On the Role of Democracy in the Ethnicity–Growth Relationship: Theory and Evidence[1]

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ABSTRACT

We study the relationship between ethnic diversity and economic performance and, in particular, focus on economic growth under democracy and dictatorship. We build a theory which emphasizes the public spending channel, and show that the relationship between public spending and ethnic diversity is qualitatively different under the two regimes. Our model also delivers that if the dictator is sufficiently corrupt, then growth is bound to be higher under a democracy irrespective of the degree of ethnicity. We then consider a panel of the most and least ethnically diverse nations and address potential endogeneity problems. Our empirical results robustly show that democracy has a significantly positive effect on growth, irrespective of the degree of ethnicity. We also show that the marginal effect of ethnicity on growth in the presence of democracy is always positive, irrespective of the type of estimator used. Finally, we establish that the negative marginal impact of increases in ethnicity can always be overcome by democracy.

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1 Introduction

We study the relationship between ethnic diversity and economic performance under different institutional frameworks. In particular, we are interested in the effect ethnic diversity has on economic growth, and our key question is the following: Is this relationship affected by the nature of the political regime in place? We first develop a theoretical model which addresses this question by considering two alternative political regimes - democracy and dictatorship.[3] We then assess the issue empirically by studying the effects of democracy on growth for samples of countries with varying degrees of ethnicity. Irrespective of the political regime, it is widely accepted that one of the main purposes of government spending is to finance public goods. Public goods have an important role to play in the economy, particularly in boosting output and economic growth, as is demonstrated by the glut of literature on endogenous growth.[4] Political parties within a democracy would understandably be interested in spending on such goods, as their terms in office would depend quite importantly on the amount of output being produced in the economy. For dictators, who are not elected through popular mandate, there is an alternative incentive to maximise the output produced in the economy - they would typically embezzle a portion for themselves, while also ensuring that they minimise the chances of a popular uprising. In this paper, we argue that ethnic diversity makes an impact on the spending on public goods and this impact varies significantly by political regime; this difference in public goods provision translates into difference in economic performance.

There exist two important strands of literature on this broad topic (we refer the reader to the section on related literature for a detailed treatment). The first deals with the issue of the role of ethnic diversity on the economic performance of a country, notably its growth rate. The second strand deals with how democracy – viewed as an institutional setting – affects economic performance. We provide a comprehensive framework to analyse the questions addressed in these two related and yet distinct bodies of work.

As a starting point, we first develop a theoretical model where there is a dominant ethnic group and an amalgamation of many other (minority) groups. Two public goods are produced in this society, both of which contribute to output – one, a 'general' public good (denoted by G) which benefits everyone irrespective of their ethnic background, while the other, an 'ethnic' public good (denoted by E), benefits only the dominant ethnic group. We assume that spending the entire available budget on the G-good creates greater output than doing so on the E-good. We first study a democratic setup with two parties which compete for the citizens' votes by each promising budgetary allocations on the two public goods. Here we show that the relationship between ethnic diversity and the share of the pure public good G (or alternatively, the ethnic-specific public good E) provided in equilibrium is (weakly) monotonic in ethnic diversity. Below (above) a certain level

[3]There is a significant literature which studies regime changes, and it is true that the economic climate in a country could affect the transition from a non-democracy to a democracy, and vice versa. However, we abstract from those considerations and simply focus on the effect of ethnic diversity on growth under different political structures.

[4]See, for instance, Barro (1990), Futagami et al. (1993), Turnovsky (1997), Ghosh and Roy (2004), etc.

of ethnic diversity, the entire budget is spent on the G-good (E-good) by either political party. This is intuitive, as in the absence of a "large" dominant group, political parties will strive to compete for votes from all sections of the population (and hence invest in the G-good), while in the presence of such a group, the parties would spend much of their energies in catering to that group (thereby investing in the E-good).

In the case of a dictatorial regime, there is no explicit role for political parties. Note, a dictatorship can also raise output via public goods, because a dictator has an interest in maximising a nation's output; however, the primary objective for this is to maximise his own gain (via apportionment of a portion of the national output). Also, there is the possibility of being ousted from power through a revolt. In this eventuality, there is a return to the (familiar) two-party democratic regime. Here we show that the higher is ethnic diversity, the less (more) the dictator invests in the G-good (E-good), and the lower is the diversity, the more (less) the dictator invests in the G-good (E-good). The intuition for this result is the following: with high diversity, the minority group has an incentive to rebel since they know that they will get to enjoy the G-good in case the dictator is ousted and elections take place; in order to prevent the dominant group from joining the rebellion, more of the E-good has to be offered to that group by the dictator. Conversely, with low ethnic diversity, the dominant group has an incentive to rebel since under democracy the entire budget will be spent on the E-good; in order to prevent the minority group from joining forces with the majority, more of the G-good has to be offered by the dictator. Thus, the pattern of expenditure on public goods – in particular, the manner it varies with the level of ethnic diversity – is completely different in a democracy as opposed to a dictatorship.

Interestingly, the relationship between economic performance – as measured by greater output – and ethnic diversity in this context is qualitatively similar under the two regimes: growth is harmed by greater ethnic diversity, which conforms to most findings in the existing literature. We also show that if the dictator is sufficiently corrupt, growth is bound to be higher under a democracy regardless of the degree of ethnic diversity in society.

We next proceed to empirically assess the predictions offered by our model. First, we look at the impact of democracy on growth for highly ethnically fractionalised as well as less fractionalised countries for the 1960-2009 period, and find that the institution of democracy positively affects efficiency and growth for both sets of countries and the relationship is quite robust. We thus assess the effects of democracy on growth for the two very different sets of countries, distinguished clearly in terms of ethnicity.[5] In a generalized set-up, we study both the direct and indirect (via ethnicity) effects of democracy. An important aspect of our methodology is the use of the system Generalized Method of Mo-

[5]Capturing the impact of the extreme cases in this way is important, because we should not in principle pool the data for countries with very high and very low degrees of fractionalisation. However, for completeness, we also pool the data and estimate one empirical model. We find that the results from the pooled sample concur with the results from the non-pooled samples, although the statistical evidence is weakened. If, on the other hand, we chose a general random sample, that would represent an average of all the coefficients, and would not capture the heterogeneity in the data.

ments (GMM) panel estimator. In our view, this tackles quite effectively the endogeneity and possible joint determination problems mentioned by Bluedorn (2001), and Alesina and La Ferrara (2005).[6] Like Bluedorn, and Alesina and La Ferrara, we obtain the result that democracy mitigates the adverse effects of ethnic diversity. However, in contrast to their findings, in our model the direct effects of democracy turn out to be positive and significant, and this result holds for both sets of countries, which lends support to the view that democracy per se is good for growth. [7]

To expand on the potential endogeneity issue that could arise in this kind of research on institutions and growth, we note that Bluedorn (2001) presents empirical evidence supportive of democracy's positive role, but also points to the fact that "endogeneity problems and some negative direct effects of democracy weaken the case for establishing democratic institutions as a policy solution for poor economic performance due to ethnic diversity" (page 122). Alesina and La Ferrara (2005) also point to the potential endogeneity problem that exists between ethnic fractionalization and democracy: "It may be the case that racially fragmented societies that choose democratic institutions are also those in which ethnic cleavages are less deep and/or the power distribution of groups is such that none can impose a nondemocratic rule" (pages 772-3). As discussed in detail later, our empirical analysis assigns particular importance to this endogeneity issue and we use an estimator that, we believe, adequately addresses this problem. Taking into account the endogeneity issue, we show that democracy favours growth even when countries are not ethnically diverse.

The remainder of the paper is organized in the following way: Section 2 provides a discussion of the related literature. Section 3 develops the theory and derives the analytical results. Section 4 discusses the data, specifies the empirical model and the econometric methodology, and reports the empirical findings; and Section 5 concludes.

[6]It should be noted that using the ELF index to capture ethnic diversity, by itself, ought to reduce the endogeneity problem significantly. Researchers generally advocate the use of ELF precisely because it is based on divisions as recorded in the 1960s, or divisions established before most countries in Latin America, Eastern Europe, Post-Soviet states and Asia democratised. However, given that our sample covers the 1960-2009 period, such endogenous relationship may have been more likely, as Eastern Europe, Post-Soviet states, and many currently democratic countries in Africa and Asia had yet to democratise.

[7]This result is significant and can be rationalised also along the lines that a greater degree of political freedom through more developed democratic institutions often fosters more economic freedom, which tends thereby to stimulate growth (see, for example, Friedman (1962), and Barro (1996)). To substantiate this empirically, we included Economic Freedom as an additional explanatory variable, by obtaining data for economic freedom for our sample from the Heritage Foundation (http://www.heritage.org/index/). We find that by considering the interaction of economic freedom with ethnic fractionalization and democracy, we obtain a positive effect on economic growth. These results are not reported, but are available from the authors upon request.

2 Related Literature

The theoretical literature dealing with the relationship between institutions, growth and redistribution on one hand and that studying the inter-play of economic performance, ethnic divisions and regime transitions (between democracy and non-democracy and vice versa) on the other, is both rich and diverse. We discuss a few papers which are most closely linked to our current work. Lizzeri and Persico (2005) consider election campaigns which can promise voters both targeted transfers and the provision of a universal public good. They analyse the effect of increasing the number of parties which compete for political power and show that the greater the number of parties, the larger are the inefficiencies in the provision of the public good. Fernandez and Levy (2008) study the relationship between redistribution and taste diversity using a model with endogenous platforms involving redistribution and targeted public goods, and find a non-monotonic relationship. Our paper – in relation to the above-mentioned work – performs a different set of comparative static exercises, namely the change in public good provision with respect to ethnic diversity and how that compares across institutional settings. Padro i Miquel (2007) provides a mechanism, different from ours, in which the presence of ethnicity and the lack of "institutionalized succession processes" enable the ruler to extort from significant parts of the population. This works through the fear of falling under an equally incompetent replacement ruler who would favour the other group. Acemoglu et al (2010) study how non-democratic regimes use the military and how this can lead to the emergence of military dictatorships. We abstract from such dynamic considerations and focus on public goods provision under alternative regimes.

Since Easterly and Levine (1997), who argue persuasively that ethnic divisions negatively affect growth, it is widely acknowledged that ethnic diversity is a factor that deters growth. The basic idea is that societies that are highly polarised usually find it difficult to find common ground as regards the type and amount of public goods like infrastructure that they would like their governments to provide (see Alesina and Drazen (1991), Alesina and Rodrik (1994), among others), and reduction in levels of public goods provision lowers growth (Alesina et al. (1999)). This idea is echoed by Banerjee and Somanathan (2007), etc., who contend that even when the amount of public goods is not the issue, the quality of such goods is. Thus ethnically diverse communities may not only have fewer public goods, but also ones of inferior quality. [8]

Why could an institution such as democracy make a difference in this context? Democracy is often regarded in policy circles as a sort of panacea for overcoming the problems associated with coordination failure in ethnically divided societies on the grounds that the electoral process would address such problems in a synchronized way. Bluedorn (2001), Collier (1998, 2000), and Alesina and La Ferrara (2005), all show that democracy, as an in-

[8] In contrast, there is also some literature that argues that ethnicity could actually facilitate collective action and strategic coordination over a range of political outcomes. For example, Fearon and Laitin (1996) explain inter-ethnic cooperation arising out of a fear of conflict between individuals spiralling to the whole group. They also analyse the situation where each ethnic group polices its members by imposing sanctions on its own deviant members, while ignoring deviations by members of other ethnic groups.

stitution, can be an important factor in ameliorating the adverse effects of ethnic diversity on growth in ethnically diverse nations. This view is challenged by some commentators (for instance, Kaplan (2000), Zakaria (2003)), who feel that ushering in democracy to low-income countries with high ethnic divisions could produce instability and chaos, but the thorough analysis conducted by Rodrik and Wacziarg (2005) for upto 154 democratised countries, as well as for sub-samples involving (i) low-income, (ii) ethnically fractionalised, and (iii) sub-Saharan African countries, shows quite the reverse.[9] Turning now to studies on countries where ethnic divisions are less prominent, the general finding of Bluedorn (2001), Collier (1998, 2000), and Alesina and La Ferrara (2005) is that although democratic institutions could quite successfully resolve conflict in ethnically diverse nations, their role in nations with fewer ethnic divisions could be less prominent. In a similar vein to Bluedorn (2001), but investigating the link between democracy and growth volatility, Yang (2008) finds that democracy can significantly reduce growth volatility for countries with high degrees of ethnic heterogeneity, but this is not true for countries with low ethnic diversity.

Although the role of democracy in the presence of ethnic diversity is well-acknowledged, its role in ethnically homogeneous societies cannot be underestimated. Olson (1993) points out, the promises that an autocrat may make (about not confiscating society's wealth, for example) are never completely credible, "because autocratic power by definition implies that there cannot be any judges or other sources of power in the society that the autocrat cannot overrule" (page 571). And as Drury et al. (2006) observe, it is not that corruption does not occur in democracies, but that politicians in power in democratic forms of government are much more likely to refrain from indulging in rampant corruption, given the threat of being punished in the next election. A good example of an ethnically homogeneous nation that suffered a great deal under a non-democratic regime is provided by Haiti (which has a fractionalization index of 1: see Table 1) under the Duvaliers – a stark reminder of the fact that much of the country's productive resources had been siphoned off by corrupt politicians is that 150 km of railroad were sold as scrap metal by a member of the ruling elite (see Abbott (1988), page 172)! This, being one of the worst recorded incidences of corruption in the world, highlights the point that non-democratic regimes are not subject to any credible commitment device in the absence of regular elections, a la Olson (1993), and this is true irrespective of whether or not there are ethnic divisions in society.

Our theoretical and empirical predictions are in concordance with Papaioannou and Siourounis (2008a) who analyse the effect on growth before and after incidents of permanent democratic transitions and find that democratisation events have sizeable long-run benefits. Using panel regression techniques, they find that democratisation leads to almost a 1% increase in real annual per capita GDP growth. They also show that countries that did the reverse switch from democracy to autocracy (like Gambia, Lebanon and Zimbabwe) experienced slower growth.[10] A similar result is obtained by Persson and Tabellini (2009),

[9] In fact, democratisation leads to a short-term boost in growth for their smaller samples that exceeds the one for their full sample!

[10] Papaioannou and Siourounis (2008b) identifies 63 democratic transitions during the 1960-2005 period.

who find that the estimated probability of autocracy reduces (has little effect on) economic growth in democracy (autocracy). This concurs with our result that democracy has a powerful positive – rather than negligible – effect on growth.

3 The Model

We develop a simple model to capture the effect of ethnic diversity on growth under different political structures. So, we will first describe the equilibria in each of the two scenarios and then conduct comparative statics vis-a-vis ethnic diversity.

We begin with the analysis of a democratic setup.

3.1 Democracy

Here we will assume that there are two (exogenously given) political parties, A and B who compete for votes from the citizens. There is a unit mass of voters and for simplicity assume that there is one dominant ethnic group with mass $\lambda \in [1/2, 1)$.[11] Hence, a lowering of (rise in) λ would correspond to an increase (decrease) in ethnic diversity. The mass $1 - \lambda$ could be composed of several different ethnic groups or just one ethnic group; it does not matter in our setup.

There is a budget, of amount M, which may be spent on providing the citizens with public goods (or public investment) which can potentially boost growth. Now, the budget could be spent on two different public goods. One is a truly *general* public good — call it G — investment in which benefits all citizens equally. The other is an ethnic-specific good E, designed to benefit only members of the dominant ethnic group, i.e., the λ– group. Hence, the budget constraint — for either of the two parties — is given by

$$\lambda.e + g \leq M.$$

We will denote party j's platform by (g_j, e_j) for $j = A, B$. The parties simultaneously propose platforms, and each party seeks to maximize its expected number of votes given the other party's platform.

We assume that there is heterogeneity in preference for the ethnic-specific good E. The payoffs to the voters are described below.

Take the case when $e > 0$. On being offered (g, e), the payoff to a member of the $(1 - \lambda)$–group is simply g. On the other hand, the payoff to a member i of the λ– group is given

Using their data-set to test theories on the pre-requisites for democracy in the countries that entered the Third Wave as non-democracies, they find that democratization is more likely to emerge in affluent and especially educated societies.

[11] One could think of this λ–group being composed of several smaller distinct ethnic groups, with some overlap in taste for a common local public good. More on this later.

by

$$u_i(g, e; \lambda) = g + e + \epsilon_i$$

where ϵ_i is drawn from a distribution with cdf F independently for every i in the λ–group. Also, $E[\epsilon] > 0$ and $f \equiv F' > 0$ everywhere on the real line. Moreover, let f be symmetric and unimodal so that the mode is at $E[\epsilon]$. This implies $F(0) < \frac{1}{2}$. This re-iterates the fact that it is more likely for a member (of the dominant group) to actually have a positive realization of ϵ, than not.

Observe that the ethnic-specific good E, with its element of taste-heterogeneity, easily lends itself to the following interpretation(s). One could think of different scenarios where the dominant ethnic group specializes (or has disproportionate shares) in a certain sector/industry. Hence, increasing investment in E would by and large benefit most members of the group but not all; some might actually be hurt if their fortunes are tied to other sectors/industries. Alternatively, one could think of this λ– group as being composed of smaller ethnically *distinct* sub–groups who are united in their common affinity for E. So the ethnic good E could be veiwed as a kind of "compromise" local public good for this λ– group, where every member of the λ– group has a positive expected return from consuming E, which is equal *ex ante*.

In this setup, public investment in either good — G or E — is beneficial to the community in *aggregate terms*. Clearly, G has the advantage of reaching out to all members of society while the benefits from E are limited to (certain) members of the dominant ethnic group. One can think of overall output Y being a standard CES function — involving g, λ and e — of the following form:

$$Y(g, \lambda e) = A[\alpha g^\rho + (1 - \alpha)(\lambda e)^\rho]^{1/\rho}$$

where $\rho \in (0, 1)$ and $\alpha \in (\frac{1}{2}, 1)$. This assumption on α guarantees that when the entire budget is being spent on either G or E, spending it on G yields a higher output. In other words,

$$Y(M, 0) > Y(0, M).$$

To see why, note the following:

$$Y(M, 0) = A\alpha^{1/\rho} M \text{ and } Y(0, M) = A(1 - \alpha)^{1/\rho} M.$$

Hence,

$$\frac{Y(M, 0)}{Y(0, M)} = \left(\frac{\alpha}{1 - \alpha}\right)^{1/\rho} > 1$$

since $\alpha > \frac{1}{2}$.

A is the TFP term which we assume satisfies the following condition:

$$A \geq \frac{1}{(1 - \alpha)^{\frac{1}{\rho}}}$$

Hence, it is possible to generate an output level of M, when all the budget is spent on the E good.[12]

Now we are in a position to analyze the equilibrium of this simple game and then study its dependence on ethnic diversity (as captured by λ). In fact, the following observation is a step in that direction.

OBSERVATION **1.** *There exists a $\underline{\lambda} > 1/2$, such that both parties proposing to spend the entire budget on the public good G is the unique equilibrium for every $\lambda \in [1/2, \underline{\lambda}]$.*

Proof. Start with $(e_A = e_B = 0, g_A = g_B = M)$. Here, each party gets an expected payoff of $1/2$. Suppose party A deviates to $\tilde{e}_A > 0$. This implies that A will definitely lose the votes from the $(1-\lambda)$–group (since they get a payoff of M from party B and A cannot guarantee them M if $\tilde{e}_A > 0$). Hence, the optimal deviation for A involves $\tilde{e}_A = M/\lambda$.

Now, a voter i of the λ–group votes for A if

$$\tilde{e}_A + \epsilon_i > g_B.$$

Otherwise, voter i favours B and this happens with probability $F(g_B - \tilde{e}_A) = F(M - M/\lambda)$. In other words, he votes for A with probability $1 - F(M[(\lambda-1)/\lambda])$. Hence expected votes for A is given by

$$V(\lambda) \equiv \lambda\{1 - F(M[(\lambda-1)/\lambda])\}.$$

Now, $V(\lambda) < 1/2$ for $\lambda = 1/2$ since $f > 0$ everywhere on the real line. This implies that the deviation by A is unprofitable for $\lambda = 1/2$. By the continuity of $V(.)$ in λ, this implies the existence of some δ–neighborhood around $\lambda = 1/2$ such that $V < 1/2$ in that δ–neighborhood. This gives a $\underline{\lambda} > 1/2$ such that $V(\lambda) < 1/2$ for every $\lambda \in [1/2, \underline{\lambda}]$ making $(e_A = e_B = 0, g_A = g_B = M)$ an equilibrium in that λ– interval.

For uniqueness, note the following. In any equilibrium, each party must have an expected payoff of $1/2$ otherwise 'mimicry' is always a profitable deviation. Any equilibrium apart from $(e_A = e_B = 0, g_A = g_B = M)$ necessarily involves at least one party offering a positive amount of E. The arguments above establish that any such platform must necessarily yield a payoff lower than $1/2$ when the other party proposes to spend the entire budget on G. Thus, $(e_A = e_B = 0, g_A = g_B = M)$ is the only equilibrium in that λ– interval. ∎

This leads us to the question of what happens when the size of the dominant ethnic group is beyond this threshold level of $\underline{\lambda}$. In particular, is there any other equilibrium other than $(e_A = e_B = 0, g_A = g_B = M)$ when we move beyond $\underline{\lambda}$? The following observation sheds some light on this matter.

OBSERVATION **2.** *There exists a $\overline{\lambda} > 1/2$, such that both parties proposing to spend the entire budget on the ethnic-specific good E is the unique equilibrium for every $\lambda \in [\overline{\lambda}, 1)$.*

[12] This automatically guarantees that it is possible to get an even higher output by spending all the budget on the G good.

Proof. Start with $(e_A = e_B = M/\lambda, g_A = g_B = 0)$. Here, each party gets an expected payoff of $1/2$.

Suppose party A deviates to $(g'_A, e'_A) > \mathbf{0}$. This implies that A will definitely lose the votes from the λ–group. To see why, note the following.

For any i in the λ–group, the payoff from B is $M/\lambda + \epsilon_i$. From (g'_A, e'_A), the same voter's payoff is $(M - g'_A)/\lambda + g'_A + \epsilon_i$. But

$$(M - g'_A)/\lambda + g'_A + \epsilon_i = M/\lambda + g'_A(1 - 1/\lambda) + \epsilon_i < M/\lambda + \epsilon_i$$

since $1/2 \leq \lambda < 1$. Hence, $(g'_A, e'_A) > \mathbf{0}$ cannot be a profitable deviation for A for any $\lambda \in [1/2, 1)$.

Now suppose A deviates to $g'_A = M$. Recall $V(\lambda) \equiv \lambda\{1 - F(M[(\lambda - 1)/\lambda])\}$ from Observation 1. Note that $V(\lambda)$ here is the payoff to B when A proposes $g'_A = M$ and B proposes $(e_B = M/\lambda, g_B = 0)$ for any given λ. Hence, $V(\lambda) \geq 1/2$ implies that A's deviation is not profitable.

Now, $V(\lambda) > 1/2$ for $\lambda = 1$ since we have $F(0) < 1/2$. By the continuity of $V(.)$ in λ, this implies the existence of some δ'–neighborhood around $\lambda = 1$ such that $V > 1/2$ in that δ'–neighborhood. This gives a $\overline{\lambda} > 1/2$ such that $V(\lambda) > 1/2$ for every $\lambda \in [\overline{\lambda}, 1)$ making $(e_A = e_B = M/\lambda, g_A = g_B = 0)$ an equilibrium in that λ– interval.

For uniqueness, note the following. Any equilibrium apart from $(e_A = e_B = M/\lambda, g_A = g_B = 0)$ necessarily involves at least one party offering a positive amount of G. The arguments above establish that any such platform must necessarily yield a payoff lower than $1/2$ when the other party proposes to spend the entire budget on E. Thus, $(e_A = e_B = M/\lambda, g_A = g_B = 0)$ is the only equilibrium in that λ– interval. ∎

So far we know that there are intervals $[1/2, \underline{\lambda}]$ and $[\overline{\lambda}, 1)$ where the equilibrium is unique though different in each of the two intervals. Moreover, it must be that $\underline{\lambda} \leq \overline{\lambda}$. This raises the following questions: *Are $\underline{\lambda}, \overline{\lambda}$ actually distinct? If yes, then what are the equilibria for any $\lambda \in (\underline{\lambda}, \overline{\lambda})$?*

It turns out that there is a unique value of λ — call it $\hat{\lambda}$ — such that $(e_A = e_B = 0, g_A = g_B = M)$ is the unique equilibrium for all $\lambda < \hat{\lambda}$ and $(e_A = e_B = 0, g_A = g_B = M)$ is the unique equilibrium for all $\lambda > \hat{\lambda}$. This is stated more formally in the following observation.

OBSERVATION **3.** *There exists a unique $\hat{\lambda} \in (1/2, 1)$, such that $V(\lambda) \equiv \lambda\{1 - F(M[(\lambda - 1)/\lambda])\}$ is lower (higher) than $1/2$ for $\lambda < (>)\hat{\lambda}$ and $V(\hat{\lambda}) = 1/2$.*

Proof. By inspection it is clear that the derivative of $V(\lambda)$ w.r.t. λ — call it V_λ — is of ambiguous sign. As noted earlier, $V(\lambda) < 1/2$ for $\lambda = 1/2$ and $V(\lambda) > 1/2$ for $\lambda = 1$. Hence, by the continuity of V in λ, there exists $\lambda \in [1/2, 1)$ such that $V(\lambda) = 1/2$. Let $\hat{\lambda}$ be such a λ. We will argue that there can only be one such $\hat{\lambda}$.

Observe the following equation:

$$\lambda\{1 - F(M[(\lambda - 1)/\lambda]) = 1/2.$$

Let $x \equiv 1/\lambda$. So, $x \in (1, 2]$. Hence, the above equation can be written as

$$x + 2F([1 - x]M) = 2.$$

If we can show that the solution to the above equation is unique, we are done. Define $y(x) \equiv x + 2F([1 - x]M)$. Note that

$$\frac{\delta y}{\delta x} = 1 - 2Mf([1 - x]M).$$

Also,

$$\frac{\delta^2 y}{\delta x^2} = 2M^2 f'([1 - x]M).$$

Given that $x > 1$ and $f'(z) > 0$ whenever $z < 0$ (by the unimodality and symmetry of f around μ_ϵ), this implies $\frac{\delta^2 y}{\delta x^2} > 0$. Hence, $\frac{\delta y}{\delta x}$ is increasing in x for $x > 1$.

Note that $y(2) > 2 > y(1)$. Hence, $\frac{\delta y}{\delta x}$ must be positive for some $x \in (1, 2]$. Combining this with the fact that $\frac{\delta y}{\delta x}$ is increasing in x for $x > 1$, we get that there is a unique x (and hence a unique $\lambda = 1/x$) where $y(x) = 2$. This completes the proof. ■

Before proceeding any further, it may be of interest to know the nature of equilibrium platforms at $\lambda = \hat{\lambda}$. It turns out (as noted in the following observation) that there are four equilibria in pure strategies for $\lambda = \hat{\lambda}$. This multiplicity arises precisely from the fact that $V(\hat{\lambda}) = 1/2$.

OBSERVATION **4.** *There exist four equilibria in pure strategies and a family of mixed strategy equilibria for $\lambda = \hat{\lambda}$. Moreover, the provision of G is either 0 or M depending upon which equilibrium is played out.*

Proof. Both parties offering $g = M$ is an equilibrium. The best possible unilateral deviation is $e = M/\hat{\lambda}$ which yields a payoff of $1/2$ given that $V(\hat{\lambda}) = 1/2$. Both parties offering $e = M/\hat{\lambda}$ is also an equilibrium. The best possible unilateral deviation is $g = M$ which yields a payoff of $1/2$ given that $V(\hat{\lambda}) = 1/2$. Also, $(e_A = M/\hat{\lambda}, g_B = M)$ and $(g_A = M, e_B = M/\hat{\lambda})$ are also equilibria platforms arising from the fact that $V(\hat{\lambda}) = 1/2$. Finally, each party mixing between $g = M$ and $e = M/\hat{\lambda}$ with any positive probability on one of the pure strategies will constitute an equilibrium. This completes the proof. ■

The observations above, taken together, give us the following result.

PROPOSITION **1.** *In a democracy, the relationship between ethnic diversity (as captured by the magnitude of λ) and the share of the pure public good G (or alternatively, the ethnic-specific public good E) provided in equilibrium is (weakly) monotonic in λ. In particular, there is unique value*

of λ — namely, $\hat{\lambda}$ — such that for all $\lambda < \hat{\lambda}$ the unique equilibrium allocation involves spending the entire budget on G, and for all $\lambda > \hat{\lambda}$ the unique equilibrium allocation involves spending the entire budget on the ethnic-specific public good E. For $\lambda = \hat{\lambda}$, the equilibrium provision of G is either 0 or M.

Proof. The proof follows immediately from Observations 1 — 4. ∎

In fact, the above proposition tells us something interesting about the relationship between ethnic diversity (λ) and overall output Y. Noting that $Y(M,0) > Y(0,M)$, we can claim that there exists a *positive* relationship between ethnic diversity and growth in a democracy. Of course, the total budget M would depend upon the total output Y; a higher output presumably means a bigger budget to spend on public goods/targetted transfers and so on. Note, the citizens in our model do not *explicitly* care about the output Y — they derive utility from consuming the public good G and for the dominant ethnic group, the good E. So Y is a *means* to secure a larger M and hence greater consumption of the good(s). [13]

Next we move on to a similar analysis when instead of a two–party electoral democracy, we have a dictatorship in place.

3.2 Dictatorship

In a dictatorship, there will be no explicit role for any political parties. The decision regarding the allocation of budgetary funds for investment into G and E will be taken by the dictator, whom we shall refer to as D.

The other elements of the model remain just as before. We will have our dominant ethnic group of size λ and it will be assumed that the citizens have no direct control over the budget M (just as before). Clearly, in a democratic setup, the allocations proposed by the two parties were governed by considerations of support by the citizens through the ballot. Here, under a dictatorial regime, certain *different* considerations will impel the dictator D to allocate spending in a particular way. We shall return to these considerations shortly.

Recall the overall output Y was given by

$$Y(g, \lambda e) = A[\alpha g^{\rho} + (1-\alpha)(\lambda e)^{\rho}]^{1/\rho}$$

where $\rho \in (0,1)$ and $\alpha \in (\frac{1}{2}, 1)$. This assumption on α guaranteed $Y(M,0) > Y(0,M)$.

There are some basic considerations which any dictator must take into account. First, there is always a threat of a mass revolution. Hence, our dictator D knows that with some chance he will not be ruling the roost in the near future. Secondly, staying in power is precious to D; he may have access to "rents" which depend on the public budget which

[13] This could be made more explicit in a dynamic setting. We avoid doing so here because we believe that the trade-off we wish to highlight can be adequately captured in a static framework.

in turn depends upon the national output.[14] For simplicity, we will assume the following: D lives for one period during which there is a chance of a mass revolution (more on this shortly) and if he survives the revolution (or if there is none) then he can usurp a part of the public budget M.[15] In case D is overthrown, he gets a zero payoff.

Now this brings us to the question of what determines the incidence and success of a "mass revolution". We take the following approach to this problem. We posit a simple two–stage game. In the first stage, the dictator proposes $(g_D, e_D) \geq (0,0)$ subject to feasibility constraints. In the second stage, the members of the two different ethnic groups simultaneously decide whether or not to revolt against D.

What happens when the revolt is "successful" and D is deposed? We take the position that a two-party democracy emerges at the conclusion of a successful rebellion. Hence, at the end of the period, *exactly* one of the two things happen: *either* there is no revolt/the revolt is unsuccessful and D gets to usurp a part of the public budget *or* the revolt results in the removal of D and democracy is restored with citizens voting and deciding the allocation of the budget via the ballot.

Let p denote the probability of a successful revolution. When it is unsuccessful (or if there is no revolt), D gets a fraction $\mu \in (0,1)$ of the public budget M. How does p depend on the parameters of the model? We assume that larger the size of the rebel group λ, the higher is p. For the sake of concreteness, let $p = r$ where r denotes the mass of people who choose to rebel. As a tie–breaking rule, we have that whenever a citizen is indifferent between D's offer and the alternative equilibrium allocation under democracy, he chooses to join the rebelliom. This is easily justified by either allowing citizens to have ethical considerations or it may be that certain other freedoms are curtailed under dictatorships, and so on.

We solve this two–stage game backwards, as is standard practice. Suppose $(g_D, e_D) \geq (0,0)$ is offered by D in the first stage. Take any given $\lambda \in [1/2, 1)$. Recall the cutoff value of λ, namely $\hat{\lambda}$, from the democratic setup. We start with $\lambda < \hat{\lambda}$.

Case 1: Let $\lambda < \hat{\lambda}$.

Take a voter from the minority group, i.e. from the $(1-\lambda)$– group. If D is removed (and voting takes place under democracy), he gets a payoff of M since the entire budget is spent on G for $\lambda < \hat{\lambda}$ (see Proposition 1). On the other hand, if D stays in power, then he gets a payoff of g_D. Hence, a member of the minority group will join the revolt whenever $g_D \leq M$. In other words, the minority group will *always* rebel under this scenario since the maximum amount of g_D possible under dictatorship is $(1-\mu)M$.

Now take a voter i from the λ–group. If D is removed, he gets a payoff of M. On the other hand, if D stays in power, then he gets a payoff of $g_D + e_D + \epsilon_i$, if $e_D > 0$; otherwise he gets g_D. So the dominant group will rebel only if one of the following is true: $e_D = 0$ (since g_D cannot exceed M) or $g_D + e_D + \mu_\epsilon \leq M$.

[14] More on these "rents" later.

[15] Clearly, the size of the budget will depend upon the national output produced.

We turn to the next scenario.

Case 2: Let $\lambda > \hat{\lambda}$.

Take a voter from the $(1-\lambda)$– group. If D is removed, he gets a payoff of 0 since the entire budget is spent on E (see Proposition 1). On the other hand, if D stays in power, then he gets a payoff of g_D. Hence, a member of the minority group will join the revolt if and only if $g_D = 0$.

Now take a voter from the λ–group. If D is removed, he gets an expected payoff of $M/\lambda + \mu_\epsilon$ since the entire budget is spent on E. On the other hand, if D stays in power, then he gets an expected payoff of $g_D + e_D + \mu_\epsilon$, if $e_D > 0$; otherwise he gets g_D. Note, $g_D + e_D \leq M/\lambda$ given the budget constraint. So the dominant group will *always* rebel.

Finally, we turn to the remaining possibility.

Case 3: Let $\lambda = \hat{\lambda}$.

Take a voter from the $(1-\lambda)$– group. If D is removed, he gets an expected payoff which ranges from 0 to M since the provision of G can range from 0 to M (see Proposition 1). On the other hand, if D stays in power, then he gets a payoff of g_D.

Now take a voter from the λ–group. If D is removed, he gets an expected payoff which ranges from M to $M/\lambda + \mu_\epsilon$. On the other hand, if D stays in power, then he gets an expected payoff of $g_D + e_D + \mu_\epsilon$, if $e_D > 0$; otherwise he gets g_D.

In this scenario the mass of the rebel group will depend upon the the expectations of the citizens as to which of the (infinite) equilibria will be played out under democracy. We shall deal with this case later.

We now return to the first–stage of this game and hence to D's problem. D chooses $(g_D, e_D) \geq (0,0)$ to maximize the following:

$$p.0 + (1-p)\mu Y$$

subject to the budget constraint

$$g + e\lambda \leq M.$$

The optimal choice of (e_D, g_D) clearly depends upon the degree of ethnic diversity λ. In fact, the magnitude of λ in relation to the threshold $\hat{\lambda}$ is potentially important.

For Case 1, the size of the rebel group is at least $1-\lambda$. In fact, it is easy to show that for any feasible $e_D > 0$ and $g_D = M - \lambda.e_D$, the dominant group will not join in the revolt. The optimal choice of D for Case 1 is described in the following observation.

OBSERVATION **5.** *Suppose $\lambda < \hat{\lambda}$. The dictator will propose a positive amount of both G and E in the first stage and the dominant ethnic group will choose not to revolt in the second stage. The minority group will revolt.*

Proof. To guarantee the non–participation of the dominant group in the rebellion, D can offer $e_D > 0$ while ensuring $g_D = M - \lambda.e_D$. This ensures the λ–group an expected

payoff of $M - \lambda.e_D + e_D + \mu_\epsilon$ which strictly exceeds M (which is what the λ–group gets in democracy). This implies $p = 1 - \lambda$. We now show that D will actually choose to propose a positive amount of G as well.

The payoff to D from choosing $e_D = M/\lambda$, call it $\pi_D(0, M/\lambda)$, is given by

$$\pi_D(0, M/\lambda) = \mu(1-\alpha)^{1/\rho}M.$$

Now, suppose $e_D > 0$ and $g_D > 0$. Setting up the standard Lagrangean form, we have:

$$L \equiv \mu\lambda[\alpha g^\rho + (1-\alpha)e^\rho]^{1/\rho} + \omega(M - g - e\lambda)$$

where ω is the associated Lagrange multiplier.

The standard FOCs w.r.t. g, e and ω yield the following:

$$\frac{\delta L}{\delta g} = \mu\lambda Y^{1/\rho-1}\alpha\rho g^{\rho-1} - \omega = 0.$$

$$\frac{\delta L}{\delta e} = \mu\lambda Y^{1/\rho-1}(1-\alpha)\rho e^{\rho-1} - \omega\lambda = 0.$$

$$\frac{\delta L}{\delta \omega} = M - g - e\lambda = 0.$$

Using the above equations, we get:

$$e_D = g_D.(\frac{1-\alpha}{\alpha\lambda})^{\frac{1}{1-\rho}}.$$

Using the budget constraint equation, we have

$$g_D = \frac{M}{1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}}.$$

This yields

$$\pi_D(g_D, e_D) = \frac{\mu\lambda M}{1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}}.[\alpha + (\frac{1-\alpha}{\alpha^\rho\lambda^\rho})^{\frac{1}{1-\rho}}]^{1/\rho}.$$

This, on simplication, gives

$$\pi_D(g_D, e_D) = \mu\lambda M\alpha^{1/\rho}[1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}]^{\frac{1}{\rho}-1}.$$

Now we are in a position to compare $\pi_D(g_D, e_D)$ with $\pi_D(0, M/\lambda)$. Note that

$$\pi_D(g_D, e_D) > \mu\lambda M\alpha^{1/\rho} > \mu\lambda(1-\alpha)^{1/\rho}M/\lambda = \pi_D(0, M/\lambda)$$

where the second inequality follows from $Y(M, 0) > Y(0, M/\lambda)$. This establishes that D will propose positive amounts of both E and G as described by the equations above, thus completing the proof. ■

Next we turn to D's choice under Case 2, i.e., when $\lambda > \hat{\lambda}$.

OBSERVATION **6.** *Suppose $\lambda > \hat{\lambda}$. The dictator will propose a positive amount of both G and E in the first stage and the dominant ethnic group will choose to revolt in the second stage. The minority group will not revolt.*

Proof. We know from the discussion above that regardless of what D offers, the dominant group will always rebel. To ensure the non–participation of the minority group, D has to offer some positive amount of G. So D will either propose $G = M$ or will offer a positive amount of both G and E. Note, the chance of the revolution succeeding in either case is $p = \lambda$.

Now, suppose $e_D > 0$ and $g_D > 0$. Setting up the standard Lagrangean form and solving (like in the previous Observation), we get:

$$e_D = g_D.(\frac{1-\alpha}{\alpha\lambda})^{\frac{1}{1-\rho}} \text{ and } g_D = \frac{M}{1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}}.$$

Thus, the payoff to D from this offer is

$$\pi_D(g_D, e_D) = \mu(1-\lambda)M\alpha^{1/\rho}[1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}]^{\frac{1}{\rho}-1}.$$

Now, if D were to spend the entire budget on G, his payoff would be

$$\pi_D(M, 0) = \mu(1-\lambda)M\alpha^{1/\rho}.$$

Clearly, $\pi_D(M, 0) < \pi_D(g_D, e_D)$. This establishes the observation. ∎

Now we come to the possibility where $\lambda = \hat{\lambda}$, i.e., what we previously termed Case 3. Now, the analysis of this case necessarily involves imposing some structure on the beliefs of the players as to what outcome will result in democracy as we saw that there is an infinite number of possible equilibria (see Observation 4). Although, this would be an interesting exercise *per se*, we abstain from a complete treatment here and just analyze two possible belief structures by the players.

First, suppose that the citizens and the dictator believe that in case of a two–party competition (under $\lambda = \hat{\lambda}$), both parties will actually offer $G = M$. The other belief structure that we will deal with is the polar opposite — namely, that the citizens and the dictator believe that (in the same scenario) both parties will actually offer to spend the entire budget on E.[16] Note, when we impose the belief (on the players) that the entire budget would be spent on G, the case boils down to the scenario of $\lambda < \hat{\lambda}$. On the other hand, when we impose the belief that the entire budget would be spent on E, the case reduces to the

[16]Clearly, one could perform a more general analysis where all concerned players assume some probability distribution over the possible equilibrium outcomes. While certainly interesting, we believe that it would add little to the main arguments in this paper.

scenario of $\lambda > \hat{\lambda}$. In either case, the dictator would offer positive amounts of both E and G as described by the equations in the previous two observations.

In sum, we have for all possible $\lambda \in [1/2, 1)$ that the dictator proposes

$$e_D = g_D.(\frac{1-\alpha}{\alpha\lambda})^{\frac{1}{1-\rho}} \text{ and } g_D = \frac{M}{1 + (\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}}.$$

It can be easily checked that $\frac{\delta g_D}{\delta \lambda} > 0$ at every equilibrium under dictatorship. In other words, as ethnic diversity increases (λ falls), the provision of G falls under a dictatorship, *irrespective of the initial level of ethnic diversity*.

The above discussion can be summarized in the following proposition.

PROPOSITION **2.** *In a dictatorship, the relationship between ethnic diversity (as captured by the magnitude of λ) and the share of the pure public good G (or alternatively, the ethnic-specific public good E) provided in equilibrium is monotonic. Specifically, the share of G offered by the dictator decreases with the level of ethnic diversity.*

We would like to draw attention to the proposition above and contrast it with our main result for the case of the democratic setup. Recall that in our democratic setup (with the standard two-party competition framework), we obtained that for a highly (ethnically) homogeneous society, the entire budget will be spent on providing E.[17] On the other hand, we find that for a dictatorship, such a homogeneous society will *not* see the entire budget being spent on E. In fact, the more homogeneous the society, the greater the amount of G proposed by the dictator. Thus, the pattern of public expenditure — in particular, the manner it varies with the level of ethnic diversity — is completely different in a democracy as opposed to a dictatorship.

Our theoretical framework can also help us in understanding how growth may be affected as one transits from a dictatorship to a democracy. Note, in our model, the budgetary allocation is never actually output–maximizing under democracy. On the other hand, the dictator always ends up choosing the output–maximizing combination of G and E.[18] This is because after conditioning on the probabilty of a successful revolt, the payoff to D depends upon the total output. However, since he siphons off a chunk of Y (captured by μ in the model) at the end of the period (if he manages to stay at the helm), he reduces the size of the budget available for the next period. There are many ways to interpret μY. Apart from this being personal "rents" to the dictator, one could also think of this as being the cost for the upkeep of a large army/groups of mercenaries and spies (sympathetic to the dictator). Hence, in principle, μ can be quite large and close to unity. Therefore, unless

[17] Interestingly, the more homogeneous the society in terms of preference for E (as captured by the magnitude of λ), the higher the chance that the allocation of the budget is inefficient. This is partly driven by the fact that political parties need compete only for the votes of the ethnic majority as long as the latter are of sufficient numerical strength.

[18] In a sense, this is partially driven by the structure of $Y(g, e)$ where the output–maximizing mix of (g, e) must necessarily be positive.

μ is negligible (which is highly unlikely for any dictator in reality!), our model informs that growth will be higher under democracy than under a dictatorial regime.[19] In other words, there is a threshold level for μ beyond which democracy will always dominate dictatorship from an economic standpoint. To see this a bit formally, note the following.

The output in a democracy depends upon the size of the dominant ethnic group. Proposition 1 tells us that it is either $\alpha^{1/\rho}M$ or $(1-\alpha)^{1/\rho}M/\lambda$. Also, we know that $\alpha^{1/\rho}M > (1-\alpha)^{1/\rho}M/\lambda$ for all $\lambda \in [1/2, 1)$. On the other hand, the amount of output (net of appropriation) under a dictatorship is given by

$$(1-\mu)\alpha^{1/\rho}M[1+(\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}]^{\frac{1-\rho}{\rho}}.$$

Hence, any μ which satisfies the following condition is sufficient for our argument:

$$(1-\mu)\alpha^{1/\rho}\lambda[1+(\frac{1-\alpha}{\alpha})^{\frac{1}{1-\rho}}(\frac{1}{\lambda})^{\frac{\rho}{1-\rho}}]^{\frac{1-\rho}{\rho}} \leq (1-\alpha)^{1/\rho}.$$

Define $x \equiv \frac{\alpha\lambda^\rho}{1-\alpha}$. By our assumptions on α and ρ, we have $x > 1$.

A simple re-arrangement of terms yields that the above requirement is equivalent to:

$$\mu \geq 1 - \frac{1}{x^{1/\rho}(1+\frac{1}{x^{\frac{1}{1-\rho}}})^{\frac{1-\rho}{\rho}}} \equiv \underline{\mu}.$$

Hence, for regimes with sufficient appropriation ($\mu \geq \underline{\mu}$), dictatorship is dominated by democracy in terms of economic performance. Of course, $\underline{\mu}$ depends upon the size of the dominant ethnic group λ and it is easily checked that $\frac{\delta\underline{\mu}}{\delta\lambda} > 0$. Intuitively, the larger the dominant ethnic group, the lower the output in a democracy (see Proposition 1) and hence stricter the requirement on the threshold level of appropriation.

Finally, we can use our model to ask if the relationship between ethnicity and growth is at all governed by the existing political regime. As Propositions 1 and 2 clearly state, the variation in the pattern of expenditure (between G and E) over the level of ethnic diversity (proxied by λ) is completely *different* under the two political regimes. Interestingly, and perhaps counter–intuitively, the relationship between output and ethnic diversity is (qualitatively) similar under the two regimes.[20] This is perhaps a pointer that one ought to turn to empirical analysis to really tease out the quantitative differences in this regard.

Overall, we believe that our model provides a useful framework to organize our intuition for our empirical analysis which we describe in detail below.

[19] This is particularly true of stable long-standing dictatorships where μ could be rising over time.

[20] It is easily checked that $\frac{\delta Y_D}{\delta\lambda} < 0$ at every equilibrium under dictatorship.

4 Empirical Analysis

4.1 Data and model specification

The empirical analysis uses panel data for the time period, 1960-2009. We follow Easterly and Levine (1997) in the choice of countries for our study. To avoid sample selection bias, we construct panel estimates for the 15 countries that are most fractionalized, and also of the 14 least fractionalized countries reported in their paper (for more details see Easterly and Levine, (1997), Table III, page 1220, reproduced in Table 1 below).[21]

[INSERT TABLE 1 HERE]

The dependent variable for our analysis is the real per capita GDP growth rate. In order to account for the possibility of reverse causality between democracy and the effect on output growth, we implement a three-year moving average of growth as the dependent variable in equation (1) below.[22] There is a lag in the response of growth to changes in democracy, which is picked up by the moving average.

Clearly, the two most important explanatory variables in this study are the fractionalization index and the democracy index. The fractionalization index is constructed from the Soviet ethnolinguistic fractionalization measure, Atlas Narodov Mira (1964), and considered by Easterly and Levine (1997) and Bluedorn (2001), among others. Easterly and Levine construct a measure of ethnolinguistic diversity that measures the probability that two randomly selected individuals in a country belong to different ethnolinguistic groups. The Soviet ethnographers mainly used language to define ethnic groups, but in some cases they included groups that were distinguished in terms of race rather than language (for example, Blacks and Whites in the US are not classified in the same group), and quite often used national origin as the basis of distinction. Alesina et al. (2003) provide new measures of fragmentation by distinguishing between ethnic, linguistic and religious groups in a sample of 190 countries in the 1990s. Their new data allows for the computation of measures of polarization as an alternative to the commonly used index of fractionalization. It is interesting to note also that the Soviet ELF and the ethno-linguistic fractionalization measures produced by Alesina et al. (2003) have very similar correlations between them.

We turn now to the other important explanatory variable, democracy. The main democracy measure that we use in our study is the Freedom House index. The index constructed by us is based on Gastil (1990), where his ranking from 1 to 7 has been converted to a scale from 0 to 1, where 0 corresponds to the fewest political rights (Gastil's rank 7), and 1 to the most political rights (Gastil's rank 1). The 0-1 scale that we use corresponds to Bollen (1990) - see Barro (1996) for details. This indicator of political rights is based on the pro-

[21] Note that in Easterly and Levine (1997), the number of least fractionalised countries is actually 15, but we have to exclude Hong Kong, as we cannot obtain a democracy index for Hong Kong.

[22] See, for example, Tavares and Wacziarg (2001), where most of the variables, including growth and the democracy index, enter as five-year averages, which limits the potential for measurement error and business cycle effects driving the results.

cedural definition of democracy.

However, given the importance of the democracy variable for our analysis, we conduct a robustness check on our results by considering two other democracy indices: (i) the Polity IV index, and (ii) the ACLP index. The Polity IV data, due to Marshall and Jaggers (2000), measures a country's level of democracy and autocracy and creates an overall measure by subtracting the latter from the former, which results in a score in the (-10, 10) range. The ACLP index created by Alvarez et al. (1996) measures democracy as a dichotomous variable, in which countries either are/are not democratic. This is in contrast to the Freedom House and Polity indices where democracy is assigned a rank within a scale. According to the ACLP index, countries are democratic if the chief executive and legislature are elected, and there is more than one political party.[23] As we shall see later, our results remain invariant to the choice of the democracy index.

The other variables used in the regression are controls that are chosen along the lines of Easterly and Levine (1997), Bluedorn (2001), and Alesina and La Ferrara (2005). These are the (log of) initial income and its square, (log of) schooling, assassinations, financial depth (M2 as percentage of GDP), black market exchange rate premium, fiscal surplus (as percentage of GDP), and (log of) telephones per worker. Log of initial income captures the convergence effect, and its square depicts the fact that this effect is non-linear (first rising and then falling with per capita income). Political instability is controlled for by including a measure of assassinations, which Barro (1991) found to be negatively associated with growth. Financial depth is closely linked with financial sector policies. The black market premium variable captures the effects of distortionary domestic (trade, exchange rate, etc.) policies that also affect the growth rate in countries where there generally exist a black market for foreign exchange; see Fischer (1993), Barro (1996), Devarajan et al. (1996), etc. The ratio of fiscal surplus to GDP is an indicator of fiscal stance (see Fischer (1993)), and is expected to have a positive relationship with growth. Telephones per worker are indicative of a country's infrastructural facilities, and is expected to have a positive effect on growth.

Following Bluedorn (2001) who builds on Easterly and Levine's (1997) framework, we examine the effects of democracy on growth by implementing a multivariate testable relationship of the following form:

$$G_{it} = a_i + b_t + \phi ELF_{it} + \eta DEM_{it} + \mu ELF_{it} * DEM_{it} + \psi(X) + e_{it} .....(1)$$

where i indexes nations, and t denotes the time period; a_i captures the time-invariant unobserved country-specific fixed effects, and b_t captures the unobservable individual-invariant time effects. G is the growth rate of real GDP per capita, ELF is the ethnolinguistic fractionalization measure, DEM is the democracy measure, X is a vector of controls, and e is a white noise error term. A negative sign for ϕ indicates that ELF affects growth adversely, a positive sign for η implies that democracy is good for growth, and a

[23] These democracy indices are used also by Drury et al. (2006) in studying the effect of democracy on growth via its effect on corruption.

positive sign for μ – the coefficient on the interactive term (ELF*DEM) – is indicative of the fact that democracy has a moderating influence on the deleterious effects of ethnicity on growth.

4.2 Econometric Methodology

4.2.1 Seemingly Unrelated Regressions (SUR)

Easterly and Levine (1997), Bluedorn (2001), and Alesina and La Ferrara (2005) employ a SUR system estimator. This is because it deals with contemporaneous correlation, which they assumed to exist between the three different decades that they examined (the 1960s, 1970s and 1980s).

We begin the empirical analysis by examining if cross-country residuals are contemporaneously correlated, since countries are exposed to similar kinds of systematic shocks. We test for the contemporaneous error correlations by computing the Breusch and Pagan (1980) Lagrange Multiplier (LM) statistic, λ_{LM} :

$$\lambda_{LM} = T \sum_{i=2}^{n} \sum_{j=1}^{i-1} r_{ij}^2 .....(2)$$

where r_{ij}^2 is the squared ij-th correlation coefficient of cross-country residuals. Under the null of no contemporaneous error correlations across the countries, the test statistic is asymptotically χ^2 distributed with $N(N-1)/2$ degrees of freedom, where N denotes the number of countries in the panel. The p-value of the LM test statistic is zero, which rejects the null hypothesis, suggesting that error series are contemporaneously correlated across all the countries in each of the samples, therefore justifying the use of the SUR econometric methodology used in previous studies. [24]

4.2.2 Generalized Method of Moments (GMM)

Even though the SUR estimator takes into account contemporaneous correlation across countries, it fails to capture the endogeneity in the explanatory variables of the panel.[25] The endogeneity issue is particularly relevant for some of the included variables, e.g.,

[24]Note the fixed effects panel estimator is not applicable to our econometric analysis because it does not encapsulate the contemporaneous correlation across the countries in our sample.

[25]In order to formally test the explanatory variables for endogeneity, we perform a Hausman test for the hypothesis that the explanatory variables are strictly exogenous. If the null hypothesis is rejected, it leads to the conclusion that the explanatory variables in equation (1) are endogenously determined. In our empirical estimates, the Hausman test rejects the null hypothesis at all conventional significance levels. This leads to the conclusion that we need to tackle the econometric issue of endogeneity for our explanatory variables. The result of the Hausman test is not reported by the authors, but is available upon request.

schooling (human capital). A higher level of education acquired through schooling is likely to be a determinant of democracy as well as one of its outcomes: see Tavares and Wacziarg (2001). This example demonstrates that tackling the endogeneity issue is particularly important in our context.

Initially, we embark upon the use of the single equation GMM panel estimator developed by Arellano and Bond (1991) to deal with the endogeneity of our explanatory variables. We implement the GMM single equation estimator instead of the Two Stage Least Squares method because, as mentioned in Biorn and Klette (1999), the GMM is asymptotically efficient under non-restrictive assumptions about error autocorrelation and heteroscedasticity. We test the validity of the instruments with the use of the Sargan test under the null hypothesis that the instruments used are valid. The Sargan test results in a p-value of zero confirming that the instruments used are not valid. The fact that the GMM single equation estimator yields invalid instruments suggests that the empirical findings in our analysis based on this estimator would be weakened.[26]

A possible reason for the weak instruments in our study (which is likely to be true also for Easterly and Levine (1997) and Bluedorn (2001)) is that the time dimensions of the panels are relatively small (49 annual observations for our study and 30 for theirs). The single equation estimator suffers from the problem of weak instruments also when the cross-sectional component of the panel is small. This implies that there is a weak correlation between the regressors and the instruments. As a result of this problem, the estimated coefficients suffer from poor precision (see, among others, Staiger and Stock (1997)). We can overcome this problem by using the panel GMM system estimator proposed by Blundell and Bond (1998), which radically reduces the imprecision associated with the single equation estimator.[27]

4.3 Results

4.3.1 Empirical estimates

[INSERT TABLES 2, 3 AND 4 HERE]

Table 2 reports the panel estimates for the first set of regressions that study the effects

[26]One of the earlier papers that uses the GMM estimator in a growth context in the presence of qualitative variables is by Caselli et al. (1996). More recent papers where GMM is used in the presence of qualitative variables include Castello-Climent (2008), where the results using a system GMM estimator reveal that education stimulates democratic institutions. Pereira and Teles (2010) also use system GMM estimation to demonstrate that political institutions work as a substitute for democracy, thus promoting economic growth. See also Gyimah-Brempong (2002).

[27]The Three Stage Least Squares (3SLS) panel estimator also estimates a system of equations simultaneously and is regarded as an alternative to the GMM system estimator. Tavares and Wacziarg (2001) use the 3SLS technique, where they first estimate the effect of democracy on a variable (e.g., physical capital) that affects growth, and then find the effect of that variable on growth. However, we implement the GMM system estimator, given that it accommodates for the possibility of joint determination of an equation system with different instruments for different equations (Schmidt (1990)).

of ethnicity and democracy on the (moving average of the) real per capita growth rate, considering the Freedom House democracy index. For robustness, we repeat the exercise for the Polity IV and ACLP democracy indices, and report these results in Tables 3 and 4 respectively. From Tables 2-4 we find, first of all, that the fixed and time effects are significant, suggesting that the country- and time-specific shocks differ significantly across the nations in our sample, justifying the use of the panel. In addition, all estimated models pass the diagnostic tests. A test for first order serial correlation is insignificant, which suggests that the panels do not suffer from serial correlation. The Jarque-Bera normality test indicates that the residuals of the models are normally distributed, implying that the empirical estimates obtained are not due to any outliers in the data. The Sargan tests confirm the validity of the instruments in both GMM system models.

The estimates for the SUR, which are performed first (for both most and least fractionalized countries), are strikingly similar to those obtained by Bluedorn (2001), with the control variables having exactly the same sign and being significant at the 5% level.[28] In addition, both ELF and DEM are negative and significant, while the (ELF*DEM) interaction term is positive and significant.[29]

Columns (3) and (4) of Tables 2—4 report the results for the most and least fractionalized countries using the GMM system. It is clear from the diagnostics that the standard error of the GMM system is significantly less than the SUR, and the R^2 is also much bigger, which amply demonstrates the better fit obtained from using the GMM. It can be observed that other than the coefficient on democracy, all the other coefficient estimates are of the same sign (and significant) as obtained under the SUR. So, using the system, we find that democracy is not only effective in ameliorating the negative effects of ethnic divisions on growth, but is by itself a positive influence on growth, unlike what is obtained by Bluedorn (2001).[30] Thus, overcoming endogeneity by the use of the system GMM also seems to enable us to obtain the positive growth effects of democracy (on its own), something that the SUR do not yield.[31]

Comparing our results with Collier (1998, 2000), we observe that in the latter, democracy raises the growth rate, while fractionalization reduces it - with a "maximally diverse society" growing around 1.6% more slowly than a homogeneous society. But once the interaction term (ELF*Political rights) is included in the regression, the effects of both ethnic diversity and political rights individually become totally insignificant, while the interaction term has a large negative coefficient. Given that in Collier, political rights are

[28]The signs of the different coefficients also agree with Tavares and Wacziarg (2001).

[29]Note that in Collier (1998, 2000), and Alesina and La Ferrara (2005), the same message is conveyed through their respective interaction terms which are negative and significant - the negative sign is due to higher democracy being assigned a smaller number by them.

[30]In the cross-section analysis of Barro (1996), if rule of law, schooling, life expectancy and fertility variables as explanatory variables are excluded, then the estimated coefficient of democracy becomes positive and significant. But including those variables makes the democracy coefficient moderately negative.

[31]Note that our empirical estimates are based on a one lag structure of the GMM system estimator. The econometric analysis is repeated using alternative lag structures and the results do not change. This suggests that the lag structure of the GMM is irrelevant in our empirical work. The GMM system panel results using alternative lag structures are not reported but can be provided by the authors upon request.

measured on a decreasing scale, his results indicate that democracy enormously reduces the problems that exist in highly ethnically divided societies (where a dictatorship could cause society to systematically lose 3% of GDP growth per annum compared with an ethnically homogeneous society).

In Alesina and La Ferrara (2005), it is shown that increasing ELF from 0 to 1 (i.e., moving from perfect homogeneity to maximum ethnic diversity) reduces a country's growth rate by 2% per year. When the authors include an interaction term (ELF*DEM), their results concur with Collier's findings that fractionalization has less negative effects in democracies. They, however, point to the possibility of the DEM variable being endogenous to ELF. This explains the importance we have placed on resolving the potential endogeneity issue in this paper.[32]

4.4 Analysis of direct and indirect effects of ELF on growth

[INSERT TABLE 6 HERE]

Our results on democracy's role in ameliorating the negative effects of fractionalization on growth are quite interesting, and deserve closer scrutiny. Like Bluedorn (2001), we study the marginal (partial) effects of ELF on economic growth.[33] Specifically, we focus on:

$$\delta G/\delta ELF = \phi + \mu DEM.....(i)$$

Bluedorn evaluated these marginal effects at the world averages for DEM in (i), and this turned out to be 0.51, so that the value for (i) in his study becomes -0.023.

We conduct a similar analysis, and for the sake of comparison, we stick to Bluedorn's world average of 0.51 for the DEM variable (which we label as $\overline{DEM}$).

We require to find the partial derivatives of growth with respect to ELF for four sets of estimates: (1) SUR case corresponding to $\overline{ELF}_M$, (2) SUR case corresponding to $\overline{ELF}_L$, (3) GMM case corresponding to $\overline{ELF}_M$, and (4) GMM case corresponding to $\overline{ELF}_L$. We have performed this exercise for the Freedom House, Polity IV and ACLP democracy indices, and all the results are reported in Table 6.

For example, using the Freedom House index, we can compute the partial derivatives

[32]The explanatory variable in the Easterly and Levine (1997) regressions is the average annual growth rate of GDP per capita in the 1960s, 1970s and 1980s, on the grounds that since they are focusing on long-run growth, they could abstract from business cycle fluctuations by studying economic performance over decades. The Bluedorn (2001), and Alesina and La Ferrara (2005) studies also use decadal averages. To be in line with their analysis, we carried out further robustness tests by replacing individual-invariant time effects with dummies for each decade in Tables 2—4. The results (not reported) are quantitatively similar, and are available from the authors upon request.

[33]Although Collier (1998, 2000), and Alesina and La Ferrara (2005) also consider the interaction between ethnicity and democracy, it is not possible to compare our results on the partial derivatives with theirs because their interaction term is negative for reasons noted earlier.

corresponding to (i) above:

$$\delta G/\delta ELF = -0.0177 + (0.056)(0.51) = 0.01086, ...(-i)$$

This provides us with information about the strengths of the overall effects of ELF on the growth rate for the most fractionalized countries. It is quite interesting to observe that although the marginal effect of the ELF variable alone is negative (-0.0177), the overall marginal effect – taking into account the interaction (with the DEM) term – is positive (0.01086), which is different from Bluedorn (2001), where the overall marginal effect of the ELF term remains negative (-0.0098). Now turning to the least fractionalized nations (i.e., (2) above), our SUR estimates reveal that the marginal effect of ELF – taking into account the interaction term – is again positive (0.02998), which means that ELF exerts a positive effect on growth in the presence of democracy, although its marginal effect by itself is negative, and this is true irrespective of the degree of ethnicity.

We perform another interesting exercise. For both most and least fractionalized nations, we compute the value of DEM that makes the partial derivative,$\delta G/\delta ELF$, equal to 0. We find using the Freedom House data that for both most and least fragmented societies, the marginal impacts are 0 when DEM is approximately 0.32. Unlike Bluedorn (2001), where the negative marginal impact of increases in ethnic diversity can never fully be overcome by democracy (as the necessary in that paper); in our case, this value being about 0.32 indicates that this is actually possible for both sets of countries, which points to the powerful impact of democracy on growth for all countries.

We next turn to our GMM estimates, and find that the results obtained therefrom are quite similar to the ones obtained from the SUR as far as the marginal effect of ELF is concerned, for both sets of countries. If we compare the marginal impacts of ELF on growth via the two sets of estimates, we find that the magnitudes of the effects are also quite similar. For instance, using the Freedom House data, we find that for the most fractionalized countries, $\delta G/\delta ELF$ is 1.09% (2.33%) under SUR (GMM); for the least fractionalized countries, $\delta G/\delta ELF$ is 3.00% (2.93%) under SUR (GMM), which again points to the robustness of our analysis.

As before, we find the values of DEM that make the partial derivatives of growth with respect to ELF equal to 0 under the GMM system. For the Freedom House data, the value of DEM that makes the partial derivative of $\delta G/\delta(ELF) = 0$ is almost identical for both highly and hardly fragmented economies (lying between 0.12 and 0.09 in the two cases).[34]

Bluedorn (2001) interprets the positive and significant coefficient on the (ELF*DEM) interaction term as that greater democratic institutions may ameliorate the negative growth effects of ethnic diversity. Also, unlike the results of Collier (1998, 2000), the negative coefficient on ELF alone remains and is significant in Bluedorn. In these two respects, our results are similar to his. However, the main differences with us are that (1) the partial

[34]As mentioned earlier, the full set of results on the values of the partial derivatives are listed in Table 6. The results for the values of DEM that make the partial derivatives equal to zero for the Polity IV and ACLP indices are very similar to those reported for the Freedom House index above, and are available upon request.

derivative of ELF (taking into account the interaction term) is positive in our case, no matter what the estimator is, and this holds for countries with large as well as small ELF values; (2) taking into account endogeneity issues through the use of the GMM system leads to the coefficient on DEM alone being positive, and this holds for most as well as least fractionalized countries: i.e., democracy benefits all sets of countries; and (3) quite importantly, the negative marginal impact of increases in ELF can always be overcome by democracy, given that $DEM \in (0,1)$ for $\delta G/\delta(ELF) = 0$ in each and every case considered.

We conclude this section with a quote from Wittman (1989), which nicely summarises some arguments in favour of democracies being able to produce efficient outcomes (as in our study): "To say that democratic political markets tend toward efficiency does not imply that political markets are superior to economic markets; rather it implies that democratic governments will allocate to the economic markets those tasks in which the economic market is most efficient" (page 1421).[35]

5 Conclusion

The main objective of this study was to explore the relationship between ethnic diversity and economic performance and how the political regime in place influences this relationship; our theoretical framework organizes our intuition and sets the ground for our empirical exercise. Also, this paper aids in the understanding of how public spending may vary across different regimes — for a given level of ethnic diversity — which in turn has implications for growth under these regimes.

Next, we attempted to ascertain empirically whether democracy, by itself, has a positive impact on growth, and also whether it mitigates the adverse effects of ethnic diversity on growth. In performing our empirical analysis, we directly addressed potential endogeneity and joint determination problems – mainly through the use of the GMM system panel estimator – not adequately captured by the previous literature. Our results — using a panel of the most and the least ethnically diverse nations — robustly show that democracy, by itself, has a significantly positive effect on growth irrespective of the degree of ethnicity, even when we include an interaction term involving ethnicity and democracy. We also show that the marginal effect of ethnicity on growth in the presence of democracy is positive, irrespective of the type of estimator (SUR/GMM) used, and holds for the most as well as the least ethnically diverse countries. Finally, in each and every case considered by us, we establish that the negative marginal impact of increases in ethnicity can always be overcome by democracy. These results confirm, but also substantially extend, the type

[35]Note that Barro (1996) advocates the propagation of Western-style economic systems (rather than their political systems per se) to the poorer nations as the effective way to expand democracy to the world. Our results indicate that propagation of economic and political freedom could go hand in hand in promoting economic growth, while Basuchoudhary and Shughart (2010) contend that sound economic, rather than political, institutions could reduce the probability of terrorist attacks in ethnically tense societies in promoting economic growth.

of findings reported in the related literature.

The importance of ethnicity, democracy and growth from a policy perspective is undeniably considerable. Given that this paper attempts first to provide a theoretical framework and then proceeds — on the empirical side — to resolve some important endogeneity and simultaneity issues not directly addressed in much of previous research, the findings of this paper seem particularly relevant.

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Table 1. Ethnolinguistic Fractionalisation Index (ETHNIC).

(1960)

15 Most fractionalized		*15 Least fractionalized*	
Country	**ETHNIC**	**Country**	**ETHNIC**
Tanzania	93	Haiti	1
Uganda	90	Japan	1
Zaire	90	Portugal	1
Cameroon	89	Hong Kong	2
India	89	Yemen	2
South Africa	88	Germany	3
Nigeria	87	Burundi	4
Ivory Coast	86	Dominican Repub	4
CAR	83	Egypt	4
Kenya	83	Ireland	4
Liberia	83	Italy	4
Zambia	82	Norway	4
Angola	78	Iceland	5
Mali	78	Jamaica	5
Sierra Leone	77	Jordan	5

(Reproduced from Easterly and Levine (1997), Table III, page 1220.)

Table 2. Growth regressions: SUR and GMM system panel estimates over the time period, 1960-2009, 3 year moving average (*Freedom House Democracy Data*)

	(1)	(2)	(3)	(4)
Variable	**SUR Estimates Most Fractionalized Countries**	**SUR Estimates Least Fractionalized Countries**	**GMM System Estimates - Most Fractionalized Countries**	**GMM System Estimates - Least Fractionalized Countries**
Constant	16.44 **(2.88)***	17.24 **(2.39)***	17.88 **(2.99)***	17.76 **(2.79)***
Log initial income	0.055 **(2.88)***	0.078 **(2.49)***	0.087 **(2.86)***	0.094 **(2.90)***
Log initial income square	-0.0055 **(-2.53)***	-0.0045 **(-2.56)***	-0.0039 **(-2.74)***	-0.0040 **(-2.84)***
Log schooling	0.067 **(2.57)***	0.056 **(2.44)**	0.0044 **(2.70)***	0.0065 **(2.19)***
Assassinations	-7.50 **(-3.04)***	-7.99 **(-2.76)***	-8.34 **(-3.04)***	-7.32 **(-3.44)***
Financial Depth	0.066 **(2.53)***	0.069 **(2.44)***	0.059 **(2.77)***	0.067 **(2.31)***
Black Market Premium	-0.047 **(2.27)***	-0.040 **(2.17)***	-0.012 **(2.29)***	-0.044 **(2.29)***
Fiscal surplus /GDP	0.27 **(2.90)***	0.33 **(2.77)***	0.29 **(2.04)***	0.33 **(2.98)***
Log telephones per worker	0.0055 **(2.99)***	0.0045 **(2.77)***	0.0023 **(2.68)***	0.0029 **(2.03)***
ELF	-0.0177 **(-3.34)***	-0.0098 **(-4.01)***	-0.0068 **(-3.50)***	-0.0059 **(-3.00)***
Democracy	-0.069 **(-2.67)***	-0.078 **(-2.49)***	0.066 **(2.50)***	0.045 **(2.69)***
(ELF*Democracy)	0.056 **(2.99)***	0.078 **(3.32)***	0.059 **(2.90)***	0.069 **(3.09)***
a_i	(0.00)	(0.00)	(0.00)	(0.00)
b_t	(0.00)	(0.00)	(0.00)	(0.00)
SE	0.50	0.63	0.27	0.33
AR(1)	(0.39)	(0.57)	(0.61)	(0.52)
NORM(2)	(0.40)	(0.22)	(0.40)	(0.59)
Diff Sargan	NA	NA	(0.69)	(0.73)
Hausman test	NA	NA	97.87	96.43
R^2	0.54	0.39	0.69	0.77
Observations	703	703	703	703

Notes: AR(1) is the first order Lagrange Multiplier test for residual serial correlation, undertaken on the residuals for the SUR estimates and on the first difference of the residuals for the GMM system because of the transformations involved. SE represents the standard error of the panel estimator. a_i and b_t are the fixed and time effects. Sargan tests follow a χ^2 distribution with r degrees of freedom under the null hypothesis of valid instruments. Note: the Difference-Sargan test is applicable to the GMM system estimator due to the transformations involved. To establish the validity of the instrument set. NORM(2) is the Jarque-Bera normality test. The Hausman test follows a χ^2 distribution with 11 degrees of freedom, resulting in a critical value of 19.68, at the 95% confidence level. The endogenous explanatory variables in the panel are GMM instrumented setting, $z \geq 1$. (.) are p values, **(.)** are t statistics, * indicate significant at the 5% level.

Table 3. Growth regressions: SUR and GMM system panel estimates over the time period, 1960-2003, 3 year moving average. (*Polity IV Democracy Data*)

	(1)	(2)	(3)	(4)
Variable	**SUR Estimates Most Fractionalized Countries**	**SUR Estimates Least Fractionalized Countries**	**GMM System Estimates - Most Fractionalized Countries**	**GMM System Estimates - Least Fractionalized Countries**
Constant	15.99 **(2.02)***	15.59 **(2.59)***	16.32 **(2.78)***	16.77 **(2.93)***
Log initial income	0.058 **(2.40)***	0.062 **(2.35)***	0.098 **(2.80)***	0.080 **(2.66)***
Log initial income square	-0.0033 **(-2.50)***	-0.0036 **(-2.48)***	-0.0039 **(-2.60)***	-0.0043 **(-2.50)***
Log schooling	0.033 **(2.24)***	0.039 **(2.17)***	0.0044 **(2.09)***	0.0030 **(2.04)***
Assassinations	-7.53 **(-2.70)***	-7.40 **(-2.89)***	-7.77 **(-2.80)***	-7.98 **(-3.33)***
Financial Depth	0.044 **(2.39)***	0.056 **(2.33)***	0.048 **(2.20)***	0.050 **(2.10)***
Black Market Premium	-0.048 **(2.18)***	-0.030 **(2.19)***	-0.020 **(2.19)***	-0.049 **(2.39)***
Fiscal surplus /GDP	0.10 **(2.14)***	0.29 **(2.30)***	0.20 **(2.36)***	0.36 **(2.33)***
Log telephones per worker	0.0048 **(3.08)***	0.0029 **(2.79)***	0.0040 **(2.60)***	0.0050 **(2.63)***
ELF	-0.0055 **(-2.89)***	-0.0077 **(-3.73)***	-0.0068 **(-3.10)***	-0.0087 **(-3.67)***
Democracy	-0.020 **(-2.59)***	-0.043 **(-2.59)***	0.042 **(2.54)***	0.039 **(2.55)***
(ELF*Democracy)	0.039 **(2.70)***	0.067 **(3.10)***	0.060 **(2.98)***	0.076 **(3.00)***
a_i	(0.00)	(0.00)	(0.00)	(0.00)
b_t	(0.00)	(0.00)	(0.00)	(0.00)
SE	0.55	0.65	0.44	0.40
AR(1)	(0.49)	(0.56)	(0.63)	(0.70)
NORM(2)	(0.30)	(0.44)	(0.54)	(0.60)
Diff Sargan	NA	NA	(0.68)	(0.74)
Hausman test	NA	NA	97.83	104.42
R^2	0.39	0.42	0.72	0.59
Observations	642	642	642	642

Notes: AR(1) is the first order Lagrange Multiplier test for residual serial correlation, undertaken on the residuals for the SUR estimates and on the first difference of the residuals for the GMM system because of the transformations involved. SE represents the standard error of the panel estimator. a_i and b_t are the fixed and time effects. Sargan tests follow a χ^2 distribution with r degrees of freedom under the null hypothesis of valid instruments. Note: the Difference-Sargan test is applicable to the GMM system estimator due to the transformations involved. To establish the validity of the instrument set. NORM(2) is the Jarque-Bera normality test. The Hausman test follows a χ^2 distribution with 11 degrees of freedom, resulting in a critical value of 19.68, at the 95% confidence level. The endogenous explanatory variables in the panel are GMM instrumented setting, $z \geq 1.$ (.) are p values, **(.)** are t statistics, * indicate significant at the 5% level.

Table 4. Growth regressions: SUR and GMM system panel estimates over the time period, 1960-2002, 3 year moving average. (*ACLP Democracy Data*)

	(1)	(2)	(3)	(4)
Variable	**SUR Estimates Most Fractionalized Countries**	**SUR Estimates Least Fractionalized Countries**	**GMM System Estimates - Most Fractionalized Countries**	**GMM System Estimates - Least Fractionalized Countries**
Constant	14.90 **(2.06)***	13.83 **(2.50)***	13.27 **(2.67)***	14.49 **(2.79)***
Log initial income	0.052 **(2.57)***	0.048 **(2.19)***	0.088 **(2.70)***	0.083 **(2.60)***
Log initial income square	-0.0033 **(-2.24)***	-0.0029 **(-2.33)***	-0.0010 **(-2.33)***	-0.0038 **(-2.67)***
Log schooling	0.022 **(2.15)***	0.029 **(2.22)***	0.0050 **(2.17)***	0.0047 **(2.24)***
Assassinations	-7.87 **(-2.67)***	-7.38 **(-2.93)***	-7.79 **(-2.80)***	-8.15 **(-3.30)***
Financial Depth	0.047 **(2.37)***	0.055 **(2.20)***	0.066 **(2.20)***	0.069 **(2.11)***
Black Market Premium	-0.039 **(2.19)***	-0.047 **(2.10)***	-0.022 **(2.19)***	-0.056 **(2.19)***
Fiscal surplus /GDP	0.18 **(2.29)***	0.32 **(2.20)***	0.10 **(2.20)***	0.30 **(2.40)***
Log telephones per worker	0.0039 **(3.10)***	0.0010 **(2.66)***	0.0030 **(2.60)***	0.0040 **(2.66)***
ELF	-0.0056 **(-2.80)***	-0.0079 **(-3.42)***	-0.0078 **(-3.00)***	-0.0080 **(-3.40)***
Democracy	-0.024 **(-2.50)***	-0.030 **(-2.65)***	0.038 **(2.39)***	0.029 **(2.55)***
(ELF*Democracy)	0.049 **(2.69)***	0.066 **(3.29)***	0.049 **(2.93)***	0.059 **(2.78)***
a_i	(0.00)	(0.00)	(0.00)	(0.00)
b_t	(0.00)	(0.00)	(0.00)	(0.00)
SE	0.60	0.57	0.30	0.57
AR(1)	(0.40)	(0.67)	(0.60)	(0.60)
NORM(2)	(0.22)	(0.30)	(0.50)	(0.67)
Diff Sargan	NA	NA	(0.71)	(0.77)
Hausman test	NA	NA	94.83	95.67
R^2	0.29	0.23	0.67	0.54
Observations	627	627	627	627

Notes: AR(1) is the first order Lagrange Multiplier test for residual serial correlation, undertaken on the residuals for the SUR estimates and on the first difference of the residuals for the GMM system because of the transformations involved. SE represents the standard error of the panel estimator. a_i and b_t are the fixed and time effects. Sargan tests follow a χ^2 distribution with r degrees of freedom under the null hypothesis of valid instruments. Note: the Difference-Sargan test is applicable to the GMM system estimator due to the transformations involved. To establish the validity of the instrument set. NORM(2) is the Jarque-Bera normality test. The Hausman test follows a χ^2 distribution with 11 degrees of freedom, resulting in a critical value of 19.68, at the 95% confidence level. The endogenous explanatory variables in the panel are GMM instrumented setting, $z \geq 1.$ (.) are p values, **(.)** are t statistics, * indicate significant at the 5% level.

Table 6: Marginal (partial) effect of ELF on growth.

$\frac{\partial G}{\partial (ELF)}$	**FH**	**FH**	**POLITY IV**	**POLITY IV**	**ACLP**	**ACLP**
	ELF_M	**ELF_L**	**ELF_M**	**ELF_L**	**ELF_M**	**ELF_L**
SUR	**0.01086**	**0.02998**	**0.01439**	**0.02647**	**0.01939**	**0.02576**
GMM	**0.02329**	**0.02929**	**0.0238**	**0.03006**	**0.01719**	**0.02209**

In calculating the partial derivatives above, we have used $\overline{DEM} = 0.51$.