Ethnic divisions, political institutions and the duration of declines

A political economy theory of delayed recovery

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Abstract

This paper analyzes the duration of large economic declines and provides a theory of delayed recovery. First, we develop a formal political economy model that illustrates a simple mechanism of how weak constraints on the political executive can lead to longer declines in ethnically heterogeneous countries. The model shows how uncertain post-recovery incomes and a 'winner-take-all' threshold effect create a commitment problem rendering a cooperative equilibrium inaccessible. Holding out can benefit groups by reducing the threshold effects in subsequent periods, thus limiting the remaining uncertainty. Placing strong constraints on the executive solves this commitment problem by reducing the uncertainty from the threshold effects, which brings about cooperation earlier on. Second, we then test several empirical predictions from the model using standard data on linguistic heterogeneity and more detailed data on ethnic power configurations. We find that the partial correlations are consistent with the proposed theory. The effect of executive constraints on the length of declines is very large in heterogeneous countries, but practically disappears in ethnically homogeneous societies. The adverse effect of heterogeneity is driven by the number of groups; increasing political concentration works in the opposite direction.

Keywords: economic crises, delayed recovery, political economy
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1 Introduction

Why do economic declines in Sub-Saharan Africa and some parts of the globe last so much longer than in others, say, Western Europe and North America? We propose a novel answer to this question which links ethnic heterogeneity and the powers of the political executive to the failure to agree on a policy response to the shock, even when the policy is economically effective and socially desirable.

The main contribution of this paper is to provide a theory of how ethnic diversity and political institutions interact during economic declines and to test the implications of this theory. We focus on the process of policy formulation during the decline phase of a slump and illustrate a simple mechanism of how weak constraints on the political executive can lead to longer declines in ethnically heterogeneous countries. The key issue we highlight is a commitment problem among winners and losers of the recovery process. Uncertainty about post-recovery incomes and a 'winner-take-all' threshold effect caused by imperfect political institutions can lead to delayed cooperation. Next, we assess the model empirically. We examine the central predictions of the model using both standard data on linguistic heterogeneity and a more detailed data set on the level of access to executive power enjoyed by the prevailing ethno-political groups.

The main theoretical results are threefold. First, delayed cooperation can occur in equilibrium. Weak constraints on the executive act as a political friction in ethnically diverse countries that can lead to large social inefficiencies. Second, stronger political institutions can entirely resolve this issue and bring about cooperation early on. Third, the commitment problem is getting worse when the number of groups increases. We also derive an additional result which takes the relative size (strength) of the groups into account. We then show empirically that the partial correlations are consistent with the theory. The effect of executive constraints on the length of declines is very large in heterogeneous countries, but muted in ethnically homogeneous societies. This finding is robust to the different data sets, as well as region and decade dummies. We also show that greater political concentration shortens declines and, *vice versa*, that a more even distribution of political power across groups increases delay. An important policy implication is that political institutions can contain the adversarial element of ethnic diversity and thus play a critical role in heterogeneous countries.

The rest of the paper is organized as follows. Section 2 briefly outlines the empirical motivation: an interaction effect of ethnic diversity and political institutions on the duration of economic declines. In Section 3, we argue that the rich literatures on ethnicity and political institutions in economics and political science have not yet offered a thorough explanation for this interaction. In Section 4, we outline our model of how ethnic fractionalization and weak constraints on the executive can lead to delayed cooperation. In Section 5, we discuss the data, the empirical strategy and the main empirical results. Section 6 concludes.

2 Empirical motivation

Our paper is motivated by a growing empirical literature which has established that economic growth is often not steady but instead characterized by different growth regimes. It is long known that the correlation of growth rates across decades is low (Easterly et al., 1993). A key finding of the newer growth episodes literature is that growth accelerations are triggered by a variety of factors but are difficult to sustain (Hausmann et al., 2005;

Berg et al., 2012). Several years of positive growth can easily be followed by long and deep slumps. Such negative shocks can wipe out previous welfare gains and are often characterized by persistent output loss (Cerra and Saxena, 2008). In light of these findings, it becomes important to understand why some declines last so much longer than others and what factors are associated with longer (or shorter) durations.

In a recent empirical contribution (Bluhm et al., 2014), we discuss the econometric identification of the decline phase of economic slumps and then analyze its duration. We empirically examine if the duration of the decline phase of large economic slumps is, among other factors, shaped by political institutions and ethnic cleavages. In a departure from the previous literature, we specifically focus on the *duration of declines* for three reasons. First, the onset of a slump may be brought about by many factors which are not necessarily related to a country's political institutions or level of social cohesion, but the duration of declines depends on socioeconomic groups agreeing on coordinated responses. Second, the dynamics of recoveries differ a lot from the dynamics of declines (both empirically and theoretically). Third, most of the variation in the overall depth of slumps is due to the duration of the decline phase and not due the rate of contraction.

Figure 1: Unconditional correlations with the duration of declines

(a) Executive Constraints　　　　　(b) Ethno-linguistic Fractionalization
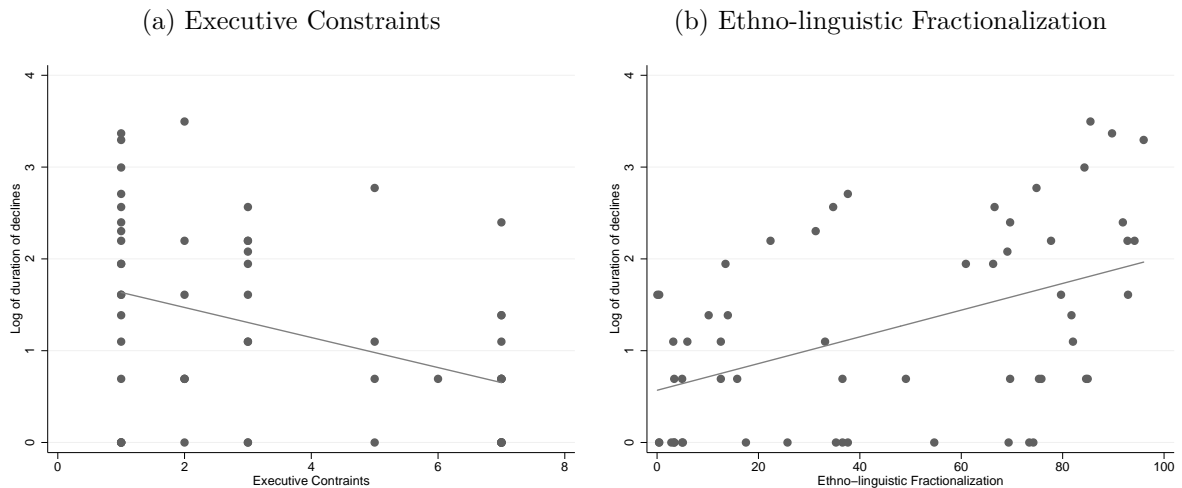
Note(s): The durations are based on the 58 slumps estimated in Bluhm et al. (2014) for the panel (b), and 57 slumps for panel (a) as we lack scores on the index of executive constraints for Trinidad and Tobago in 1961. No adjustment has been made for censored observations (unfinished declines).

We first show that the duration (in years) until a recovery starts increases with greater degrees of ethnic cleavages, and that it decreases with stronger constraints on the executive. A slump is defined by a trend break or shift in the growth regime with a restricted pattern. The duration of the decline phase is simply the time from the downbreak until the trough. Institutional strength is measured by the constraints placed on the political executive using an index scaled 1 to 7 (least to most constrained). Ethnic heterogeneity is proxied for by an index of linguistic fractionalization (scaled 0 to 100). Figure 1 illustrates the unconditional correlation of the (log) duration of declines with executive constraints (-0.38) and ethno-linguistic fractionalization (0.47).

We also provide evidence of a more subtle pattern: the adverse effect of high ethnic heterogeneity is conditional on the quality of political institutions. A log-normal survival regression of the duration of the decline phase on executive constraints, ethno-linguistic

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fractionalization and an interaction term yields the following (the standard errors are in parentheses below the coefficients):[1]

$$\widehat{\ln \tilde{t}} = \underset{(0.201)}{1.808} - \underset{(0.080)}{0.254} XCONST_0 + \underset{(0.004)}{0.018} ELF - \underset{(0.002)}{0.004} XCONST_0 \times ELF$$

The estimated effects are statistically significant and qualitatively meaningful. Even though this is a very naïve model of the duration process, the basic findings are robust to more demanding specifications. We centered the two explanatory variables on their sample mean, so that the interaction term only needs to be considered when both regressors change. *Ceteris paribus*, a unit increase in executive constraints away from the average leads to a 22.4% shortening of the duration until the trough and thus predicts a substantially faster exit from the decline phase. Conversely, a one percentage point increase in ethnic heterogeneity prolongs the duration by about 1.8%. Political institutions seem to moderate the effects of ethnic heterogeneity. At perfect executive constraints the negative effect of diversity is virtually zero, whereas it is very large when the political executive has unlimited powers. We also show that the effect of these two variables on the overall depth of slumps runs through the duration and not the average rate of declines.

In Bluhm et al. (2014) we are primarily concerned with the econometrics of identifying declines and establishing this stylized fact. The main objective of this paper is twofold: first, to propose a theory that can generate such an interaction effect, and, second, to then empirically examine additional theoretical predictions using much more detailed data on ethnic groups and their political power.

3   Related literature

Ethnic heterogeneity is a fundamental determinant of prosperity. It is typically associated with low growth (Easterly and Levine, 1997), the undersupply of public goods (Alesina et al., 1999), and civil conflict (Fearon and Laitin, 2003; Esteban and Ray, 2011; Esteban et al., 2012). Ethnicity plays a rampant role in Sub-Saharan Africa where political organization is mostly ethnic (Francois et al., 2012), but diversity has also been linked to inadequate public good provision in US states (Alesina et al., 1999), school quality in Kenya (Miguel and Gugerty, 2005), or excessive deforestation in Indonesia (Alesina et al., 2014). Furthermore, high economic inequality among ethnic groups is associated with regional underdevelopment and political inequality (Alesina et al., 2012).

Heterogeneity is not necessarily a problem and viewed favorably in many literatures. In lower income economies, organizing along ethnic lines may resolve a contracting problem and help to enforce social sanctions within family or kin groups (Bates, 2000). In highly developed economies, the negative effects of heterogeneity are muted, as skill complementarities matter more, or political institutions tame the conflict element inherent in diversity (Alesina and Ferrara, 2005). Ethnic diversity and political institutions also have an impact on one another. On the one hand, the adverse effects of ethnic heterogeneity may only be relevant in weakly institutionalized societies where political leaders often use (or abuse) ethnic and other divisions in their favor (Eifert

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[1]The estimation is based on 57 episodes using the data from Bluhm et al. (2014). A subscripted zero means that the variable is fixed at the last year before the slump to avoid endogenous feedback. The standard errors are clustered on the country level to account for repeated spells.

et al., 2010). On the other hand, diversity affects the (endogenous) choice of institutions governing the executive power of such leaders (Aghion et al., 2004).

There is some empirical evidence consistent with the view that ethnicity and political institutions interact. Collier (2000), for example, argues that ethnicity plays no role in democracies but is growth reducing in autocracies and provides evidence along these lines. Easterly (2001) empirically investigates an interaction effect between institutions and ethnicity in determining growth and conflict. However, the precise mechanisms behind how these two jointly determine the length of crises have not been investigated and may explain substantial parts of the robust negative correlation between ethnicity and growth. While there is plenty of anecdotal evidence, we are only aware of a paper by Rodrik (1999) which explicitly considers ethnicity and *negative* growth empirically (and more formally in the working paper version).

The theoretical literature on delayed reform and policy non-adoption offers important insights. Ethnic groups may be engaged in "wars of attrition" over the burden of reform, so that groups are trying to shift the costs of, say, a debt consolidation onto competing groups (Alesina and Drazen, 1991). In these models, agreement on a particular policy is required for stabilization and veto power lies either with groups represented within the executive or an effective parliamentary or non-parliamentary opposition. Stabilization occurs only once one of the groups concedes. Drazen and Grilli (1993) use this set-up to show that crises can be welfare improving by reducing delay and Spolaore (2004) examines the impact of different government systems on the expected time until a stabilization occurs. Alternatively, a socially optimal reform may not be undertaken at all because it is *ex ante* not known to which (ethnic or other political) groups the benefits will accrue (Fernandez and Rodrik, 1991). Labán and Sturzenegger (1994a,b) show that such a model can also generate delay and an endogenous economic deterioration. Both approaches have two key elements in common: 1) *uncertainty* about the expected outcomes, and 2) an *ex ante commitment problem* between (*ex post*) beneficiaries and losers of the reform. However, while instructive, this literature does not explicitly focus on ethnic diversity and constraints on the executive. As a result, it does not capture an interaction between these two factors in determining the length of declines.

Our paper also relates to the veto player literature in political science. These contributions generally find that policy stability is greater, the more numerous the players in the political system that are required to agree (Tsebelis, 1995, 2002). Veto player arguments have been used to explain why governments may not reform during an economic shock (Cox and McCubbins, 1997; Haggard, 2000), but recently Gehlbach and Malesky (2010) turn the argument on its head by demonstrating that (more) veto players weaken the power of special interest groups which encourages wholesale reform. Using a different setup based on the selectorate framework by Bueno de Mesquita et al. (2005), Hicken et al. (2005) stress an alternative mechanism which suggests that accountability of the executive matters in response to exchange-rate devaluations. They conclude that greater checks on the executive do not aid the recovery which stands in sharp contrast to the results developed in this paper.

The degree of ethnic diversity is entirely endogenous in the (very) long run. Heterogeneity is related to migratory distance from Africa (Ashraf and Galor, 2013), the duration of settlements and the history of the state (Ahlerup and Olsson, 2012), and variation in terrain and land endowments (Michalopoulos, 2012). At the micro-level, people may choose their group affiliation and switch groups depending on how discernible the individual features are which identify group membership (Caselli and Coleman, 2013).

Ethnic markers are usually more salient than other group identifiers which may explain why interest groups organize among ethnic lines to limit "infiltration" by outsiders.

We do not expect ethnic compositions to change fundamentally in the short run (especially in the post-colonial period). However, ethnicity is not always the most prominent political fault line in a society and the degree of access to political power of a particular group varies over time (Posner, 2004). Early empirical studies of the effects of ethnic heterogeneity (e.g. Easterly and Levine, 1997) use data Soviet ethnographers published in 1964, incorporate possibly irrelevant cleavages and do not account for differences in political power. Several later studies use up-to-date data on *linguistic* fragmentation (e.g. Fearon, 2003; Desmet et al., 2012), but still remain confined to the cross-section and disregard political power. Wimmer et al. (2009), as well as Cederman et al. (2010), present a new data set which explicitly aims to remedy this situation. The *Ethnic Power Relations* (EPR) data codes the degree of access to executive power by different groups, focuses on politically relevant groups, and employs a more flexible notion of political division capturing the main fault line in a particular country (such as ethnicity, language, race or religion).[2] In our empirical part, we use the latest EPR data and contrast the results to more traditional measures of linguistic diversity.

4 Theory

We model group interactions during a slump as a cooperation game where groups decide on whether to formulate a policy response to a crisis that will initiate a recovery. We first focus on the symmetric two group case and then extend the model to allow for unequal sizes and multiple groups.

4.1 Basic setup

We consider a population normalized to unity and split into J equal-sized (ethnic) groups. These J groups constitute the players of the game. Time is discrete and there is an infinite number of periods, indexed by $t = 1, 2, \ldots, \infty$. The per-period discount rate is δ. With slight abuse of notation, groups are indexed by $j = 1, 2, \ldots, J$, where $J = 2$ for the baseline model considered in this subsection. Each group acts as a single agent and we do not analyze internal coordination issues among individual members within the same group.

Preferences. Group j receives a net income of y_j in period zero. Total initial income in the economy is normalized to unity ($\sum_j y_j = 1$). Utility in each period is $g(y_j)$, where $g(\cdot)$ is increasing in y_j, concave and identical for all groups.

Slumps: decline and recovery. When a slump occurs, output declines by a fixed amount (Δ) in the first period, which affects both groups proportionally, and then remains at that level until both groups cooperate. Total income is now ($1 - \Delta$) as long as the slumps lasts. Once a decision to cooperate has been reached, we assume that the economy recovers within one period. Groups decide to cooperate or not based on their expected future returns to cooperation.

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[2]Rainer and Trebbi (2012) and Francois et al. (2012) extend this approach further and code an ethnic group's access to power at the ministerial level for 15 African countries.

Slumps: uncertainty. We assume that groups are uncertain about their post-recovery incomes – their relative economic standings and political power may change after the slump is over. In the baseline model, $y_1 = y_2 = 1/2$. Each group experiences a random shock to its income, where the probability that a group falls below a "threshold of safety" and is expropriated by the other group is given by a process p_t (which is explained in greater detail below). The setting is symmetric in the sense that p_t also gives the probability of the second group falling below the threshold. For the first group, the shock has support $\nu_1 \in [-y_1, 1 - y_1]$. Let w_1 denote actual income after the shock, so that y_1 is now a counterfactual; similarly for y_2, w_2. This implies that a slump will hit the groups unequally after recovery, but *ex ante* neither group expects to be hit harder.

Political institutions. We interpret executive constraints as limits on how much one can group gain or lose relative to the other through expropriation, as is common practice in the literature (Besley and Persson, 2011a,b). The intuition is as follows. If a particular group has been sufficiently weakened by the slump, the now stronger group may be in a position to expropriate part or all of the weaker group's income and exclude it from the political process. If the executive is unconstrained there are no checks on this type of predatory behavior. A complete constraint on how much one group can extract means that no expropriation can occur. A partial constraint implies that expropriation occurs only when one group becomes too weak. The dominant ethnic group controls the executive and shares the spoils from expropriating the weaker group with its members.

To be more precise, we model political institutions in a simple way by including thresholds in the random shock. Boundary outcomes (expropriation) are realized only beyond these thresholds. Let the parameter $c \in [0, 1/2]$ represent the weakness of executive constraints, and let the set $\mathcal{A} = [c, 1 - c]$ be the political safe zone in which there is no expropriation. Once a group falls below c, its income is expropriated (pushed to zero) and the other group gains the remainder. Thus, $1 - 2c$ can be interpreted as the ability of one group to commit to not expropriating the other group; alternatively, $c = 1/2$ can be thought of as the total lack of constraint.

Figure 2: Threshold effects as constraints on the executive
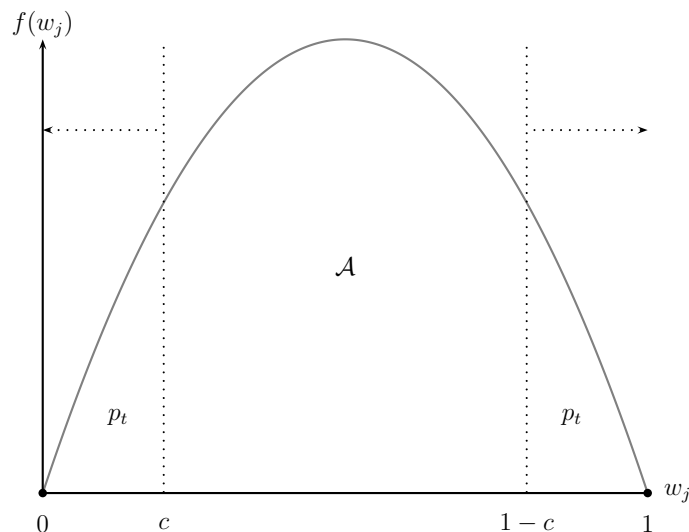
To fix ideas, we interpret the 'winner-take-all' event as political extinction of the weaker group, though it can be understood in a variety of ways. In non-democratic

politics, the threshold mechanism symbolizes the potential of some ethnic groups to exclude other groups from the political process and capture the rents of those that have been excessively weakened by the slump. Alternatively, it may even represent physical extinction due to ethnic conflict. In democratic politics, assuming that ethnic or other identity groups are represented by parties reflecting their interests, it captures the existence of thresholds that allow minorities to block political change (e.g. the filibuster rule used in the U.S. Senate as well as several state legislatures, or the 5% minority threshold used in the German *Bundestag*).

Delay. We assume that groups are able to fortify their position through non-cooperation. This implies that a group can (in part) counterbalance the uncertainty introduced by weak institutions through not cooperating, and thus potentially avoid falling below the threshold. Both groups would cooperate and the recovery would be immediate if there were no gains from delay.

In terms of the model, delay limits how likely it is that a particular group will be expropriated. The parameter x is a measure of how much a group can reduce the risk of expropriation by holding out in each period. We assume that the probability of landing on either side outside the safe zone follows a linear process, so that $p^t = c - (t-1)x$ at each t when the groups can chose to cooperate or delay. Furthermore, we assume that expected utility conditional upon being in the "safe zone" is independent of p^t.

Figure 2 gives an example of a distribution of w_j and illustrates the relevant regions.

Timing. The following timing summarizes the structure of the game. At $t = 0$, the economy is in its initial state. Output $\sum_j y_j = 1$ is produced and shared equally.

1. At $t = 1$, the slump occurs, and incomes decline to $(1 - \Delta)y_j$. Both groups simultaneously choose to cooperate C or delay D.

2. For all $t > 1$, incomes remain at $(1 - \Delta)y_j$ if both groups did not cooperate in the previous period. They once again simultaneously choose whether to cooperate C or delay D. If, instead, there was cooperation in the previous period, incomes recover within one period, but are subject to a random shock and groups can land outside the political safe zone with twice the probability p^t. After a recovery, each group receives the same payoff as in the first post-recovery period forever.

The present discounted value of the lifetime utility for each group is

$$v_j = \sum_{\tau=1}^{\infty} \delta^{\tau-1} \mathbb{E}g(\cdot) \tag{1}$$

where $g(\cdot)$ is $g((1 - \Delta)y_j)$ if the recovery has not yet occurred and $(1 - 2c)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + c(g(0) + g(1))$ otherwise. The discounted utility has two components: 1) if the economy has not recovered, groups are on a delay path, and 2) once the slump is over, they remain on a post-recovery path.

Figure 3 sketches how the economy evolves over time given different choices and presents a stylized view of the process we envision. Note that the action pair (D, d) has the same implication as (C, d) and (D, c); that is, cooperation of both groups is required for a recovery to occur.

Figure 3: A sketch of decisions and timing
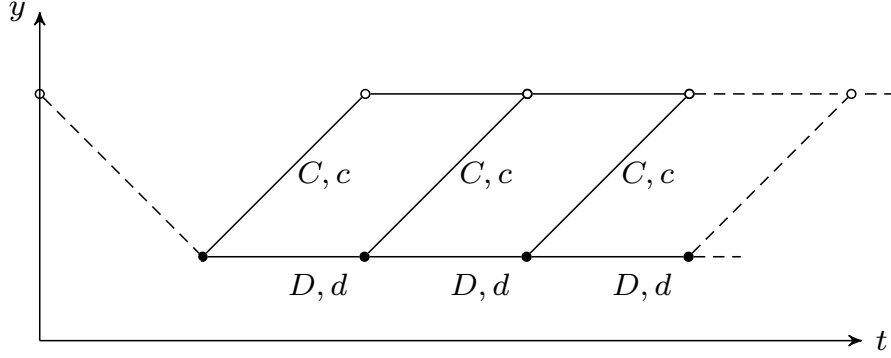
The game has a symmetric structure. At each choice node (solid nodes), the comparison between any two adjacent periods always looks alike. The utility from cooperating in a particular period t when the other group cooperates in period t is

$$v_j^t(C,c) = \frac{1}{1-\delta}\left\{(1-2p^t)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^t(g(0)+g(1))\right\} \tag{2}$$

and the utility from cooperating in the next period when the other group cooperates in period t is

$$v_j^t(D,c) = g((1-\Delta)y_j) + \frac{\delta}{1-\delta}\left\{(1-2p^{t+1})\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^{t+1}(g(0)+g(1))\right\}. \tag{3}$$

It is useful to establish the social optimum before we characterize the non-cooperative equilibrium. Our first comment summarizes two key aspects of the planner's solution.

Comment 0. *i) The utilitarian welfare-maximizing outcome involves no delay.*

To see this, note that due to the concavity of the utility function the sum of the group's utilities is maximized when their share is equal. At equal shares, the total welfare from any non-delay path dominates any delay path.

ii) Any outcome with delay is Pareto dominated by some outcome without delay.

To see why this is the case, take any path with delay, give the groups the same shares in every period, but let the recovery happen immediately. In this case, all groups receive more in the period before the recovery than they did with delay, and the same in every period after the recovery.

The intuition behind this comment is straightforward. Given that there are two groups in the economy, a social planner would give both the same shares and avoid delay; only then is their combined utility maximized. Even if these two groups have unequal shares, an immediate recovery is beneficial to both. The social planner is unconstrained, in the sense that the solution involves no uncertainty towards the post-recovery utilities or political boundary effects. This benchmark is particularly interesting when contrasted to the non-cooperative equilibrium of the game, where groups face a trade-off between immediately recovering and falling below the threshold c, or recovering later and reducing future uncertainty.

By comparing the utilities from cooperating in the first period and in the second period it is relatively straightforward to show that delay can occur in equilibrium. Our first result establishes this.

Proposition 1. *There exist parameter values, such that all equilibria involve delay.*

Proof. See Appendix. ∎

The proof to the proposition shows that all components that make the immediate cooperation scenario less attractive are conducive to delay. The key issue rendering the cooperative equilibrium inaccessible is the *ex ante* commitment problem among potential winners and losers. Hence, worse institutions, or less ability to commit to not expropriate the loser (larger c), larger gains from holding out (larger x) and a larger value placed on the future (higher δ) make immediate cooperation less likely. Conversely, a larger shock (Δ) makes cooperation more attractive since a (potentially sizable) one period loss is avoided. The concavity of $g(\cdot)$ matters in the sense that it implicitly captures how averse groups are to negative events (falling below c) or how much they value expropriating other groups (landing above c).

Note that the proposition is formally true only in a weak sense; it does not rule out that equilibria with immediate recovery could exist for some parameter values.[3] Rather, the result should be viewed in light of Comment 0. What Proposition 1 establishes is that for some parameter values *all* equilibria are inefficient and welfare-suboptimal.

While still in the two-group case, we can already highlight an interesting comparison to the homogeneous (one group) case.

Comment 1. *Without heterogeneity, there always exists an equilibrium with immediate recovery.*

Note that if the groups were to pool their resources as one, then all the elements inducing delay – except pure miscoordination – are absent. In other words, we need antagonistic political (ethnic) groups for the proposed mechanism to work, i.e. for the model developed here to provide a theory of why there is delay. A more careful analysis of group asymmetries and multiple groups follows in the model extensions.

To better understand when we are likely to see delay, we now characterize the subgame perfect equilibrium with (the earliest possible) recovery, if such an equilibrium exists. Given the symmetric structure of the game an interior solution exits and the optimal time to recovery can be derived using equations eq. (2) and eq. (3). Our second result summarizes a central insight of the model.

Proposition 2. *Stronger constraints on the executive shorten the time to recovery.*

Proof. See Appendix. ∎

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[3]There are many "coordination failure" equilibria where neither group cooperates simply because they believe the other group will not. Such equilibria always exist, including an equilibrium with infinite delay. Our analysis, however, is focused on the more interesting scenarios (equilibria) where delay does not happen *only* as a result of this type coordination failure.

The proof shows that the optimal time to recovery is

$$t^* = \frac{g((1-\Delta)y_j) - \mathbb{E}[g(w_j)|w_j \in \mathcal{A}]}{x\{2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - (g(0) + g(1))\}} + \frac{c}{x} + \frac{1}{1-\delta} \tag{4}$$

where the key comparative static result is $\partial t^*/\partial c > 0$.

This proposition says that if institutions are imperfect ($c > 0$), delay is going to be longer than if the groups are able to perfectly commit to not expropriating the losers.[4] In fact, the weaker the constraints on the executive (larger c), the longer is the expected time to cooperation. Intuitively, either group will find it optimal to delay until a point is reached when the benefit of holding out for an additional period is equal to the benefit of cooperating in this period, where the former may be the period in which all uncertainty regarding the political threshold is resolved. At this point, or the next discrete period, it is optimal to cooperate. Where exactly this point in time occurs depends on the trade off between recovering and potentially falling outside the political safe zone, or recovering later and reducing the remaining uncertainty.

For the remainder, we do not explicitly derive this equilibrium solution. Instead, we focus on the case where all uncertainty is resolved in the next period and compare different scenarios (e.g. perfect and imperfect institutions). We outline such an argument in the next comment.

Comment 2. *The existence of imperfect (weak) institutions makes delay more likely.*[5]

If institutions are perfect ($c = 0$), we have

$$\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] \geq g((1-\Delta)y_j) \tag{5}$$

and if institutions are imperfect (and $p^t = c$ for all t), we have

$$(1 - 2c)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + c(g(0) + g(1)) \geq g((1-\Delta)y_j). \tag{6}$$

Inequality (6) is harder to satisfy than inequality (5) under the concavity assumptions imposed on the utility function. Note that this is entirely due to the presence of weak institutions ($c > 0$).

Discussion of the model. The baseline model focuses on several key aspects of the political economy of declines. First, we have modeled group interactions during crises under uncertain post-recovery incomes in a way that highlights that groups are not able to commit to compensating the losers. There are no enforceable contracts where the winners return the (additional) post-recovery gains, which is precisely the role played by strong constraints on the executive. Second, outcomes with delay can occur in equilibrium, and they do *not* coincide with the social optimum or with efficiency. Weak institutions act as a political friction creating potentially large economic inefficiencies. Third, heterogeneity

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[4]Again, this is only holds if we rule out equilibria involving immediate cooperation or infinite delay.

[5]Strictly speaking, a probabilistic statement (delay becomes "more likely") should not be used in this comment, as, for any given set of parameters, there either exists an equilibrium with immediate recovery or not. However, we follow Acemoglu and Robinson (2006) and say that a change in the setup of the model makes a particular outcome "more likely" if it becomes an equilibrium outcome for a larger parameter set.

matters and political groups are assumed to be willing to cooperate once it is optimal to do so. Entrenched distrust would only increase delay.

We abstract from several other features, such as modeling slumps in a more realistic manner (both in terms of the decline and the recovery phase) or the precise nature of the policy response. Clearly, some policies can prolong the decline phase and make recovery more difficult. We also do not differentiate between democratic and autocratic regimes, or examine the impact of particular political constitutions (presidential or parliamentary). The exact form of the boundary events is also left open and could, for example, also represent the exclusion from public goods. Nor do we differentiate between political and economic power. Such specificities are not essential to the main argument, but clearly our contribution is particularly relevant for understanding declines in Africa where political divisions are often ethnic and executive power is shared (Francois et al., 2012).

The mechanism we propose is different than those suggested in the policy reform literature, which has previously focused on shifting the burden of reform (Alesina and Drazen, 1991) and status-quo bias (Fernandez and Rodrik, 1991). While both literatures highlight the importance of *ex ante* uncertainty (either about the costs or benefits of reform), their core focus is not on the role of political institutions in general or executive constraints in particular. The empirical content also differs substantially. For example, Drazen and Grilli (1993) stress that crises help stabilizations and Spolaore (2004) shows that political systems with a strong government (less constrained executive) reform more quickly, whereas we propose that crises coinciding with an unconstrained executive are at the heart of the problem.

4.2   Extensions: asymmetric and multigroup settings

We now briefly sketch two extensions. To extend the model to the asymmetric and *J*-group cases, we make the following simplifying assumptions. First, we restrict attention to the uncertainty associated with falling below the political threshold. Specifically, we assume that if a group falls within the political safe zone its share of total economic activity will be equal to its pre-recovery share. Second, we use a piecewise linear utility function, in particular:

$$g(y_j) = \left\{ \begin{array}{ll} y_j & \text{for} \quad y_j > 0 \\ z & \text{otherwise} \end{array} \right. \tag{7}$$

where $z < 0$. Furthermore, for the case when there are more than two groups, we assume that at most one group can fall outside the political safe zone. We now work with a probability function $p_t(y_j)$, where we only assume $\frac{dp_t(y_j)}{dy_j} < 0$. Finally, our comparative statics will be done for the case where all uncertainty is resolved after one period of delay.

How do changes in political concentration affect the political equilibrium? Intuition may suggest that smaller groups are more afraid of falling out of the political safe zone, implying that greater asymmetry between groups increases the likelihood of delay. However, our theoretical result suggests that the effect of changes in political concentration can go either way. Several things change in the two-group case if the share of an initially weaker group moves closer to an equal allocation, so that the size of the previously more powerful group decreases in return. On the one hand, the emboldened group finds itself further away from the political threshold (c) and hence faces a lower probability of being expropriated ($p_t(y_j)$). In addition, the group also has to forgo more

utility in the delay scenario. Both work in favor of cooperation. On the other hand, the group now has more to lose if it gets expropriated and is thus less likely to cooperate. Without imposing further restrictions, the overall direction of the effect is undetermined and depends on the parameter values. We consider this an empirical issue and return to it in the next section. The following result gives the condition that has to hold for greater symmetry to lead to more delay.

Proposition 3. *A decrease in (political) concentration makes delay more likely, if the following condition holds*

$$\Delta + \frac{1}{1-\delta} \left\{ \frac{dp_1(y_j)}{dy_j}(z - y_j) - p_1(y_j) \right\} < 0. \tag{8}$$

Proof. See Appendix. ∎

Using this condition, we can summarize the circumstances that determine the direction of this effect.

Comment 3. *A decrease in concentration is more likely to work in favor of delay, if the shock is smaller, the future is less heavily discounted, the negative consequence of falling outside the political safe zone is greater and the probability of that event is not very responsive to the weaker group's share.*

Up until this point, we assumed that there are only two groups deciding on whether to cooperate or not. The final proposition relaxes this constraint and highlights another key insight of the model with respect to group heterogeneity (assuming symmetric groups).

Proposition 4. *An increase in the number of groups makes delay more likely.*

Proof. See Appendix. ∎

Contrary to the more equivocal result in Proposition 3, a larger number of groups decreases the likelihood of cooperation. The proof shows that the condition for immediate cooperation (when all uncertainty is resolved in the next period) boils down to an inequality that decreases in J. The intuition behind this proposition is simple. As the number of groups increases, every group becomes poorer and thus more vulnerable during a slump. Simplifying the model helped to show that this is driven by the uncertainty arising from the lack of executive constraints (which we now no longer denote c but implicitly define through $p_t(y_j)$.

So far we did not explicitly consider political power or political relevance. Instead we assumed that all groups start from inside the political safe zone, matter equally for the decision to cooperate, and may only fall into political irrelevance as a consequence of the slump. Keeping the decision mechanism fixed, we now reflect on what this implies for different power (group) configurations. We do so with an eye to the concepts that we can empirically capture in the next section. With this in mind, we summarize the role of political relevance in the last comment as follows.

Comment 4. *More politically relevant groups make delay more likely, while politically irrelevant groups do not matter. Conversely, this implies that if a group dominates or monopolizes the decision making process, delay becomes less likely.*

Here, political relevance refers to being a party to the negotiations and thus being included in this model. Note that this separates the issue of political relevance (and the number of groups) from the strength of constraints on the executive. For example, there may be a dominant group which is unconstrained and thus poses a threat for smaller groups, or there may be a dominant group whose hands are tied so that it cannot expropriate smaller groups. Since these cases are distinct, we should still observe an independent effect for both the number of groups represented in the executive (or different qualitative assessment of their access to executive power), and constraints on the executive *per se*.

5   Empirics and Discussion

Decline spells.   Our dependent variable is the duration of the decline segment during deep economic slumps. Since the identification of the duration of these negative growth spells is not trivial and beyond the scope of this paper, we only briefly summarize the method here. The details are discussed in Bluhm et al. (2014).

Figure 4: A stylized decline spell
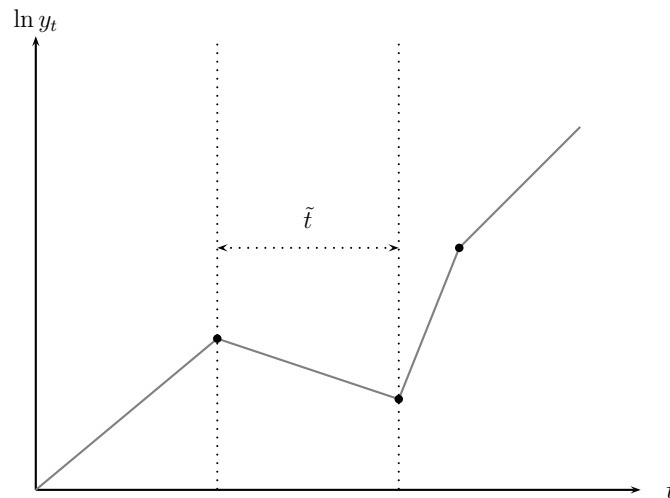
The procedure involves several steps. First, we fit a restricted partial structural change model with two breakpoints to each GDP per capita series in the *Penn World Table 7.0*. We impose sign restrictions on the model parameters, so that we only find major economic slumps. Second, we estimate candidates for the endogenous breakpoints and conduct a bootstrap Monte Carlo test of their significance. Third, we keep only breaks that are significant at the 10%-level and run the procedure again on the remaining data (before the first and after the second break) until all breaks have been found or the sample gets too small. Fourth, for each slump, we identify the empirical trough (the lowest point in the GDP series after the beginning of the slump) and then compute the duration of the decline segment (denoted $\tilde{t}$). Figure 4 sketches the process we had in mind when designing the algorithm, including the duration of the decline phase.

This algorithm yields 58 slumps from 1950 to 2008. The basic correlations are as expected. Poorer countries have longer and deeper declines than richer countries; countries in Africa have the longest and deepest spells while OECD countries experience only few, shallow and short spells. Table 1 provides some basic summary statistics.

Table 1: Summary Statistics of Slumps

	Africa	Americas	Asia	Europe	Oceania	World
Slumps	14	16	16	9	3	58
Total years in decline	178	78	60	23	9	348
Duration of decline:						
- Min	1	1	1	1	2	1
- Median	16	2	2	1	3	3
- Mean	12.71	4.88	3.75	2.56	3.00	6.00
- Max	33	15	13	9	4	33
Incidence Rate	0.04	0.19	0.22	0.39	0.33	0.14

Note(s): The incidence rate is defined as the number of exits from the decline period over the total years in decline.

Measuring institutions. Our core measure of political institutions is the variable *Executive Constraints* from the Polity IV data set. The variable directly measures the degree of institutionalized constraints placed on the political executive. It is coded unity when there is "unlimited executive authority" and seven when there is "executive parity or subordination"; intermediate values represent some constraints. We believe that this variable corresponds well with the parameter *c* in our model. The Polity IV project has information on executive constraints annually from 1800 (or the year of independence) until 2010. We do not use this wealth of time variation, since political institutions may endogenously respond to the slump. We only rely on the degree of executive constraints in the last year *before* the slump and denote this variable $XCONST_0$.[6]

Measuring heterogeneity. We rely on two data sources to capture very different aspects of ethnic heterogeneity. The first source is a set of measures computed by Desmet et al. (2012) on the basis of the *Ethnologue* data. This data does not measure ethnicity directly but captures *linguistic* diversity. Fearon (2003) shows that linguistic (cultural) diversity coincides well with ethnic heterogeneity in some regions, notably Sub-Saharan Africa, but not so well in others. Together with the *Atlas Narodov Mira* data gathered by Soviet ethnographers in the 1960s, it is a standard source for data on ethnic heterogeneity and considerably more up-to-date than the former. Desmet et al. (2012) compute linguistic diversity at different levels of the language tree to capture the historical depth of ethnic divisions. We only make use of the most disaggregate level, since they also show that current divisions are correlated with economic growth more strongly than historical cleavages. The second data source is the *Ethnic Power Relations* (EPR) data

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[6]An alternative measure of political constraints is the *POLCON* index proposed by Henisz (2000). This index is not our preferred measure for three reasons. First, the measure is derived from a veto-player model, while we propose a different theoretical approach. Second, it focuses on the number of parties in the legislature, not structural features of the executive. Third, it explicitly includes legislative fractionalization whereas we emphasize ethnic fractionalization of the executive. Additional results using this measure can be found in Table A-3.

presented in Wimmer et al. (2009), as well as Cederman et al. (2010). The EPR data has several advantages over other measures of linguistic or ethnic diversity, particularly for our application. It provides time series information on the degree of access to *executive* power of ethno-political groups from 1946 to 2010. Contrary to the *Ethnologue* data, it is not restricted to linguistic cleavages existing today. Instead, expert coders identified the most relevant division which may be ethnic, linguistic, racial or religious depending on the country and time period. The data contains information on the power status of each group, so that it allows us to focus on politically relevant groups; that is, groups with some form of representation in the presidency, cabinet, or other senior posts in the administration or army.

Our primary measure of heterogeneity is the commonly used index of ethno-linguistic fractionalization (e.g. Easterly and Levine, 1997). It is defined as

$$ELF_i = 1 - \sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i} \right)^2 \tag{9}$$

where n_{ij}/N_i is the population share of group j in country i ($j = 1, 2, \ldots, J$, n_{ij} is the number of people in group j, and N_i the size of the population in country i). We employ two versions of this index: one computed by Desmet et al. (2012) and one computed using the EPR data (denoted ELF_0). We scale all heterogeneity indices by 100 to give changes on the right hand side a percentage point interpretation.

Another important dimension of diversity is the degree of polarization of a society into two (opposing) groups. The literature on ethnic conflict often stresses that fractionalization and polarization have very different effects (e.g. see Esteban and Ray, 2011). We capture polarization with an index developed by Esteban and Ray (1994):

$$POL_i = k \sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i} \right)^{1+\alpha} \left(1 - \frac{n_{ij}}{N_i} \right) \tag{10}$$

where $\alpha = 1$ (as they show in an auxiliary theorem) and $k = 4$ to scale the index between zero and one. Again, we use a version computed by Desmet et al. (2012) and one we compute for the EPR data (denoted POL_0).

While the polarization index captures the extent of bimodality of a distribution[7], it is not a measure of asymmetries (such as the existence of one large and many small groups). To capture these, we propose another simple measure of ethno-linguistic asymmetries:

$$ELA_i = \frac{\sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i} \right)^2 - \frac{1}{N_i}}{1 - \frac{1}{N_i}} = \frac{N_i}{N_i - 1} \left[\sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i} \right)^2 - \frac{1}{N_i} \right], \quad \forall N_i > 1 \tag{11}$$

and $ELA_i = 1$ if $N_i = 1$. The ELA index is simply the (normalized) difference between fractionalization with equal shares and observed fractionalization; it's a normalized Herfindahl index. We only compute this index for the EPR data (denoted ELA_0). Desmet et al. (2012) do not use this measure. Recall that for any particular number of groups, the ELF measure attains its maximum at an equal allocation. The global maximum is reached when, in the limit, each person constitutes an ethnic group. Contrary to the polarization or fractionalization measure, the ELA index is zero when the groups are of

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[7]It attains its maximum at a symmetric bimodal distribution.

Table 2: Definitions of Variables

Symbol	Description	Source and Notes
	Dependent Variable	
$\tilde{t}$	Duration of decline segment	From Bluhm et al. (2014) computed using structural break model with a significance level of 10%. Underlying GDP per capita data is from the Penn World Table 7.0.
	Independent Variables	
$XCONST_0$	Constraints on the executive	From Polity IV data. Measures *de facto* independence of the executive. Scaled from 1 (no constraints) to 7 (fully constrained). Fixed at last year before slump.
ELF	Ethno-linguistic fractionalization	From Desmet et al. (2012), the original source is the Ethnologue data (15th edition). Cross-section.
ELF_0	Fractionalization of ethno-political groups	From Ethnic Power Relations data version 3.01 (Wimmer et al., 2009). Fixed at last year before slump.
POL	Ethno-linguistic polarization	From Desmet et al. (2012) using the Esteban and Ray (1994) measure with $\alpha = 1$ and $k = 4$. The original source is the Ethnologue data (15th edition). Cross-section.
POL_0	Ethno-political polarization	Computed using Ethnic Power Relations data version 3.01 (Wimmer et al., 2009) and Esteban and Ray (1994) measure with $\alpha = 1$ and $k = 4$. Fixed at last year before slump.
ELA_0	Asymmetries between ethno-political groups (relative to fractionalization at equal sizes).	Computed using Ethnic Power Relations data version 3.01 (Wimmer et al., 2009). Fixed at last year before slump.
$GROUPS_0$	Number of groups	———
$EGIPGRPS_0$	Number of included groups	———
$EXCLGRPS_0$	Number of excluded groups	———
$DOMPOP_0$	Dominant population (in %)	———
$MONPOP_0$	Monopoly population (in %)	———
	Control Variables	
GDP per capita	Log of initial real GDP per capita	From the Penn World Table 7.0. Fixed at last year before slump.
Regional dummies	Africa, Americas, Asia, Europe, and Oceania.	UN classification. Oceania is base.
Decade dummies	1950s, 1960s, 1970s, 1980s, 1990s, and 2000s.	Coded at beginning of slump. 2000s is base.

equal sizes and approaches unity as a single group becomes dominant. For the empirical analysis that follows, using the index of group asymmetries together with the number of groups allows us to analyze the effect of these two components of ethnic heterogeneity separately and investigate the more subtle aspects of the theoretical model.

Table 3: Summary Statistics of Independent Variables

VARIABLES	Obs	Mean	Std. Dev.	Min	Max
$XCONST_0$	57	3.42	2.47	1.00	7.00
ELF	58	45.39	33.71	0.07	95.98
ELF_0	57	36.00	25.71	0.00	80.39
POL	58	40.04	24.98	0.14	85.99
POL_0	57	19.35	16.42	0.00	56.95
ELA_0	57	48.75	33.40	0.10	100.00
$GROUPS_0$	57	4.19	6.43	0.00	47.00
$EGIPGRPS_0$	57	1.37	1.33	0.00	7.00
$EXCLGRPS_0$	57	2.33	6.17	0.00	46.00
$MONPOP_0$	57	0.21	0.36	0.00	0.97
$DOMPOP_0$	57	0.21	0.34	0.00	0.98
(Log) GDP per capita	58	8.53	1.21	5.87	10.63

We also obtain several additional variables from the EPR data. $GROUPS_0$ is the number of relevant (active) ethno-political groups. $EGIPGRPS_0$ is the number of included ethno-political groups at the last year before the slump; that is, groups with have some level access to executive power. $EXCLGRPS_0$ is the number of ethno-political groups without access to the political executive. Finally, $DOMPOP_0$ and $MONPOP_0$ are the population shares of the dominant or monopoly groups (the two highest levels of political power). All of these variables are fixed at the last year before the slump to rule out any feedback from the duration to the group composition. Table 2 describes all variables and lists the underlying data sources. Table 3 presents the associated summary statistics.

Empirical approach. Our approach is to examine partial correlations and test whether these are consistent with the proposed theory. While we cannot rule out all forms of endogeneity, we do take care to ensure temporal precedence. We employ standard event history techniques to study the duration of the decline phase.

To estimate the partial correlations, we run log-normal accelerated failure time (AFT) regressions of the form:

$$\ln \tilde{t} \equiv \ln(t - t_0) = \beta_0 + \beta_1 XCONST_0 + \beta_2 H + \beta_3 (XCONST_0 \times H) + \mathbf{x}_0' \boldsymbol{\xi} + \epsilon_t \qquad (12)$$

where $\tilde{t}$ is analysis time, t_0 is the last year before the slump, $XCONST_0$ is executive constraints, H is a measure of group (ethnic) heterogeneity, $\mathbf{x}_0$ is a vector of controls, and $\epsilon_t \sim \mathcal{N}(0, \sigma_\epsilon)$. Variables which could endogenously react to a prolonged duration of declines are kept fixed at t_0 to rule out any such feedback; if they have no time dimension, then we drop the subscript. All parameters are estimated using Maximum Likelihood and the standard errors are clustered on the country level to account for repeated spells.

Our main parameters of interest are β_1, β_2, and β_3. In several regressions, we impose $\beta_3 = 0$ to estimate first-order effects before examining a possible interaction effect. The

vector $\mathbf{x}_0$ may include additional heterogeneity measures, the (log of) initial GDP per capita before the slump, region effects and decade dummies.

Accelerated failure time models are so named due to their interpretation. A coefficient greater than zero implies that time passes more slowly, so that the exit of the decline phase is prolonged. A coefficient less than zero implies that time passes more quickly and hence that the recovery starts sooner. Alternatively, we may simply read the effects as elasticities (or semi-elasticities) of the expected duration with respect to the variables on the right hand side. While duration models have the main benefit of accounting for unfinished spells (ongoing declines), their interpretation is otherwise identical to log-linear OLS when they are cast in the AFT form.

Results. Table 4 presents the first set of results relating mainly to the empirical predictions derived from the baseline model. We compute two sets of estimates. One using the *Ethnologue* data which focuses on linguistic diversity and one based on the EPR data which incorporates only politically-relevant groups divided along the predominant social cleavage (ethnic, linguistic, racial, etc.).

Columns (1) to (3) use the *Ethnologue* data. Column (1) establishes that stronger constraints on the political executive shorten the expected duration of the decline phase and that greater linguistic heterogeneity has an adverse effect on the expected duration. The effects are statistically significant at the 1%-level and economically meaningful. A one point improvement in executive constraints (before the slump) leads to an approximate 18.7% reduction in the duration until the trough. Conversely, a one percentage point change towards greater linguistic heterogeneity prolongs the decline phase by about 1.7%. Column (2) allows for a conditional effect and strongly suggests that the effect of political institutions depends on the level of linguistic diversity (and *vice versa*). Whenever we introduce an interaction term, we first center the two constituent variables on their average. This shifts the coefficients of the two base levels into a meaningful range, but leaves the magnitude and statistical significance of the interaction term unaffected. Holding the other variable constant, the coefficient on either base variable now measures the effect of a one unit change away from the average. As a result, the interaction effect can be ignored; it has to be taken into account only when both variables change. The interaction between executive constraints and linguistic fractionalization is significant at the 5%-level and comparatively large. The specification predicts that at perfect homogeneity the median decline lasts about 2 years, while at perfect heterogeneity it lasts about 15 years. These estimates cover nearly all of the observed differences between declines in Western Europe and Sub-Saharan Africa. The results in columns (1) and (2) are consistent with our theoretical predictions; greater constraints on the executive shorten the expected duration unless the society is nearly homogeneous. The partial effect of executive constraints is not statistically different from zero for low ELF values. Column (3) adds the linguistic polarization measure to the specification in column (1). The literature on civil conflict stresses that polarization matters; e.g. Esteban and Ray (2011) show theoretically that conflict over public goods is driven by polarization and conflict over private goods by fractionalization. Contrary to this literature but in line with our model, we find no evidence in favor of the hypothesis that polarization is an issue for (the lack of) cooperation during declines, while the coefficient on fractionalization is robust to this perturbation. In other words, existence of two equally powerful groups does not predict longer declines than, say, three equally-sized linguistic groups.

Measures of linguistic diversity tend to describe Sub-Saharan Africa as more diverse in

Table 4: Baseline – Executive Constraints, Heterogeneity and Interactions

	Dependent Variable: $\ln \tilde{t}$					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ethnologue			*Ethnic Power Relations*		
$XCONST_0$	-0.187***	-0.291***	-0.171***	-0.187***	-0.262***	-0.170**
	(0.063)	(0.092)	(0.064)	(0.067)	(0.085)	(0.067)
ELF	0.017***	0.019***	0.023***			
	(0.004)	(0.004)	(0.006)			
$XCONST_0 \times ELF$		-0.004**				
		(0.002)				
POL			-0.011			
			(0.007)			
ELF_0				0.020***	0.023***	0.025***
				(0.007)	(0.007)	(0.007)
$XCONST_0 \times ELF_0$					-0.004*	
					(0.002)	
POL_0						0.012
						(0.009)
Control sets						
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Summary stats						
Exits	47	47	47	47	47	47
Spells	57	57	57	57	57	57
Years of Decline	346	346	346	346	346	346
Log-$\mathcal{L}$	-73.677	-71.621	-72.679	-76.294	-74.952	-75.597
Pseudo-R^2	0.149	0.173	0.161	0.119	0.134	0.127

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

comparison to other regions than alternative diversity measures. This begs the question if we are just estimating an "Africa effect". Columns (4) to (6) use the EPR data which addresses this issue by alternating the relevant cleavage by country (from racial over linguistic to religious). This changes the relative location of Sub-Saharan Africa, which is only the second most diverse region on this measure, after South Asia, contrary to being the most linguistically diverse region based on the *Ethnologue* data. The EPR data also only codes politically relevant groups, so that the level of heterogeneity – no matter the measure – is generally lower. Note that we compute the heterogeneity measures for all politically relevant groups, not just the included groups. Strikingly, the results are virtually unchanged. Column (4) shows that the first order effects of executive constraints are the same, and the effect of fractionalization is well within one standard error of the previous estimate. Moreover, the sign and size of the interaction effect in column (5) is nearly identical to the one in column (2). Only the statistical significance of the interaction effect is a bit lower (cluster robust t-stat = -1.71). Column (5) shows that we also find no evidence in favor of *ethno-political* polarization affecting

the duration of declines, just as with linguistic polarization. Contrasting these results to the *Ethnologue* data, it seems safe to conclude that we are not only explaining that declines in Sub-Saharan Africa last longer than elsewhere because the subcontinent is the most linguistically diverse, but that this holds try when we account for political relevance and the prevalence of different divisions in different parts of the world.

Overall, Table 4 provides significant evidence that there is a robust partial correlation of the duration of the decline phase with executive constraints on the one hand and with ethnic diversity on the other hand. In addition, the effect of weak constraints on the executive seems to be conditional on the degree of (ethno-political) fractionalization.

In Table 5 we "unpack" these statements further and examine what type of group configurations give rise to the cooperation problem we are analyzing. These results relate mainly to the empirical content of the model extensions. We now only use the EPR data, as it provides the necessary detail on the number of groups, their power status and more. Column (1) presents a result that may appear puzzling at first sight. If we measure heterogeneity simply by the number of ethno-political groups, then we find no evidence of an effect on the duration of declines. However, this coefficient amalgamates two effects. The EPR data distinguishes between *included* groups, which have access to executive power, and *excluded* groups, which lack power at the state level or are (at worst) discriminated against. In the model presented earlier, only the former are relevant players and thus we also expect that only the former category is empirically relevant. Column (2) confirms this expectation. The effect of included groups is statistically significant at the 1%-level and economically very large: an additional group increases the duration of the decline phase by about 53%. On the contrary, the effect of excluded groups is estimated to be near zero and has a comparatively tight 99% confidence interval centered near zero. In line with the theory, these results suggest that only ethnic groups with some degree of access to political power matter for the duration of declines.

We have not yet isolated whether this adverse effect of heterogeneity is due to several equally powerful groups co-existing in the society or due to particular asymmetries in political power. Columns (3) to (6) represent different attempts towards empirically answering this question. In Comment 4, we translated the theoretical results regarding political concentration from Proposition 3 and the number of groups from Proposition 4 into the concepts of monopoly groups and dominant groups. Column (3) is the empirical counterpart. Here we relate the share of population represented by a group that either monopolizes or dominates the political executive to the duration of the decline phase. The results are unambiguous. Both variables are associated with substantially shorter declines. Columns (4) and (5) try to explicitly tackle the issue of the number of groups versus group asymmetries. In column (4), we include the number of ethno-politically relevant group together with the index of ethno-political fractionalization. This leads to an interesting *ceteris paribus* condition. Increasing the degree of fractionalization by one percentage point while holding constant the number of groups necessarily implies that political concentration is decreasing; that is, the groups are becoming more alike. Once again, recall that for any given number of groups, fractionalization is maximized at equal shares. The estimates thus suggest that less political concentration leads to longer declines. Column (5) again distinguishes between included and excluded groups to illustrate that only the former are relevant. The coefficient on the ELF_0 measure loses significance, suggesting that the number of included groups may drive the effect of ethnic heterogeneity and that group imbalances hardly matter. However, column (6) addresses this issue more directly by using our index of ethnic asymmetries and

Table 5: Extensions – Number of Groups, Political Relevance, and Asymmetries

| VARIABLES | Dependent Variable: $\ln \tilde{t}$ | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
$XCONST_0$	-0.225***	-0.241***	-0.215***	-0.179***	-0.210***	-0.196***
	(0.070)	(0.063)	(0.065)	(0.066)	(0.070)	(0.066)
$GROUPS_0$	-0.008			-0.031**		
	(0.018)			(0.014)		
$EGIPGRPS_0$		0.426***			0.290**	0.285**
		(0.095)			(0.124)	(0.113)
$EXCLGRPS_0$		-0.012			-0.021*	-0.013
		(0.013)			(0.012)	(0.012)
$DOMPOP_0$			-0.007*			
			(0.004)			
$MONPOP_0$			-0.011**			
			(0.005)			
ELF_0				0.022***	0.013	
				(0.007)	(0.009)	
ELA_0						-0.012**
						(0.005)
Control sets						
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Summary stats						
Exits	47	47	47	47	47	47
Spells	57	57	57	57	57	57
Years of Decline	346	346	346	346	346	334
Log-$\mathcal{L}$	-81.069	-75.062	-77.647	-75.457	-73.253	-71.791
Pseudo-R^2	0.064	0.133	0.103	0.129	0.154	0.171

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

provides the same answer as column (4). Now the effect is easy to interpret, negative and significant at the 5% level. A one percentage point move towards greater asymmetries (political concentration) shortens the duration by about 1.3%. Note that the effect of executive constraints remains robust throughout, fluctuating around a 20% reduction in the duration of declines for a one point improvement.

To summarize, Table 5 adds several valuable insights about the effect of ethnic diversity on the duration of declines. Fractionalization of linguistic or ethno-political groups masks two effects: 1) the expected duration is increasing in the number of politically relevant groups, and 2) the expected duration is decreasing in greater group asymmetries (political concentration). Both theory and evidence suggest that this is not an issue of polarization, but rather an issue of adding a smaller, potentially irrelevant, group to any multi-modal distribution of power as opposed to adding another powerful group (an additional mode).

Table 6 selects three key specifications, for each data source, and then subjects them to two robustness checks. First, we return to the issue of whether we are estimating an

VARIABLES	Dependent Variable: $\ln \tilde{t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$XCONST_0$	-0.245***	-0.216***	-0.211***	-0.171**	-0.181***	-0.145**
	(0.079)	(0.065)	(0.077)	(0.068)	(0.066)	(0.064)
ELF	0.020***	0.021***				
	(0.004)	(0.003)				
$XCONST_0 \times ELF$	-0.003**	-0.004***				
	(0.001)	(0.001)				
ELF_0			0.017**	0.015**		
			(0.007)	(0.006)		
$XCONST_0 \times ELF_0$			-0.003	-0.003*		
			(0.002)	(0.002)		
$EGIPGRPS_0$					0.298***	0.212*
					(0.097)	(0.119)
$EXCLGRPS_0$					0.024*	0.009
					(0.013)	(0.026)
Control sets						
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Decade dummies	No	Yes	No	Yes	No	Yes
Summary stats						
Exits	47	47	47	47	47	47
Spells	57	57	57	57	57	57
Years of Decline	346	346	346	346	346	346
Log-$\mathcal{L}$	-62.777	-55.812	-67.966	-64.108	-68.705	-66.701
Pseudo-R^2	0.275	0.355	0.215	0.260	0.207	0.230

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

"Africa effect" by including region dummies in each specification. Second, we control for temporal heterogeneity by including a dummy for the decade in which the slump began in every other specification, since the 1970s, 1980s and 1990s exhibit significantly higher volatility than the other decades.

The Africa dummy is significant in all specifications, capturing that declines take substantially longer on the African continent. Nevertheless, we still find comparable effects. Column (1) uses the *Ethnologue* data and shows that our two variables of interest are robustly correlated with within region differences in the duration of declines. Column (2) adds that this is still the case when we also control for temporal heterogeneity. Using the *EPR* data, columns (4) and (5) verify that the same holds for ethno-political fragmentation. The standard error of the interaction term becomes somewhat wider, leading to a loss of significance, but the estimated coefficient is extremely stable. The last two columns show that this also hold for the effect of the number of included groups. In general, there is significant evidence of regional heterogeneity (a χ^2-test always rejects the null of no heterogeneity at the 5%-level), but there is somewhat less evidence of temporal

heterogeneity (on top of duration dependence).[8] Throughout Table 6 the coefficient of political institutions and the coefficients of the various measures of ethnic heterogeneity remain statistically significant at conventional levels and well within their usual range.

We report further robustness checks in the appendix. Table A-1 uses a more lenient threshold for the identification of slumps (a significance level of 0.2). Our main results hold in this larger set of episodes. Table A-2 exchanges the fractionalization data with data on ethnic, linguistic and religious heterogeneity from Alesina et al. (2003), data on ethnic and cultural distance from Fearon (2003), and the original *Atlas Narodov Mira* data. For all but religious fractionalization, we find very similar interaction effects. Table A-3 switches the Polity IV data with the political constraints data from Henisz (2000). Here too, the main results remain intact for the alternate measures of executive constraints. Finally, Table A-4 shows that the results do not depend on the specific functional form of the survival process.

These last sets of empirical findings reveal the following: first, ethnic heterogeneity and constraints on the political executive are robust determinants of the length of the decline phase during major economic slumps. Second, this result is not due to regional differences in ethnic heterogeneity but holds when we only use within region variation. Third, the results are robust to a variety of perturbations in the dependent and independent variables. Taken as a whole, we believe that our empirical approach operationalizes the key parameters of the model and demonstrates that there is robust evidence consistent with the theory outlined here.

6   Concluding remarks

This paper presents a political economy theory of declines, highlighting a commitment problem between winners and losers of the recovery process after a crisis, and then analyzes empirical implications of this theory. We show that ethno-political heterogeneity coupled with weak constraints on the political executive can bring about delayed cooperation during the decline phase of a slump and hence explain why we observe such long declines in some countries and relatively short declines in others.

Both the theory and the empirical analysis suggest that ethnic heterogeneity is indeed harmful for getting groups to agree on a response to a crisis when political institutions are weak. More subtle predictions show that this is mostly an issue of having many powerful groups in the society and does not apply to the same degree when there is a politically dominant group. The overarching policy implication here is not that ethnic diversity is necessarily a problem, but that political institutions can be designed to contain the adversarial element of ethnic heterogeneity in particular and political heterogeneity in general. While not restricted to understanding declines in Sub-Saharan Africa, we would like to once again emphasize that we believe these insights are particularly important for understanding the political economy of declines on the subcontinent. Sub-Saharan Africa is home to the longest and deepest declines, politics shaped by ethnicity, and weak institutions governing executive power. While we still need to better understand why ethnic diversity tends to coincide with weak political institutions and how one shapes the other, we find that there is ample room for managing this heterogeneity better so that welfare gains are not lost in the next crisis.

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[8]A χ^2-test rejects the null of no temporal heterogeneity at the 1%-level in column (1), at the 5%-level but not the 1%-level in column (4), and fails to reject the null at conventional levels in column (6).

This line of research is far from complete. Fruitful avenues for future research would be to extend these models further by integrating a richer description of the executive decision-making process, altering the decision rules, treating the quality of political institutions as endogenous to the decline, or modeling details of the policy response. On the empirical side, richer data on cabinet allocations, ethnicity and executive power would help to trace out the proposed mechanism more carefully.

References

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

Aghion, P., A. Alesina, and F. Trebbi (2004). Endogenous political institutions. *Quarterly Journal of Economics 119*(2), 565–611.

Ahlerup, P. and O. Olsson (2012). The roots of ethnic diversity. *Journal of Economic Growth 17*(2), 71–102.

Alesina, A., R. Baqir, and W. Easterly (1999). Public goods and ethnic divisions. *Quarterly Journal of Economics 114*(4), 1243–1284.

Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat, and R. Wacziarg (2003). Fractionalization. *Journal of Economic Growth 8*(2), 155–194.

Alesina, A. and A. Drazen (1991). Why are stabilizations delayed? *American Economic Review 81*(5), 1170–1188.

Alesina, A. and E. L. Ferrara (2005). Ethnic diversity and economic performance. *Journal of Economic Literature 43*(3), 762–800.

Alesina, A., C. Gennaioli, and S. Lovo (2014, September). Public goods and ethnic diversity: Evidence from deforestation in Indonesia. Working Paper 20504, National Bureau of Economic Research.

Alesina, A. F., S. Michalopoulos, and E. Papaioannou (2012, November). Ethnic inequality. Working Paper 18512, National Bureau of Economic Research.

Ashraf, Q. and O. Galor (2013). The "Out of Africa" hypothesis, human genetic diversity, and comparative economic development. *American Economic Review 103*(1), 1–46.

Bates, R. H. (2000). Ethnicity and development in Africa: A reappraisal. *American Economic Review 90*(2), 131–134.

Berg, A., J. D. Ostry, and J. Zettelmeyer (2012). What makes growth sustained? *Journal of Development Economics 98*(2), 149–166.

Besley, T. and T. Persson (2011a). Fragile states and development policy. *Journal of the European Economic Association 9*(3), 371–398.

Besley, T. and T. Persson (2011b). The logic of political violence. *Quarterly Journal of Economics 126*(3), 1411–1445.

Bluhm, R., D. de Crombrugghe, and A. Szirmai (2014). Do weak institutions prolong crises? On the identification, characteristics, and duration of declines during economic slumps. CESifo Working Paper Series 4594, CESifo Group Munich.

Bueno de Mesquita, B., A. Smith, and R. M. Siverson (2005). *The logic of political survival*. MIT press.

Caselli, F. and W. J. Coleman (2013). On the theory of ethnic conflict. *Journal of the European Economic Association 11*, 161–192.

Cederman, L.-E., A. Wimmer, and B. Min (2010). Why do ethnic groups rebel? New data and analysis. *World Politics 62*(1), 87–119.

Cerra, V. and S. C. Saxena (2008). Growth dynamics: The myth of economic recovery. *American Economic Review 98*(1), 439–57.

Collier, P. (2000). Ethnicity, politics and economic performance. *Economics & Politics 12*(3), 225–245.

Cox, G. W. and M. D. McCubbins (1997). Political structure and economic policy: The institutional determinants of policy outcomes. In S. Haggard and M. D. McCubbins (Eds.), *Presidents, Parliaments, and Policy*, pp. 21–63. Cambridge University Press.

Desmet, K., I. Ortuño-Ortín, and R. Wacziarg (2012). The political economy of linguistic cleavages. *Journal of Development Economics 97*(2), 322–338.

Drazen, A. and V. Grilli (1993). The benefit of crises for economic reforms. *American Economic Review 83*(3), 598–607.

Easterly, W. (2001). Can institutions resolve ethnic conflict? *Economic Development and Cultural Change 49*(4), 687–706.

Easterly, W., M. Kremer, L. Pritchett, and L. Summers (1993). Good policy or good luck? *Journal of Monetary Economics 32*(3), 459–483.

Easterly, W. and R. Levine (1997). Africa's growth tragedy: Policies and ethnic divisions. *Quarterly Journal of Economics 112*(4), 1203–1250.

Eifert, B., E. Miguel, and D. N. Posner (2010). Political competition and ethnic identification in Africa. *American Journal of Political Science 54*(2), 494–510.

Esteban, J., L. Mayoral, and D. Ray (2012). Ethnicity and conflict: An empirical study. *American Economic Review 102*(4), 1310–1342.

Esteban, J. and D. Ray (2011). Linking conflict to inequality and polarization. *American Economic Review 101*(4), 1345–1374.

Esteban, J.-M. and D. Ray (1994). On the measurement of polarization. *Econometrica 62*(4), 819–851.

Fearon, J. (2003). Ethnic and cultural diversity by country. *Journal of Economic Growth 8*(2), 195–222.

Fearon, J. D. and D. D. Laitin (2003). Ethnicity, insurgency, and civil war. *American Political Science Review 97*, 75–90.

Fernandez, R. and D. Rodrik (1991). Resistance to reform: Status quo bias in the presence of individual-specific uncertainty. *American Economic Review 81*(5), 1146–1155.

Francois, P., I. Rainer, and F. Trebbi (2012, September). How is power shared in Africa? Working Paper 18425, National Bureau of Economic Research.

Gehlbach, S. and E. J. Malesky (2010). The contribution of veto players to economic reform. *The Journal of Politics 72*(4), 957–975.

Haggard, S. (2000). *The political economy of the Asian financial crisis*. Peterson Institute for International Economics.

Hausmann, R., L. Pritchett, and D. Rodrik (2005). Growth accelerations. *Journal of Economic Growth 10*(4), 303–329.

Henisz, W. J. (2000). The institutional environment for economic growth. *Economics & Politics 12*(1), 1–31.

Hicken, A., S. Satyanath, and E. Sergenti (2005). Political institutions and economic performance: The effects of accountability and obstacles to policy change. *American Journal of Political Science 49*(4), 897–907.

Labán, R. and F. Sturzenegger (1994a). Distributional conflict, financial adaptation and delayed stabilizations. *Economics & Politics 6*(3), 257–276.

Labán, R. and F. Sturzenegger (1994b). Fiscal conservatism as a response to the debt crisis. *Journal of Development Economics 45*(2), 305 – 324.

Michalopoulos, S. (2012). The origins of ethnolinguistic diversity. *American Economic Review 102*(4), 1508–39.

Miguel, E. and M. K. Gugerty (2005). Ethnic diversity, social sanctions, and public goods in Kenya. *Journal of Public Economics 89*(11–12), 2325–2368.

Posner, D. N. (2004). Measuring ethnic fractionalization in Africa. *American Journal of Political Science 48*(4), 849–863.

Rainer, I. and F. Trebbi (2012, September). New tools for the analysis of political power in Africa. Working Paper 18424, National Bureau of Economic Research.

Rodrik, D. (1999). Where did all the growth go? External shocks, social conflict, and growth collapses. *Journal of Economic Growth 4*(4), 385–412.

Spolaore, E. (2004). Adjustments in different government systems. *Economics & Politics 16*(2), 117–146.

Tsebelis, G. (1995). Decision making in political systems: Veto players in presidentialism, parliamentarism, multicameralism and multipartyism. *British Journal of Political Science 25*(03), 289–325.

Tsebelis, G. (2002). *Veto players: How political institutions work*. Princeton University Press.

Wimmer, A., L.-E. Cederman, and B. Min (2009). Ethnic politics and armed conflict: A configurational analysis of a new global data set. *American Sociological Review 74*(2), 316–337.

Appendix

Proof of Proposition 1. The utility from cooperation in the first period when the other group cooperates is

$$v_j^1(C, c) = \frac{1}{1 - \delta} \left\{ (1 - 2c)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + c(g(0) + g(1)) \right\} \tag{A-1}$$

and the utility from choosing to delay cooperation one period when the other group cooperates is

$$v_j^1(D, c) = g((1 - \Delta)y_j) + \frac{\delta}{1 - \delta} \left\{ (1 - 2p^2)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^2(g(0) + g(1)) \right\} \tag{A-2}$$

where $p^2 = c - x$; that is, half the probability of landing outside the safe zone in the second period.

The proof is by contradiction. We conjecture an equilibrium with immediate recovery, such that $v_j^1(C, c) \geq v_j^1(D, c)$. Using $p^2 = c - x$ and rearranging terms, we get

$$g((1 - \Delta)y_j) \leq$$
$$\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - \left[c + \frac{\delta}{1 - \delta}x \right] \left\{ 2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - g(0) - g(1) \right\}. \tag{A-3}$$

Note that concavity implies that $\{2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - g(0) - g(1)\} > 0$. Inequality (A-3) is contradicted whenever c, x or δ are large enough in relation to Δ, depending on the shape of the utility function $g(y_j)$ and its range, which completes the proof. ∎

Proof of Proposition 2. First of all, it is useful to demonstrate that the difference in utility between recovery at any time period (t) and recovery at the subsequent period $(t + 1)$ decreases over time. For all $s > t$, we need to check whether

$$v_j^{t+1}(C, c) - v_j^t(C, c) > v_j^{s+1}(C, c) - v_j^s(C, c). \tag{A-4}$$

Note that $v_j^{t+1}(C, c) = v_j^t(D, c)$.

Substituting the utilities and rearranging the inequality, we get

$$g((1 - \Delta)y_j) - (1 - 2p^t)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - p^t(g(0) + g(1)) +$$
$$\frac{\delta}{1 - \delta} \left\{ 2(p^t - p^{t+1})\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (p^{t+1} - p^t)(g(0) + g(1)) \right\} >$$
$$g((1 - \Delta)y_j) - (1 - 2p^s)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - p^s(g(0) + g(1)) +$$
$$\frac{\delta}{1 - \delta} \left\{ 2(p^s - p^{s+1})\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (p^{s+1} - p^s)(g(0) + g(1)) \right\}. \tag{A-5}$$

Recall that $p^t = c - (t - 1)x$ implies $p^{t+1} - p^t = -x$, so the second and third terms cancel and the inequality reduces to

$$(1 - 2p^t)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^t(g(0) + g(1)) <$$
$$(1 - 2p^s)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^s(g(0) + g(1)). \tag{A-6}$$

Substituting $p^t = c - (t - 1)x$ again, it is straightforward to show that this inequality is

always satisfied when $s > t$.

Having established this, setting the utility of choosing to cooperate in period t equal to the utility of recovering in period $t + 1$ results in an equation that will deliver a potentially non-integer t, such that the smallest higher integer ($\lceil t \rceil$) is the equilibrium time to recovery:

$$\frac{1}{1-\delta}\left\{(1 - 2p^t)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^t(g(0) + g(1))\right\} = g((1 - \Delta)y_j) +$$
$$\frac{\delta}{1-\delta}\left\{(1 - 2p^{t+1})\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + p^{t+1}(g(0) + g(1))\right\}. \tag{A-7}$$

Inserting the linear process on $p^t = c - (t - 1)x$ yields

$$\frac{1}{1-\delta}\left\{(1 - 2(c - (t - 1)x))\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (c - (t - 1)x)(g(0) + g(1))\right\} =$$
$$g((1 - \Delta)y_j) + \frac{\delta}{1-\delta}\left\{(1 - 2(c - tx))\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (c - tx)(g(0) + g(1))\right\}. \tag{A-8}$$

Isolating the first term of the geometric series gives

$$\left\{(1 - 2(c - (t - 1)x))\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (c - (t - 1)x)(g(0) + g(1))\right\} +$$
$$\frac{\delta}{1-\delta}\left\{(1 - 2(c - (t - 1)x))\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (c - (t - 1)x)(g(0) + g(1))\right\} = \tag{A-9}$$
$$g((1 - \Delta)y_j) + \frac{\delta}{1-\delta}\left\{(1 - 2(c - tx))\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + (c - tx)(g(0) + g(1))\right\}$$

and after canceling the common terms, we have

$$(1 - 2c)\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] + c(g(0) + g(1)) +$$
$$tx\{2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - (g(0) + g(1))\}$$
$$= g((1 - \Delta)y_j) + \frac{1}{1-\delta}x\{2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - (g(0) + g(1))\}. \tag{A-10}$$

Solving for t^* and simplifying gives

$$t^* = \frac{g((1 - \Delta)y_j) - \mathbb{E}[g(w_j)|w_j \in \mathcal{A}]}{x\{2\mathbb{E}[g(w_j)|w_j \in \mathcal{A}] - (g(0) + g(1))\}} + \frac{c}{x} + \frac{1}{1-\delta}. \tag{A-11}$$

The proposition follows directly from comparative statics w.r.t. to c

$$\frac{\partial t^*}{\partial c} = \frac{1}{x} > 0 \tag{A-12}$$

that is, stronger executive constraints (smaller c) shorten the time to cooperation. This completes the proof for the interior case. Note that it can also be the case that recovery happens at the point when all uncertainty is resolved, i.e. the point where the probability of being outside the safe zone is zero and no longer changes. If this is the case it is straightforward to see that the time to recovery is shorter with stronger constraints on the executive. This follows directly from the fact, that the time it takes until all uncertainty is resolved is shorter with smaller c. ∎

Proof of Proposition 3. Recall that for the asymmetric case only one group risks falling outside the political safe zone. Hence, for there to exist an equilibrium with recovery in the first period, the following condition needs to be true

$$\frac{1}{1-\delta}\left\{(1-p_1(y_j))y_j + p_1(y_j)z\right\} \geq (1-\Delta)y_j + \frac{\delta}{1-\delta}y_j \tag{A-13}$$

which simplifies to

$$\Delta y_j + \frac{1}{1-\delta}\left\{p_1(y_j)(z-y_j)\right\} \geq 0. \tag{A-14}$$

An decrease in concentration (asymmetry) makes delay more likely if the left hand side of the inequality is a decreasing function of y_j. This is true when the derivative of the left hand side is negative:

$$\Delta + \frac{1}{1-\delta}\left\{\frac{dp_1(y_j)}{dy_j}(z-y_j) - p_1(y_j)\right\} < 0 \tag{A-15}$$

which completes the proof. ∎

Proof of Proposition 4. Remember that there always exists an equilibrium with recovery in period two in the sub-game that starts in period two after delay in period one. If all of the other groups decide to cooperate in period 1, it is optimal for the remaining group to cooperate if the following condition holds

$$\frac{1}{1-\delta}\left\{(1-Jp_1(y_j))\frac{1}{J} + (J-1)p_1(y_j)\left(\frac{1}{J} + \frac{1}{(J-1)J}\right) + p_1(y_j)z\right\} \geq$$
$$(1-\Delta)\frac{1}{J} + \frac{\delta}{1-\delta}\frac{1}{J}. \tag{A-16}$$

The second term inside the curly braces simplifies to $p_t(y_j)$, so that inequality (A-16) becomes

$$\frac{1}{1-\delta}\left\{(1-Jp_1(y_j))\frac{1}{J} + p_1(y_j) + p_1(y_j)z\right\} \geq (1-\Delta)\frac{1}{J} + \frac{\delta}{1-\delta}\frac{1}{J} \tag{A-17}$$

or

$$\frac{1}{1-\delta}\left\{\frac{1}{J} + p_1(y_j)z\right\} \geq (1-\Delta)\frac{1}{J} + \frac{\delta}{1-\delta}\frac{1}{J} \tag{A-18}$$

and, after some algebraic manipulation, this simplifies to

$$\frac{\Delta}{J} + \frac{1}{1-\delta}p_1(y_j)z \geq 0. \tag{A-19}$$

Note that $p_1(y_j)$ is increasing in J, as symmetry implies $y_j = 1/J$, and $z < 0$ by definition. As a result, the inequality becomes harder to satisfy if the number of groups increases, which completes the proof. ∎

Table A-1: Robustness – Sample of Slumps

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent Variable: $\ln \tilde{t}$			
		Ethnologue			*Ethnic Power Relations*	
$XCONST_0$	-0.195***	-0.245***	-0.187***	-0.180***	-0.220***	-0.173***
	(0.050)	(0.054)	(0.051)	(0.054)	(0.051)	(0.053)
ELF	0.013***	0.014***	0.017***			
	(0.004)	(0.003)	(0.004)			
$XCONST_0 \times ELF$		-0.003**				
		(0.001)				
POL			-0.007			
			(0.006)			
ELF_0				0.013**	0.014***	0.015***
				(0.005)	(0.005)	(0.005)
$XCONST_0 \times ELF_0$					-0.003**	
					(0.001)	
POL_0						0.008
						(0.008)
			Control sets			
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
			Summary stats			
Exits	71	71	71	69	69	69
Spells	83	83	83	81	81	81
Years of Decline	468	468	468	464	464	464
Log-$\mathcal{L}$	-114.133	-111.929	-113.498	-114.993	-113.526	-114.556
Pseudo-R^2	0.093	0.110	0.098	0.068	0.080	0.072

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

Table A-2: Robustness – Measures of Fractionalization

VARIABLES	Dependent Variable: $\ln \tilde{t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
	Alesina et al.			Fearon		Atlas
$XCONST_0$	-0.230***	-0.293***	-0.184**	-0.239***	-0.243***	-0.284***
	(0.069)	(0.082)	(0.073)	(0.073)	(0.053)	(0.073)
Ethnic (H^A)	0.020***					
	(0.006)					
$XCONST_0 \times H^A$	-0.004**					
	(0.002)					
Linguistic (H^B)		0.021***				
		(0.006)				
$XCONST_0 \times H^B$		-0.004***				
		(0.002)				
Religious (H^C)			0.005			
			(0.008)			
$XCONST_0 \times H^C$			-0.004*			
			(0.002)			
Ethnic (H^D)				0.019***		
				(0.006)		
$XCONST_0 \times H^D$				-0.005***		
				(0.002)		
Cultural (H^E)					0.028***	
					(0.005)	
$XCONST_0 \times H^E$					-0.008***	
					(0.002)	
Ethnic (H^F)						0.020***
						(0.005)
$XCONST_0 \times H^F$						-0.005***
						(0.002)
Control sets						
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Decade dummies	Yes	Yes	Yes	Yes	Yes	Yes
Summary stats						
Exits	48	45	48	48	48	45
Spells	58	55	58	58	58	55
Years of Decline	348	337	348	348	348	333
Log-$\mathcal{L}$	-63.681	-55.225	-67.932	-63.073	-58.602	-58.670
Pseudo-R^2	0.275	0.341	0.227	0.282	0.333	0.298

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

Table A-3: Robustness – Measures of Political Contraints

VARIABLES	(1) $\ln \tilde{t}$	(2) $\ln \tilde{t}$	(3) $\ln \tilde{t}$	(4) $\ln \tilde{t}$	(5) $\ln \tilde{t}$	(6) $\ln \tilde{t}$
	Henisz Political Constraints Data					
ELF	0.017***	0.020***	0.021***	0.021***	0.022***	0.022***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
POLCON III	-1.317**	-2.130***				
	(0.568)	(0.631)				
POLCON III × ELF		-0.041***				
		(0.016)				
POLCON V			-0.901**	-1.092**		
			(0.399)	(0.477)		
POLCON V × ELF				-0.009		
				(0.010)		
POLCON V J					-1.076	-2.289**
					(0.730)	(1.019)
POLCON V J × ELF						-0.027*
						(0.016)
	Control sets					
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Decade dummies	Yes	Yes	Yes	Yes	Yes	Yes
	Summary stats					
Exits	47	47	39	39	34	34
Spells	57	57	49	49	44	44
Years of Decline	347	347	335	335	325	325
Log-$\mathcal{L}$	-62.983	-60.722	-50.894	-50.602	-45.363	-44.934
Pseudo-R^2	0.269	0.295	0.304	0.308	0.305	0.311

Note(s): Executive constraints are now measured using the data from Henisz (2000). *POLCONIII* is derived from a structural veto-player model. *POLCONV* adds two additional veto points for the judiciary and sub-federal entities. *POLCONVJ* includes measures of alignment and fractionalization of the High Court. Only *POLCONIII* is still remotely related to the parameter *c* in our model. However, these measures always include legislative fractionalization, while we are concerned with ethnic fractionalizaton of the executive. The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** p<0.01, ** p<0.05, * p<0.1.

Table A-4: Robustness – Functional Form

VARIABLES	(1) $\ln \tilde{t}$	(2) $\ln \tilde{t}$	(3) $\ln \tilde{t}$	(4) $\ln \tilde{t}$	(5) $\ln \tilde{t}$	(6) $\ln \tilde{t}$
	Coefficients ($\mathbb{H}_0 = 0$)		*Hazard Ratios* ($\mathbb{H}_0 = 1$)			
	Log-logistic		*Weibull*		*Cox*	
$XCONST_0$	-0.270***	-0.253***	1.455***	1.547***	1.323***	1.352***
	(0.084)	(0.075)	(0.126)	(0.147)	(0.099)	(0.097)
ELF	0.020***	0.020***	0.968***	0.963***	0.976***	0.974***
	(0.004)	(0.004)	(0.008)	(0.009)	(0.006)	(0.006)
$XCONST_0 \times ELF$	-0.004**	-0.004***	1.004*	1.008***	1.004**	1.005***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
	Control sets					
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Decade dummies	No	Yes	No	Yes	No	Yes
	Summary stats					
Exits	48	48	48	48	48	48
Spells	58	58	58	58	58	58
Years of Decline	348	348	348	348	348	348
Log-$\mathcal{L}$	-64.578	-59.569	-66.091	-59.615	-148.403	-145.124
Pseudo-R^2	0.274	0.330	0.306	0.374	0.103	0.123

Note(s): The standard errors are clustered on the country level to account for repeated spells. All specifications include a constant (not shown). *** $p<0.01$, ** $p<0.05$, * $p<0.1$.