Article

How Ethnic Exclusion Influences Rebellion and Leader Survival: A Simulation Approach

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Abstract

This study extends selectorate theory in the form of an agent-based model to explore how the leader's ethnic policy—ethnic exclusion or inclusion—influences the risk of rebellion and leader survival in different sizes of the minimum winning coalition. The theoretical simulation shows that when the minimum winning coalition is small, (1) highly exclusive leaders not only survive longer in power but also face a lower risk of violent removal from office than moderately exclusive leaders; (2) leaders who pursue an inclusive ethnic policy are more likely to be overthrown by disaffected members of the ruling coalition; and (3) there is an inverted U-shaped relationship between the level of ethnic exclusion and the risk of rebellion, with the greatest risk of rebellion among semiexclusive regimes. These findings indicate that an exclusive ethnic policy provides political benefits to nondemocratic leaders even if it motivates excluded groups to rebel.

Keywords

ethnic exclusion, winning coalition, leader survival, rebellion, agent-based modeling

Introduction

Ethnopolitical exclusion inflicts enormous suffering on the populations who are excluded from political power.[1] Previous studies have shown that political exclusion along ethnic lines fuels collective grievances among disadvantaged ethnic groups by reducing the provision of public goods (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999), limiting representation in public offices (Bangura, 2006), and creating poorer levels of health and education (Kabeer, 2006) and greater income inequalities (Barron, 2008; Stewart, 2009). Moreover, the contemporary literature on civil war gives particular significance to ethnic exclusion and the resulting "grievances" as major sources of internal armed conflict (Cederman, Weidmann, & Gleditsch, 2011; Cederman, Wimmer, & Min, 2010; Gurr, 2000; Østby, Nordås, & Rød, 2009; Stewart, 2008). According to Stewart (2008, p. 3), horizontal inequalities between ethnic groups are positively associated with civil war onset because underprivileged ethnic groups are more likely to be mobilized for participation in rebellion.

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Table 1. Ethnic Policy, Civil War, and Leader Survival in 52 Nondemocratic Countries, 1946–2004.

Ethnic Policy	Involved in Civil War, *n* (%)	Average Tenure	Removed by Coup, *n* (%)	Total, *n* (%)
Inclusive	74 (39.6)	4.8 years	87 (46.5)	187 (70.0)
Exclusive	42 (52.5)	6.5 years	26 (32.5)	80 (30.0)

Note. Data come from the Ethnic Power Relations (EPR) data set (Cederman et al., 2010), UCDP/PRIO Armed Conflict data set (Gleditsch et al., 2002), and Archigos data set on political leaders (Goemans et al., 2008).

Likewise, Cederman, Wimmer, and Min (2010) finds that ethnic groups excluded from state power are about 3 times more likely to initiate rebellion against the state than those represented in central government.

Based on the above-mentioned findings, a number of policy makers and scholars have proposed the idea of "inclusive coalition" as a way to manage and prevent conflict in ethnically divided countries (Elbadawi & Sambanis, 2000; Gurr, 2000; Hegre & Nygard, 2012; Lewis, 1965; Lijphart, 1977; Vogt, 2007; World Bank, 2011). For example, to contain conflict, Gurr (2000) calls for democratic governance directed at eliminating discrimination, recognizing cultural pluralism, and promoting power sharing and political inclusion for marginalized ethnic groups. Similarly, the World Bank (2011) encourages "inclusive-enough coalition-building" as one of its basic principles for conflict prevention and resolution. Defined as the governing coalition encompassing broader segments of the society—including private businesses, civil society movements, opposition parties, and, in some cases, rebel groups—this strategy aims at abolishing discriminatory laws, ensuring equal access to jobs, and restoring public confidence in state institutions (World Bank, 2011, p. 17).

These arguments tend to assume that ethnic exclusion is the principal source of violence and political instability and therefore must be eliminated to restore peace and stability in conflict-affected states. Indeed, inclusive governments that provide their citizens with peace and stability are successful governments. The problem is that the political inclusion of marginalized groups does not always achieve both of these desirable outcomes; in fact, the opposite could be the case. Leaders who promote integration and unity among ethnic groups are less likely to experience civil war onset. Yet, they could be removed from office in a violent manner—often in the form of coup d'état (Choi, 2012; Roessler, 2011). On the other hand, leaders who foster ethnic hatred and exclusion might face higher risks of civil war, but their regime could obtain long-term stability (Choi, 2012).

Table 1 compares the survival and civil war involvement of inclusive and exclusive leaders in 52 nondemocratic countries with small minimum winning coalitions between 1946 and 2004.[2] Consistent with previous findings on ethnic conflict, exclusive leaders faced a higher risk of civil war than inclusive leaders: 52.5% of exclusive leaders were involved in at least one civil war during their tenure, while only 39.6% of inclusive leaders experienced civil war. Nevertheless, exclusive leaders enjoyed better survival prospects than inclusive leaders: Exclusive leaders lasted, on average, about 6.5 years in office, while inclusive leaders survived on average 4.8 years. Moreover, 46.5% of inclusive leaders lost power by a coup d'état, while only 32.5% of exclusive leaders were removed from office by a coup. Although purely descriptive, these data raise an important question: Why does ethnic exclusion enhance political survival of dictators even if it increases the risk of rebellion, which might put their tenure in danger? Simply put, is ethnic exclusion good politics, although not good policy, for nondemocratic leaders? This study provides an explanation for this question using an agent-based computational model (ABM) as a heuristic device.

Majority of the existing research on ethnic exclusion has applied statistical models to observational data to estimate its association with political violence after controlling for confounding factors. However, a limitation of this approach is the inability to fully identify and analyze the

temporal dynamics through which ethnic exclusion shapes violence within a country. It is a primary virtue of ABM to allow us to investigate "changes over time" and to experiment with various hypothetical scenarios. For instance, one can use ABM to compare the scenario where a leader who abruptly switched from an inclusive ethnic policy to an exclusive one after winning office with the scenario where a formerly exclusive leader embraces political inclusion. In this study, the development of the theory rather than empirical analysis has been focused, although wherever possible the workings of the theory have been illustrated with real-world examples. In the future work, empirical tests of the new hypotheses proposed by the model would be carried out.

The basic framework of the model is informed by the selectorate theory (Bueno de Mesquita, Smith, Siverson, & Morrow, 2003). In *The Logic of Political Survival*, Bueno de Mesquita, Smith, Siverson, and Morrow (2003) assume that all leaders have political survival as their primary goal, and to stay in office, they must maintain the support of their ruling coalition by providing a mix of private and public goods. Public goods, such as national defense and highway systems, are those that cannot be withheld from anyone without withholding them for everyone. Hence, public goods benefit all members of the society—both inside and outside the coalition—if they are provided. On the other hand, private goods, such as jobs in state-owned companies and luxuries for the ruling class, are both rival in consumption and excludable. Thus, leaders can restrict access to private goods to members of their ruling coalition.

The main component of the selectorate theory is the size of the minimum winning coalition (henceforth W), which is defined as "the number of supporters a leader needs in order to maintain power" (Bueno De Mesquita & Smith, 2010, p. 937). The larger the minimum winning coalition is, the more difficult it is to provide private goods to every coalition member due to budget constraints. Hence, leaders in large-W systems are more likely to rely on public goods than private goods to retain the support of their coalition. In contrast, leaders in small-W systems shift the mix toward private goods because they can reward a small group of supporters through private benefits (Bueno de Mesquita et al., 2003, pp. 91–92). The model presented in this study is an extension of the selectorate theory in a way that explains how ethnic exclusion plays a role in the incumbent leader's coalition-building and how it affects the risk of rebellion and subsequent fates of leaders. In so doing, I combine the baseline model with Joshua Epstein's (2002) model of civil violence to derive novel insights that are not apparent in the original theory: Ethnic exclusion is beneficial to nondemocratic leaders even if it motivates excluded groups to rebel.

The article is organized as follows: In the next section, the computational model is introduced. The model distinguishes between two ways by which leaders can lose office: one by insiders of the coalition and the other by outsiders of the coalition. First, leaders can lose office by losing the support of coalition members. In democratic countries with free and fair elections, this process typically means electoral defeat, whereas in autocracies it often takes the form of coup d'état (Tullock, 1987). Second, leaders can also be removed from power by those outside the coalition, such as by successful rebellion. The model's principal aim is to explore how the leader's ethnic policy—ethnic exclusion or inclusion—and the size of the minimum winning coalition interact to shape different ways of losing office. While some studies examine the causes of ethnic salience (Bates, 1983; Caselli & Coleman, 2006; Fearon, 1999), I begin with the assumption that ethnic identities are politically salient and ethnic exclusion is a feasible policy option. Therefore, this model is applicable only to countries where politically relevant ethnic groups are present (Cederman et al., 2010, p. 99).

In the section that follows, the data generated by the model are analyzed. The findings suggest that (1) leaders in small-W systems are more likely to survive in office when they employ an exclusive ethnic policy; (2) when small-W leaders promote ethnic inclusion, they are likely to be overthrown by disaffected members of the ruling coalition; (3) in small-W systems, the relationship between the degree of ethnic exclusion and the risk of rebellion takes the shape of an inverted-U, with the greatest risk of rebellion among semiexclusive regimes; and (4) in large-W systems, leaders

who employ even a moderate form of exclusion face a higher risk of electoral defeat. Finally, the article is concluded by discussing the broader implications of the simulation presented. I turn next to a specification of the proposed model.

The Model

Following the assumptions in Bueno de Mesquita et al. (2003) and Epstein (2002), the model contains four agent types—the incumbent leader L, a challenger C, citizens, and soldiers—with simple attributes and behavioral rules local to their environment. The model landscape consists of a 40 $\times$ 40 torus, with the initial citizen and soldier population density (as a percentage of the 1,600 cell in total) given by $\boldsymbol{d_C}$ and $\boldsymbol{d_S}$, respectively. The attributes of the agents are as follows.

Incumbent Attributes

The incumbent leader (L) is defined by two distinct attributes: a coalition identity c_L and a budget b_L. Ranging from 0 to 5, a coalition identity (c_L) denotes a key identity that establishes the criteria for determining who constitutes the incumbent's ruling coalition. It is assumed that c_L approaches 5 as the ruling coalition is organized along the lines of L's own ethnic identity. Here, I use a rather broad definition of ethnic identity as a subtype of identity categories whose membership is determined based on descent-based attributes, including skin color, religion, language, and parents' place of birth (Chandra, 2006). Consider the following examples where leaders form an exclusive coalition on the basis of their ethnic identity. After Idi Amin, an ethnic Kakwa, seized power in Uganda, he filled his coalition with co-ethnics, allowing the Kakwa elites to dominate the government and military, and excluding Langis and Acholis (Horowitz, 2000, pp. 487–492). Juvénal Habyarimana of Rwanda created his ruling coalition on the basis of a "Hutu northwest," which corresponds to his own ethnoregional background (Straus, 2006, p. 23). Similarly, Saddam Hussein's ruling coalition was dominated by the Sunni Arab community in northwestern Iraq, especially those from his home region of Tikrit (Tripp, 2007, p. 219). The commanding positions in the army and the Republican Guard came to be occupied by privileged officers from Tikrit, and other members from the Sunni northwest staffed many key positions in the state's central administration and the security services (Marashi & Salama, 2008, p. 144). In contrast, c_L approaches 0 as the ruling coalition is based on nonethnic identities, such as political ideology (Wagner & Kritzinger, 2012), party identity (Richardson, 1991), or socioeconomic status (Simmons, 1967). In sum, the higher the value of c_L is, the more "ethnic" the incumbent's coalition becomes, and therefore the more likely that citizens with different ethnic identities are excluded from the incumbent's coalition. In this model, a parameter c_L is exogenous and determines the degree of ethnic exclusion employed by the leader.

A budget (b_L) denotes the total amount of financial resources available to L during a given time step and is set to 5,000 at the outset of the simulation.[3] The incumbent's budget can be affected by an external shock—financial crisis—during simulation, creating a situation in which b_L temporarily goes down below the initial level.

Challenger Attributes

Similar to the incumbent, the challenger (C) is characterized by two attributes: its coalition identity c_C and prospective budget b_C. A coalition identity (c_C) is a key identity that constitutes the challenger's coalition and has the same properties as c_L—that is, the higher the value of c_C is, the more ethnic the challenger's coalition becomes and the higher the degree of ethnic exclusion employed by the challenger.[4] A prospective budget (b_C) denotes the total amount of budget in the hands of the challenger once he comes to power and is fixed at 5,000.

Citizen Attributes

Each citizen is endowed with four distinct attributes: ethnic differences (e_L, e_C), perceived hardship h, a propensity for risk aversion r, and an ideological preference i. Ethnic differences ($e_L e_C$) denote the extent to which a given citizen's ethnicity is different from L and C, respectively, and is randomly drawn from a uniform distribution on the interval [0,1]. If a citizen has $e_L = 0$, he or she has the same ethnic identity with L. If he or she has $e_L = 0.99$, then his or her identity is highly distinguished from L's. Let me illustrate the concept of ethnic difference using the fictional example of Kasim, who was born in Saddam Hussein's hometown of Tikrit, located 140 km northwest of Baghdad. He had the same skin and eye colors as Saddam and was brought up as a Sunni Muslim by strict Sunni parents in the early days of Saddam's presidency. His childhood friend Sara had similar features as Kasim and grew up with liberal Sunni parents. But, she converted to Shia Islam after moving to the Shia lands of southern Iraq with her husband. In this example, the model considers Kasim to have a smaller ethnic difference (e_L) than Sara because he shares more descent-based attributes with Saddam.[5]

The citizen's perceived hardship (h) is fixed for a citizen's lifetime as is a propensity for risk aversion (r), both randomly distributed on the unit interval (Epstein, 2002).[6] An ideological preference i follows a normal distribution with mean 1 and standard deviation σ_i, which is a model parameter that is fixed at the beginning of the simulation. Here, it is assumed that citizens with i below 1 (the leftists) are more likely to favor a change in the status quo and thus are more favorably inclined toward the challenger, while those with i above 1 (the rightists) are inclined toward the incumbent.

Soldier Attribute

Each soldier is defined by a single attribute: an arrest capacity a. The soldier's arrest capacity (a) denotes the ability of successfully detecting and arresting rebellious citizens. Here, it is assumed that a is heterogeneous across soldiers and randomly distributed on the interval [0,1].

Global Parameters

In addition to these agent-level parameters, this model has eight global parameters: the size of the minimum winning coalition w, the maximum jail term m, the price of public goods p, the frequency and strength (denoted as f and s, respectively) of external shocks, a vision v, a threshold for joining rebellion τ_1, and a threshold for irregular turnover τ_2. Ranging from 0 to 1, the minimum winning coalition size w denotes the minimum proportion of citizen supporters that a leader needs to stay in power.[7] As a general rule, liberal democracies require larger minimum winning coalitions than do authoritarian regimes. In competitive two-party presidential systems with simple majority voting, w is typically about 0.5; while in majoritarian parliamentary systems, it is about 0.25 (Bueno de Mesquita et al., 2003, p. 54). w can be much smaller than one quarter in military dictatorships or rigged electoral systems where a small elite group's support can ensure political survival (Bueno de Mesquita et al., 2003, p. 54). For example, in Hussein's Iraq, a small group of incumbent supporters—especially those in the ruling party and security apparatus—wielded sufficient instruments of power to ensure electoral victory (United Nations, 1995); hence, w was considerably small.

The price p ranges from 1 to 1,000 to denote the cost of producing a unit of public goods. Ranging from 0 to 100, the maximum jail term (m) specifies the duration of imprisonment for arrested rebels (Epstein, 2002, p. 7244). When a rebellious citizen is arrested by soldiers, he or she is assigned a jail term that is randomly drawn from a uniform distribution $U[0, m]$. An imprisoned citizen can neither move nor rebel during his or her jail term.

Table 2. Model Parameters.

Agent-Level parameters		
Incumbent attributes		
c_L	Coalition identity	$c_L \in [0, 5]$
b_L	Budget	$b_L = 5,000$
Challenger attributes		
c_C	Coalition identity	$c_C = [0, 5]$
b_C	Prospective budget	$b_C = 5,000$
Citizen attributes		
e_L	Ethnic difference vis-à-vis the incumbent	$e_L : U[0, 1]$
e_C	Ethnic difference vis-à-vis the challenger	$e_C : U[0, 1]$
h	Perceived hardship	$h : U[0, 1]$
r	Risk version	$r : U[0, 1]$
i	Ideological preference	$i : N[1, \sigma_i]$
Solider attribute		
a	Arrest capacity	$a : U[0, 1]$
Global parameters		
w	Size of the minimum winning coalition	$w \in [0, 1]$
d_C	Citizen density	$d_C \in [0, 1]$
d_S	Soldier density	$d_S \in [0, 1]$
m	Maximum jail term	$m \in [0, 100]$
p	Price of public goods	$p \in [0, 1000]$
f	Frequency of external shocks	$f \in [0, 1]$
s	Strength of external shocks	$s \in [0, 1]$
v	Vision	$v \in [0, 10]$
τ_1	Threshold for joining rebellion	$\tau_1 \in [0, 1]$
τ_2	Threshold for irregular turnover	$\tau_2 \in [0, 1]$

Next, this model assumes that a leader's budget (b_L) and citizens' ideologies (i) are affected by two types of external shock—economic crisis and political scandal—that occur with a probability f and strength s, both with a range of 0–1. Here, it is assumed that external shocks decrease the survival prospects of the incumbent leader either by reducing his or her budget or by making citizens less favorable toward him or her.[8] This model also assumes that citizens and soldiers have a vision of radius v that specifies a range of cells they are able to observe. In addition to these parameters, rebellion and turnover thresholds (τ_1, τ_2), both of which range from 0 to 1, are defined globally and common to all citizens. All of these global parameters are fixed at the outset of a model run. Table 2 summarizes the model parameters and value ranges.

Sequence of Play

At the beginning of the simulation, citizens and soldiers are created and randomly located on the two-dimensional torus composed of 1,600 cells (see Figure 1A). Once the initial conditions are set, the simulation proceeds through the following successive steps:

1. Both the incumbent leader and the challenger announce their coalition identities (c_L, c_C).
2. The incumbent proposes a plan for x_L public and g_L private goods from a fixed budget b_L, while the challenger proposes provisions of x_C public and g_C private goods from his or her prospective budget b_C.
3. All citizens choose to support either L or C, or to remain independent. Then, they also decide whether or not to join a rebellion.

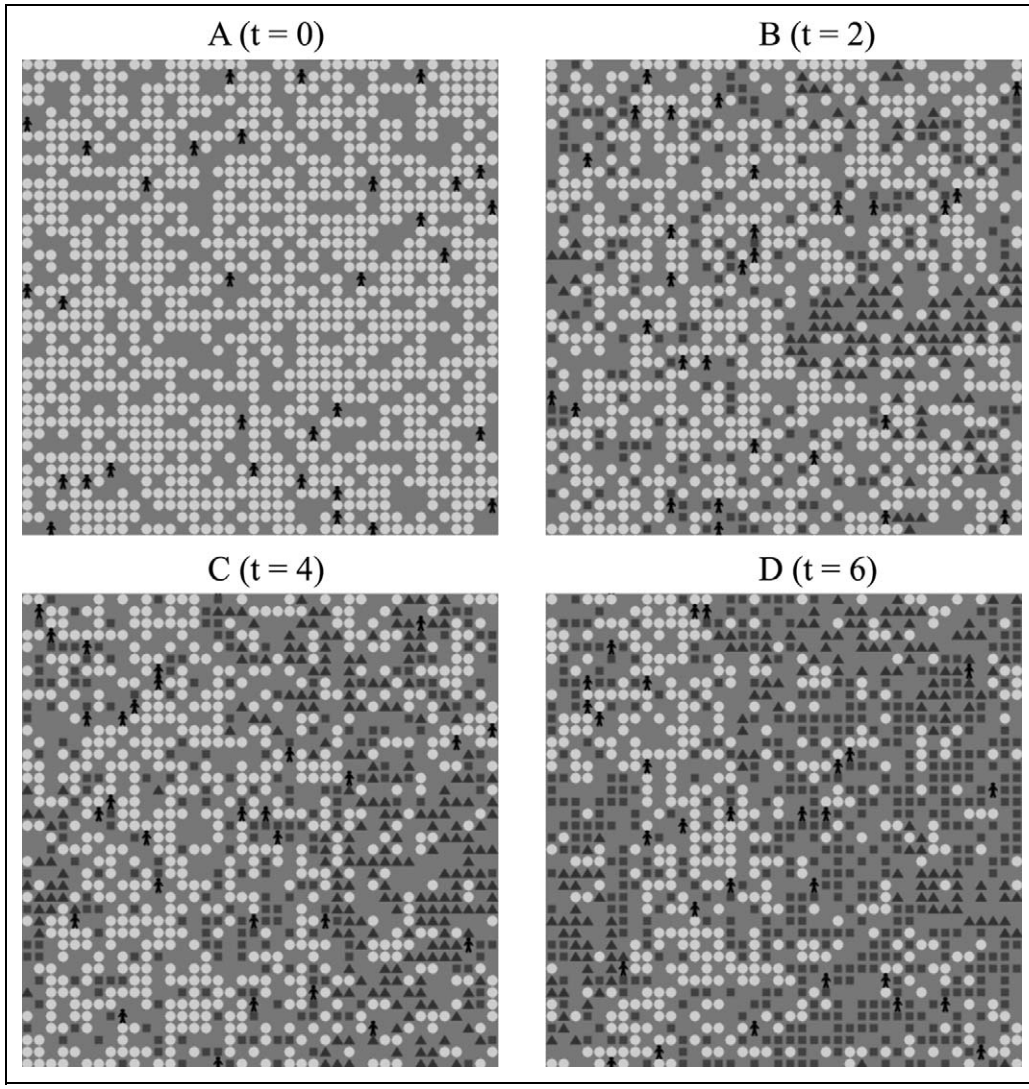

Figure 1. Screenshots of the simulation process. "Quest" citizens are shown as circles; "rebellious" citizens are shown as triangles; "jailed" citizens are shown as squares; soldiers are shown as persons.

4. Some of the rebellious citizens are arrested by soldiers and sent to jail (see Figure 1B–D).
5. The incumbent is removed from office by the loss of coalition support and the challenger becomes the new leader if and only if the following two conditions hold: (1) L retains less than w proportion of supporters in his or her coalition and (2) C has more supporters than L. The incumbent is removed by successful rebellion if and only if the proportion of rebellious citizens exceeds a turnover threshold τ_2.
6. If the challenger becomes the new incumbent leader, nature picks a new challenger and the simulation returns to Step 1. Otherwise, the incumbent remains in power and a new round begins at Step 2 where L and C update their policy provisions based on the number of supporters in their respective coalitions.

Now, let us move on to the specification of decision rule for each player.[9]

Incumbent's Policy Choice. Based on the selectorate theory (Bueno de Mesquita et al., 2003, p. 108), it is assumed that citizens who are included in the incumbent's coalition receive payoffs from two different sources—the incumbent-provided public goods (x) and private goods (g)—and have the following specific utility function: $U(x, g) = \sqrt{x} + \sqrt{g}$. The incumbent's strategy is, given a budgetary constraint, to find the best possible provision of public and private goods to maximize the welfare of his or her coalition members:

$$\text{Incumbent rule} : \max_{x_L, g_L} U(x_L, g_L),$$

subject to the budget constraint that $b_L = N_L \times g_L + p \times x_L$, where N_L refers to the number of supporters in the incumbent's coalition. The value of N_L is equal to the size of the minimum winning coalition in the first round of simulation. If the incumbent survives the first round, N_L will be the actual number of coalition members in each subsequent round.

Challenger's Policy Choice. The challenger's strategy, similar to that of the incumbent, is to find the spending policy that maximizes the welfare of his or her coalition members within the limit of his or her prospective budget. Therefore, the challenger's optimal policy choice is

$$\text{Challenger rule} : \max_{x_C, g_C} U(x_C, g_C),$$

subject to the budget constraint that $b_C = N_C \times g_C + p \times x_C$, where N_C is the number of supporters in the challenger's coalition. The value of N_C is updated in the same way as in the incumbent case.

Citizens' Choice. Citizens randomly move to empty cells on the model landscape, become a coalition member, and/or rebel against the incumbent based on two simple rules. The first rule specifies the conditions for joining the coalition. All citizens know how many public and private goods are offered by L and C and what are their coalition identities. Having this information, each citizen calculates his or her utility from joining each side's coalition and enters the one that provides him or her with greater utility.[10]

Specifically, the expected reward to a citizen from joining the incumbent's coalition in the current and future rounds is given by $Z_L = \frac{1}{1-\delta} U(x_L^*, g_L^*)$, where δ is a common discount factor that takes the value between 0 and 1,[11] and (x_L^*, g_L^*) are optimal policy provisions of the incumbent in each round. However, when a citizen calculates the expected reward from joining the challenger's coalition, he or she must consider the probability of being excluded from the challenger's future coalition after the challenger comes to power. In this case, he or she receives payoffs only from public goods (x). The selectorate theory defines the probability that a citizen will be included in a successor coalition as (w/S), where S is the size of the enfranchised population (or the selectorate) and is assumed to be 1 in this model (Bueno de Mesquita et al., 2003, pp. 65–68).[12] Hence, the expected reward from joining the challenger's coalition is $Z_C = \frac{1}{1-\delta}\left(\frac{w}{S} U\left(x_C^*, g_C^*\right) + \left(1 - \frac{w}{S}\right) U\left(x_C^*\right)\right)$. The benefit from joining the incumbent's or challenger's coalition is then calculated according to the following formula:

$$B(L) = (Z_L \times i)/(Z_L + Z_C)$$
$$B(C) = Z_C/(Z_L + Z_C).$$

As such, it is assumed that citizens with ideological preferences (i) below 1 (or above 1) underestimate (or overestimate) the benefit provided by the incumbent's coalition. Both $B(L)$ and $B(C)$ are normalized to lie between 0 and 1 by dividing by $(Z_L + Z_C)$.

Entering a coalition also entails a cost to citizens unless they share the same ethnic identity with L or C. Here, the cost of joining either the incumbent or the challenger's coalition is defined as

$$C(L) = e_L \times c_L$$
$$C(C) = e_C \times c_C,$$

where e_L and e_C indicate the extent to which a given citizen's ethnic identity is different from that of L and C, respectively, and take values between 0 and 1. This set of equations suggests that the importance of ethnic difference depends on a coalition identity chosen by L or C. The more the incumbent's coalition is based on the leader's ethnicity, the more costly it will be for citizens with different ethnic identities to join his or her coalition. To put it another way, if the incumbent's coalition is based on nonethnic identity (e.g., $c_L = 0.1$), any citizen can join the coalition without much difficulty even if he or she has a markedly different ethnic identity from the incumbent leader (e.g., $e_L = 1$). On the other hand, if the coalition is based on the leader's own ethnicity (e.g., $c_L = 5$), even a citizen whose identity is slightly different from that of the leader (e.g., $e_L = 0.2$) finds it difficult to become a coalition member. Having defined both the cost and benefit of coalition membership, the citizen's overall utility from joining either the incumbent or the challenger's coalition is given by

$$U(L) = B(L) - C(L)$$
$$U(C) = B(C) - C(C),$$

Therefore, the citizen's first behavioral rule is:

Citizen rule 1: If $U(L)>U(C)$ (where $U(L) > 0$), then enter the incumbent's coalition; if $U(C) > U(L)$, where $U(C) > 0$, then enter the challenger's coalition; else remain independent.

The second rule specifies the conditions under which a citizen who is excluded from the incumbent coalition will rebel against the state.[13] Included citizens benefit both from public and private goods provided by L, while excluded citizens benefit only from public goods. Hence, an excluded citizen's relative deprivation is defined by $D = 1 - \left[x_L^* / \left(x_L^* + g_L^*\right)\right]$, where x_L^* and g_L^* refer to the incumbent-provided public and private goods, respectively, in each round of play. The level of grievance this citizen feels toward the state is then defined as the product of relative deprivation and perceived hardship:

$$G = D \times h.$$

The decision to rebel is also influenced by the risk of joining rebellion. Following Epstein (2002, pp. 7243–7244), a rebellious citizen's estimated arrest probability P is calculated as a function of the ratio of soldiers to already rebellious citizens within vision v. This probability is given by $P = 1 - \exp\left[-2.3(S/R)_v\right]$, where $(S/R)_v$ denotes the solider-to-rebellious ratio within v.[14] The key intuition behind this equation is straightforward: If there are five soldiers in your neighborhood, you are more likely to be arrested if you are the only rebel ($S/R = 5$) than if you join a rebellion when there are already nine rebellious citizens ($S/R = 0.5$; Epstein, 2002, pp. 7243–7244). As a result, a spatial concentration of aggrieved citizens catalyzes local outbursts of rebellion by depressing the ratio of soldiers to rebellious citizens (Epstein, 2002, p. 7245). The net risk N is then defined as the product of the estimated arrest probability and risk aversion:

$$N = P \times r.$$

If the difference between G and N exceeds a threshold τ_1, then an excluded citizen rebels against the state; otherwise, he or she remains quiet. The citizen's second behavioral rule is summarized as follows:

Citizen rule 2: A citizen will join the rebellion if and only if he or she is excluded from the incumbent's coalition and $G - N > \tau_1$.

Soldiers' Behavior. Soldiers randomly patrol the model landscape. When a rebellious citizen is observed, soldiers arrest and send him or her to jail based on the following rule. In this model, it is assumed that every soldier is part of the incumbent's coalition and benefits both from public and private goods. In addition, the "loyalty" that any solider has toward the incumbent leader is assumed to be based on the amount of private goods that they receive from L. The more they profit from the current leader, the harder they will fight in the face of rebellion to secure future access to private goods. Hence, the soldier's loyalty T is given by $T = x_L^* / \left(x_L^* + g_L^*\right)$. The probability of arresting rebellious citizens P^* is then defined as the product of soldier's loyalty and arrest capacity:

$$P^* = T \times a.$$

Soldier rule

Within v, arrest rebellious citizens with probability P^* and send them to jail for a maximum of m rounds.

External Shocks. In addition to the basic rules described earlier, this model assumes that the incumbent budget (b_L) and citizens' ideologies (i) are affected by random external shocks. Given that surprises are inevitable in systems of humans, ABM is particularly useful in analyzing the effects of unpredictable events on leader survival, which are not easily addressed by other traditional modeling methods. In this simulation, two types of external shock—economic crisis and political scandal—play an important role by creating chances for the incumbent to be removed from the office either by decreasing the incumbent's resources or by shifting citizens' ideologies to the left. When external shocks occur, they affect b_L and i according to the following sets of equations:

1. The impact of economic crisis on b_L at time t

$$b_t = (1 - \rho)b + \rho \cdot b_{t-1} - v_t.$$
$$v_t = \varphi \cdot b_{t-1}.$$

2. The impact of political scandal on i at time t

$$i_t = (1 - \rho)r + \rho \cdot i_{t-1} - \varepsilon_t,$$
$$\varepsilon_t = \varphi \cdot i_{t-1},$$

where $0 < \rho < 1$ and φ is a random number drawn from $U[0, s]$ with probability f, or 0 with probability $1 - f$ in each round of play. As such, the current values of budget and ideologies are part of their original and previous values plus a random shock weighted by coefficient ρ. How fast the effect of previous shocks decays depends on the value of ρ.[15] As $0 < \rho < 1$, all shocks will eventually dissipate over time, and b_L and i will revert to their original values.

Experiments and Analysis

A total of 26 distinct model variants were run in NetLogo (v. 4.0.5) to examine how ethnic exclusion (c_L) influences the risk of rebellion and leadership survival in different sizes of the minimum

Table 3. Simulation Results.

Model Variant	Min. Winning Coalition Size (w)	Ethnic Exclusion (c_L)	Average Number of Rebels	Average Number of Prisoners	Average Tenure in Office	% of Removal by Rebellion
Experiment A: Large-W system ($w = 0.40$)						
1	0.40	0.1	59.17	15.92	9.12	1.00
2	0.40	0.2	86.52	27.39	6.52	3.80
3	0.40	0.3	136.80	58.82	4.26	16.80
Experiment B: Large-W system ($w = 0.50$)						
4	0.50	0.1	61.85	13.86	5.97	0.20
5	0.50	0.2	103.81	28.39	4.83	8.60
Experiment C: Small-W system ($w = 0.05$)						
6	0.05	0.3	72.11	50.39	4.40	5.26
7	0.05	0.4	84.88	114.72	10.27	25.26
8	0.05	0.5	92.69	173.93	20.68	92.87
9	0.05	0.6	95.58	223.79	22.29	100.00
10	0.05	0.7	95.79	267.33	23.07	100.00
11	0.05	0.8	95.88	303.70	25.08	100.00
12	0.05	0.9	93.79	343.71	31.73	100.00
13	0.05	1.0	92.03	373.48	38.72	100.00
14	0.05	2.0	75.21	491.74	40.79	98.04
15	0.05	3.0	67.99	543.49	41.80	91.46
16	0.05	4.0	61.96	566.94	38.66	81.16
17	0.05	5.0	61.27	571.92	33.30	58.70
Experiment D: Small-W system ($w = 0.10$)						
18	0.10	0.2	54.00	24.65	8.59	2.97
19	0.10	0.3	86.50	89.09	28.04	52.80
20	0.10	0.4	93.63	141.19	29.80	97.35
21	0.10	0.5	96.18	195.23	22.67	96.54
22	0.10	0.6	98.10	250.55	27.14	95.37
23	0.10	0.7	100.70	290.28	25.91	92.67
24	0.10	0.8	97.32	324.25	27.78	89.33
25	0.10	0.9	99.37	354.72	25.95	86.99
26	0.10	1.0	90.93	368.36	26.95	78.74

Note. For all model variants in Table 3, the following parameters were held constant: Challenger coalition identity ($c_C = 0.1$); *SD* of ideological preferences ($\sigma_i = 0.1$); citizen density ($d_C = 0.7$); soldier density ($d_S = 0.025$); maximum jail term ($m = 20$); price of public goods ($p = 200$); frequency and strength of external shocks ($f = 0.1$, $s = 0.3$); vision ($v = 7$); threshold for joining rebellion ($\tau_1 = 0.05$); and threshold for irregular turnover ($\tau_2 = 0.2$).

winning coalition (w). Every simulation was run for a maximum of 100 rounds, considering that leaders are still surviving at the end of 100 rounds to be right-censored. The simulation was repeated 1,000 times for each model variant to generate a total of 26,000 leaders. The results, reported in Table 3, are based on mean values of key experimental outcomes from each model variant.

The results from Experiment A indicate that in large-W systems ($w = 0.40$), even a small increase in the exclusion parameter (c_L) results in a significant increase in the number of rebels. When $c_L = 0.3$, about 137 citizens, on average, participated in rebellion, whereas only 59 citizens participated in rebellion when $c_L = 0.1$. In addition, leaders in large-W systems last longer in office when they employ no exclusion policy. It was found that leaders with $c_L = 0.3$ lasted, on average, 4.26 rounds, while those with $c_L = 0.1$ survived, on average, 9.12 rounds in office.[16] This shows why large-W leaders do not want to exclude anyone from joining their coalition based on ethnicity. This increases the hazard of losing office by allowing the challenger to include these excluded

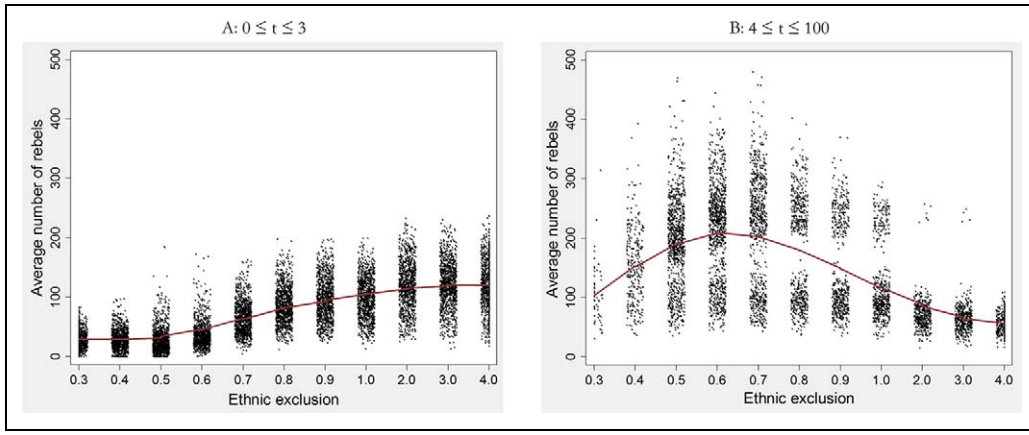

Figure 2. The risk of rebellion in small-*W* systems ($w = 0.05$). (A) $0 \leq t \leq 3$, (B) $4 \leq t \leq 100$.

citizens in his or her coalition without needing to attract them away from the incumbent's coalition. Also noteworthy is the manner of losing office. While most leaders in large-W systems lose office in a regular manner, the percentage of removal by successful rebellion increases as the level of ethnic exclusion goes up, due to the rise in the number of rebels. Results from Experiment B show patterns similar to those reported in Experiment A, although leaders tend to stay shorter in office when $w = 0.50$ than when $w = 0.40$. In sum, the higher the level of ethnic exclusion in large-W systems, the higher is the risk of rebellion, and lesser is the number of leaders who could survive in office. Ethnic exclusion is not just a bad policy but also bad politics in large-W systems.

In small-W systems with $w = 0.05$ (see Experiment C), an inverted U-shaped relationship was observed between the level of ethnic exclusion and the risk of rebellion, with the greatest risk of rebellion among semiexclusive regimes that combine insufficient capacity to suppress rebellion and insufficient political inclusiveness to mitigate excluded citizens' grievances. Figure 2 compares the relationship between the degree of ethnic exclusion and the average number of rebels in rounds 0–3 and 4–100. In the first three rounds in office, leaders with higher levels of ethnic exclusion tend to face a greater number of rebels than those with lower levels of exclusion (see Figure 2A). Beyond this short initial period, however, highly exclusive leaders find a significantly lower risk of rebellion than semiexclusive leaders (see Figure 2B). Why is this so? Exclusionary leaders from small-W systems provide the majority of rewards in the form of private goods (Bueno de Mesquita et al., 2003, pp. 86–87; Choi, 2012, pp. 19–25). The loyalty of soldiers to the incumbent leader is especially high in such systems (McLauchlin, 2010). As victory is essential for their future access to private goods, they fight hard against rebels, as demonstrated by the increase in the average number of prisoners in highly exclusive regimes. That is, although exclusionary leaders generate high levels of grievances among excluded citizens, they have high capacity to suppress the rebellion.

Experiment C also indicates that in small-W systems ($w = 0.05$), ethnic exclusion can enhance the probability that leaders will survive in office. The mean tenure in office for leaders with $c_L = 3.0$ is 41.80 rounds, while for leaders with $c_L = 0.3$, the mean tenure is only 4.40 rounds.[17] As such, when c_L starts off small, increases in the level of ethnic exclusion enhance a leader's survival in office. However, beyond a certain point (3.0 in this experiment), further increases in c_L may put a leader at a higher risk of losing office, as suggested by the decreased average tenure in Model 16. Excluding too many citizens might decrease the number of supporters below its minimum level (w) in times of external shocks, making leaders less immune to unexpected crises. Finally, when exclusionary leaders ultimately lose office in small-W systems, they are likely to fall in a violent manner, not in regular elections. Only an escalation of violence to a full-scale rebellion is likely

to remove such leaders from office (Horowitz, 2000, p. 499). Overall, the results from Experiment C suggest that ethnic exclusion is good politics in small-W systems even if it increases the level of grievances among ethnically excluded citizens. In addition, unlike the selectorate theory's main proposition, leaders in small-W systems do not always have an incumbency advantage over their large-W counterparts; rather, they have an advantage only when they are ethnically exclusive.

Finally, Experiment D indicates that the effect of c_L is less noticeable in small-W systems when $w = 0.1$ than when $w = 0.05$. Although leaders with $w = 0.1$ are more likely to survive when the exclusion parameter (c_L) is greater than 0.2, higher levels of exclusion (e.g., $c_L = 1.0$) do not improve their survival prospects. This result suggests that if the size of the minimum winning coalition is smaller, then the positive effect of ethnic exclusion on leader survival is higher and more leaders are likely to pursue an exclusive ethnic policy.

Survival Time Distribution

To examine how political survival differs according to the policy of ethnic exclusion and the size of the minimum winning coalition, the distribution of survival times in the two groups, namely, leaders from large-W systems ($w = 0.40$, Models 1–3) and those from small-W systems ($w = 0.05$, Models 6–16) was compared.

Figure 3 shows the proportion of leaders who survive at a particular time in office, estimated by the Kaplan–Meier method. In small-W systems with $w = 0.05$ (Figure 3A), leaders who implement a strong exclusion policy ($1.0 \leq c_L \leq 4.0$) find it easier to survive than those who employ a weaker form of exclusion ($0.3 \leq c_L \leq 0.9$). About 45% of leaders with $c_L \geq 1.0$ survive in office beyond the third round, while about 37% of leaders with $c_L \leq 0.9$ survive their third round. By the end of Round 50, 42% of leaders with $c_L \geq 1.0$ are still in office, while only 17% of leaders with $c_L \leq 0.9$ remain. The log-rank test of the difference in survival rates between these two groups is statistically significant at the .01 level ($\chi^2 = 177.70$, $p = .000$). On the other hand, in large-W systems with $w = 0.4$ (Figure 3B), even a small increase in the exclusion parameter poses a threat to the leaders' survival. The median survival times for leaders with $c_L = 0.1$ and those with $c_L = 0.2$ or 0.3 are seven rounds and four rounds, respectively. The difference in the survival rates is also statistically significant at .01 ($\chi^2 = 51.57$, $p = .000$). These results indicate that ethnic exclusion is good politics for small-W leaders, although large-sized W can turn the same policy into bad politics.

Hazard Rates for Leadership Turnover

Next, a Cox's proportional hazard model was fitted to the simulated data to observe how hazard rates for leaders with different levels of ethnic exclusion change over time. Figure 4 shows the predicted hazard rates of violent removal by successful rebellion in small-W systems (Models 11 and 15) and regular removal by the loss of support in large-W systems (Models 1 and 3)—the most common type of removal in each system. These figures provide compelling evidence that the leader's ethnic policy and the size of the minimum winning coalition interact to influence the removal of leaders in a particular manner. Figure 4A shows that in small-W systems, leaders who employ a higher degree of ethnic exclusion ($c_L = 3.0$) face a significantly lower risk of losing office in a violent rebellion than those who employ a lower degree of exclusion ($c_L = 0.8$). In small-W systems, both types of leaders are at greater risk of deposition during the first three rounds. After this initial period, the hazard rate for highly exclusionary leaders declines more rapidly over time than that for semiexclusionary leaders. On the other hand, in large-W systems (see Figure 4B), leaders who employ a low level of exclusion ($c_L = 0.3$) are constantly at a higher risk of losing office in a regular manner that those who have no exclusion ($c_L = 0.1$).[18]

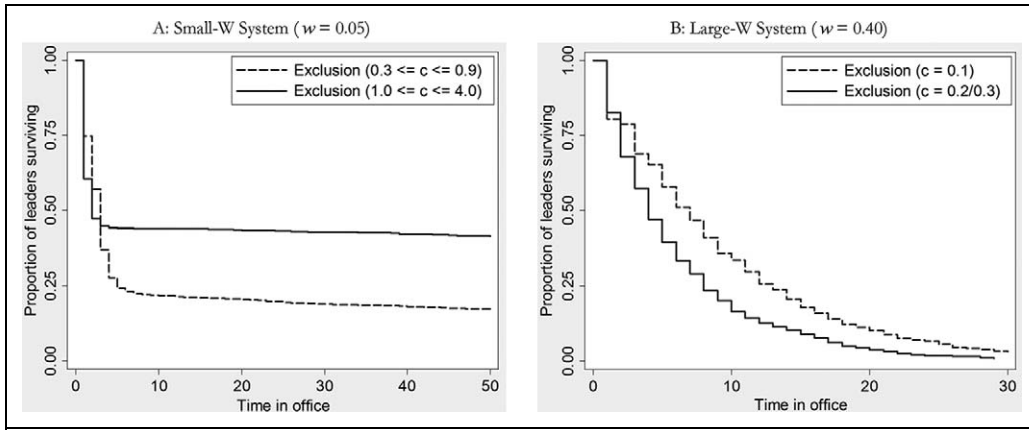

Figure 3. Kaplan–Meier survival estimates. (A) small-*W* system ($w = 0.05$). (B) Large-*W* system ($w = 0.40$).

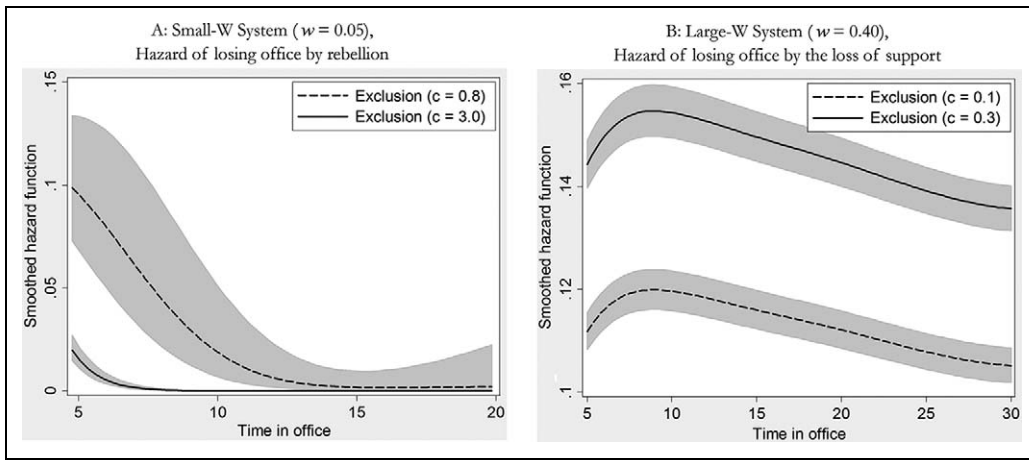

Figure 4. Predicted hazard rates. Curves smoothed by a Gaussian kernel density estimator. Shaded areas represent 95% confidence intervals. (A) Small-*W* system ($w = 0.05$), hazard of losing office by rebellion, (B) Large-*W* system ($w = 0.40$), hazard of losing office by the loss of support.

Four Scenarios

Four hypothetical scenarios are presented here to explore how changes in ethnic exclusion during the leader's tenure alter the risk of rebellion and prospects for survival in office. Figure 5 compares the scenario where a formerly exclusive leader changes his or her policy to embrace ethnic inclusion in small-*W* systems with the scenario where a formerly inclusive leader switches to ethnic exclusion in large-*W* systems. Figure 5A plots the number of rebels, prisoners, and incumbent supporters when a leader decreases the level of ethnic exclusion at two different time points during his or her tenure in small-*W* systems ($w = 0.05$, shown as a horizontal dashed line). The value of c_L is set to 3.0 for the first 19 rounds; then it is decreased to 0.8 at Round 20 and to 0.3 at Round 70. Although the incumbent receives a greater support after the initial reduction of ethnic exclusion, he or she also faces a greater number of rebellious citizens between Rounds 40 and 55, which might put him or her at a higher risk of being overthrown by rebel forces. Another reduction of c_L at Round 70 further increases the number of supporters in the incumbent's coalition; yet, a short period of burgeoning

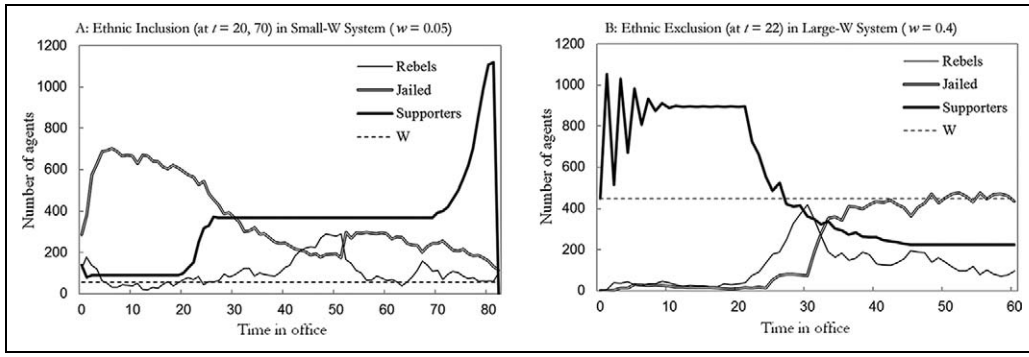

Figure 5. Two scenarios of political transition. (A) Ethnic inclusion (at $t = 20, 70$) in small-W system ($w = 0.05$). (B) Ethnic exclusion (at $t = 22$) in large-W system ($w = 0.4$).

support is followed by a sudden collapse of support at Round 81, putting the leader at a significant risk of being deposed by his or her ex-supporters.

As suggested by this scenario, when a formerly exclusive leader embraces ethnic inclusion in small-W systems, the size of the ruling coalition will expand as large numbers of citizens will try to enter the coalition to participate in the distribution of private goods. This process results in an oversized coalition that includes more supporters than necessary to maintain power—that is, the size of the ruling coalition is much larger than W. Now, with additional coalition members, the incumbent is forced to reduce the rewards he or she provides to each coalition member, thereby diminishing both the welfare and the loyalty of the existing supporters. Faced with decreasing welfare, disaffected members of the ruling coalition might attempt to enhance their welfare either by defecting to the challenger or by displacing the incumbent in an irregular manner. Through a coup or other irregular means, they eventually want to install a new leader who can advance their interests in a smaller coalition (Bueno de Mesquita et al., 2003, p. 397). After all, this leader is likely to be overthrown by his previous supporters.

Consider, for example, Abd al-Karim Qasim who ruled Iraq between 1958 and 1963. During his years in office, Iraq was a small-W system where political power resided in the Sunni military elites (Andrews & Ra'anan, 1969, p. 73). However, Qasim had an integrative vision for an Iraq, and thus tried to represent all Iraqis by including civilians with diverse ethnic backgrounds in his governing coalition (Tripp, 2007, pp. 146–147). Although Qasim's rule led to a number of positive changes that benefited all members of the Iraqi society, he was unable to win over the support of Sunni military elites (Andrews & Ra'anan, 1969, pp. 75–76). Faced with the impending loss of power and privileges, a group of disgruntled Sunni officers staged a military coup in February 1963. Fierce fighting continued around the Ministry of Defense for 2 days until Qasim was forced to surrender to the rebel forces. Qasim and his followers were executed after a show trial on February 9.

Another example is Burundi in the early 1990s. When President Pierre Buyoya, a Bururi Tutsi, decided to end ethnic exclusion that had been in effect since the 1960s, the ruling Bururi Tutsis had little intention of giving up their power and privileges without a fight (Ngaruko & Nkurunziza, 2005, pp. 44–45). As predicted by the simulation, they deposed a new President in October 1993 through assassination. This event was followed by violent reprisals against Tutsi civilians throughout the country, resulting in the deaths of about 50,000 civilians, mostly Tutsis, in the first week following the assassination. After Buyoya came back to power through a military coup in July 1996, Burundi had fallen into a civil war between the Tutsi-dominated army and Hutu rebel groups, where approximately 200,000 people were killed in ethnic violence. These events are clear examples of violent leadership turnover in the wake of ethnic inclusion in small-W systems.

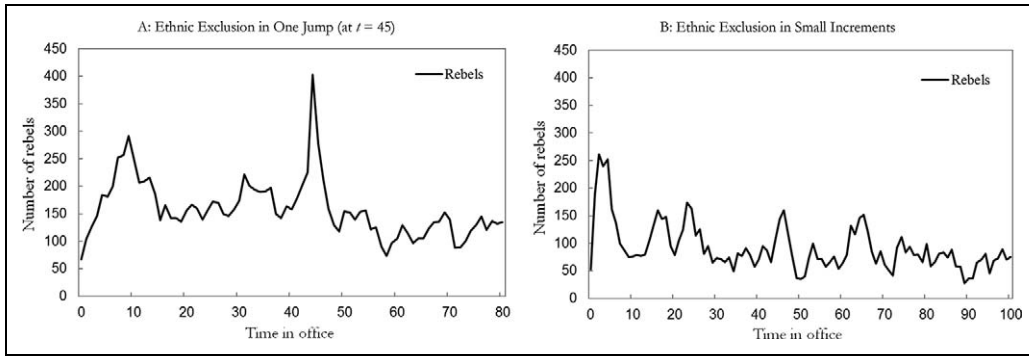

Figure 6. Transition to ethnic exclusion in small-*W* system ($w = 0.05$). (A) Ethnic exclusion in one jump (at $t = 45$). (B) Ethnic exclusion in small increments.

Figure 5B shows the results when the exclusion parameter was increased in large-*W* systems ($w = 0.4$). The incumbent's ethnic exclusion (c_L) was set to 0.1 for the first 21 rounds; then, gradually it was increased to 1.0 between Rounds 22 and 45. This scenario suggests that pursuing an exclusive ethnic policy in large-*W* systems not only decreases the number of incumbent supporters below its minimum level ($w = 0.4$) but also increases the number of rebellious citizens and jailed population. As suggested by this scenario, excluding even a small portion of ethnic group significantly increases the hazard of losing office in large-*W* systems. Employing ethnic exclusion is political suicide for large-*W* leaders.

One example of such a scenario is Bolivia in the early 2000s. Bolivia was a large-*W* system: Political leaders have been recruited and chosen through open, competitive elections and no systemic restrictions have been placed on political participation. However, the Bolivian governing coalition in this period was dominated by nonindigenous groups, which comprise about 35% of the population, at the exclusion of the majority indigenous population. The indigenous Quechua and Aymara groups were excluded from positions in the executive branch (Cederman et al., 2010) and had less access to public services (e.g., water, health care, education, housing, etc.) than nonindigenous peoples (Gigler, 2009). Starting in early 2000, the indigenous led a series of large-scale riots in protest against government policies on water and natural gas. Peaceful protests grew into violent confrontations between the masses of indigenous rioters and armed forces in 2003, killing more than 80 civilians and soldiers (Rohter, 2003). The riots subsided only after President Carlos Mesa left the office and Evo Morales was elected as the country's first indigenous president in December 2005.

Figure 6 shows the number of rebels when the level of ethnic exclusion in small-*W* systems ($w = 0.05$) is increased. In the first scenario (see Figure 6A), the exclusion parameter (c_L) was set to 0.5 for the first 40 rounds. Then, in one jump, it was increased to 3.0 at Round 41. As shown in Figure 6A, there is an explosion of rebels between Rounds 42 and 45. In Figure 6B, the same information was plotted with a different scenario where the value of c_L was increased from 0.5 to 3.0 in a steady and incremental manner. No explosion of rebels was found in this scenario because many of the new rebels were arrested by soldiers before they can spark a wider rebellion (Epstein, 2002, p. 7247). These findings have important implications for the strategies used by small-*W* leaders. Rather than turning toward exclusive rule in a short period of time, it is safer to implement ethnic exclusion in a gradual, covert manner.

Perhaps this is why leaders in small-*W* systems often call for inclusion and equality, although their actual policies deliver exclusion and inequality. For example, the Burundian regime under President Jean-Baptiste Bagaza (1976–1987) evolved to a system where a small coalition of Bururi Tutsis monopolized key positions in the army and government to the exclusion of Tutsis from other

provinces and many other Hutus. However, President Bagaza included all Tutsis in the Supreme Revolutionary Council—a symbolic interim government—to build his political image as an inclusive leader (Weinstein, 1977, p. 56). Similarly, Saddam Hussein publicly advocated the values of justice, equality, and good life for all Iraqis and diverse Muslim communities, although his regime favored a small segment of the Sunni minority, especially those from his home region of Takrit and others from the Sunni lands of the north west (Tripp, 2007, p. 191).

Conclusion

Why do some leaders employ ethnopolitical exclusion even though it generates grievances among excluded ethnic groups? Focusing on the role of ethnic identity in the incumbent leader's ruling coalition, the simulation suggests that when the size of the minimum winning coalition (W) is small, (1) highly exclusive leaders not only survive longer in office but also face a lower risk of violent removal from office than moderately exclusive leaders; (2) when leaders pursue an inclusive ethnic policy, they are likely to be overthrown by disaffected coalition members; and (3) there is an inverted U-shaped relationship between the level of ethnic exclusion and the risk of rebellion, with a maximum effect in semiexclusive regimes. When W is large, (4) leaders who employ even a moderate form of exclusion are likely to be removed from office in a regular manner.

Overall, the findings suggest that the relationship between ethnic exclusion and leader survival is shaped by different sizes of the minimum winning coalition. While ethnic exclusion is detrimental to leaders' survival in large-W systems, it enhances their survival prospects in small-W systems even if it fuels collective grievances among excluded groups. This does not mean to rationalize the continuation of discrimination but advise caution and preventive measures before attempting to abolish ethnic exclusion in small-W systems. An important lesson from the simulation is that political reforms toward inclusive governance could return the country to violence and instability if policy makers ignore the political incentives of leaders and thus fail to understand the risks associated with these reforms.

To conclude, as with other computational models, my approach comes with limitations and suggestions for future research. First, this model was implemented in an artificial landscape populated by hypothetical agents. One could think of applying it to a particular country by seeding the model with georeferenced data on ethnic settlement patterns and population density (e.g., Wucherpfennig, Weidmann, Girardin, Cederman, & Wimmer, 2011). Such an effort will provide opportunities for testing whether the simulation results correspond to empirical data, as well as its predictive ability. Second, this model assumes that the size of the minimum winning coalition is exogenous and does not change in response to the threat of rebellion. Future research may address this limitation by providing an endogenous account of how the incumbent leader changes W in the face of revolutionary threats (Bueno De Mesquita & Smith, 2009). Finally, the analysis presented in this article is purely theoretical at this point. Therefore, providing an empirical test that utilizes global data sets of leadership survival and rebellion will be the next step in assessing the plausibility of these new findings.

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Notes

1. I define ethnic exclusion as the "intentional and targeted" exclusion of elites from particular ethnic categories from state power including key positions in the ruling party, the army, and the central government.
2. Fifty-two countries were chosen based on Bueno de Mesquita et al.'s (2003) measure of minimum winning coalition size ($W \leq 0.25$). Leaders are classified as "exclusive" if ethnic group members who account for more than 10% of the country's population "are subjected to active, intentional, and targeted discrimination" in their access to government positions (Cederman et al., 2010, p. 101), and "inclusive" if no ethnic groups are subjected to political discrimination. Data on civil war and leadership tenure come from the UCDP/PRIO Armed Conflict data set (Gleditsch, Wallensteen, Eriksson, Sollenberg, & Strand, 2002) and Archigos data set on political leaders (Goemans, Gleditsch, & Chiozza, 2008), respectively.
3. In this model, the choice of b_L is arbitrary and does not affect the simulation results as long as the challenger has the same level of (prospective) budget (b_C) as the incumbent leader.
4. To attain office in a regular manner, the challenger must have a larger number of supporters in his or her coalition than the incumbent leader; thus, for the challenger, excluding any citizens based on ethnicity does not improve the odds of attaining office. Hence, the challenger's coalition identity (c_C) is set to the small value of 0.1 in all model runs.
5. In this sense, ethnic difference, as defined here, is not necessarily equal to the difference in nominal ethnic categories—such as Shia Muslim, Sunni Muslim, Hutu, and Tutsi—that are commonly used in calculating the ethnolinguistic fractionalization index (Roeder, 2001).
6. Perceived hardship (h) is an agent-level property and is conceptually different from collective grievances of particular ethnic groups.
7. It is important to note that the size of the minimum winning coalition (w) is a part of the institutional arrangements of the country and is not necessarily equal to the actual number of supporters in the incumbent's ruling coalition.
8. A decrease in economic growth, especially during the economic crisis, is commonly associated with an increase in the risk of removal from office (Bueno De Mesquita & Smith, 2010; Debs & Goemans, 2010; Goemans, 2008) or governmental collapse (Alesina, Özler, Roubini, & Swagel, 1996). Political scandal, a major corruption or abuse of power, often affects the fate of leaders in democratic countries. Examples include Richard Nixon of the United States (1969–1974), Yasuhiro Nakasone of Japan (1982–1987), and Christian Wulff of Germany (2010–2012).
9. Here, insights and formulas from the selectorate model (Bueno de Mesquita et al., 2003, pp. 106–120) have been applied in specifying the incumbent rule, challenger rule, and citizen rule 1.
10. Generally, the way citizens join the coalition in large-W systems is different from the way it occurs in small-W systems. For instance, in large-W systems, such as the United States, citizens can join the incumbent's coalition by voting for the incumbent in the presidential election. In many small-W systems, such as Iraq under Saddam Hussein, one way citizens can join the incumbent coalition is to obtain membership of the ruling party.
11. The value of δ is set to 0.9 in all model runs.
12. As such, I have assumed that all citizens are part of the selectorate. This model does not consider the variation in the size of the selectorate (S) and instead focuses on the interaction between ethnic exclusion and the size of the minimum winning coalition (W). Analyzing a three-way interaction between ethnic exclusion, W, and S is beyond the scope of the present article, but remains a worthwhile topic for future research.
13. This rule builds upon the Joshua Epstein (2002)'s civil violence model I: generalized rebellion against central authority.
14. The constant –2.3 is chosen to ensure that P is close to .9 when $S = 1$ and $R = 1$.
15. The value of ρ is set to 0.5 in all model runs.
16. No leaders with $c_L \geq 0.4$ survived the first round in large-W systems ($w = 0.40$).
17. No leaders with $c_L \leq 0.2$ survived the first round in small-W systems ($w = 0.05$).

18. The results obtained might be sensitive to different values of background parameters, which are held constant in the initial experiments reported in Table 3. Hence, the robustness of the findings was assessed by reanalyzing the results of simulation with three alternative values of the following parameters: soldier density (dS) = 0.02, 0.025, 0.03; maximum jail term (m) = 10, 20, 30; price of public goods (p) = 150, 200, 250; and vision (v) = 6, 7, 8. The simulation was repeated 100 times for each parameter combination, generating a total of 8,100 leaders in each model variant. The findings remain robust to different parametric assumptions.

References

Alesina, A., Özler, S., Roubini, N., & Swagel, P. (1996). Political instability and economic growth. *Journal of Economic Growth*, *1*, 189–211.

Andrews, W. G., & Ra'anan, U. (1969). *The politics of the coup d'état: Five case studies*. New York, NY: Van Nostrand Reinhold.

Bangura, Y. (2006). Ethnic inequalities in the public sector: A comparative analysis. *Development and Change*, *37*, 299–328.

Barron, M. (2008). Exclusion and discrimination as sources of inter-ethnic inequality in Peru. *Economia*, *31*, 51–80.

Bates, R. (1983). Modernization, ethnic competition, and the rationality of politics in contemporary Africa. In D. S. Rothchild & V. A. Olorunsola (Eds.), *State versus ethnic claims: African policy dilemmas*. Boulder, CO: Westview Press.

Bueno de Mesquita, B., & Smith, A. (2009). Political survival and endogenous institutional change. *Comparative Political Studies*, *42*, 167–197.

Bueno de Mesquita, B., & Smith, A. (2010). Leader survival, revolutions, and the nature of government finance. *American Journal of Political Science*, *54*, 936–950.

Bueno de Mesquita, B., Smith, A., Siverson, R. M., & Morrow, J. D. (2003). *The logic of political survival*. Cambridge, MA: MIT Press.

Caselli, F., & Coleman, W. J. (2006). On the theory of ethnic conflict. In *CEP Discussion* (Paper No. 732). London, England: Centre for Economic Performance, London School of Economics and Political Science.

Cederman, L.-E., Weidmann, N. B., & Gleditsch, K. S. (2011). Horizontal inequalities and ethnonationalist civil war: A global comparison. *American Political Science Review*, *105*, 478–495.

Cederman, L.-E., Wimmer, A., & Min, B. (2010). Why do ethnic groups rebel? New data and analysis. *World Politics*, *62*, 87–119.

Chandra, K. (2006). What is ethnic identity and does it matter? *Annual Review of Political Science*, *9*, 397–424.

Choi, H. J. (2012). *When ethnic exclusion is good politics: Ethnic exclusion, armed conflict, and leadership tenure in small-coalition systems* (PhD), Michigan State University, East Lansing, MI.

Debs, A., & Goemans, H. E. (2010). Regime type, the fate of leaders, and war. *American Political Science Review*, *104*, 430–445.

Elbadawi, E., & Sambanis, N. (2000). Why are there so many civil wars in Africa? Understanding and preventing violent conflict. *Journal of African Economies*, *9*, 244–269.

Epstein, J. M. (2002). Modeling civil violence: An agent-based computational approach. *Proceedings of the National Academy of Sciences*, *99*, 7243–7250.

Fearon, J. D. (1999). *Why ethnic politics and "Pork" tends to go together*. Paper presented at the MacArthur Foundation-sponsored conference on Ethnic Politics and Democratic Stability, Chicago, IL.

Gigler, B. (2009). *Poverty, inequality and human development of indigenous peoples in Bolivia*. Washington, DC: Georgetown University Center for Latin American Studies. Retrieved from http://pdba.georgetown.edu/CLAS%20RESEARCH/Working%20Papers/WP17.pdf

Gleditsch, N. P., Wallensteen, P., Eriksson, M., Sollenberg, M., & Strand, H. (2002). Armed conflict 1946–2001: A new dataset. *Journal of Peace Research*, *39*, 615–637.

Goemans, H. E. (2008). Which way out? The manner and consequences of losing office. *Journal of Conflict Resolution*, *52*, 771–794.

Goemans, H. E., Gleditsch, K. S., & Chiozza, G. (2008). ARCHIGOS: A data set on leaders 1875–2004. Retrieved from http://www.prio.no/CSCW/Research-and-Publications/Publication/?oid=57558

Gurr, T. R. (2000). *Peoples versus States: Minorities at Risk in the New Century*. Washington, DC: U.S. Institute of Peace Press.

Hegre, H., & Nygard, H. M. (2012). *Governance and conflict relapse*. Paper presented at the International Studies Association Annual Convention, San Diego, CA.

Horowitz, D. L. (2000). *Ethnic groups in conflict* (2nd ed.). Berkeley: University of California Press.

Kabeer, N. (2006). Social exclusion and the MDGs: The challenge of durable inequalities in the Asia region. *Institute of Development Studies Bulletin*, *37*, 64–78.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (1999). The quality of government. *Journal of Law, Economics, and Organization*, *15*, 222–279.

Lewis, W. A. (1965). *Politics in West Africa*. London, England: Allen & Unwin.

Lijphart, A. (1977). *Democracy in plural societies: A comparative exploration*. New Haven, CT: Yale University Press.

Marashi, I., & Salama, S. (2008). *Iraq's armed forces: An analytical history*. London, England: Routledge.

McLauchlin, T. (2010). Loyalty strategies and military defection in rebellion. *Comparative Politics*, *42*, 333–350.

Ngaruko, F., & Nkurunziza, J. D. (2005). Civil war and its duration in Burundi. In P. Collier & N. Sambanis (Eds.), *Understanding civil war: Evidence and analysis* (Vol. 1, pp. 35–61). Washington DC: The World Bank.

Østby, G., Nordås, R., & Rød, J. K. (2009). Regional inequalities and civil conflict in sub-Saharan Africa. *International Studies Quarterly*, *53*, 301–324.

Richardson, B. M. (1991). European party loyalties revisited. *The American Political Science Review*, *85*, 751–775.

Roeder, P. G. (2001). Ethnolinguistic fractionalization (ELF) indices, 1961 and 1985. Retrieved from http://weber.ucsd.edu/∼proeder/elf.htm

Roessler, P. (2011). The enemy within: Personal rule, coups, and civil war in Africa. *World Politics*, *63*, 300–346.

Rohter, L. (2003, October 18). Bolivian leader resigns and his vice president steps. *The New York Times*. Retrieved from http://www.nytimes.com/2003/10/18/world/bolivian-leader-resigns-and-his-vice-president-steps-in.html

Simmons, J. W. (1967). Voting behaviour and socio-economic characteristics: The Middlesex East federal election, 1965. *The Canadian Journal of Economics and Political Science/Revue canadienne d'Economique et de Science politique*, *33*, 389–400.

Stewart, F. (2008). Horizontal inequalities and conflict: An introduction and some hypotheses. In F. Stewart (Ed.), *Horizontal inequalities and conflict: Understanding group violence in multiethnic societies* (pp. 3–24). Basingstoke, England: Palgrave Macmillan.

Stewart, F. (2009). Horizontal inequality: Two types of trap. *Journal of Human Development and Capabilities*, *10*, 315–340.

Straus, S. (2006). *The order of genocide: Race, power, and war in Rwanda*. Ithaca, NY: Cornell University Press.

Tripp, C. (2007). *A history of Iraq* (3rd ed.). Cambridge, England: Cambridge University Press.

Tullock, G. (1987). *Autocracy*. Dordrecht, Netherlands: Kluwer Academic Publishers.

United Nations. (1995, November 8). Situation of human rights in Iraq. Retrieved from http://www.un.org/documents/ga/docs/50/plenary/a50-734.htm

Vogt, M. (2007). Ethnic exclusion and ethno-nationalist conflicts: How the struggle over access to the state can escalate (Lic phil I Univ Zèurich, 2008 - Ref Lars-Erik Cederman), Zèurich.

Wagner, M., & Kritzinger, S. (2012). Ideological dimensions and vote choice: Age group differences in Austria. *Electoral Studies*, *31*, 285–296.

Weinstein, W. (1977). The Burundi coup. *Africa Report*, *22*, 52–56.

World Bank. (2011). *World development report 2011: Conflict, security, and development*. Washington, DC: Author.

Wucherpfennig, J., Weidmann, N. B., Girardin, L., Cederman, L., & Wimmer, A. (2011). Politically relevant ethnic groups across space and time: Introducing the GeoEPR dataset. *Conflict Management and Peace Science*, *28*, 423–437.

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