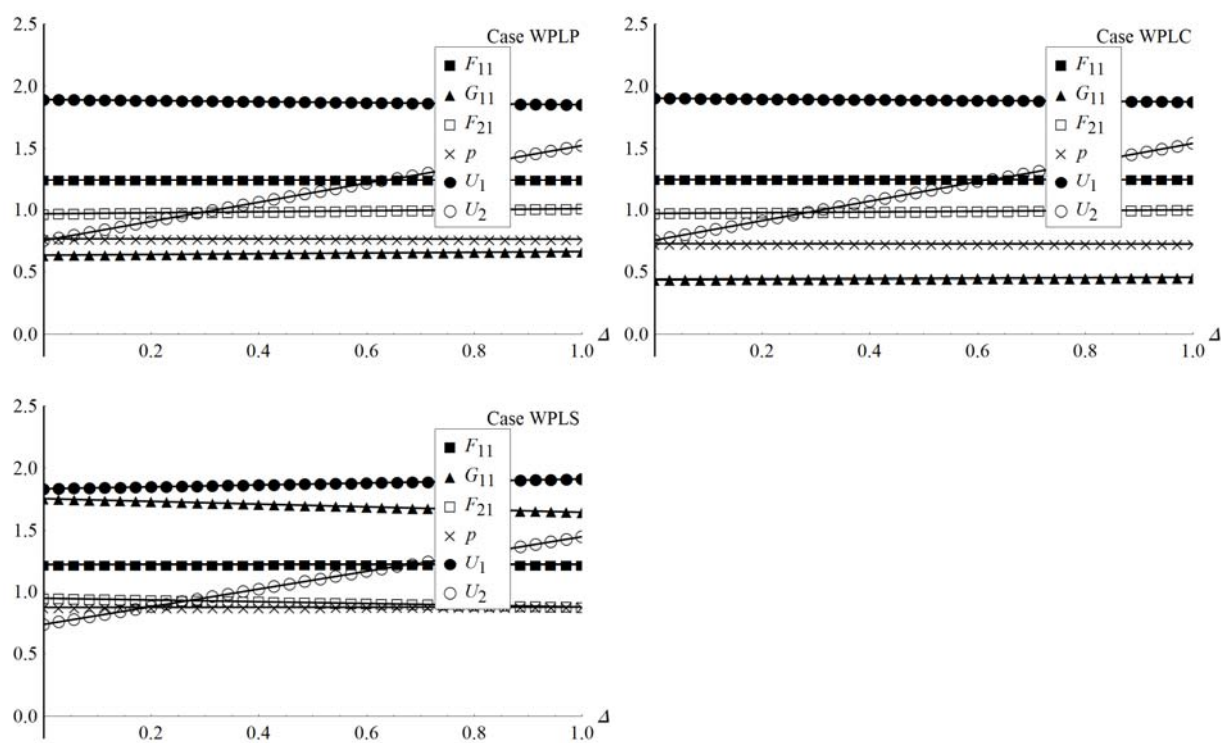
- Alesina, A. (1988), Credibility and Policy Convergence in a two-Party System with rational Votes, *American Economic Review* LXXVIII, 796-806
- Alesina, A. and Rosenthal, H. (1995), *Partisan Politics, Divided Government and the Economy* Cambridge University Press, New York
- Ashworth, S. and De Mesquita, E.B. (2008), "Electoral Selection, Strategic Challenger Entry, and the Incumbency Advantage", *The Journal of Politics* 70, 4, 1006-1025.
- Calvert, R. (1985), Robustness of the Multidimensional Voting Model: Candidates Motivations, Uncertainty, and Convergence, *American Journal of Political Science* XXIX, 69-95.
- Collier, P. (2009), *Wars, Guns and Votes*, Harper, New York.
- Ellman, M. and Wanthekeon, L. (2000), "Electoral Competition Under the threat of Political Unrest", *Quarterly Journal of Economics* 115, 2, 499-531.
- Hausken, K. (2005), "Production and Conflict Models Versus Rent Seeking Models," *Public Choice* 123, 59-93.
- Hausken, K. (2010), "Risk, Production, and Conflict when Utilities are As if Certain," *International Journal of Decision Sciences, Risk and Management* 2, 3/4, 228-251.
- Hirshleifer, J. (1995), "Anarchy and Its Breakdown," *Journal of Political Economy* 103, 1, 26-52.
- Lindberg, S.I. (2006), *Democracy and Elections in Africa*, John Hopkins University Press, Baltimore.
- Salop, S.C., and Scheffman, D.T. (1983), "Raising Rivals' Costs," *A.E.R. Papers and Proceedings* 73, 267-271.
- Skaperdas, S. (1991), "Conflict and Attitudes Toward Risk," *American Economic Review* 81, 116-120.
- Skaperdas, S. (1996), "Contest Success Functions," *Economic Theory* 7, 283-290.
- Schedler, A. (2007), "The Mexican Standoff: The Mobilization on Distrust," *Journal of Democracy* 18, 1, 88-102.
- Schmitter, P.C. (1978), *Elections without Choice*, MacMillan, London.
- Tullock, G. (1967), "The Welfare Costs of Tariffs, Monopolies, and Theft," *Western Economic Journal* 5, 224-232.
- Tullock, G. (1980), "Efficient Rent-Seeking," in Buchanan, J.M., Tollison, R.D., and Tullock, G., *Toward a Theory of the Rent-Seeking Society*, Texas A. & M. University Press, College Station, 97-112.

Fig. 2 f_i panels.Fig. 3 R_{i1} panels.

Fig. 4 e_i panels.Fig. 5 g panels.

Fig. 6 γ panels.Fig. 7 r panels.Fig. 8 ϕ panels.

Fig. 9 ε panels.Fig. 10 e_s panels.Fig. 11 m panels.

Fig. 12 δ panels.Fig. 13 Δ panels.